Monroe County and Incorporated Municipalities

Key West, Marathon, Key Colony Beach, Layton,
and Islamorada Village of Islands

Local Mitigation Strategy

2010 Update

October, 2010

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Chapter 1. Introduction

Monroe County, Florida, and its incorporated municipalities of the Village of Islamorada, City of Layton, City of Key Colony Beach, City of Marathon, and the City of Key West, undertook development of this 2010 Update of the *Local Mitigation Strategy* (LMS) because of its awareness that natural and man-made hazards, especially hurricane and flooding hazards, may affect many people and property. The 2010 Update replaces the 2005 Update of the 1999 LMS. The LMS is a requirement associated with receipt of certain federal mitigation grant program funds administered by the Florida Department of Community Affairs and the Federal Emergency Management Agency (FEMA).

1.1 Authority

The Board of County Commissioners directed the Monroe County Emergency Management Department (Monroe EMD) to coordinate with other appropriate departments and agencies, and the cities of Key West, Marathon, Key Colony Beach, Layton, and Islamorada, to facilitate the development of the LMS, and subsequent 5-year updates, in conformance with state and federal guidelines.

The 2010 LMS Update was prepared to comply with the Florida Department of Community Affairs' requirements (Florida Administrative Code Chapter 9G-22) and the provisions of the federal Hazard Mitigation and Pre-Disaster Mitigation Programs (44 CFR Parts 201 and 206), and the Flood Mitigation Assistance Program (44 CFR 78.6). Communities and the non-profit organizations located in them must participate in a mitigation planning process that results in an adopted strategy that is approved by FEMA in order to qualify for certain federal mitigation funds.

Florida Administrative Code Chapter 9G-22 sets forth the composition and responsibilities of LMS Working Groups. In particular, Working Groups are to develop and revise the LMS, set the order of priority of projects submitted for funding, and submit an annual report. The minimum contents of the LMS are specified and include a number of provisions that are not explicitly set forth in federal requirements.

1.2 Working Group Membership

The LMS Working Group was established in 1998 pursuant to authorization by the Monroe County Board of County Commissioners (BOCC). It has met periodically since then, convening on November 12, 2009 for the specific purpose of initiating the 2010 Update of the Local Mitigation Strategy (LMS).

The Working Group includes representatives from the Monroe County and all incorporated municipalities in the county. Prior to the 1999 LMS, Working Group Agreements were

established between Monroe County and the municipalities. The City of Marathon joined upon its incorporation in late 1999. All jurisdictions have continued participation in the quarterly LMS Working Group meetings and the process to update the LMS every five years.

Representatives from following are designated members of the Working Group who were notified of each meeting, invited to participate in all meetings (see meeting minutes in Appendix A) and to provide comments on various drafts, and invited to review and comment on the 2010 Update before it was finalized for adoption:

- Monroe County, Emergency Management (Chair)
- Monroe County, Growth Management
- Monroe County Engineering
- Monroe County, Health Department
- Monroe County School District
- Monroe County, Grants Coordinator
- Monroe County Extension Service
- City of Layton, City Administrator (Vice-Chair)
- Village of Islamorada, Principal Planner
- City of Key Colony Beach, Building Official
- City of Key West, KWFD Training Chief / Emergency Management Coordinator
- City of Marathon, Marathon Fire Department / Emergency Management Coordinator
- Monroe County, Historic Florida Keys Foundation
- Habitat for Humanity of Key West and Lower Florida Keys
- Keys Energy Systems
- Florida Keys Electric Cooperative
- Florida Keys Aqueduct Authority

The following were notified and invited to review and comment throughout the 2010 Update process:

- Florida Division of Emergency Management (DEM)
- Florida Keys Community College
- The Salvation Army
- Monroe County Association for Retarded Citizen's
- American Red Cross
- St. Justin The Martyr Catholic Church, Key Largo

- The Island Christian School, Islamorada
- Big Pine Moose Lodge, Big Pine Key
- St. Mary Star of the Sea School, Key West
- Monroe County Mosquito Board
- Florida Keys Outreach Coalition
- The South Florida Regional Conservation and Development Council (SFRC&D)
- Office of Congressional Representative Ileana Ros-Lehtinen, 18th District
- Office of State Representative Ron Saunders, District #120

1.3 Acknowledgments

The 2010 LMS Update was supported by a planning grant administered by the Department of Homeland Security through the Florida Division of Emergency Management.

The 2010 LMS Update (and the 2005 revision) was prepared with the support of RCQuinn Consulting, Inc., Charlottesville, VA. RCQuinn Consulting, a mitigation planning consultant, helped to guide the Working Group through the update process, helped to research and update each chapter, documented decisions of the group, and collected comments, data, and incorporated the material into the LMS Update. The 1999 LMS was prepared with the support of Janice Drewing Consulting, Inc. of Plantation Key, Florida.

1.4 Key Terms

For the most part, terms used in the Plan have the meanings that are commonly associated with them:

- **Disaster** means the occurrence of widespread or severe damage, injury, loss of life or property, or such severe economic or social disruption that supplemental disaster relief assistance is necessary for the affected political jurisdiction(s) to recover and to alleviate the damage, loss, hardship, or suffering caused thereby.
- **Floodplain:** See "Flood Hazard Area."
- **Hazard** is defined as the natural or technological phenomenon, event, or physical condition that has the potential to cause property damage, infrastructure damage, other physical losses, and injuries and fatalities.
- **Mitigation** is defined as actions taken to reduce or eliminate the long-term risk to life and property from hazards. Mitigation actions are intended to reduce the need for emergency response – as opposed to improving the ability to respond.
- **National Flood Insurance Program (NFIP),** located within the U.S. Department of Homeland Security, Federal Emergency Management Agency

(FEMA), is charged with preparing Flood Insurance Rate Maps, developing regulations to guide development, and providing insurance for flood damage.

- **Risk** is defined as the potential losses associated with a hazard. Ideally, risk is defined in terms of expected probability and frequency of the hazard occurring, people and property exposed, and potential consequences.
- **Flood Hazard Area** or **Floodplain** is the area adjoining a river, stream, shoreline, or other body of water that is subject to partial or complete inundation. The area predicted to flood during the 1% annual chance flood is commonly called the "100-year" flood.

1.5 Acronyms

The following acronyms are used in the document:

- **CRS** – Community Rating System (NFIP)
- **DEM** – Florida Division of Emergency Management
- **FEMA** – U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA)
- **FIRM** – Flood Insurance Rate Map
- **FMA** – Flood Mitigation Assistance (FEMA)
- **GIS** – Geographic Information System
- **HMGP** – Hazard Mitigation Grant Program (FEMA)
- **LMS** – Local Mitigation Strategy
- **NFIP** – National Flood Insurance Program (FEMA)
- **PDM** – Pre-Disaster Mitigation grant program
- **ROGO** – Rate of Growth Ordinance
- **SRL** – Severe Repetitive Loss grant program (FEMA)
- **TAOS** – The Arbiter of Storms

1.6 References

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Chapter 2. The Planning Area

The planning area includes Monroe County and the incorporated municipalities of the Village of Islamorada, City of Layton, City of Key Colony Beach, the City of Marathon, and the City of Key West. The Monroe County *Year 2010 Comprehensive Plan* contains extensive narrative to describe the County and its policies. The following brief summaries are, in large part, taken from that document.

2.1 Geography and Planning Area

Monroe County is located at the southernmost tip of the State of Florida. The Florida Keys are situated in a precarious physical location between the Gulf of Mexico and the Atlantic Ocean. The Keys consist of an archipelago that sweeps for almost 150 miles in a southwesterly direction from southeastern Miami-Dade County. The mainland portion of the County is bordered by Collier County to the north and Miami-Dade County to the east (See Figure 2-1).

Figure 2-1. Location Map

The total area of Monroe County is approximately 1.2 million acres (about 1,875 square miles). Large portions are submerged lands associated with parks and preserves that are under the jurisdiction of the federal and state governments. The total land area is approximately 885 square miles, of which about 102 square miles are in the Keys (including unincorporated and incorporated municipalities). The entire mainland portion is within the Everglades National Park or the Big Cypress National Preserve and is virtually uninhabited.

The County's *Year 2010 Comprehensive Plan* focuses primarily on the Florida Keys – which is the same planning area for the Local Mitigation Strategy. The Florida Keys are typically long, narrow, and low-lying islands. The average elevations of the various larger islands range from four to seven feet above mean sea level. Only one small area in the City of Key West referred to as Solares Hill rises to 16 feet above mean sea level. Other relatively high areas are several coral ridges in Key Largo are near Mile-Marker 106.

2.2 Population

The 2007 estimated projected population of Monroe County and the incorporated municipalities is just over 73,000 (see Table 2-1). The permanent resident population has decreased by approximately 6,300 persons, or 0.8%, from 2000 to 2007. The area's population varies considerably due to seasonal residents; at peak season, the seasonal population is estimated at nearly 74,000. All told, the Florida Keys receives approximately 3 million visitors per year.

Table 2-1. Projected Permanent Population*

	Permanent Resident
Monroe County (unincorp)	33,540
Islamadora	6,386
Layton	193
Key Colony Beach	772
Key West	22,682
Marathon	9,650
Total	73,223

*The projected permanent population is based on the U.S. Census Bureau 2007 population estimates

Approximately 15% of the total population is over the age of 65. As of 2008, the Special Needs Registry includes 404 people enrolled in the Special Needs Hurricane Evacuation Program due to age, medical condition, or other factors that require assistance from the County to evacuate during an emergency (Table 2-2). The County has a small non-English speaking population spread throughout the Keys and a small transient worker population.

Table 2-2. Special Needs Registry (2009)

Mile Marker	Registered Special Needs
0-12	204
13-40	43
41-72	51
73-92	36
93-113	70
Total	404

2.3 Land Use & Growth Trends

Growth trends in Monroe County are regulated through the number of residential permits issued. The majority of the new residential permits issued are for permanent residential use, although some permanent dwellings are used by seasonal residents.

The number of dwelling units (permanent and seasonal) which can be permitted in Monroe County and incorporated municipalities has been controlled by the Rate of Growth Ordinance adopted by Monroe County in 1992 to implement portions of its Comprehensive Plan. Called "ROGO," this approach was developed as a response to the inability of the road network to accommodate a large-scale hurricane evacuation in a timely fashion. A series of complex models developed during the area's first evacuation study identified an approximate number of additional dwelling units which could be permitted and which would not have a detrimental effect on the time needed to evacuate the Keys. The number of allocations for each area was based upon the supply of vacant buildable lots. The ROGO system was developed as a tool to equitably distribute the remaining number of permits available both geographically and over time. As of early 2010, the ROGO process is under review.

The ROGO system distributes a pre-determined number of allocations for new residential permits on a yearly basis from July 14 of one year to July 13th of the following year. Each service area of unincorporated Monroe County and several of the incorporated areas receive allocations. The Ocean Reef area of north Key Largo is exempted from the ROGO system due to its proximity to Card Sound Road, an alternate evacuation route.

In unincorporated Monroe County, the ROGO system allowed 255 allocations for new residential units for each of the first six years. The number of allocations available was reduced by 20% (from 255 to 204) by the State of Florida Administration Commission during Year 7, based upon a lack of progress on the implementation of the *Year 2010 Comprehensive Plan*.

The County's annual allocation was further reduced to 158 by the incorporation of Islamorada and Marathon, which receive 28 and 24 allocations per year, respectively.

The County, in an effort to further address concerns of carrying capacity, implemented Monroe County 2010 Comprehensive Plan Goal 105 by adopting the Tier System. This system qualified land into three primary categories of development potential. Tier 1 a conservation tier, Tier 3 an infill/continued development tier and Tier 3a, a small subset of Tier 3 to protect isolated tropical hardwood hammock patches. The adoption of this classification altered the ROGO competition to guard against continued fragmentation of critical threatened and endangered species habitat. The Tier System also increased the total number of annual allocations to 197.

The current allocation of 197 is divided into 126 "market rate" and 71 "affordable" units and are distributed in unincorporated Monroe County as follows:

- 61 market rate units in the Upper Keys service area,
- 57 market rate units in the Lower Keys service area,
- 8 market rate units in the Big Pine and No Name Keys service area,
- 36 affordable units for Very Low, Low, and Median Incomes*, and
- 35 affordable units for Moderate Income*
- *Includes one each for Big Pine Key and No Name Key.

Nonresidential permitting also plays a role in land use and growth trends. Nonresidential permits include everything that is not residential, including industrial, commercial, non-profit and public buildings, and replacement or remodeling of existing nonresidential structures. Also included are vested and ROGO-exempt hotels, motels, campgrounds, marinas and other commercial facilities.

With very little industrial and agricultural activity in the Keys, the predominant form of nonresidential development is commercial. There are two primary types of commercial development: retail trade and services (which includes tourism-related development such as marinas and restaurants). Therefore, the impact of nonresidential development on public facilities varies significantly based on the type of commercial use.

Nonresidential and residential developments tend to fuel one another. Residential populations provide markets for nonresidential activities. Nonresidential development, in turn, helps to drive permanent and seasonal population growth by providing services and employment. Certain types of nonresidential development also concentrate the demand for public facilities within certain locations and during peak seasons.

Since residential development is constrained through the Rate of Growth Ordinance and the Permit Allocation System, it was thought that nonresidential (commercial) development should also be constrained in the interest of maintaining a balance of land uses.

At the time the Comprehensive Plan was prepared in 1991, 17.6% of the land was under residential use, while 4.6% was used for commercial development). It was determined that this balance was appropriate at the time. To assure that balance was maintained, the Comprehensive Plan proposed Policy 101.3.1. In effect, the square footage of new commercial development that may be permitted is limited to 239 square feet for each new residential permit issued. This equates to around 37,762 square feet of new commercial development per year throughout unincorporated Monroe County.

2.4 Number and Value of Buildings and Structures

The data for two years shown in Table 2-3 are from two sources, which makes any comparison questionable. However, in the ten years between 1998 and the end of 2008, it appears there was a 41% increase in the total number of structures. The increase is primarily attributed to erroneous data used to produce the 1998 TAOS assessment, and not an actual increase in the total number of buildings. Similarly, it appears the value of all structures more than tripled, also attributable to the data used in 1998 – also likely to be erroneous.

Table 2-3. Number and Value of Buildings and Structures (1998* and 2009).**

Occupancy	# in 1998	# on 1/1/2009	$ in 1998	# on 1/1/2009
Single-Family Homes	16,618	26,149	$3.01 B	$14.86 B
Manufactured Homes	5,881	5,619	$308 M	$1.09 B
Multi-Family (<10)	1,312	2,475	$250 M	$1.29 B
Other Residential	7,652	7,501	$2.3 B	$3.11 B
Commercial	1,431	4,227	$409 M	$2.74 B
Institutional	155	504	$80 M	$565 M
Hotels	215	452	$614 M	$1.03 B
TOTALS	33,264	46,927	$6,971 B	$24,685 B

* From a 1998 analysis prepared by the Florida Department of Community Affairs

** From the Monroe County Property Appraiser (2009)

Figure 2-2 shows how the average and median sale prices of single family homes have changed between 1965 and 2009. When the 1999 LMS was prepared, the average property value was $120,000; as of mid-2005 when the 2005 LMS was prepared, the average value had climbed to $281,000. In 2009, the average property value was $570,500. Similar variations have been experienced in the values of other types of properties.

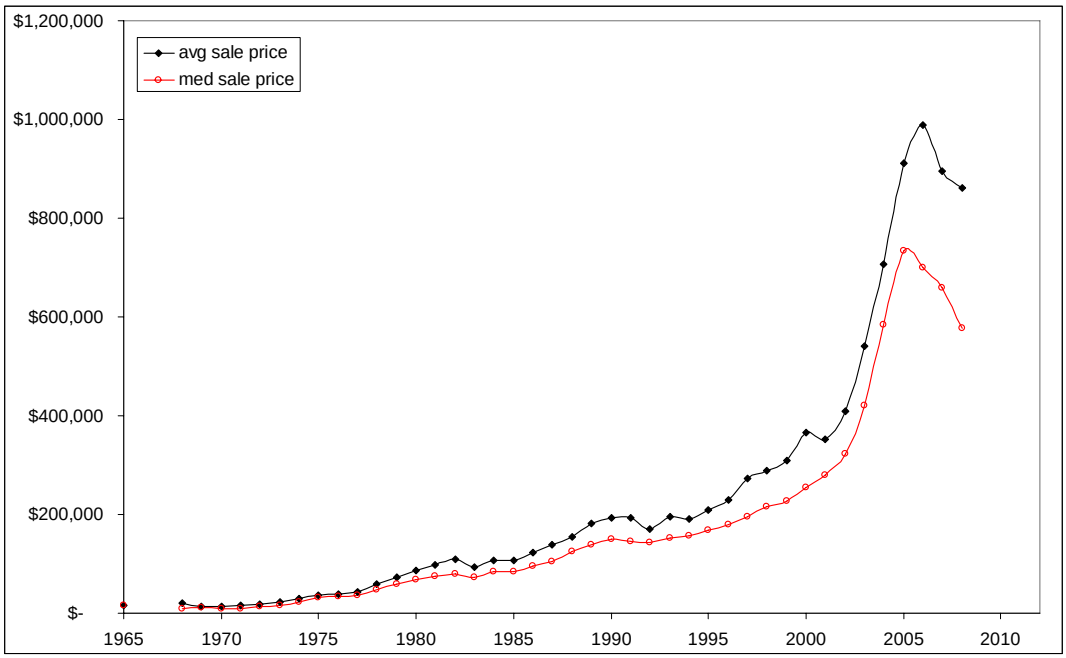

Figure 2-2. Average and Medial Sale Prices of Single Family Homes in Monroe County
(Monroe County Property Appraiser, 2009)

2.5 Economic Characteristics

Monroe County's economy is unique in a number of respects due to its location and geography. The area attracts both seasonal residents and short-term visitors, drawn by the amenable climate and recreational opportunities. The economy is dominated by tourism and the commercial fishing industry. The following text is based on the *2010 Comprehensive Plan*.

The service sector, dominated by hospitality (food and lodging), is the largest segment of the private sector, followed by retail trade. These industries account for nearly 52% of total employment, and 67% of private sector employment.

Commercial fishing represents 7% of total employment and 9% of private sector employment. A combination of economic and natural resources factors have lead to a decline in the number of commercial fishing vessels and a long-term downward trend in the total poundage of the harvest.

Two other private sector categories together account for about 15% of total employment: construction and finance/insurance/real estate.

Public sector employment accounts for just over 20% of total employment. This category includes the federal government (and military), State and local government agencies, and utilities.

Because the tax base in Monroe County is supplemented by tourism, declines in the number of visitors after major hurricanes lead to reduced revenue associated with the Bed Tax, Sales Tax, and Infrastructure Tax. Historically, damaging storms result in significant loss of revenues.

2.6 Transportation

The transportation network in the Florida Keys is unique in that a single road forms its backbone and the sole link to the Florida mainland. U.S. Route 1, referred to as the Overseas Highway, runs for 126 miles from Florida City in Dade County to Key West in Monroe County. Maintained by the Florida Department of Transportation, for most of its length U.S. 1 is a two-lane highway with 42 bridges (combined total length of 19 miles of bridge structure).

U.S. 1 is a lifeline for the Keys, functioning as both highway and "Main Street." Each day it brings food, materials, and tourists from the mainland, driving the local economy.

Approximately 450 miles of roads, including 37 bridges, are maintained by the County. Card Sound Road, operated as a toll road, is an alternate to U.S. 1 in some locations. Mainland Monroe County consists primarily of government-owned parks and preserves, and consequently has few roads. The only County-maintained road is Loop Road, a 16-mile excursion off of U.S. 41 crossing the Dade and Collier County lines.

The cities of Key West, Marathon, Key Colony Beach, Layton, and Islamorada are responsible for the streets within their boundaries.

Air transportation is a viable alternative to highway travel. Monroe County's by two airports: Key West Airport and Marathon Airport, serve major commercial airlines. Four privately-owned community airports are also located in the Keys.

2.7 Environmental & Historic Resources

2.7.1 Environmental Resources

The Florida Keys contains many valuable environmental resources. It has unique habitats, with many rare and/or endangered plant and animal species. Because of these special environmental considerations, in 1980, through legislative act, the State of Florida designated the Keys portion of unincorporated Monroe County and the incorporated municipalities as “Areas of Critical State Concern.” The purpose of the program is to protect the unique environment, vegetation, and natural resources of the designated area by regulating land development and other activities regarded as detrimental to the environment. In conjunction with the designation, the legislature enacted the "Principles for Guiding Development,” which are set forth in Chapter 380.0552(7). The law provides for State oversight of development and changes to land use regulations, a function carried out by the Department of Community Affairs. The Department established Field Offices in Monroe County to assist in review of development permits and related issues for compliance with the “Principles.”

The Florida Department of Environmental Protection’s Office in Marathon submitted the following list of specific environmentally sensitive areas referred to as “Special Management Areas” (state and federal):

- Florida Keys Marine Sanctuary (comprehensive designation)
- Bahia Honda State Park
- Fort Zachary Taylor State Historic Site
- Indian Key State Historic Site
- John Pennekamp Coral Reef State Park
- Lignum Vitae Key State Botanical Site
- Long Key State Park
- Windley Key Fossil Reef State Geological Site
- Curry Hammocks State Park
- San Pedro Underwater Archaeological Preserve
- Key Deer National Wildlife Refuge
- Great White Heron National Wildlife Refuge
- Looe Key National Marine Sanctuary
- Key Largo National Marine Sanctuary
- Everglades National Park (primarily mainland Monroe)

2.7.2 Historic Resources

A significant percentage of tourism in the Keys is associated with its unique archeological, historical, and cultural heritage and many landmarks. Many sites are listed on the National Register of Historic Places and designated for protection (available at http://www.cr.nps.gov/places.htm). Many identified historic resources could experience irreversible damage from hurricanes. The Historic Florida Keys Foundation, Inc. has agreement with County to provide professional staffing for historic preservation. The County has about 330 locally-designated sites identified under Article 8 of the Monroe County Code as Archaeological, Historical, and/or Cultural Landmarks (available on the County's webpage). Key West's Historic Architect Review Commission has locally-designated about 2,300 sites (available on the City's webpage).

Despite recent hurricanes, historic resources have, for the most part, escaped significant damage. A number of significant properties have been mitigated:

- The Old Monroe County Courthouse, a state-owned building, has suffered wind damage in the past; it was retrofit with window protection using FEMA's Hazard Mitigation Grant Program funds.
- Retrofit the steeple of the Old Key West City Hall with motorized hurricane shutters was funded by FEMA.

2.8 Critical Facilities

The Monroe County *Comprehensive Emergency Management Plan* includes content related to essential services, critical facilities, and important infrastructure. The LMS Work Group determined that the following distinctions are appropriate for "critical facilities," where that term includes buildings and facilities that are identified by the public entities, utilities, and non-profit organizations that own them:

- **Critical Facilities** are buildings and infrastructure that are vital to the operations and continuity of government operations necessary to perform essential security missions and services to ensure the general public health and safety in order to make daily living and working possible. Critical facilities generally should be functional within 24 to 72 hours after a declared disaster depending on the severity of the event.
- **Primary/Important Facilities** are those that should be functional within seven days after a declared disaster.
- **Secondary/Standard Facilities** are those that need not be fully functional until six months after a declared disaster.

Monroe County Emergency Management Department maintains a secured database of public and critical facilities and certain private non-profit facilities. Figures 2-3a through 2-

3f (end of chapter) show locations of the critical facilities identified by each jurisdiction that can be plotted (figures prepared mid-2005; no significant changes as of 2010). Table 2-4 contains notes on selected critical facilities and Table 2-5 contains notes on selected infrastructure. Chapters 8 through 12, the chapters for the municipalities, also include lists of selected facilities identified by the municipalities.

Table 2-4. Notes on Selected Critical Facilities

Hospitals/Nursing Homes	**Hospitals** • Florida Keys Health Systems (Depoo Hospital and Lower Florida Keys Health Center) • Marathon (Middle Keys) – Fishermen's Hospital • Tavernier (Upper Keys) – Mariner's Hospital • All hospitals must evacuate Monroe County in a storm of Category 3 or greater. **Nursing Home** • Bayshore Manor, Key West (Monroe County owned and operated) must evacuate Monroe County when a storm of Category 3 or greater is predicated
Schools/Shelters	**Public Schools/Hurricane Shelters** Only selected schools have been identified as suitable shelters for use in tropical storms, Category 1-2 hurricanes, and other emergency purposes. In most cases, for hurricanes of Category 3 and higher all persons must evacuate Monroe County and shelters will not be used: • Key West High School, 2100 Flagler Ave., KW • Sugarloaf Elementary School, Mile-Marker 19, Sugarloaf Key • Stanley Switlik Elementary School, Mile-Marker 48.5, Marathon • Coral Shores High School, Mile-Marker 90 Plantation Key • Key Largo School Cafetorium, Mile-Marker 105, Key Largo **Other facilities that may be used as hurricane shelters:** • Saint Justin Martyr Catholic Church, Key Largo • Poinciana Elementary School, 1212 14th St, KW (open in 2008) • Marathon High School
Other	**Other facilities critical/important for recovery:** • Habitat for Humanity of Key West and Lower Florida Keys, 30320 Overseas Highway (storage for water, temporary roof coverings and supplies, client intake for emergency home repair needs and staging area for volunteer coordination) • Monroe County Medical Examiner's Office (added 2009)

Table 2-5. Notes on Selected Infrastructure

Bridges • 42 bridges connect primary roadway US 1. • Bascule-type drawbridge on Snake Creek Bridge at Mile-Marker 86, open periodically for marine traffic; drawbridge operations and possible breakdowns can interrupt traffic flow. • "Lifelines" (Linear components of critical infrastructure)
Water Lines • Primary supply pipeline on mainland in Florida City (managed by Florida Keys Aqueduct Authority) • Some distribution pipeline connected to roads and bridges. • Contingency and redundancy: • Primary pipeline serving Upper Keys is subaqueous and does not depend on roads and bridges. • Reverse Osmosis Plant located in Marathon to serve Middle Keys. • Reverse Osmosis Plant located in Stock Island (Key West) to serve Lower Keys. • Reverse Osmosis Plan located in Florida City (Upper Keys)
Power Lines • Electric Power supplied by Florida Keys Electric Cooperative (FKEC) Upper Keys to Marathon • Electric Power supplied by Keys Energy Service (KES) Marathon to Key West. • Majority of electric lines above ground. • No power poles located on bridges. • To prevent loss if bridges are damaged, transmission line power poles are pile-driven into the water along roads and bridges. • Subsequent to Hurricane Andrew poles re-designed to withstand serious storm conditions were installed in certain areas such as along the 18-mile stretch. Old equipment is being replaced with newer, more resilient materials.
Telephone Service • To provide redundancy, two major trunk fibers are provided from Homestead on the mainland to Key West. One is buried and the other is aerial. • Most cable lines located along underside of fixed bridges, therefore vulnerable if bridges fail. • Digging not feasible because of rock substructure. • Environmental considerations inhibit underwater installations.

2.9 2010 Updates

The LMS Working Group reviewed and updated the pertinent sections. Some of the more significant changes include:

- Section 2.2: Updated population Special Needs Registry data.
- Section 2.3: Noted the ROGO system is being revised.
- Section 2.4: Moved content on the number and value of structures from another section and updated the data.
- Section 2.7: Noted that the Monroe County Emergency Management Department maintains a secure list of critical facilities and updated the table of critical facilities.
- Section 2.8: Updated the list of schools and facilities that are secondary shelters.

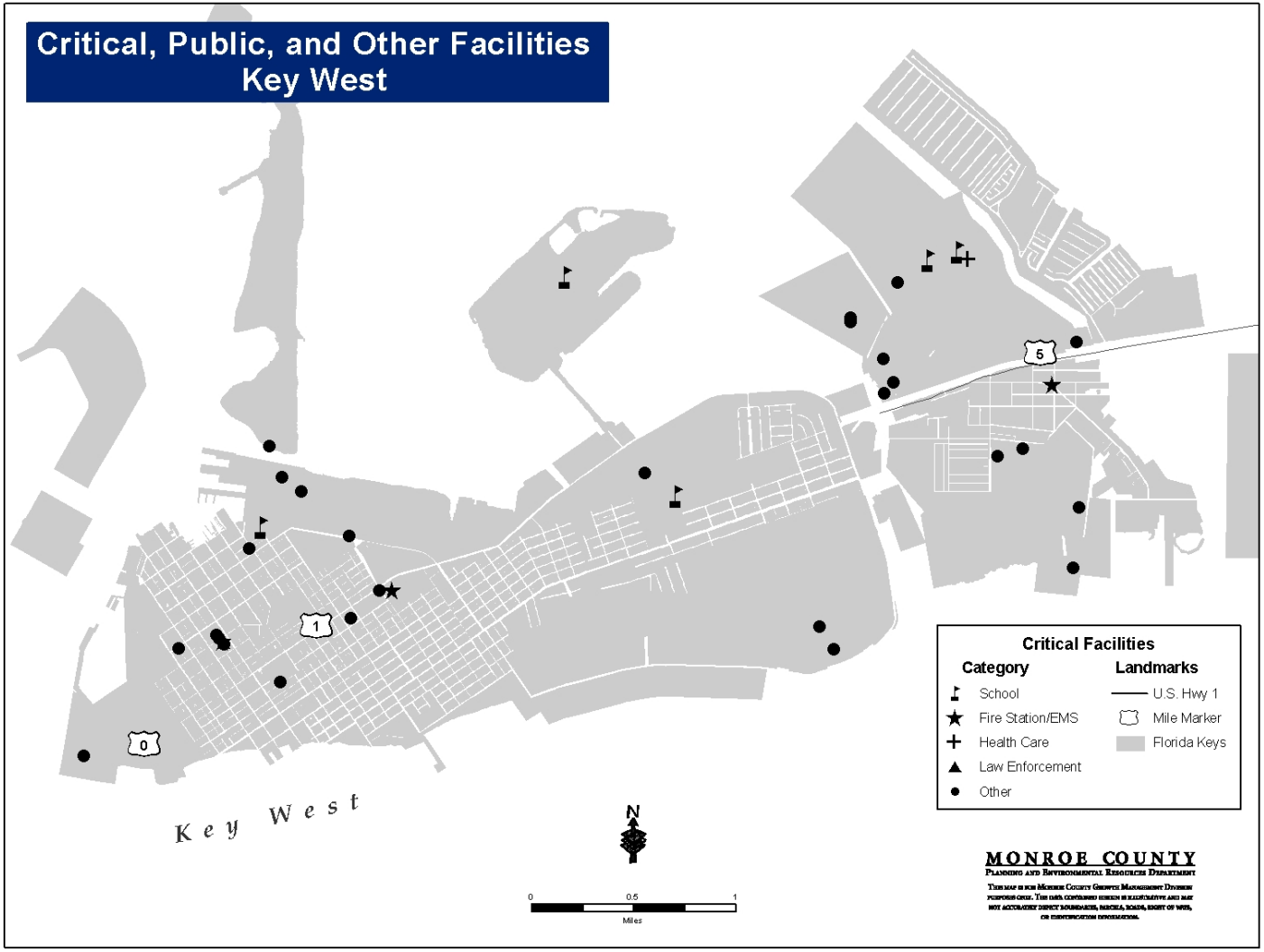

Figure 2-3a. Critical, Public, and Other Facilities, Key West

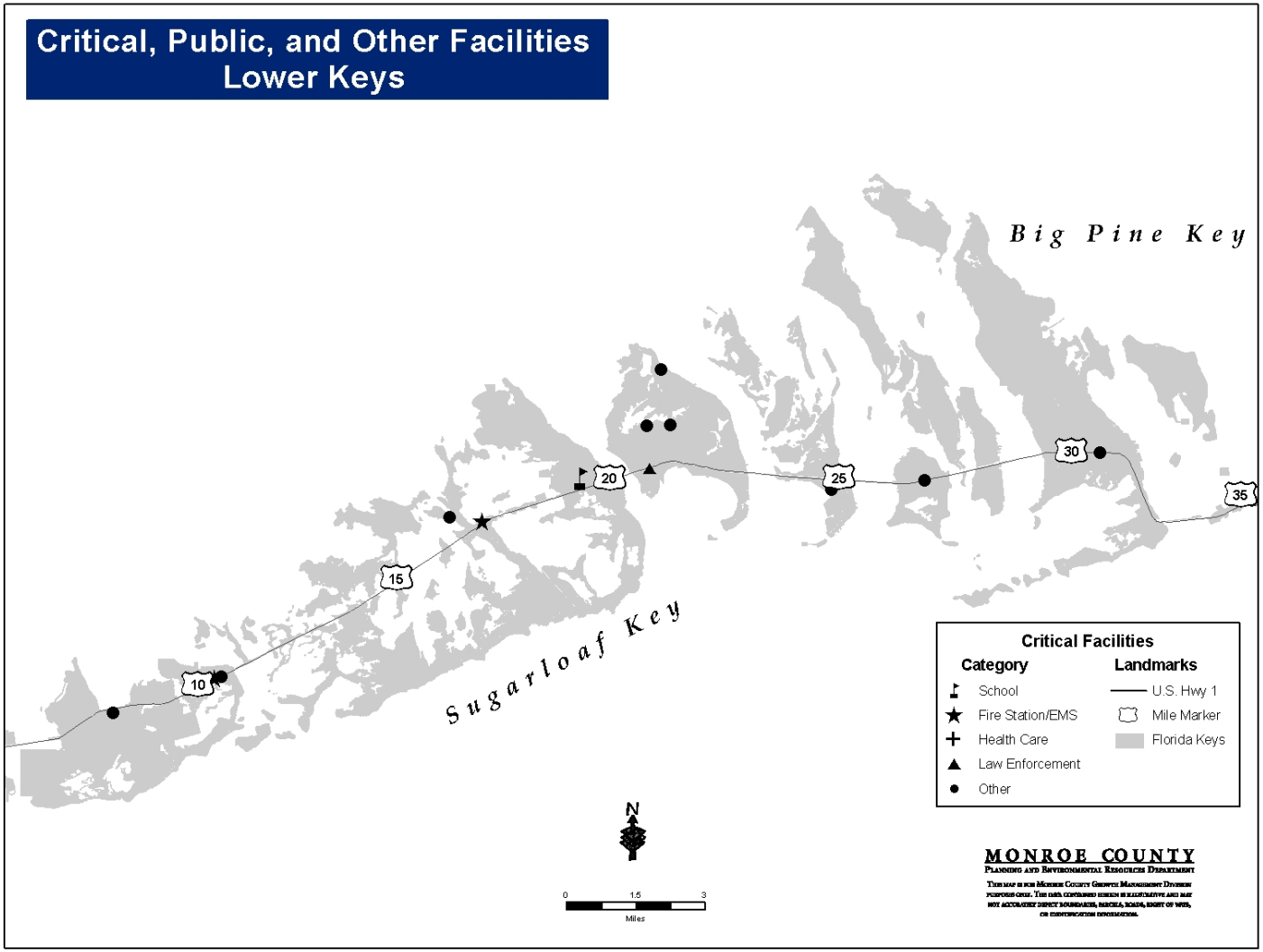

Figure 2-3b. Critical, Public, and Other Facilities, Lower Keys

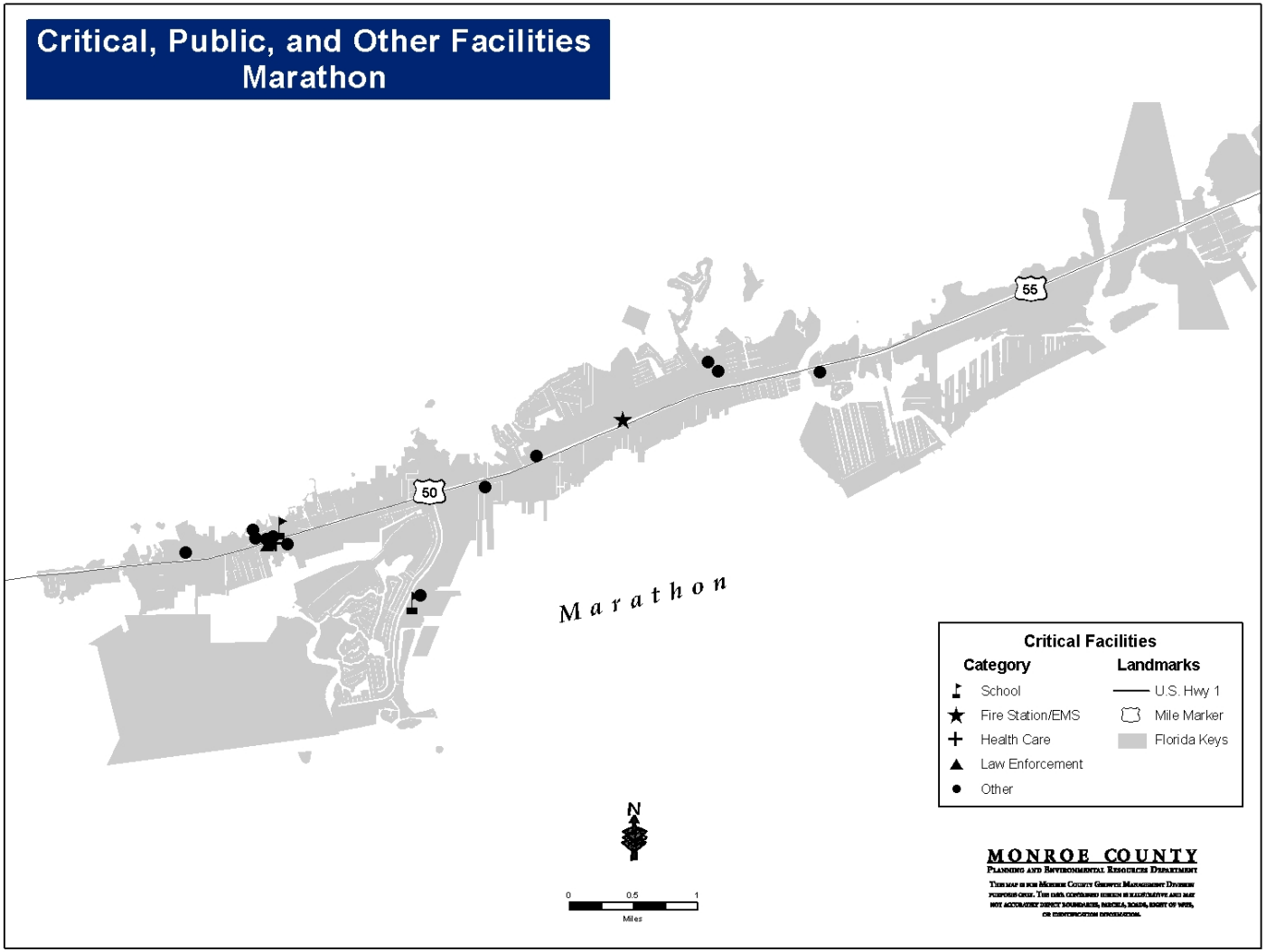

Figure 2-3c. Critical, Public, and Other Facilities, Marathon

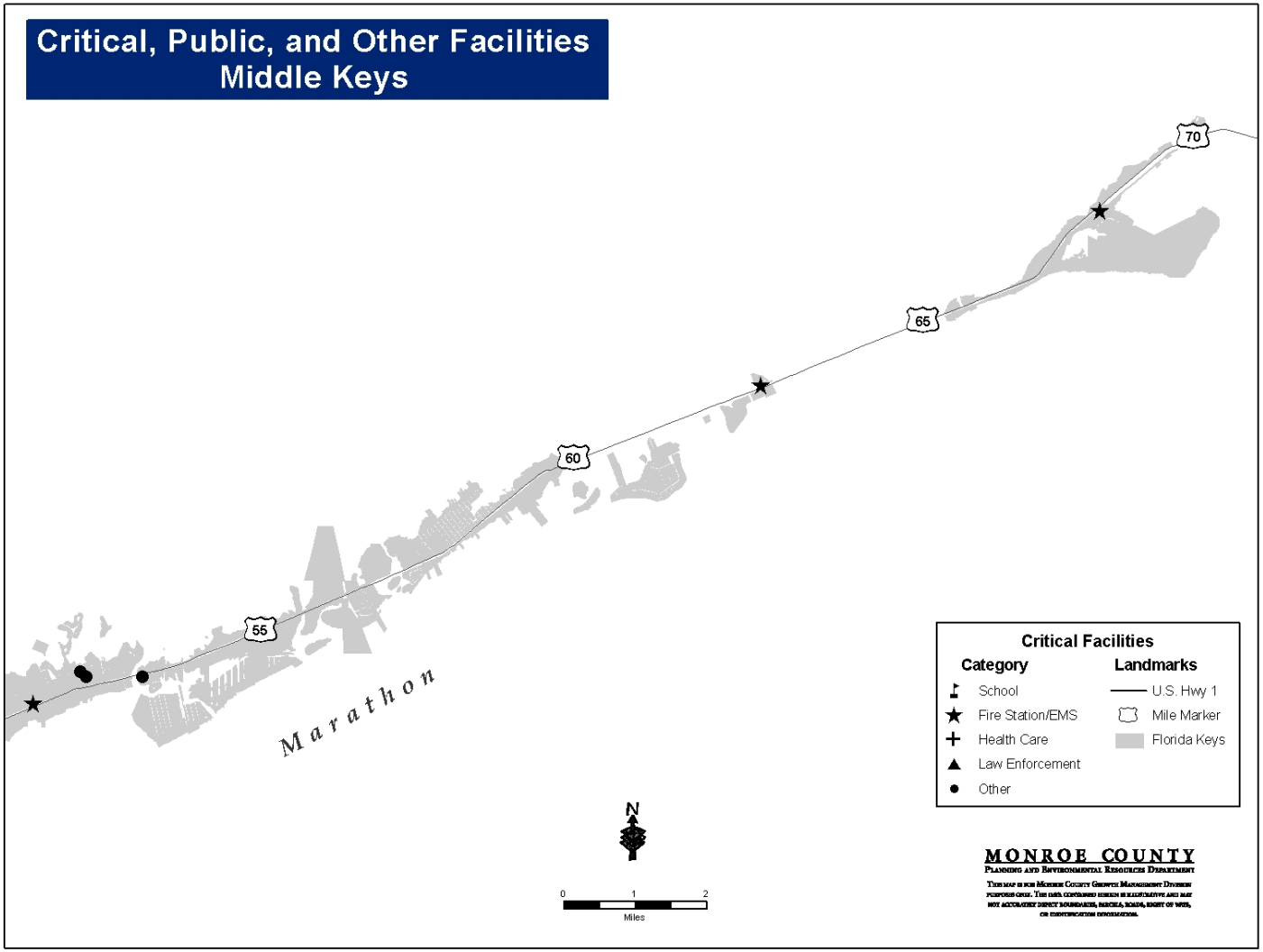

Figure 2-3d. Critical, Public, and Other Facilities, Middle Keys

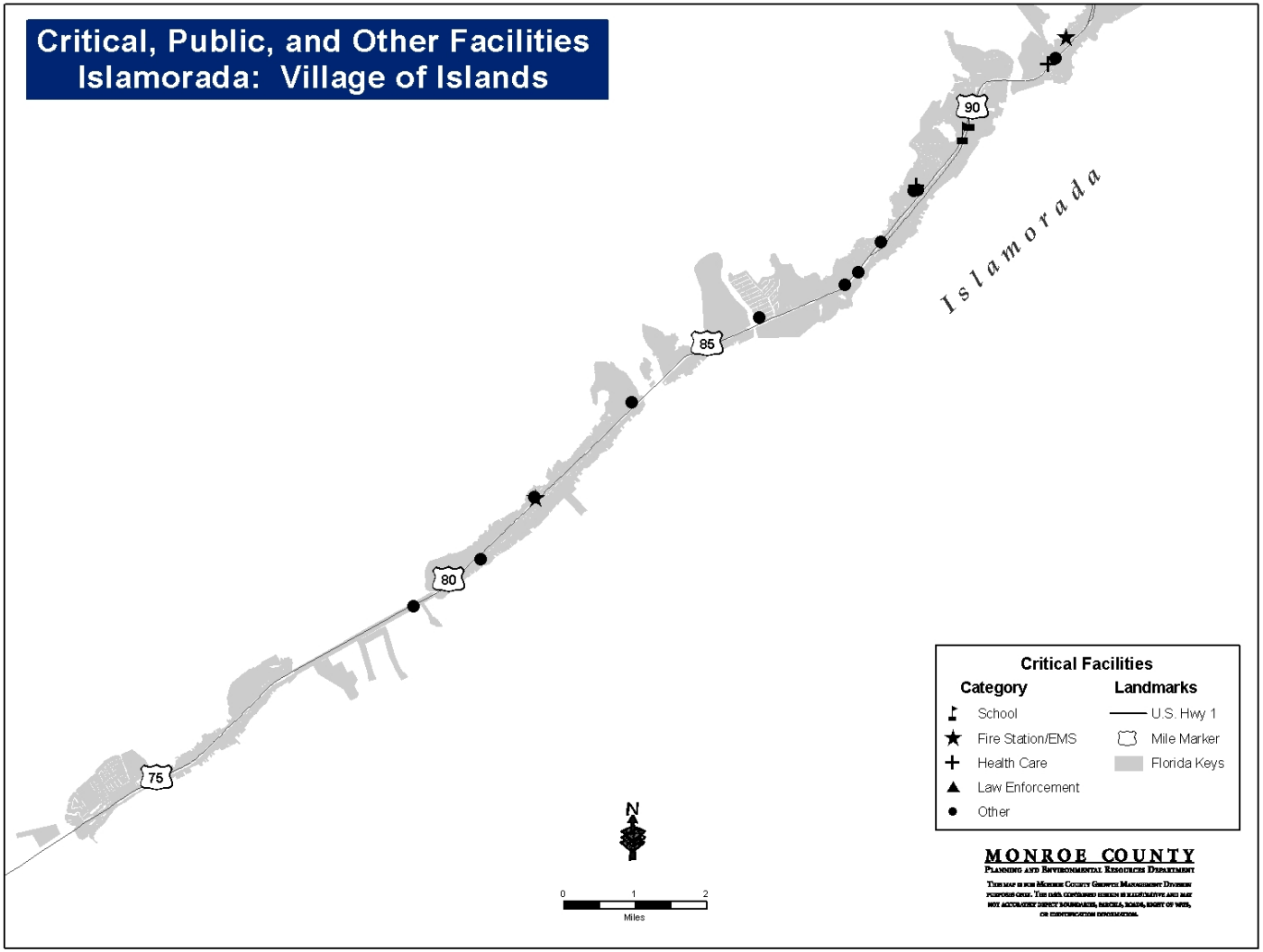

Figure 2-3e. Critical, Public, and Other Facilities, Islamorada: Village of Islands

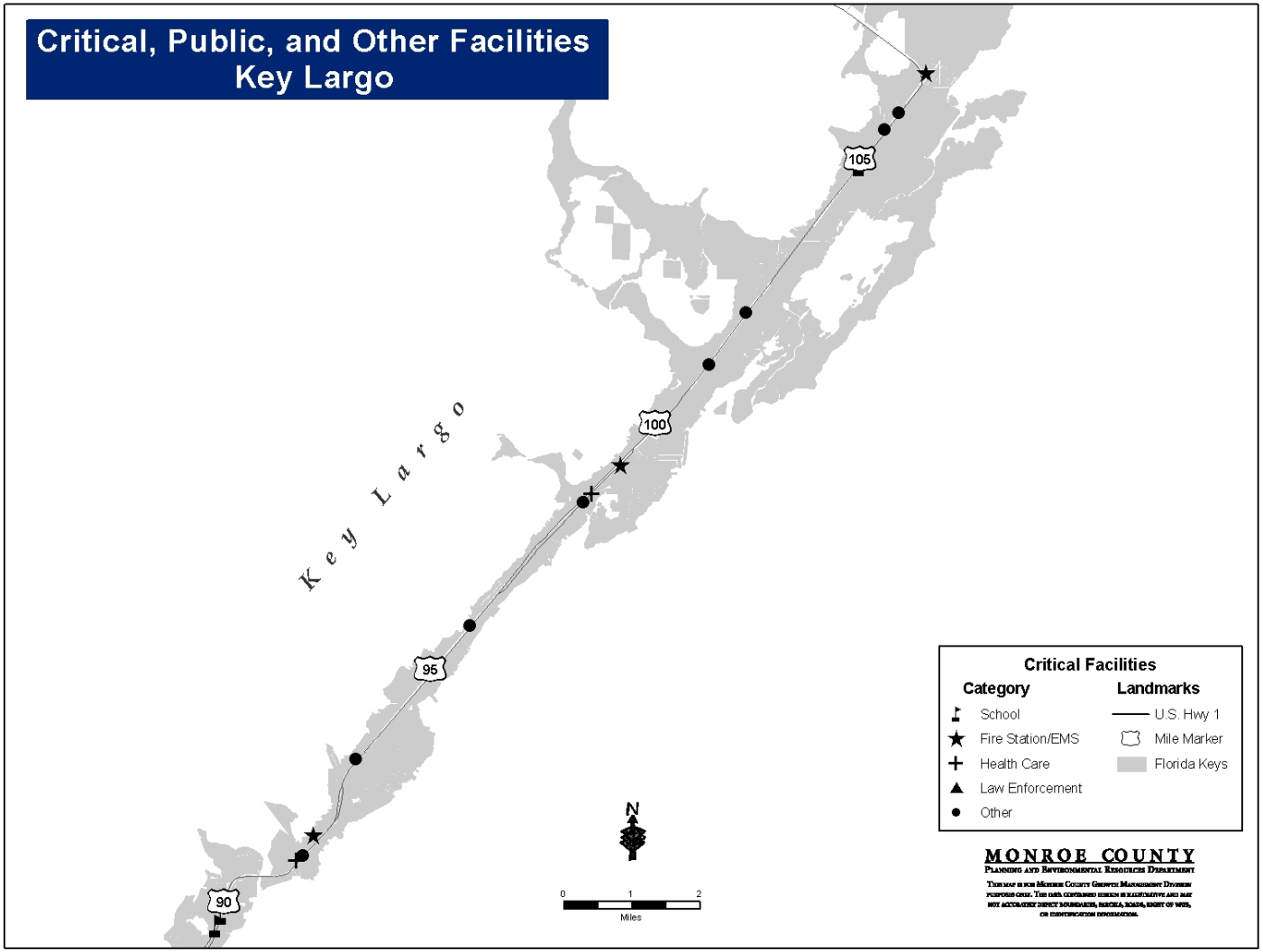

Figure 2-3f. Critical, Public, and Other Facilities, Key Largo

Chapter 3. Mitigation Planning

3.1 Introduction

An important step in the lengthy process of improving resistance to natural hazards is the development of a Local Mitigation Strategy. The Monroe County LMS was prepared in accordance with the guidelines provided by the Federal Emergency Management Agency and the Florida Division of Emergency Management, and steps outlined in guidance documents for the National Flood Insurance Program's (NFIP) Community Rating System.

The LMS serves several purposes. It sets the stage for long-term resistance to natural hazards through identification of actions that will, over time, reduce the exposure of people and property. Further, the LMS is required to be eligible for certain state and federal mitigation grant funds.

Chapter 5 (Hurricanes & Coastal Storms) and Chapter 6 (Other Hazards & Risks) provide overviews of hazards that threaten the County, estimates of the people and property exposed to hazards, the planning process, how hazards are recognized in the local government processes and functions, and priority mitigation action items. The hazard summary and disaster history help to characterize future hazards. When the magnitude of past events, the number of people and properties affected, and the severity of damage, hurricanes and coastal storm flooding hazards clearly are the most significant natural hazard to threaten Monroe County.

The LMS Working Group acknowledges that many buildings were built before the adoption of regulations for development in floodplains in the County and the incorporated municipalities. Current regulations require new development to be designed and built to resist anticipated wind and flood hazards. Older buildings, then, may reasonably be expected to sustain more property damage than new buildings.

3.2 The Mitigation Planning Process

The LMS Working Group followed a well-established planning process to revise the LMS. A mitigation planning consultant was retained to guide the Working Group through the update process, to help research and update each chapter, to document decisions of the group, and to collect comments and incorporate them into the LMS Update. Several meetings were held during which the 2010 LMS Update was discussed (see Appendix A for meeting agendas and minutes):

- **August 20, 2009.** Review the LMS update process and State and federal requirements that require the Working Group to update the LMS every five years. The Working Group must examine each section, and a summary of the

update process must be included. The entire updated plan must be adopted by every jurisdiction, not just a summary of the updates. Monroe EMD will publicize the Working Group meetings through the County's normal channels. An announcement was provided to the city members for their use, if they want to announce the update process at city council meetings. It was reported that a representative of the Key West National Weather Service office offered to review and comment on Chapter 5 (Hurricanes & Coastal Storms), Chapter 6 (Other Hazards & Risks).

- **November 12, 2009.** Notice of this meeting was published in the November 7 edition of the *Keynoter* (Appendix B) and distributed to the LMS listserve of interested parties. The importance of Working Group participation and contribution was stressed. Each local government member will be responsible for ensuring that their chapters are reviewed. Following up on DEM recommendations, the approval process was reviewed (especially the importance of holding until after the public meeting and comment period, the Working Group's approval and recommendation for formal adoption by the councils/commissions. DEM has also emphasized the requirement to identify at least one action that addresses each "high" priority risk. The NWS and consultant have prepared revisions to Chapter 5 (Hurricanes & Coastal Storms) and Chapter 6 (Other Hazards & Risks), which will be distributed to the Working Group. Those chapters were reviewed; coastal erosion was discussed (it appears the information available from the State Hazard Mitigation Plan is only for state-owned shorelines). Every local government member must review and comment, especially to incorporate the impacts of Hurricane Wilma (2005). The Working Group discussed the fact that the hurricane "risk assessment" information is based on the 1998 TAOS damage projections and concluded that those estimates remain acceptable for the purpose of indentifying and prioritizing mitigation actions. Similarly, the Working Group agreed that the remaining hazard identification and risk assessment content continues to characterize the hazard and risks and are acceptable for the purposes of relative ranking. It was also noted that the results of the update of the hurricane storm surge modeling (SLOSH) are expected some time in 2010. Prior to initiation of the 2015 Update, the Working Group will reevaluate whether it is appropriate to revise the risk assessment using FEMA's GIS-based tools.
- **April 26, 2010.** Media partners were asked to publish notice of this meeting (Appendix B) and it was posted on the County's and webpage and distributed to the LMS listserve of interested parties. The primary purposes of this meeting were to review revisions to the forms used to place initiatives on the initiatives list, to update the status of actions listed in the 2005 LMS Update, and to discuss mitigation actions for the Working Group as a whole. Each member was instructed to review the initiatives list and submit updates, especially to identify which hazards and which element(s) of the mitigation goal each initiative is intended to address.

- **July 26, 2010.** The Working Group was convened by conference call to concur with making the Public Review Draft available for public review, to schedule a public meeting, and to submit the document to the Florida Division of Emergency Management for review. Prior to the call, the draft document was distributed so that all members could review all changes (still shown in <track changes>).
- **August 16, 2010**. The public meeting was held on August 16, 2010. Notice of this meeting was published in the Wednesday, July 8, 2010 edition of the *Keynoter* (Appendix B) and distributed to the LMS listserve of interested parties. One public comment was received regarding the separate fire and EMS district in Key Largo (this comment did not prompt a change in the LMS).
- **October 6, 2010.** The Working Group was convened by conference call to review public comments and comments received from DEM; and to approve 2010 LMS Update and forward it to FEMA for review. Each local jurisdiction indicated it would initiate the process for formal adoption.

The overall mitigation planning process, summarized below, was facilitated by a mitigation planning consultant:

- **Get Organized.** The Monroe County LMS Working Group was charged with coordinating a committee comprised of its members to review and update the LMS.
- **Coordinate.** Prior to the August 20, 2009, meeting, other agencies and other interested organizations were notified of the planning activity and invited to participate.
- **Review Identified Hazards.** The LMS Working Group reviewed the hazard identification content in the 2005 LMS (which was based on materials from the 1999 LMS) and hazard events that had occurred in the intervening years, and confirmed the priority ranking of natural hazards. In 2009, the Working Group considered adjusting the 1999 results from "The Arbiter of Storms" (TAOS) using data provided by the Monroe County Property Assessment Office, but determined that discrepancies in the raw numbers precluded a straightforward adjustment. However, even if adjusted, the end result would not alter the risk assessment and prioritization of hazards.
- **Review how Natural Hazards are Addressed.** Working Group members reviewed brief descriptions of their agencies and on-going actions related to hazards and provided updates. The results are summarized in Chapter 7 (Monroe County) and Chapters 8 through 12 for the cities of Key West, Key Colony Beach, Layton, Islamorada and Marathon.
- **Review Assessment of Risks.** The Working Group reviewed the risk assessment content in the 2005 LMS (based on materials from the 1999 LMS). Despite the age of the damage projections, the Working Group determined they remain sufficient for the purpose of identifying and prioritizing mitigation actions.

- **Research Existing Plans.** The Working Group reviewed existing comprehensive plans and flood damage reduction regulations and referenced pertinent provisions into the LMS.
- **Confirm the Mitigation Goals.** The mitigation goals were discussed and confirmed by the Working Group.
- **Identification of Mitigation Actions.** The list of potential mitigation actions is not static, it changes as new projects are identified, as projects are completed, and as the priorities of proponents change or better information about the feasibility and cost-effectiveness of an activity comes to light. Mitigation actions include projects (typically involving specific buildings or drainage problems) and other actions that have broader impact (such as public information and regulatory requirements). A high priority action identified in the 2005 LMS called for the Working Group to improve the method by which the list of projects is maintained and updated (this action was completed).
- **Draft the LMS Update.** The draft LMS Update was prepared and circulated to LMS Working Group members and, after the local government members confirmed their concurrence, electronic copies were provided to adjacent communities, interested parties, and pertinent state and federal agencies. Comments were collected and incorporated into the "public review" draft.
- **Make Available to the Public and Hold Public Meeting.** A press release was issued and posted on the County's webpage. A notice of the public meeting and the availability of the Public Review Draft of the 2010 LMS Update was published in the *Florida Keys Keynoter* (see Appendix B). The draft was posted on the County's webpage and hardcopies placed in the five libraries, the five city offices, and the County's Growth Management office in Marathon. Notices were sent to adjacent counties, regional organizations, the utility companies that serve the area, the e-mail listserve maintained by the LMS coordinator. The LMS Update was presented at the public meeting held on August 16, 2010.
- **Adopt LMS.** The draft LMS Update was presented to the Monroe County Board of County Commissioners and the governing bodies of the Village of Islamorada, the City of Layton, the City of Key Colony Beach, the City of Marathon, and the City of Key West. Copies of the resolutions of adoption are found in Appendix C.

3.3 Public Involvement in Mitigation Planning

Consistent with the standard practices to inform and provide citizens the opportunity to comment, and to fulfill the public involvement requirements of the mitigation planning programs, the input was solicited and residents were notified and invited to review the LMS and attend a public meeting. In January 2004, a letter advising that the County and cities were initiating the planning process, including a public meeting, was sent to selected state and federal government agencies, neighborhood associations and other interested and related organizations.

The public meeting of the LMS Working Group that initiated the 5-year update was advertised in the *Florida Keys Keynoter* on November 7, 2009 and a notice was posted on the County's web page. To further inform the public, the following cities announced that the Working Group was initiating the update process, that meetings are open to the public and notices of meetings are published, and that the public is encouraged to comment when the draft LMS Update is made available prior to approval by the Working Group:

- Key Colony Beach (September 10, 2009 Commission meeting)
- Marathon (September 3, 2009 City Council and city newsletter)
- Islamorada (October 8, 2009, Village Council Meeting)

Meetings of the LMS Working Group are open to the public, notices are posted on the County's web page, and some meetings are announced in *The Keynoter*.

The Monroe County LMS 2010 Update (Public Review Draft) was scheduled for presentation to the public at a meeting on August 16, 2010. Notice of the meeting was published in the *Florida Keys Keynoter*. Prior to the meeting, copies of the Public Review Draft were made available to the public in the offices of the cities, in the five County public libraries, and posted on the County's webpage. A notification letter was sent to adjacent communities, federal and state agencies, neighborhood associations, and the LMS email notification list. Comments were requested by August 20, 2010. No citizens attended the public meeting and one comment was submitted.

3.4 The 2010 Update: Hazard Identification and Risk Assessment

Chapter 5 (Hurricanes & Coastal Storms) and Chapter 6 (Other Hazards & Risks) include descriptions of hazards and characterizations of the assessments of risk. Chapter 5 includes a series of tables that summarize the 1998 damage projections from data developed by the State using "The Arbiter of Storms" (TAOS). As noted in Section 5.5.1, in 2005 the Working Group decided that although the TAOS projections were several years old, the value of the results is not in the precise numbers, but in the order of magnitude of projected damage (see Tables 5-10 through 5-16).

At the November 12, 2009 meeting, the Work Group reconfirmed this assessment. With regard to buildings, while many new buildings have been constructed, compliance with the Florida Building Code and each jurisdictions flood damage prevention regulations limits vulnerabilities. To account for some of the changes in the preceding 10 years, the Work Group obtained the total number of each structure category and the current total value of those structures from the Monroe County Property Assessment Office (see Table 2-3 in Section 2.4). However, given the apparent significant discrepancies between the raw

numbers (both number of parcels/buildings and total improved values), it was not feasible to use the 2009 data to adjust the TAOS projections. This does not alter the conclusion that the order of magnitude of project damage is sufficient for the purpose of prioritizing hazards and risks.

Two additional factors were considered in the decision to retain the risk assessment information from the 2005 LMS and anticipate updating it for the 2015 Update:

- The 2010 U.S. Census information will be available; and
- The update of the hurricane storm surge modeling (SLOSH) is underway, although the anticipated publication date is unknown.

3.5 2010 Updates

The LMS Working Group reviewed and updated the pertinent sections. Some of the more significant changes include:

- Section 3.2: Described the LMS meetings related to the 2010 Update. Updated the description of the planning process to reflect recent actions.
- Section 3.3: Added that three cities announced the initiation of the update process at council meetings. Noted the public meeting and the Working Group meeting at which public comments were addressed.
- Section 3.4: Added explanation that the Working Group reconfirmed its 2005 assessment that, although prepared in 1999, the hazard identification and risk assessment are sufficient for the intended purpose (updated to reflect events).

Chapter 4. Mitigation Goals

4.1 Introduction

State and federal guidance and regulations pertaining to mitigation planning require the development of mitigation goals to reduce or avoid long-term vulnerabilities to identified hazards. Mitigation goals have been established by the Federal Emergency Management Agency, the State of Florida, and Monroe County's LMS Working Group.

4.2 LMS Mitigation Goals

State and federal guidance and regulations pertaining to mitigation planning require the identification of mitigation goals that are consistent with other goals, mission statements and vision statements. The Monroe County Comprehensive Plan (Year 2010) includes **Goal 217:** "Monroe County shall develop and implement a program of hazard mitigation and post-disaster redevelopment to increase public safety and reduce damages and public expenditures."

The LMS Working Group first developed a set of goals as part of the 1999 LMS. These goals were reviewed and confirmed for the LMS revision in 2005, with one minor addition. The goals were discussed and reconfirmed for the 2010 Update. To move towards meeting these goals, the members of the LMS Working Group consider the range of mitigation initiatives outlined in Section 13.2 when identifying initiatives within their jurisdictions.

Monroe County Local Mitigation Strategy Goals

1. *Preservation of sustainability of life, health, safety and welfare.*
2. *Preservation of infrastructure, including power, water, sewer and communications.*
3. *Maintenance and protection of roads and bridges, including traffic signals and street signs.*
4. *Protection of critical facilities, including public schools and public buildings.*
5. *Preservation of property and assets.*
6. *Preservation of economy during and after disaster, including business viability.*
7. *Preservation and protection of the environment, including natural and historic resources.*

4.3 Florida's Mitigation Vision & Mission Statement

The Florida *State Hazard Mitigation Plan* was revised in 2007 and approved by FEMA in early 2008. The Plan outlines the State's mitigation vision, mission statement, primary goals and a wide variety of actions.

Florida's Mitigation Vision & Mission Statement

VISION: Florida will be a disaster resistant and resilient state, where hazard vulnerability reduction is standard practice in both the government and private sectors.

MISSION: Ensure that the residents, visitors and businesses in Florida are safe and secure from natural, technological and human induced hazards by reducing the risk and vulnerability before disasters happen, through state agencies and local community communication, citizen education, coordination with partners, aggressive research and data analysis.

The primary goals set forth in the State plan include:

- Goal 1: Enhance and maintain state capability to implement a comprehensive statewide hazard loss reduction strategy
- Goal 2: Support the development and enhancement of local capability to practice hazard mitigation
- Goal 3: Increase public and private sector's awareness and support for disaster loss education practices as a means of developing a culture of hazard mitigation in Florida.
- Goal 4: Reduce Florida's hazard vulnerability through the application of scientific research and development.
- Goal 5: Protect the state's cultural, economic and natural resources.
- Goal 6: Reduce the vulnerabilities of state-owned facilities and infrastructure to natural and manmade hazards

4.4 FEMA's Mitigation Goals

FEMA's mitigation strategy is set forth in a document originally prepared in the late 1990s. This strategy is the basis on which FEMA implements mitigation programs authorized and funded by the U.S. Congress.

FEMA's National Mitigation Goals

To engender fundamental changes in perception so that the public demands safer environments in which to live and work; and

To reduce, by at least half, the loss of life, injuries, economic costs, and destruction of natural and cultural resources that result from natural disasters.

4.5 2010 Updates

The LMS Working Group reviewed and updated the pertinent sections:

- Section 4.2: Noted the mitigation goals were discussed and confirmed.
- Section 4.3: Listed primary goals from the State's mitigation plan.

Chapter 5. Hurricanes & Coastal Storms

The descriptions of hazards, hazard histories, and impacts that are detailed in this chapter and Chapter 6 are summarized as "relative" vulnerabilities in Table 6-7.

The Working Group discussed the fact that the hurricane "risk assessment" information in this Chapter is based on the 1998 TAOS damage projections. The conclusion was that those estimates remain acceptable for the purpose of indentifying and prioritizing mitigation actions. It was also noted that the results of the update of the hurricane storm surge modeling (SLOSH) are expected some time in 2010. Prior to initiation of the 2015 Update, the Working Group will reevaluate whether it is appropriate to revise the risk assessment using FEMA's GIS-based tools.

Since 1965, fifteen of the seventeen events that prompted Presidential disaster declarations have been associated with tropical cyclones and coastal storms (Table 5-1). One declaration was for fire hazard and one was for a severe cold spell that affected South Florida.

Table 5-1. Presidential Disaster Declarations (1965-2009)

DR#	Date of Declaration	Event	Assistance Provided*
209	09/14/1965	Hurricane Betsy	IA,PA
337	06/24/1972	Tropical Storm Agnes	IA,PA
955	08/24/1992	Hurricane Andrew	IA,PA
982	03/22/1993	Tornadoes, Flooding, High Winds & Tides, Freezing	IA,PA
1204	02/20/1998	Severe Storms, High Winds, Tornadoes & Flooding	IA,PA
1223	06/19/1998	Extreme Fire Hazard	PA
1249	09/28/1998	Hurricane Georges	IA,PA
1259	11/06/1998	Tropical Storm Mitch	IA,PA
1306	10/22/1999	Hurricane Irene	IA,PA
1345	10/04/2000	Severe Storms & Flooding	IA
1359	02/06/2002	Severe Winter Storm	Disaster unemployment
1539	08/11-30/2004	Tropical Storm Bonnie & Hurricane Charlie	IA
1551	09/13/2004	Hurricane Ivan	PA-B
1595	07/10/2005	Hurricane Dennis	PA
1602	08/28/2005	Hurricane Katrina	PA
1609	10/24/2005	Hurricane Wilma	IA, PA
1785	08/24/2008	Tropical Storm Fay	PA

* IA = Individual Assistance; PA = Public Assistance

5.1 Defining the Hazard

The most significant hazards that could affect Monroe County are winds and flooding associated with tropical cyclones (hurricanes, tropical storms, and tropical depressions) and non-tropical coastal storms. Non-tropical coastal storms are less common, although such storms can be produce high winds and flooding rains.

The Monroe County *Comprehensive Emergency Management Plan* states that "the Florida Keys has one of the highest probabilities of being affected by tropical cyclones in the Continental United States," a characterization that is echoed by the National Hurricane Center.

Most of Monroe County has natural elevations of about 4 to 7 feet above mean sea level. This makes the area vulnerable to coastal flooding. A few areas have poor drainage and accumulate water during heavy rainfalls.

Hurricanes and tropical storms, as well as tropical depressions, are all tropical cyclones defined by the National Weather Service, National Hurricane Center, as warm-core non-frontal synoptic-scale cyclones, originating over tropical or subtropical waters, with organized deep convection and closed surface wind circulation about a well-defined center. Once they have formed, tropical cyclones maintain themselves by extracting heat energy from the ocean at high temperatures and releasing heat at the low temperatures of the upper troposphere. Hurricanes and tropical storms bring heavy rainfalls, storm surge, and high winds, all of which can cause significant damage. These storms can last for several days, and therefore have the potential to cause sustained flooding, high wind, and erosion conditions.

Tropical cyclones are classified using the Saffir-Simpson Hurricane Wind Scale, which replaces the Saffir-Simpson Hurricane Scale (Table 5-2). As described on the NOAA National Hurricane Center's webpage (below), the scale has been modified to indicate only wind intensity and anticipated types of damage and impacts. The description notes that the scale no longer indicates anticipated storm surge depths.

Saffir-Simpson Hurricane Wind Scale (Experimental)

The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 categorization based on the hurricane's intensity at the indicated time. The scale provides examples of the type of damages and impacts in the United States associated with winds of the indicated intensity. In general, damages rise by about a factor of four for every category increase. The maximum sustained surface wind speed (peak 1-minute wind at 10 m [33 ft]) is the determining factor in the scale. The historical examples (one for the U.S. Gulf Coast and one for the U.S. Atlantic Coast) provided in each of the categories correspond with the intensity of the hurricane at the time of landfall in the location experiencing the strongest winds, which does not necessarily correspond with the peak intensity reached by the system during its lifetime.

The scale does not address the potential for such other hurricane-related impacts, as storm surge, rainfall-induced floods, and tornadoes. These wind-caused impacts are to apply to the worst winds reaching the coast and the damage would be less elsewhere. It should also be noted that the general wind-caused damage descriptions are to some degree dependent upon the local building codes in effect and how well and how long they have been enforced. For example, recently enacted building codes in Florida, North Carolina and South Carolina are likely to somewhat reduce the damage to newer structures from that described below. However, for a long time to come, the majority of the building stock in existence on the coast will not have been built to higher code. Hurricane wind damage is also dependent upon such other factors as duration of high winds, change of wind direction, amount of accompanying rainfall, and age of structures.

Earlier versions of this scale - known as the Saffir-Simpson Hurricane Scale - incorporated central pressure and storm surge as components of the categories. The central pressure was utilized during the 1970s and 1980s as a proxy for the winds as accurate wind speed intensity measurements from aircraft reconnaissance were not routinely available for hurricanes until 1990. Storm surge was also quantified by category in the earliest published versions of the scale dating back to 1972. However, hurricane size (extent of hurricane force winds), local bathymetry (depth of near-shore waters), and topographic forcing can also be important in forecasting storm surge. Moreover, other aspects of hurricanes - such as the system's forward speed and angle to the coast - also impact the storm surge that is produced. For example, the very large Hurricane Ike (with hurricane force winds extending as much as 125 mi from the center) in 2008 made landfall in Texas as a Category 2 hurricane and had peak storm surge values of 15-20 ft. In contrast, tiny Hurricane Charley (with hurricane force winds extending at most 25 mi from the center) struck Florida in 2004 as a Category 4 hurricane and produced a peak storm surge of only 6-7 ft. These storm surge values were substantially outside of the ranges suggested in the original scale. Thus to help reduce public confusion about the impacts associated with the various hurricane categories as well as to provide a more scientifically defensible scale, the storm surge ranges, flooding impact and central pressure statements are being removed from the scale and only peak winds are employed in this revised version - the Saffir-Simpson Hurricane Wind Scale.

Source: www.nhc.noaa.gov/aboutsshs.shtml

Table 5-2. Saffir-Sampson Scale and Typical Damages

Tropical Storm: Sustained winds 39-73 mph.	
Category One Hurricane: Sustained winds 74-95 mph.	*Damaging winds are expected.* Some damage to building structures could occur, primarily to unanchored mobile homes (mainly pre-1994 construction). Some damage is likely to poorly constructed signs. Loose outdoor items will become projectiles, causing additional damage. Persons struck by windborne debris risk injury and possible death. Numerous large branches of healthy trees will snap. Some trees will be uprooted, especially where the ground is saturated. Many areas will experience power outages with some downed power poles.
Category Two Hurricane: Sustained winds 96-110 mph *Very strong winds will produce widespread damage.*	Some roofing material, door, and window damage of buildings will occur. Considerable damage to mobile homes (mainly pre-1994 construction) and poorly constructed signs is likely. A number of glass windows in high rise buildings will be dislodged and become airborne. Loose outdoor items will become projectiles, causing additional damage. Persons struck by windborne debris risk injury and possible death. Numerous large branches will break. Many trees will be uprooted or snapped. Extensive damage to power lines and poles will likely result in widespread power outages that could last a few to several days.

Category Three Hurricane: Sustained winds 111-130. *Dangerous winds will cause extensive damage.*	Some structural damage to houses and buildings will occur with a minor amount of wall failures. Mobile homes (mainly pre-1994 construction) and poorly constructed signs are destroyed. Many windows in high rise buildings will be dislodged and become airborne. Persons struck by windborne debris risk injury and possible death. Many trees will be snapped or uprooted and block numerous roads. Near total power loss is expected with outages that could last from several days to weeks.
Category Four Hurricane: Sustained winds 131-155 mph. *Extremely dangerous winds causing devastating damage are expected.*	Some wall failures with some complete roof structure failures on houses will occur. All signs are blown down. Complete destruction of mobile homes (primarily pre-1994 construction). Extensive damage to doors and windows is likely. Numerous windows in high rise buildings will be dislodged and become airborne. Windborne debris will cause extensive damage and persons struck by the wind-blown debris will be injured or killed. Most trees will be snapped or uprooted. Fallen trees could cut off residential areas for days to weeks. Electricity will be unavailable for weeks after the hurricane passes.
Category Five Hurricane: Sustained winds greater than 155 mph. *Catastrophic damage is expected.*	Complete roof failure on many residences and industrial buildings will occur. Some complete building failures with small buildings blown over or away are likely. All signs blown down. Complete destruction of mobile homes (built in any year). Severe and extensive window and door damage will occur. Nearly all windows in high rise buildings will be dislodged and become airborne. Severe injury or death is likely for persons struck by wind-blown debris. Nearly all trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months.

Storm surge is a large dome of water which may be 50- to 100-miles wide and rising from less than 4-feet to over 18-feet high. Generally, surges begin to arrive before a storm's landfall, although the timing is influenced by the path, forward speed, and timing of each storm with respect to the tide cycle. Wind-driven waves are a significant component of tropical cyclones. The height of waves is influenced by storm characteristics and whether shorelines are buffered by barrier islands.

Storm surge can be modeled by various techniques; one such technique is the use of the National Weather Services' Sea, Lake and Overland Surges from Hurricanes (SLOSH) model. The model is used to predict storm surge heights based on hurricane category. Surge inundation areas are classified based on the category of hurricane that would cause flooding. As the category of the storm increases, more land area will become inundated. Storm surge is a major component of Nor'easter storms along the East Coast of the U.S. Because winds are moving from a north and/or eastward position, winds move across the ocean towards shore and form large waves.

5.1.1 Flood Insurance Rate Maps

The National Flood Insurance Program (NFIP) prepares maps to depict areas that are predicted to flood during events up to and including the 1-percent annual chance flood (commonly called the 100-year flood). In Monroe County and the cities, virtually all areas shown on the Flood Insurance Rate Maps (FIRMs) are impacted by coastal flooding,

whether due to hurricanes or other coastal storms. Monroe County and the cities all maintain copies of their current effective FIRMs and the maps are available for inspection by the public.

In order to make federal flood insurance available to citizens, communities adopt FIRMs and administer floodplain management ordinances. Table 5-3 indicates when the County and cities first joined the NFIP and the date of the current map. Monroe County and the cities were among the first to have maps revised and updated into the Geographic Information System format under FEMA's Map Modernization initiative.

Table 5-3. Flood Insurance Rate Maps

	Joined the NFIP	Date of Current Map
Monroe County	June 15, 1973	February 18, 2005
Islamorada	October 1, 1998	February 18, 2005
Key Colony Beach	July 16, 1971	February 18, 2005
Key West	September 3, 1971	February 18, 2005
Layton	July 13, 1971	February 18, 2005
Marathon	October 16, 2000	February 18, 2005

5.1.2 NFIP Flood Insurance Policies & Repetitive Loss Properties

The Florida Division of Emergency Management provided National Flood Insurance Program data that identifies properties in Monroe County and the cities that are, or have been, insured by the National Flood Insurance Program and that have received two or more claims of at least $1,000. Table 5-4a shows that as of February 28, 2010, there are a total of 912 such properties and Table 5-4b shows how the repetitive loss structures breakdown by type of structure as identified by the NFIP.

Table 5-4a. NFIP Repetitive Loss Properties (as of February 28, 2010)

	# of Properties	# Claims	Total Claim Payments
Monroe County	636	1,356	$29,093,568
Islamorada	14	42	$1,113,453
Key Colony Beach	15	39	$1,827,679
Key West	216	544	$24,630,891
Layton	0	0	-0-
Marathon	31	67	$3,638,596
Total	912	2,048	$60,304,187

Table 5-4b. NFIP Repetitive Loss Properties (by structure type)

	Single Family Home	2-4 Family Home	Other Resi-dential	Condo-minimum	Non-Resi-dential	Total
Monroe County	525	30	14	18	49	636
Islamorada	8	2	2	2	0	14
Key Colony Beach	2	0	6	3	4	15
Key West	152	15	9	6	34	216
Layton	0	0	0	0	0	0
Marathon	22	3	2	3	1	31
Total	709	50	33	32	88	912

5.2 Hurricane Effects in Monroe County

Hurricane modeling prepared for South Florida predicts surge depths for different categories as a function of track path. Some paths are predicted to producer higher surges than others. Throughout Monroe County, most locations will experience surges of 9-feet or more as a result of category 3, 4 and 5 hurricanes (Table 5-5). Figure 5-1 shows that most of the Keys and upper mainland portions of the County will be affected by category 2 and more severe storms. Chapters 8 through 12 include tables detailing maximum predicted water depths above mean seal level in Key West, Key Colony Beach, Layton, Marathon, and Islamorada.

Table 5-5. Probable Storm Tide Ranges*

Saffir-Simpson	Elevation (ft above MSL)	
	Monroe	Dade
Category 1	5	5
Category 2	7	7
Category 3	10	10
Category 4	13	13
Category 5	+15	+15

* Lower Southeast Florida Hurricane Evacuation Study (1983)

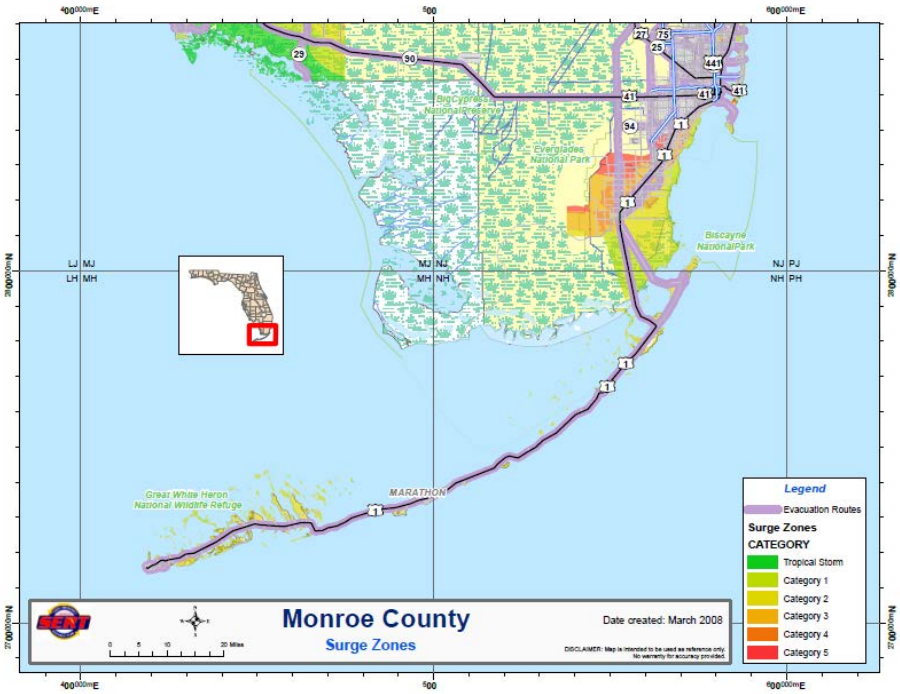

Figure 5-1. Surge Zones for Monroe County, prepared by Florida Division of Emergency Management (online at http://www.floridadisaster.org/publicmapping/index.htm).

Assigning frequencies to hurricanes is difficult, in large part because of the relatively short record. Based on past storms, it appears that the frequency for a Category 5 storm in Key West is one every 36 years (or about 3-percent chance in any given year – by comparison, the "100-year" storm has a 1-percent chance of occurring in any given year). A Category 4 storm is likely to occur about once every 22 years (or about 5-percent in any given year). Category 3, 2, and 1 hurricanes and tropical storms have increasing probabilities of occurrence in any given year. Overall, Monroe County has been advised that in any given year, there is a one in four chance (25-percent) that the area will be affected by a tropical cyclone of some intensity.

One of the greatest threats posed by hurricanes is their erratic and irregular tracks, making prediction of landfall difficult. Figure 5-2 illustrates the tracks of past hurricanes and tropical storms. More hurricanes make landfall during September and October, although they have occurred in all months of hurricane season.

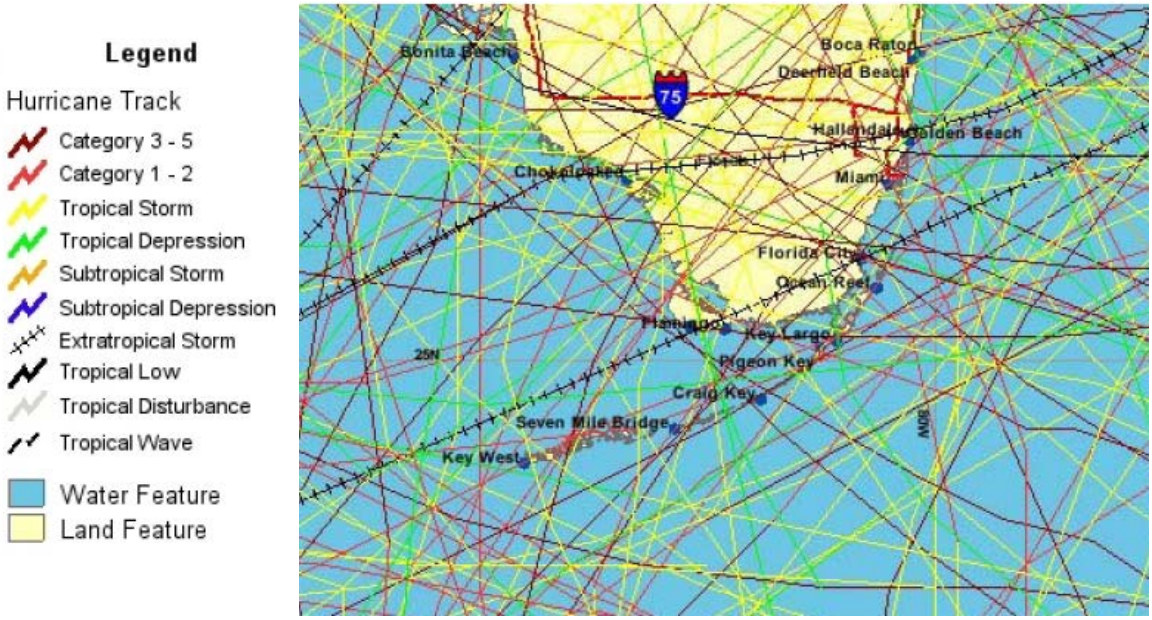

Figure 5-2. Historical hurricane and tropical storm tracks, South Florida (online at http://csc-s-maps-q.csc.noaa.gov/hurricanes/viewer.html).

5.3 Some Major Hurricanes

The Florida Keys have experienced many hurricanes and tropical storms. Brief descriptions of some or the more significant storms (Table 5-6) are sufficient to characterize the hurricane history of the area.

Table 5-6. Some Major Hurricanes that Affected Monroe County

1919 Hurricane (September 2-15). The hurricane passed Key West and the Dry Tortugas on a westward course. Key West recorded winds of 95 mph, with a barometric pressure of 28.81 inches. Water levels were 5-7 feet above Mean Sea Level (MSL)
1929 Hurricane (September 22 to October 4). The hurricane crossed over Key Largo on a northerly course. Key Largo reported winds estimated at over 100 mph, a central barometric pressure of 28 inches, and tide levels of 8-9 feet above MSL. Key West experienced tide levels of 5-6 feet above MSL and winds of 66 mph.
1935 Hurricane (August 29-September 10). The small, extremely violent, Category 5 hurricane crossed the Florida Keys on a northwesterly track. The Tavernier-Islamorada area reported winds estimated at 120 mph with gusts from 190-210 mph. Tide levels ranged from 14 feet above MSL in Key Largo to 18 feet above MSL in Lower Matecumbe Key. The storm was so intense and tightly wrapped that Key West had tide levels of only 2 feet above MSL and average sustained winds of less than 40 mph. Tragically, the storm caused the death of many WWI veterans who were working on construction of Henry Flagler's Overseas Railroad. The 1935 Keys Hurricane remains the strongest storm ever to hit the Continental U.S.
Hurricane Donna, 1960 (August 29-September 19). Hurricane Donna curved northwestward over the Middle Keys near Long Key/Layton and then traveled northward toward the Gulf Coast towns of Naples and Fort Myers. Areas in the vicinity of the storm experienced winds speed of 128 mph and a central pressure of 28.44 inches. The storm affected the Everglades with estimated winds of 150 mph. Tide levels were reported at Upper Matecumbe Key of 13.5 feet above MSL, at Plantation Key 10+ feet above

Table 5-6. Some Major Hurricanes that Affected Monroe County

MSL, and 8.9 feet above MSL in Key Largo. As of 1992 Hurricane Donna, a Category 4 storm, was listed as the 6th most intense hurricane in the U.S.
Hurricane Betsy, 1965 (August 26-September 12). Hurricane Betsy passed over Marathon while moving westward into the Gulf of Mexico. The lowest central pressure was measured in Tavernier at 28.12 inches and wind speeds were estimated to be 120 mph. Tide levels in Tavernier were 7.7 feet above MSL and Key Largo had tide levels of around 9 feet above MSL.
Hurricane Andrew, 1992. This storm made landfall in southern Dade and northern Monroe Counties in the early morning hours of Monday, August 24, 1992. A strong Category 4, the storm severely affected Monroe County in the Key Largo area, particularly North Key Largo and the community of Ocean Reef. According to National Hurricane Center, maximum sustained winds for this storm were 145 miles per hour, with gusts to 175 miles per hour. At landfall, its central barometric pressure was, 926 Mb, is the third lowest in the 20th Century. At the time, Hurricane Andrew was the third strongest storm this Century. Storm tides at Ocean Reef have been estimated at about 4.5 feet on the bay side and 3.9 to 5.0 feet on the ocean side. Because of the storm's intensity and tight configuration, it quickly moved inland. Hurricane Andrew was costly for Monroe County, including extensive roof and other structural damage to residences; public safety and administrative buildings; the Card Sound Road toll facility; and resort buildings; loss of emergency equipment; severe damage to roadways and signs; loss or emergency and security vehicles; and damage to marinas and craft. Other expenses accrued from large-scale landscape loss and damage; loss of and damage to private vehicles; damage to recreational facilities; and great loss of personal property. Many businesses in Upper Key Largo experienced some damage (especially roofs) and loss of signs and landscaping. County roadways were blocked by debris and street and road signs were lost. The Florida Keys Electric Coop reported $130,000 in losses of utility poles and related infrastructure. Total damage in Monroe County exceeded $131,000,000.
Hurricane Georges, 1998. On September 25, 1998, this hurricane made landfall in the Lower Keys and affected the entire county to some extent. Hurricane Georges devastated the Caribbean, including Haiti and the Dominican Republic, Puerto Rico, and Cuba before taking aim at Monroe County. When it hit Santo Domingo in the Dominican Republic on September 22nd, it was a strong Category 3 with sustained winds of120 mph. It weakened to a Category 2 by the time it arrived in the Florida Keys, with maximum sustained winds of 92 mph measured at the Naval Air Station (Boca Chica) near Key West. Gusts of 110 mph were reported in Marathon. According to the Key West Weather Service, precipitation levels in the Lower Keys were identified as 8.65 inches on the south side of Sugarloaf Key, 8.38 inches at Key West International Airport, 8.20 inches on Cudjoe Key, and 8.4 inches at Tavernier in the Upper Keys. The most severe damage was sustained between Sugarloaf Key and Big Pine Key in the Lower Keys. Damage estimates, including insurable, uninsurable, and infrastructure loss, was nearly $300 million. Substantial damage occurred to mobile homes and landscaping throughout the keys. Roof and flood damage occurred in several areas including Big Coppitt, Sugarloaf, Summerland, Ramrod, and Big Pine in the Lower Keys. Similar damage affected the Middle Keys including Marathon, Key Colony Beach, Grassy Key, Long Key/Layton, and Duck Key. In the Upper Keys, several hotels and motels, such as the Cheeca Lodge received damage as did portions of roadway, e.g. Lower Matecumbe where overwash occurred. A school under construction in Sugarloaf Key sustained damage to the unfinished roof, heavy damage to the Big Pine Community Center, and damage to the air conditioning unit on the roof of Marathon High School, which resulted in interior water damage. The City of Key West sustained damage to private buildings and public property, especially along low-lying areas along South Roosevelt Boulevard.
Tropical Storm Mitch, 1998. Arriving on November 4 and 5, Mitch initially was forecast to bring minimal tropical storm conditions to the Keys. Unfortunately, feeder bands from Mitch containing super cells spawned several damaging tornadoes in the Upper Keys. Sections with mobile homes were especially hard hit. Islamorada experienced an F-1 tornado. Rock Harbor and Key Largo were hit by F-2 tornadoes. The State reported Monroe County's damages were estimated at nearly $11 million.
Hurricane Wilma, October 2005. During the night of October 23 to 24, 2005. Hurricane Wilma visited Monroe County, resulting in at least 2 injuries and at least $33 million in damage. Over the Upperr Keys from Craig Key to Ocean Reef, maximum winds were measured at 65 knots with gusts to 79 knots. At Molasses Reef C-MAN station. Overall, average winds across the inhabited Lower Keys were estimated at 70 to 80 mph with gusts up to 90 mph with general Category 1 Saffir Simpson Damage noted. Rainfall across the Lower Keys was fairly light but typical for a fast-moving hurricane, 1.50 inches measured at Pennekamp State Park in Key Largo. Wilma's storm surge primarily affected the bayside of the Upper

Table 5-6. Some Major Hurricanes that Affected Monroe County

Keys, ranging from 4 to 5 feet above sea level with the worst in Lower Matecumbe Key. U.S. Route 1 north of Key Largo was temporarily flooded at least 3 inches at maximum surge during the afternoon hours on October 24. For a more complete description of the impacts, see Appendix D, "Hurricane Wilma in the Florida Keys" by Kennard Kasper, National Oceanic and Atmospheric Administration (NOAA)/National Weather Service (NWS) Weather Forecast Office (WFO) Key West, Florida (http://www.srh.noaa.gov/media/key/Research/wilma.pdf).

5.4 Losses Due to Major Disasters

No definitive record exists of all losses – public and private – due to disasters for Monroe County. For the United States as a whole, estimates of the total public and private costs of natural hazards range from $2 billion to over $6 billion per year. Most of those costs can only be estimated. In most declared major disasters, the Federal government reimburses 75% of the costs of cleanup and recovery, with the remaining 25% covered by states and affected local jurisdictions. FEMA administers two programs that help with recovery:

- Public Assistance program, that provides cost-shared grants for certain categories of damage/expenditures sustained by State and local governments and certain types of nonprofit organizations. FEMA provides supplemental assistance for debris removal, emergency protective measures, and the repair, replacement or restoration of damaged public facilities and facilities of certain nonprofit organizations, including damaged roads and bridges, flood control facilities, public buildings and equipment, public utilities, and parks and recreational facilities; and
- Individual Assistance program, which provides direct assistance to individuals, families, and businesses for certain losses that are not covered by insurance. This assistance is intended to help with critical expenses that are not covered in other ways – it is not intended to restore damaged property to pre-disaster condition.

The Florida Division of Emergency Management coordinates and administers aspects of FEMA's Public Assistance Program. DEM provided the data shown in Table 5-7, which summarizes some costs associated with disaster recovery from declared disasters in the past decade (including estimates of some costs that were covered by insurance).

Table 5-7. Some Past Disaster Recovery Costs

Hurricane Georges Damage As Of September 1, 1999*	
Public Assistance (Infrastructure & Emergency Activities)	$ 54,257,290
Temporary Housing	$ 6,584,782
Individual Assistance	$ 3,966,572
Small Business Administration	$ 61,366,100
National Flood Insurance Program	$ 38,044,669
Wind Insurance (est.)	$131,000,000
TOTAL	$ 295,219,413
Tropical Storm Mitch Damage As Of September 1, 1999*	
Public Assistance (Infrastructure & Emergency Activities)	$ 4,021,718
Temporary Housing	$ 754,845
Individual Assistance	$ 395,663
Small Business Administration	$ 5,678,700
National Flood Insurance Program	$ 51,527
TOTAL	$ 10,902,183
Hurricane Ivan (DR# 1551)**	
Public Assistance (Infrastructure & Emergency Activities)	$362,648
Temporary Housing	Not declared
Individual Assistance	Not declared
Small Business Administration	Not declared
TOTAL	$362,648
Hurricane Dennis (DR# 1595)**	
Public Assistance (Infrastructure & Emergency Activities)	$6,260,342
Temporary Housing	Not declared
Individual Assistance	Not declared
Small Business Administration	Not declared
TOTAL	$6,260,342
Hurricane Katrina (DR# 1602)**	
Public Assistance (Infrastructure & Emergency Activities)	$5,522,803
Temporary Housing	Not declared
Individual Assistance	Not declared
Small Business Administration	$3,480,700
TOTAL	$9,003,503
Hurricane Wilma (DR# 1609)**	
Public Assistance (Infrastructure & Emergency Activities)	$69,875,249
Temporary Housing	$1,980,852
Individual Assistance	$24,596,806

Small Business Administration	$97,349,200
TOTAL	$193,802,107
Tropical Storm Fay (DR# 1785)**	
Public Assistance (Infrastructure & Emergency Activities)	$4,403,549
Temporary Housing	Not declared
Individual Assistance	Not declared
Small Business Administration	Not declared
TOTAL	$4,403,549

* Florida DCA, Recovery & Mitigation Section (2005)

** Florida DEM, Recovery Bureau (as of November 6, 2009)

5.5 Impacts of Hurricanes

The State Hazard Mitigation Plan (SHMP, 2007) summarizes analyses of "population at risk" and the dollar values of residential and commercial structures exposed to Category 2 hurricanes (SHMP Table 3.3.7), Category 5 hurricanes (SHMP Table 3.3.8), hurricane wind (SHMP Table 3.3.9). The results are shown in Table 5-8.

Table 5-8. SHMP Summary: Impacts of Hurricanes in Monroe County (2007).

		Population	Value of Residential Structures	Value of Commercial Structures
Coastal Flooding	**Category 2**	37,849	$4,715 million	$765 million
	Category 5	57,323	$6,797 million	$1,111 million
Hurricane Wind		79,589	$9.3 million	$2.1 million

To improve understanding of hurricanes and their impacts, in the mid-1990s the Florida Department of Community Affairs developed "The Arbiter of Storms" (TAOS). TAOS was an integrated hazards model that provided higher resolution data than were produced by the National Hurricane Center's SLOSH model. The SLOSH model calculated storm surge for an area of coastline called a basin. TAOS, which makes more extensive use of satellite and digital terrain data, had a higher resolution. In addition to storm surge estimates, TAOS calculated estimates of wave height, maximum winds, inland flooding, debris and structural damage. Computer models are approximations and all predications of storm impacts and damage that are based on models include some degree of uncertainty.

In 1998, estimates of projected damage for various land use types in different storm scenarios developed through the TAOS model were provided by the State. The projections included the number of parcels by type, total improved value, and six storm scenarios

(tropical storm and all categories of hurricane). Anticipated damage was included for floods, winds, and wave action.

5.5.1 Buildings

The Monroe County Property Appraiser reports that as of January 1, 2009, there are 74 mobile home/recreational vehicle parks (land owned by park operator). Between the units installed in those parks and those installed on individual parcels of land, there is a total of 5,619 manufactured homes units. New manufactured home parks have not been approved since 1987. Installation of new or replacement units must comply with current codes.

Four hundred fifty-two parcels of land are recorded as "hotel/motel" and it is estimated that there are 7,100 available rooms (including guest houses but not including "condotels," which are privately-held condominiums that can function as hotels). Most were built before current strict standards related to wind and flood hazards. Additions or substantial renovation will trigger the need to comply with current codes.

A need for affordable housing has been identified in the County and Municipal Comprehensive Plans and was underscored by the experiences in Hurricane Georges and Tropical Storm Mitch. The preliminary damage assessments identified of housing units that were determined to have been destroyed or to have sustained major or minimal damage (see Table 5-9).

Table 5-9. Monroe Housing Units Affected by Hurricanes Georges and Mitch

	Total Affected	Degree of Damage		
		Minimal	Major	Destroyed
Hurricane Georges	1,854	893	470	173
Tropical Storm Mitch	664	165	40	43

The TAOS information covered the entire county and did not provide separate data on the incorporated municipalities. Tables 5-10 through 5-16 summarize the damage projections for single-family homes, manufactured homes, multi-family homes, other residential buildings, commercial property, institutional property and hotels.

In 2005, the LMS Work Group decided that although the TAOS projections were prepared for the 1999 LMS, the value of the results is not in the precision of the numbers, but in the order of magnitude of projected damage. In 2009, the Working Group considered adjusting the TAOS data using current data provided by the Monroe County Property Assessment Office (see explanation in Section 2.4). However, given the apparent significant discrepancies between the raw numbers (both number of parcels/buildings and total

improved values), it was not feasible. This does not alter the conclusion that the order of magnitude of project damage is sufficient for the purpose of prioritizing hazards and risks:

- A category 3 hurricane is projected to result in some degree of damage to all occupancies, totally on the order of 50% of improved value.
- All single family homes will experience some degree of damage in all storms, with total structural damage approaching 100% in a Category 5 hurricane.
- All manufactured homes will be damaged to some degree in all storms, with total damage approaching 100% in a Category 3 hurricane.
- All multi-family residential buildings, other residential buildings, hotels, commercial buildings, and institutional buildings will be damaged to some degree in all storms, with total structural damage approaching 100% in a Category 5 hurricane.

Table 5-10. 1998 TAOS Damage Projections: Single-Family Homes (Total Parcels = 16,618; Improved Value = $3.01 billion, 1998 dollars)

		Tropical Storm	Hurricane Category				
			1	2	3	4	5
	Parcels Damaged	8,565	16,618	16,618	16,618	16,618	16,618
Damage ($000s)	Total Structure	243	686	1,066	1,571	2,248	2,946
	Structure Flood	100	245	413	620	848	1,128
	Structure Wind	0	50	188	492	1,102	2,380
	Structure Wave	139	40	518	657	830	10,819
	Total Content	63	169	3,295	696	1,217	1,487

Table 5-11. 1998 TAOS Damage Projections: Manufactured Homes (Total Parcels = 5,881; Improved Value = $308 million, 1998 dollars)

		Tropical Storm	Hurricane Category				
			1	2	3	4	5
	Parcels Damaged	5,881	5,881	5,881	5,881	5,881	5,881
Damage ($000s)	Total Structure	116	169	235	304	308	308
	Structure Flood	26	52	80	110	155	221
	Structure Wind	9	51	135	297	308	308
	Structure Wave	92	111	123	137	155	183
	Total Content	11	46	99	152	153	154

Table 5-12. 1998 TAOS Damage Projections: Multi-Family (<10) (Total Parcels = 1,312; Improved Value = $250 million, 1998 dollars)

		Tropical Storm	Hurricane Category				
			1	2	3	4	5
	Parcels Damaged	522	1,312	1,312	1,312	1,312	1,312
Damage ($000s)	Total Structure	14	41	68	112	173	243
	Structure Flood	6	14	17	43	61	84
	Structure Wind	0	4	15	40	90	196
	Structure Wave	8	22	28	36	47	66
	Total Content	3	10	19	49	94	123

Table 5-13. 1998 TAOS Damage Projections: Other Residential
(Total Parcels = 7,652; Improved Value = $2.3 billion, 1998 dollars)

		Tropical Storm	Hurricane Category				
			1	2	3	4	5
	Parcels Damaged	5,629	7,652	7,652	7,652	7,652	7,652
Damage ($000s)	Total Structure	186	496	809	1,292	2,018	2,262
	Structure Flood	68	136	262	411	617	826
	Structure Wind	13	101	284	654	1,335	2,250
	Structure Wave	106	281	350	419	518	691
	Total Content	37	102	288	633	1,057	1,126

Table 5-14. 1998 TAOS Damage Projections: Commercial
(Total Parcels = 1,431; Improved Value = $409 million, 1998 dollars)

		Tropical Storm	Hurricane Category				
			1	2	3	4	5
	Parcels Damaged	1,287	1,431	1,431	1,431	1,431	1,431
Damage ($000s)	Total Structure	43	107	163	250	366	409
	Structure Flood	15	30	49	74	106	142
	Structure Wind	4	20	56	128	259	409
	Structure Wave	25	64	77	93	115	149
	Total Content	10	24	59	121	189	203

Table 5-15. 1998 TAOS Damage Projections: Institutional
(Total Parcels = 155; Improved Value = $80 million, 1998 dollars)

		Tropical Storm	Hurricane Category				
			1	2	3	4	5
	Parcels Damaged	142	155	155	155	155	155
Damage ($000s)	Total Structure	5	17	28	45	70	80
	Structure Flood	1	4	74	12	18	26
	Structure Wind	1	4	11	25	51	80
	Structure Wave	4	9	11	15	18	24
	Total Content	0.5	2	9	22	36	40

Table 5-16. 1998 TAOS Damage Projections: Hotels
(Total Parcels = 215; Improved Value = $614 million, 1988 dollars)

		Tropical Storm	Hurricane Category				
			1	2	3	4	5
	Parcels Damaged	155	215	215	215	215	215
Damage ($000s)	Total Structure	22	72	170	320	563	614
	Structure Flood	5	9	54	97	147	201
	Structure Wind	6	30	85	195	396	614
	Structure Wave	11	35	40	49	63	90
	Total Content	3	7	57	158	294	306

5.5.2 Transportation Infrastructure

Historically, some areas and streets are more vulnerable than others to coastal flooding and/or pooling of rainfall runoff flooding from heavy rains. In the past decade, the following areas have been identified as likely to flood repetitively:

- MM 109 in the Upper Keys, which can hamper evacuation.
- MM 106, Lake Surprise area, vulnerable to the effects of wind driven wave run-up from E/NE and W/SW directions; heavy rainfall results in ponding.
- MM 111, the exposed beach area along the 18-mile stretch bordering Barnes Sound, experiences wave runup or "piling" with strong E and NE winds.
- MM 113, the Point Laura Marina Area, borders Barnes Sound is similarly susceptible to strong E and NE winds.
- MM 73.5 to approximately MM 74.5, the Lower Matecumbe area known as "Sea Oats Beach", vulnerable to NE / E / SE wind driven wave run-up.
- MM 30 -31, Big Pine Key. The area north of the Big Pine Plaza Shopping Center encompassing Wilder Road and Key Deer Boulevard, while not normally vulnerable to storm surge effects, experience rainfall ponding.
- MM 9-10, Big Coppitt Key, Bayside, experiences wind-generated wave run-up.

Hurricane Andrew, Hurricane Georges, Tropical Storm Mitch. Transportation disruptions in the Keys occurred during evacuations for Hurricane Andrew and Hurricane Georges. Following Tropical Storm Mitch and Hurricane Georges, debris on U.S. 1 somewhat impeded traffic flow. Both of the areas airports, Key West Airport and Marathon Airport, were closed before Hurricane Georges moved through the area. Damage to the airfield lighting at the Key West Airport closed the facility for five days. The Marathon Airport did not suffer any notable physical damage, but was closed for four days for debris removal and assessment and repair.

Hurricane Wilma. The Monroe County Public Works Division reported the following:

- Twenty-five separate work orders were issued for sign repairs in the upper Keys ($12,799) and Lower Keys ($29,732).
- Repair of revetment at the Long Key transfer station ($47,199).
- Road repairs on Lobster Lane, Key Largo ($4,869).
- Repairs to asphalt and limerock base on Seaview Avenue, Conch Key ($8,900).
- Repairs to various roads in the Lower Keys ($299,375).

- Repair of asphalt and limerock base, 450 linear feet of riprap barrier wall, and 750 linear feet of new riprap barrier wall (considered as "mitigation") at the end of Boca Chica Road (estimated $382,000).
- Repaired several street lights ($12,000).
- Storms were cleaning in the Lower Keys ($15,000).
- Repair of traffic signal equipment that was deteriorated by corrosion likely caused by salt water/moisture intrusion at several locations; it is likely the damage is attributable to Hurricane Wilma, even though the work was done nearly a year after the storm.

5.5.3 Communications

Most telephone service in the Keys is directed through facilities in Miami, although some local capability provides services within single exchanges. To ensure redundancy, two major trunk fibers are furnished from Homestead on the mainland to Key West (one buried and one aerial). However, most cable lines are located along the underside of fixed bridges, making them vulnerable if bridges fail. Installing sub-surface cable is not feasible because of rock substructure; environmental considerations inhibit underwater installations.

Communications infrastructure suffered in Hurricanes Andrew and Georges, downing towers and antennas in Dade County (cell towers, radio and TV towers, and repeaters) and damaging poles and switching equipment. The NOAA weather radio transmitter in Key Largo was damaged in Hurricane Andrew. Winds associated with Hurricane Georges destroyed the Key West Police Department's communication's tower. Major communication problems result from loss of electrical power.

The Monroe County Sheriff's Office Florida Keys reported installing a special door to protect the 911 equipment room from flooding.

5.5.4 Water Supply

Although Monroe County receives approximately 42 inches of rainfall per year, there are virtually no fresh water sources in the Upper Keys due to characteristics of the underlying limestone base rock. Some small fresh water lenses exist in the Lower Keys, primarily in Big Pine Key and Key West. Consequently, virtually all-potable water comes from the Biscayne Aquifer in Florida City via pipeline owned and operated by the Florida Keys Aqueduct Authority. The main pipeline that connects to the Upper Keys is laid underwater; some distribution pipelines are connected to roads and bridges and thus vulnerable to washout.

The Florida Keys Aqueduct Authority is an independent Special District created by the State of Florida Legislature, with the primary purpose and function to obtain, treat and distribute

an adequate water supply to the residents and businesses of the Florida Keys. In 1998, the Florida Legislature modified the Authority's enabling Act to include providing wastewater collection, treatment and disposal throughout the unincorporated areas of Monroe County, with the exception of Key Largo. The Authority manages the infrastructure used to supply water and wastewater services to its customers in the Florida Keys, sets rates and provides customer service.

The Florida Key's Aqueduct Authority's mitigation and response activities include:

- The Authority's pipeline originates in Florida City in south Miami-Dade County. It ensures that the supply is protected from hazards and complies with South Florida Water Management Districts permit requirements, including identification and use of alternative sources. The Authority also operates and maintains two Reverse Osmosis emergency water treatment plants in the Florida Keys, to provide an alternate source when water cannot be supplied through the pipeline.
- The Authority participates in developing policies and procedures for responding to and recovering from shortages or disruptions in the supply and delivery of electricity, potable water, waste water collection and treatment and other fuels which affect or threaten to affect significant numbers of citizens and visitors.

The Authority, an agency of the State, has contingency plans and works diligently to provide water in the event of a hurricane in the Keys. Although not required to obtain local building permits, FKAA is required to meet or exceed the latest edition of the Florida Building Code when building or renovating its facilities. In addition, FKAA complies with the minimum design standards for flood protection of water and wastewater infrastructure and the standards set by the Florida Department of Environmental Protection. Some redundancy for the regular supply line was provided by restoring two reverse osmosis plants: the Marathon facility would serve the Middle Keys and the Stock Island (Key West) facility would serve the Lower Keys. All primary pumping and water treatment facilities have backup power generation capability.

Hurricane Andrew: The water treatment plant in Florida City was damaged (lost roof on control room; roof on high service pump building; loss of Quonset hut; other minor building damage; partial loss of communication system). The only impact to customers was discontinuation of lime softening at the plant.

Hurricane Georges: The Florida Keys Aqueduct Authority reported that little, if any, disruption occurred in the transmission system during Hurricane Georges. Distribution system disruptions occurred in isolated areas due to broken water mains caused by uprooted trees. Wave action on the ocean side of the Spanish Harbor Bridge washed out a portion of

the approach road and exposed about 250 feet of 24-inch transmission main (subsequently relocated to the roadway). As a private non-profit entity, FKAA was eligible to receive $1.69 million in federal disaster assistance. The assistance was used to rehabilitate damaged facilities.

All new or replaced pump stations are built above the estimate storm surge level of 14 feet above mean seal level. Other new structures are hardened to help withstand storm damage and protection operational capacity. An existing transmission station was retrofit with floodproofed doors.

Private water wells that draw from shallow freshwater sources can be contaminated by flooding, whether from storm surge or ponded runoff. A number were contaminated by floodwaters in Hurricane Georges, especially on Big Pine Key, where it appears that flooded septic tanks, cesspools and drain fields overflowed. After that event the South Florida Water Management District provided funding to the FKAA to install distribution mains to homes on Big Pine Key that had wells contaminated by the tidal surge. The project also supported environmental objectives related to the Key Deer, and endangered species, by reducing withdrawals from the fresh water lens.

***Hurricane Wilma*:** In its 2007 Comprehensive Annual Financial Report, the FKAA reported having sustained no significant infrastructure damage and there were no interruptions of service.

5.5.5 Electric Power

Electric power is supplied by Florida Keys Electric Cooperative (FKEC) from the Upper Keys to Marathon, and by Keys Energy Service (KEYS) from Sunshine Key to Key West. The two agencies cooperate to provide the best service for the area. Both utilities purchase power from larger suppliers.

Keys Energy Service has the capability to generate electricity at its plant in Key West. The FKEC has limited generating capability at its Marathon Plant. With the exception of the private community of Ocean Reef in North Key Largo, the majority of electric lines in the county are above-ground. Due to vulnerability, power poles are not located on bridges but are submerged. Subsequent to Hurricane Andrew, some poles were re-designed to withstand higher wind forces. Both electric utilities have replaced older equipment with newer, more resilient designs and materials.

Hurricane Andrew: Due to the loss of the Florida Power and Light Company's electrical tie line in Dade County, Monroe County's approximately 78,000 residents were without power or on limited power for approximately two weeks. The Florida Keys Electric Cooperative reported a $130,000 loss of utility poles and related infrastructure. A report by

the Florida Sea Grant Program identified lack of power as one the most significant factors affecting businesses and, while such damages were difficult to quantify in a monetary sense, they "left an indelible economic footprint on many businesses in the Keys."

Hurricane Georges: The Lower Keys experienced significant disruption of electric power. Damage to transformers, power poles, and transmission lines was responsible for widespread power outages, especially in areas serviced by Keys Energy Service. Power was restored on a priority basis with efforts directed at hospitals and critical services. Most electricity was reestablished within two weeks; however, as with most disasters, restoration in the hardest hit areas progressed more slowly. Power outages created major economic loss to Key businesses that are heavily dependent on the tourist trade. Disaster related unemployment, primarily due to the lack of electricity was significant because of loss of jobs in the service industry.

Hurricane Wilma:

- **Florida Keys Electric Cooperative (FKEC)** reported that its power transmission system sustained no damage and was able to transmit power immediately after Hurricane Wilma. The power distribution system sustained moderate damage, with repair costs totaling $712,500. Damage was sustained by the land-based portion of the distribution system (downed primary taps, broken poles, transformer failures) and by the Channel Five water crossing, where severe winds caused disconnection of the wires. Overall, FKEC assessed that its power distribution and power transmission systems held up well, with limited outage.
- **Keys Energy System (KEYS)**, in the Lower Florida Keys, experienced only moderate damage to its system. The utility had very minor damage to the main transmission 138kV line from the mainland power grid. In the distribution system, 68 utility poles failed (less than 0.5% of all poles). Seventy eight (78%) of customers had service restored within 24 hours. Within 72 hours, 93% of KEYS' customers had electrical service reestablished. Power was restored in accordance with a "Restoration Priority Plan" (i.e. hospital, EOC, critical customers) approved by local governmental agencies. KEYS activated its Mutual Aid Agreement with Florida's utilities and contractors. Approximately 112 outside crews and supporting staff assisted KEYS in the restoration efforts. Total damage was approximate $3.6 million, with impacts to transmission, distribution, generation, and other support building locations. Even though Hurricane Wilma was a major flood event, KEYS experienced minimal damage to its underground lines.

5.5.6 Wastewater Facilities

Hurricane Georges: The State's Hurricane Georges assessment report noted that domestic wastewater facilities were surveyed in the two weeks following the storm. All regional facilities remained functional throughout the event, including facilities in Key West and Key

Colony Beach. Approximately 250 package treatment plants are located throughout the County to serve such uses as motel, mobile home and RV parks, restaurants, and others. The loss of power to these small package plants did not result in overflows. While power was being restored, to prevent health and safety problems sewage was hauled away from these small collection systems.

5.5.7 The Economy

Disruption of the local economy is an anticipated consequence of hurricanes that directly affect the Florida Keys. Although major storms may generate debris and cause building and infrastructure damage, the most detrimental short-term impact of large and small storms is caused by the loss of electric power. The most significant long-term impact would be caused by major damage to U.S. 1. Lengthy repairs and limited easy access to the Florida Keys would directly affect tourism and the flow of goods.

The Florida Keys are susceptible to economic disruption because the primary industries are related to retail sales, service, tourism, and fishing. Events that cause visitors to stay away would result in economic loss to local businesses and loss of tax income to local governments. The fishing industry would suffer economically with loss of power (affects ice production) and transportation disruption (affects transport to the mainland).

With a relatively high percentage of retirees in the area, interruption in government services that provide social security, disability, unemployment, and welfare payments would result in some economic impacts.

Major disasters can create a “domino effect” that can hurt the economy. For example, major damage and loss to residential properties can lead to displacement of people. Decrease in population means loss of clientele for local businesses. Businesses themselves may be destroyed or damaged to the degree that they cannot operate (whether short- or long-term). Even without initial major population relocation, business closings can contribute to reduced services, leading some to relocate in the short-term. Business closings and destruction or severe damage of facilities like schools, libraries, and other public buildings may eliminate jobs (even in the short-term) may lead some people to leave the area.

Since 1998, the Florida Keys Employment and Training Council has noted the significance of disasters on employee dislocation, unemployment, and underemployment. Because of the nature of the economy and the severe shortage of affordable housing, many employees do not have a stable economic base. Even a minor interruption in business may have serious effects on the work force. Given the already short supply of housing, another complicating factor is the likely reduction in the housing supply due to damage.

***Hurricane Andrew and Hurricane Georges*:** Both Hurricane Andrew and Hurricane Georges caused economic disruption in Monroe County, primarily due to the interruption of tourism. In addition, the fishing industry was hard hit due to the loss of many seafood traps, lack of ice for storage, and transportation disruption. Loss of power disrupted not only hospitality and retail businesses, but affected gas stations that could not pump and were slow to receive fuel because of transportation disruptions. The loss of more than 80 channel markers throughout the Keys curtailed boating and caused the suspension of cruise ship visits. In addition, the County and municipal governments were affected by a reduction in sales, infrastructure, and bed tax revenues immediately after the storm, resulting from business slow-downs.

***Hurricane Wilma*:** It has been reported that a number of permanent residents moved out of the area after flooding rendered at-grade dwelling units uninhabitable. Because affordable housing is limited throughout the Keys, the damage to those living units has an adverse impact on an already difficult housing market which makes it more difficult for low income residents and, in turn, affects the available work force.

5.5.8 Environmental Resources

After Hurricane Andrew in 1992, the Monroe County Cooperative Extension Service received a grant to study environmental consequences. The study, "The Effect of Hurricane Andrew on Monroe County's Natural Resources and Its Dependent Industries," identified natural resources affected by the hurricane. It states that impacted resources include "pine rocklands, hard wood hammocks, mangrove forests, cypress domes, the freshwater regimes of the sawgrass community, and the coral reefs offshore of Key Largo."

The study notes that although South Florida ecosystems have evolved to adapt to natural episodic massive disturbances, including hurricanes, droughts, wildfires, and freezes, the growth of urban environments has significantly altered the ecology and ability of the ecosystems to respond and recover from catastrophic events.

Mangroves are very important to the environment of the Keys and serve as protective buffers in storms. Hurricane Andrew damaged the mangroves in Everglades National Park as severely as 80-95% in places, although areas south of the hurricanes' eye experienced more limited defoliation and branch damage. The study demonstrated that trees continue to suffer after the passage of a storm; initial estimates of mortality eventually were increased by up to 50%. Delayed mortality has been observed following past hurricanes, sometimes up to 2 years after the initial event.

Marsh Communities appeared to have survived Hurricane Andrew with little apparent damage, although the loss of periphyton, (which fish feed on) could affect "fish abundances." Pineland damage had a positive influence because of increased sapling

growth. Hardwood hammocks are more susceptible to wind damage than pines. In North Key Largo, Hurricane Andrew damaged about two-thirds of the upland hardwood hammock trees.

Because Hurricane Andrew came ashore north of Monroe County, the Florida Keys reefs, including those in the Key Largo National Marine Sanctuary, were spared the affects of hurricane force conditions. Hurricanes can cause major damage to coral reefs; in past surveys in Puerto Rico, it was found that major hurricanes leave behind considerable breaks in coral formations.

Hurricanes can have a variety of impacts on fishery resources, including short-term and long-term impacts that are detected only after extended monitoring. After Hurricane Andrew, three species appeared to experience harvest declines in 1992 and 1993: Spanish Mackerel, Dolphin, and Spiny Lobster. In addition, there was a consistent decline in shrimp following the storm, but catches increased in the following year.

A survey of the commercial fishing industry after Hurricane Andrew, found that 53% of 43 survey respondents reported adverse impacts, primarily in the lobster industry because the storm occurred during the lobster season. The industry experienced inventory loss (virtually all 1 million traps were in the water), disruption of utilities (electric power to make ice), communications (for sales transactions), and transportation.

Overall, hurricanes are necessary and natural occurrences for the historical maintenance of the natural environment of the Florida Keys. Although Hurricane Andrew caused a relatively minor disruption of the portion of Monroe County's economy that is based on natural resources, the event pointed out opportunities to mitigate the impacts on the industry. In particular, restoration of power is a high priority.

***Hurricane Wilma*:** Hurricane Wilma, particularly its storm surge, severely damaged pine rocklands throughout the Florida Keys National Wildlife Refuges. Virtually all pines on Cudjoe Key were killed, with high mortality of both young and mature trees on Big Pine, Sugarloaf, and Little Pine Keys. Within a month of the storm's passage, boring insects attacked and killed significant numbers of the surviving pines on Big Pine Key. Recovery of the pinelands will be protracted and on Cudjoe Key especially, recovery is far from assured.

All backcountry islands in Great White Heron and Key West National Wildlife Refuges were severely damaged by Hurricane Wilma, with both wind and storm surge exacting a toll. Virtually all vegetation was either defoliated or killed. Little Crane Key was nearly obliterated, with only a few isolated trees left standing. As of late 2009, most backcountry islands are on the way to recovery.

A noteworthy large sand island near Boca Grande Key was created by Hurricane Wilma. In the 2006 and 2007 seasons the site harbored nesting roseate terns, the first known nesting by this species in Key West National Wildlife Refuge. Fifty-four bird species, including 4 federally listed species, have been observed at the site. The island has progressively shrunk due to erosion and is now less than 10% of its original size.

5.5.9 Historic Resources

Monroe County has many historic structures that are listed on the State and National Registers of Historic Places. These structures are owned by the State, the County, and private owners. Many historic properties, especially in Key West, attract many visitors.

In recent years, properties and sites that are listed on the National Register of Historic Places have not sustained major damage because the Keys have not had any landfalling major hurricanes. The Old Monroe County Courthouse, a state-owned building, has suffered wind damage in the past. It was retrofit with window protection using FEMA's Hazard Mitigation Grant Program funds. FEMA's funds also were used to retrofit the steeple of the Old Key West City Hall with motorized hurricane shutters. In 2005, flooding associated with Hurricane Wilma was approximately 14" deep, flooding the entire ground floor of the Old Key West City Hall, destroying all of the doors. The tenant abandoned the space because the saturated interior led to mold growth. Repair work was completed in January 2009: all old finishes were removed, mold was remediated, and retaining walls and impact windows were used to infill the large arched openings. The total cost of repairs was approximately $350,000. The Key West Arts & Historical Society operates three historic sites. During the 2004 and 2005 hurricane seasons, each site suffered significant damage:

- The Custom House Museum (State owned). During Hurricane Wilma, the basement was flooded, damaging all of the fire protection and electrical equipment. The roof and winds were damaged by wind and water intrusion contributed to interior damage.
- The Lighthouse and Keeper's Quarters Museum is located on high ground. During Hurricane Wilma, windows and shutters were damaged by wind. The fence has deteriorated because of inundation.
- Fort East Martello, located near the airport, is flooded during most hurricanes, affecting the interior courtyard and the citadel. In Hurricane Wilma, floodwaters destroyed the massive front doors and damaged the gift shop.

5.6 2010 Updates

The LMS Working Group reviewed and updated the pertinent sections. Some of the more significant changes include:

- Added explanation that the Working Group reconfirmed its 2005 assessment that, although prepared in 1999, the hazard identification and risk assessment are sufficient for the intended purpose (updated to reflect events).
- Updated Presidential disaster declarations. Revised the new Saffir-Simpson Hurricane Wind Scale.
- Section 5.1.2: Added summary tables of NFIP repetitive loss data.
- Section 5.2: Added surge zone map and map of hurricane tracks.
- Section 5.3: Added description of Hurricane Wilma.
- Section 5.4: Updated descriptions of FEMA's Public Assistance and Individual Assistance programs. Added data on recovery costs for hurricanes Ivan, Dennis, Katrina and Wilma and Tropical Storm Fay.
- Section 5.5: Added summary of impacts of hurricanes in Monroe County, from the State Hazard Mitigation Plan.
- Several subsections: Added description of impacts of Hurricane Wilma.
- Section 5.5.1: Updated data on mobile home parks and hotel/motels. Noted the Working Group considered adjusting the 1999 TAOS results.
- Section 5.5.8: Revised text to note and describe the effects of hurricanes in 2004 and 2005 on historic resources.

Chapter 6: Other Hazards & Risks

6.1 Introduction

Hurricanes and tropical storms pose major risks to Monroe County due to high winds and flooding (the effects of those storms are addressed in Chapter 5). Other natural hazards addressed in this chapter that affect the area to a lesser degree are high winds other than hurricane (severe storms/tornadoes), rainfall flooding, drought, wildland fires, and coastal erosion. These hazards are not profiled with the same degree of detail as hurricanes/coastal storms because they do not represent the same level of risk and do not threaten large areas nor affect many people. This is reflected in the summary table at the end of the chapter that identifies the relative vulnerability. As described in the following sections:

- Strong storms, including tornadoes and water spouts can equally affect the entire county. As with hurricanes and coastal storms, all types buildings are exposed to the effects of winds, with those that pre-date building code requirements somewhat more vulnerable than more recent buildings (Section 6.2);
- Rainfall pooling and occasional flooding of depressed areas occurs locally in Marathon and Key West, without severe property damage (Section 6.3);
- Drought affects the entire county, is managed by the water providers, and does not result in property damage (Section 6.4);
- Wildland fire risk is very localized, has affected only small areas in the past, the impacts are limited because of effective response capabilities (Section 6.5); and
- Coastal erosion areas have been identified only in a state study; there is insufficient reported evidence that many private properties with buildings are experiencing significant erosion (Section 6.6).

In 2009, the Working Group agreed that the hazard identification and risk assessment content in this chapter, combined with Chapter 5, continues to characterize the hazard and risks and are acceptable for the purposes of relative ranking. Prior to initiation of the 2015 Update, the Working Group will reevaluate whether it is appropriate to revise the risk assessment using FEMA's GIS-based tools.

Recent advice from NOAA/NWS is that, although extremely rare, some tsunami hazard exists for the Atlantic and Gulf coasts for elevations less than 15 feet above mean high tide and within 300 feet horizontal distance from mean high tide line. Because seismic and/or tsunami events have been so rare, they are not further considered in this Plan.

Other hazards that do not affect the area include landslides/sinkholes, dam/levee failure flooding, and winter storms; thus, these hazards are not addressed by this Plan. Winter storms and freezes do not pose risks to agricultural interests and property because of the climatological and meteorological characteristics of the Keys. The winter of 1981 was especially cold, with temperatures in the low 40°s (record low was 35°F at Coral Key Village). In mid-January 2010, the Florida Keys experienced one of the longest and most intense periods of cold weather recorded, with temperatures remaining more than 10 degrees below normal for nearly two weeks. The greatest effect of an unusually low temperature would be a resulting low wind chill factor and the National Weather Service Weather Forecast Office in Key West issues wind chill advisories from time to time.

Numerous federal agencies maintain a variety of records regarding losses associated with natural hazards. Unfortunately, no single source is considered to offer a definitive accounting of all losses. The Federal Emergency Management Agency maintains records on federal expenditures associated with declared major disasters. The National Climatic Data Center (NCDC) of the National Oceanographic & Atmospheric Administration collects and maintains certain data in summary format, indicating injuries, deaths, and costs, although the basis of the cost estimates is not identified and the reports are not independently verified (http://www.ncdc.noaa.gov/oa/climate/severeweather/extremes.html).

6.2 Strong Storms, Including Tornadoes & Water Spouts[1]

The term "strong storms" is used to cover weather events that exhibit all or some of these characteristics: high winds (including tornadoes), heavy rainfall, lightning, and hail. Generally, thunderstorms form on warm-season afternoons and are local in effect. Storms that form in association with a cold front or other regional-scaled atmospheric disturbance can become severe, thereby producing strong winds, frequent lightning, hail, downbursts and even tornadoes. Strong storms are equally likely to occur through the entire extent of Monroe County.

Of the estimated 100,000 thunderstorms that occur each year in the U.S., only about 10% are classified as severe (produces hail at least 1 inch in diameter, winds of at least 58 miles per hour, or tornadoes). In Monroe County, most strong storms do not cause property damage unless the storm spawns a tornado.

Strong storms generally produce lightning, which kills more people in Florida, on average, than any other weather related phenomenon. Lightning is defined as a sudden and violent discharge of electricity from within a thunderstorm due to a difference in electrical charges and represents a flow of electrical current from cloud-to-cloud or cloud-to-ground.

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[1] The Monroe County LMS Working Group gratefully acknowledges the contributions to this section by Andrew Devanas, Science and Operations Officer, National Weather Service Office in Key West, FL.

Nationally, lightning causes extensive damage to buildings and structures, kills or injures people and livestock, starts many forest fires and wildfires, and disrupts electromagnetic transmissions.

Figure 6-1 shows Figure 1609 from the 2007 Florida Building Code which delineates windborne debris regions and the "basic wind speed" used to design buildings to withstand reasonably anticipated winds in order to minimize property damage. In Monroe County, the "design wind" speed is 159 miles per hour (3-second gust measured at 33 feet above the ground). A probability or recurrence interval is not assigned to the design wind speed. The structures that are most vulnerable to high winds, especially winds that reach the design wind speed of 159 mph, are mobile/manufactured homes and recreational vehicles. Data from the Monroe County Property Appraiser (see Section 5.5.1) indicates there were 5,619 mobile/manufactured home units.

A tornado is a relatively short-lived storm composed of an intense rotating column of air, extending from a thunderstorm cloud system. Tornadoes may be spawned from storm systems associated with hurricanes and tropical storms. Average winds in a tornado, although never accurately measured, are thought to range between 100 and 200 miles per hour; extreme tornadoes may have winds exceeding 300 miles per hour. The Enhanced Fujita Scale, Table 6-1, classifies tornadoes by wind speed and is accompanied by a series of 28 damage indicators (http://www.spc.noaa.gov/efscale/ef-scale.html).

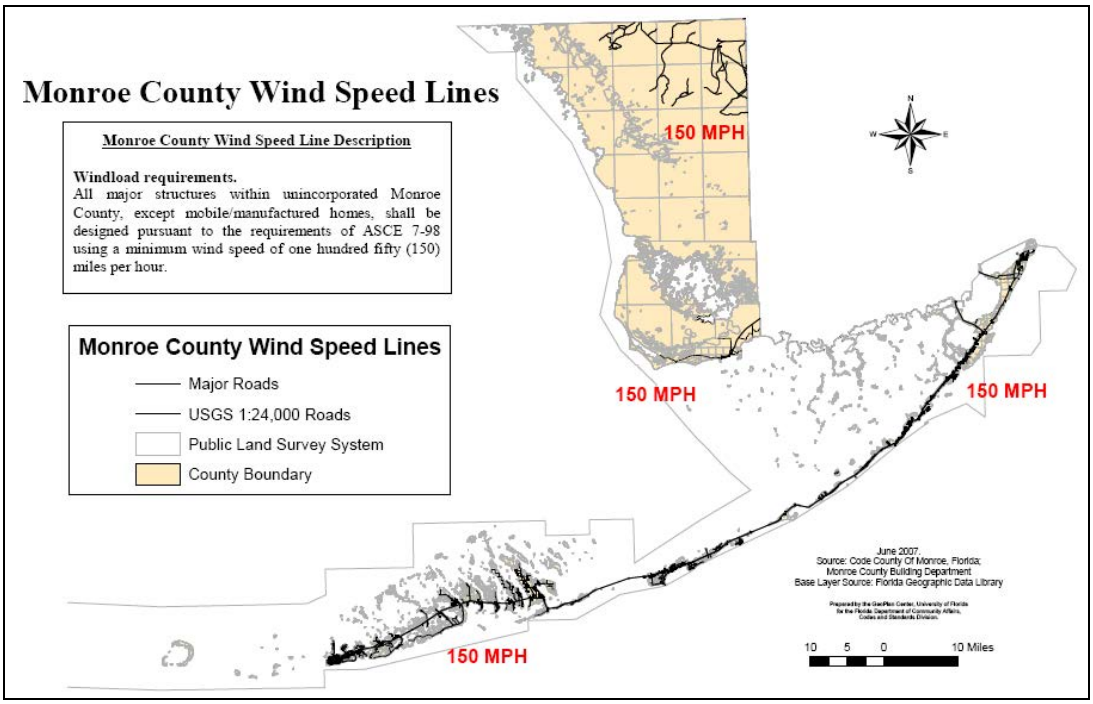


Figure 6-1. Monroe County Wind Speed Lines

A water spout is a violently rotating column of air over water, often spawned from a strong or severe thunderstorm. Waterspouts that come ashore are classified as tornadoes. Fortunately, most waterspouts dissipate over water and do not result in many deaths or serious injuries. However, over water they are a threat to marine interests.

Table 6-1. Enhanced Fujita Scale

Scale	3-Second Gust (miles per hour)
EF-0	65 to 85
EF-1	86 to 110
EF-2	111 to 135
EF-3	136 to 165
EF-4	166 to 200
EF-5	Over 200

On the U.S. mainland, tornado paths range from a few feet long to as long as 300 miles. Path widths average 300-400 yards, but severe tornadoes have cut swaths a mile or more in width, or have formed groups of two or three funnels traveling together. On the average, tornadoes move over land at speeds between 25 and 45 miles per hour, but speeds of up to 70 miles per hour have been reported. Tornadoes rarely linger more than a few minutes over a single spot or more than 15-20 minutes in a 10-mile area, but their short periods of existence do not limit the devastation. The destructive power of the tornado results primarily from its high wind velocities, sudden changes in pressure, and windborne debris. Since tornadoes are generally associated with severe storm systems, they are often accompanied by hail, torrential rain and intense lightning. Depending on intensity, tornadoes can uproot trees, bring down power lines and destroy buildings.

Strong Storm &Tornado/Lightning Experience and Probability

Tornadoes

Most tornado deaths in Florida occur during the fall, winter, and spring seasons when stronger dynamics are present in the atmosphere capable of producing ‘supercell’/mesocyclone thunderstorms.” According to the National Weather Service Weather Forecast Office in Key West, there is an equal likelihood of any one area in the Florida Keys being impacted by a tornado. This demonstrates that the low-lying terrain and narrow islands do not appreciably slow onshore winds, nor does the topography and configuration of the islands favor tornado development in any specific area.

Half of tornadoes in Florida occur in the summer months from May through August, but only less than 10% of tornado-related deaths happen during this period of time. Most tornado deaths occur during seasons when stronger atmospheric dynamics may produce supercell/mesocyclone thunderstorms. Figure 6-2 illustrates the frequency of tornado occurrences in the State, and shows that Monroe County falls in the mid-range, having experienced between 40 to 70 tornadoes during the 52 year period between 1950 and 2002.

The State Hazard Mitigation Plan (2007) identifies the entire population and total building inventory as being at risk of impacts by tornadoes (SHMP Table 3.3.11).

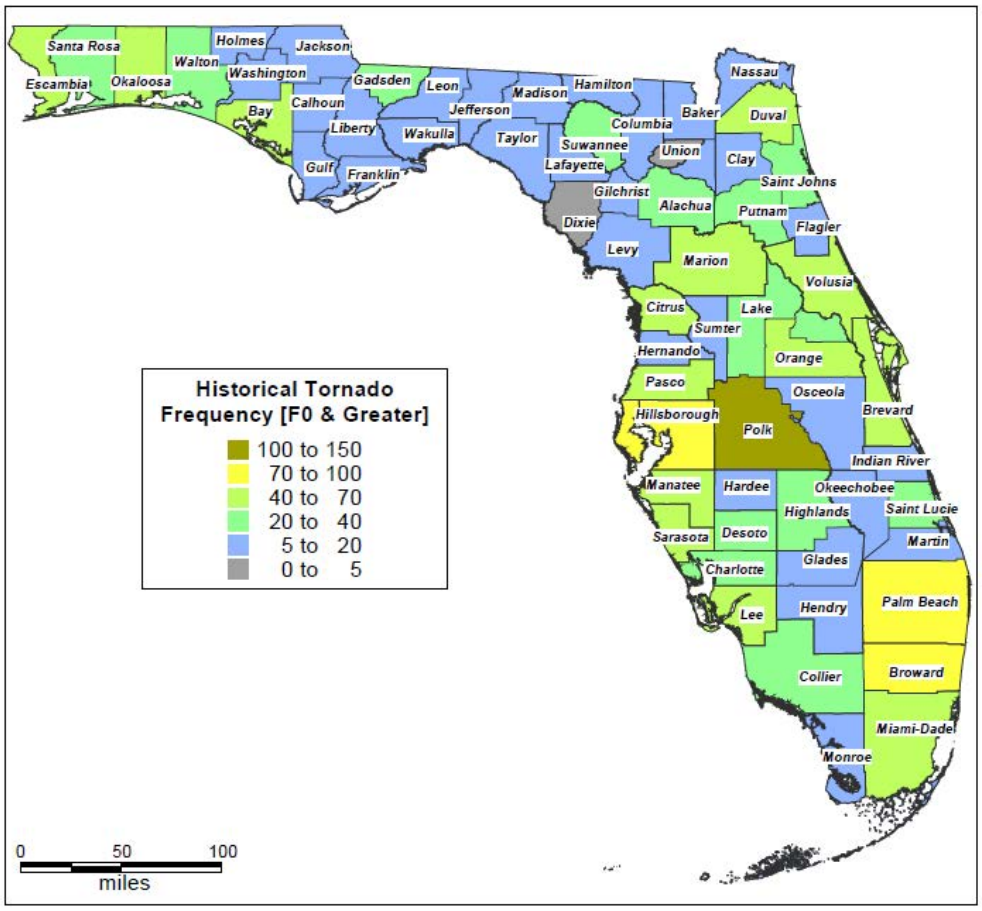


Figure 6-2. Frequency of Tornadoes: 1950-2002 (SHMP Figure 3.3.12).

Table 6-2 summarizes tornadoes that affected Monroe County from 1959 to mid-2009 and Table 6-3 lists detail on tornadoes that hit the area between 1998 and mid-2009. During the 50 year span reflected in the two tables:

- A tornado of intensity F0 or F1 occurs, on average, about once each year; and
- F2 tornadoes, much rarer with only 6 reported associated with two hurricanes, caused most injuries and considerably more property damage.
- More intense tornadoes appear unlikely.

Table 6-2. Tornadoes: 1959 - 1995

Fujita Scale	# Tornadoes Reported	Deaths	Injuries	Cumulative Damage (not adjusted)
F-0	33	0	5	More than $5 million
F-1	15	0	0	More than $30 million
F-2	6	0	71	More than $55 million

Table 6-3. Tornadoes: 1998 – 2009

Location Affected	Date	Fujita Scale	Deaths	Injuries	Damage
Marathon	February 1998	F-1	0	0	$20,000
Islamorada	February 1998	F-0	0	0	
Key West	June 1998	F-0	0	0	$15,000
Islamorada	November 1998	F-1	0	0	$100,000
Rock Harbor	November 1998	F-2	0	0	$50,000
Key Largo	November 1998	F-2	0	20	$25 mil
Key West	May 1999	F-0	0	0	
Rick Harbor	September 1999	F-0	0	0	
Craig Key	October 1999	F-1	0	0	
Key West	October 2000	F-0	0	0	
Big Pine Key	July 2000	F-0	0	0	$15,000
Big Pine Key	August 2000	F-0	0	0	
Key West	October 2003	F-0	0	0	
Marathon	June 2005	F-0	0	0	$5,000
Marathon	August 2005	F-2	0	0	$5 mil
Sugarloaf Key	June 2007	F-0	0	0	$20,000
Marathon	June 2007	F-0	0	0	$3,000
Marathon	February 2008	F-0	0	0	$2,000
Big Coppit Is	August 2008	F-0	0	0	$1,000
Summerland Key	August 2008	F-0	0	0	$1,000
Upper Key Largo	September 2008	F-0	0	0	$25,000
Craig Key	September 2008	F-1	0	0	$120,000
Sugar Loaf Key	September 2008	F-0	0	0	0
Stock Island	September 2008	F-0	0	0	0

Source: NCDC online

Lightning

Florida leads the nation in lightning deaths and injuries, with most occurring from May to October (peaking in July). People near water appear to be at greater risk. Because the Florida Keys are surrounded by water and most tourism and recreation activities are water-based, lightning is a significant hazard (Table 6-4).

Table 6-4. Lightning Deaths/Injuries (1959-2009)

Date	Death	Injury	Remarks
September 1959	0	1	Bridge tender
October 1962	0	1	Unknown
June 1974	1	0	Trash collector in vehicle
July 1976	1	1	Fishing boat
August 1980	1	0	Fishing from bridge
September 1982	1	1	Snorkeling
June 1983	1	0	Fishing from bridge
August 1986	0	1	Standing under tree
August 1990	0	1	Fishing from boat
July 1995	0	1	Police officer next to car
July 1997	0	1	Unknown
July 2000	0	1	Fishing boat
August 2001	0	1	Restaurant employee
July 2009	0	1	White St pier
Total	5	10	
Average of 0.1 deaths and 0.2 injuries per year			

Source: NWS Warning Meteorologists, Miami & Key West

Notable Storms

A significant non-tropical weather event that affected Monroe County was the "Storm of the Century," a very strong winter storm that occurred from March 12-23, 1993. Moving from Florida's West Coast across the state and up the eastern seaboard, the storm eventually wreaked havoc from Florida to New England. It brought heavy rains, wind, and coastal flooding to the Southeast and blizzard-like conditions in the Northeast. When it was finally over, the total damage estimates were over $800 million (over $200 million in Florida). The Florida Keys experienced high winds and tides and substantial amounts of rainfall and the County was among the 38 counties declared a Presidential disaster area.

A particularly active year was 1998. The first event of that year, referred to as the "Ground Hog's Day Storm," occurred on February 2, 1998 and involved multiple tornado touchdowns. Areas most affected were the Middle Keys including Grassy Key and Valhalla Beach in the vicinity of Duck Key. Several buildings were damaged. Also significant problems arose from the displacement of lobster traps which contributed to seaborne debris and navigational problems. The fishing industry suffered considerable loss of income.

Another notable weather event occurred on July 4, 1998, when severe thunderstorms with lightning and high winds came up quickly in the Middle Keys. The Key West Weather Service Office recorded sustained wind speeds up to 70 mph. Because it was July 4th, many boats were offshore celebrating and waiting for fireworks displays. One boat capsized, resulting in a fatality. This storm did not prompt a major disaster declaration.

The most damaging tornadoes in 1998 were spawned by Tropical Storm Mitch on November 4 and 5. Islamorada experienced an F-1 tornado, while Rock Harbor and Key Largo were hit by F-2 tornadoes. One tornado moved at 30 mph, tearing down utility lines, damaging boats, and damaging more than 600 structures, many of them were mobile homes.

6.3 Rainfall/Fresh Water Flooding

Flooding due to the accumulation of rainfall generally is not a problem in most of Monroe County and the municipalities. Most of the rainfall runs off into the surrounding seas. The rainfall which is caught in closed basins (depressed areas which collect rainfall and rainfall runoff) usually will drain relatively quickly because the underlying coral rock and limestone soils have high infiltration rates. The exceptions to this are:

- The City of Key West does experience some freshwater flooding when storm drains cannot handle the volume of runoff and the excess flows through the streets, often more than one-foot deep and more than two-feet deep depending on the tidal cycle; some low areas do not drain well, resulting in ponding. The city maintains records of the locations of these areas and actively pursues projects to improve drainage.
- The City of Marathon has identified several locations where ponded water that can range in depth from one to three feet deep causes access problems and can affect older, non-elevated, buildings. The city maintains records of the locations of these areas and actively pursues projects to improve drainage.

The most significant rainfall/fresh water flooding event occurred on November 11-12, 1980. The storm resulted in $1 million in property damage, primarily in the City of Key West. Known as the “Veteran’s Day Storm,” the event resulted from the influence of a stalled cold front and Tropical Storm Jeanne that was over Cuba. These combined systems produced 23 inches of rain in 24 hours, the heaviest 24-hour rainfall ever recorded for the area. Even though the water was pouring out into the surrounding seas, the intense rainfall resulted in widespread flooding especially in streets and low-lying areas. Weather Service reports indicated that 300 vehicles and 500 buildings were seriously damaged.

Monroe County Public Works reports that runoff from intense rainfalls generally does not result in road or drainage swale damage, although some unpaved roads exhibit washing and potholes.

The State Hazard Mitigation Plan (2007) summarizes analyses of "population at risk" and the dollar values of residential and commercial structures exposed "riverine" flooding (SHMP Table 3.3.6). As used in the State Plan, "riverine" flooding is characterized as resulting from rainfall-runoff and typically refers to flooding along rivers and streams, as opposed to tidally-influenced storm surge. In Monroe County, the term refers to rainfall/freshwater flooding. The results are shown in Table 6-5.

Table 6-5. SHMP Summary: Riverine Flooding Impacts (2007).

	Population	Value of Residential Structures	Value of Commercial Structures
Riverine Flooding	25,000	$2,896 million	$648 million

6.4 Drought

A drought is defined as a prolonged period of dry weather during which there is an inadequate supply of water to meet water demands that can have severe effects on people animals, and plants. Lack of rainfall and adequate water supply could result in health problems for humans, animals, and vegetation. Regulations and water restrictions may force residents to stop the waste of any potable water or water supply. Drought may be accompanied by prolonged periods of extreme heat.

Drought is a natural and expected part of the climate in most areas, but the severity of drought impacts differs based on duration, geographic extent, intensity, human demand for water, and agricultural practices. Drought can be defined as:

- Meteorological drought, an extended period of dry weather.
- Agricultural drought, a shortage of precipitation that affects crops.
- Hydrologic drought, a reduction in water content in lakes, rivers, streams, aquifers, and soils that may affect supplies available for all users.

6.4.1 Florida's Keetch-Byram Drought Index[2]

The Keetch-Byram Drought Index (KBDI) is used by the Florida Division of Forestry to indicate the dryness of the soil and surface fuels. The drought index is a continuous reference scale for estimating the dryness of the soil and duff layers. The index increases for each day without rain (the amount of increase depends on the daily high temperature) and decreases when it rains. The scale ranges from 0 (no moisture deficit) to 800. The range of the index is determined by assuming that there is 8 inches of moisture in a saturated soil that is readily available to the vegetation. Using 35 years of rainfall and temperature

[2] http://www.fl-dof.com/fire_weather/information/kbdi.html

measurements from 9 locations throughout the state average KBDI values are determined for the state on a regional basis. Figure 6-3 is an example of how the KBDI is illustrated each day.

For different soil types, the depth of soil required to hold 8 inches of moisture varies (loam=30", clay=25" and sand=80"). A prolonged drought (high KBDI) influences fire intensity largely because more fuel is available for combustion (i.e. fuels have a lower moisture content). In addition, the drying of organic material in the soil can lead to increased difficulty in fire suppression.

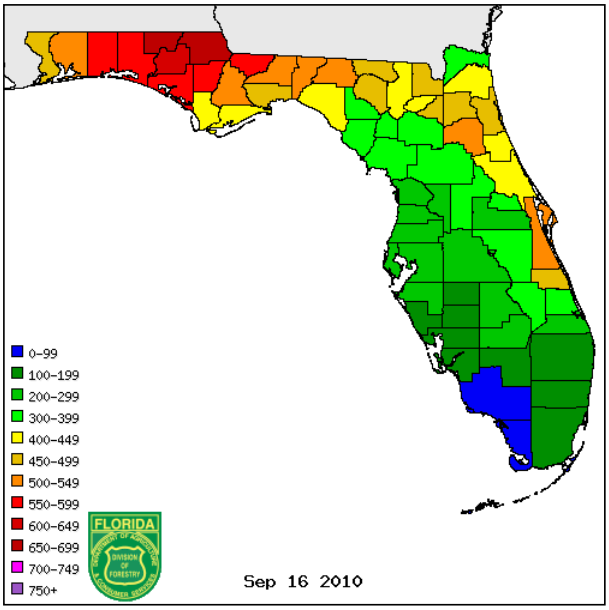


Figure 6-3. Example of the KBDI (September 16, 2010).

6.4.2 Drought in the Florida Keys

The Florida Keys are normally characterized by an arid climate and native vegetation is acclimated to such conditions. However, human usage of potable water continues to rise as development occurs. The water providers for the Keys, the Florida Keys Aqueduct Authority and the South Florida Water Management District, impose restrictions on water use depending on conditions which are continuously monitored. Situations requiring water usage restrictions have occurred over the last several years:

- The City of Key West imposed water restrictions in November 1990.
- The City of Layton operated under water restrictions in the mid-1990s.
- In 2001 the South Florida Water Management District imposed Phase 1 and Phase 2 water restriction rules throughout the Keys.

- Late 2009, the South Florida Water Management District imposed Landscape Irrigation Water Restrictions throughout the District's jurisdiction, including Monroe County.

Using a simplified approach of occurrence over a given period, for the ten-year period of the 1990s the frequency of drought was 20%. This statement of frequency does not imply severity. Indeed, the National Weather Service Weather Forecast Office indicated that drought periods in the Keys have not been prolonged or widespread and thus drought is not considered to be a significant hazard for Monroe County. However, the Department of Agriculture's online archived records of the KBDI show that the maximum index recorded for Monroe County is 764 (out of a maximum 800). Based on this, Monroe County can expect to see severe drought conditions, even if not prolonged. Because there is relatively little agricultural activity in Monroe, a drought that impacts the mainland source of water is expected to equally affect the entire extent of Monroe County. Drought does not cause property damage to buildings.

The County is supplied with water from the mainland and all residents are very aware of the need for water conservation on a regular basis, not only during announced drought periods. Typical usage is 169 gallons per person per day during tourist season and 96 gallons per person per day off-season. Measures such as encouraging native vegetation and using native ground cover vegetation in place of lawns contribute to reducing water consumption. Compared to other counties in South Florida, Monroe County's per capita water use is at or below average in most areas.

In mid-2009, the South Florida Water Management District issued restrictions on water use throughout its service area, including Monroe County. During this period, the KBDI peaked at 692 in mid-May. Water restrictions are mandatory and are enforced by the District, local governments, and law enforcement agencies. Residents and businesses were placed on two-day-a-week alternating schedules, with watering not allowed between 10 a.m. and 4 p.m. The restrictions apply to all sources of water for irrigation, including wells, canals, ponds, and lakes. Use of 100% reclaimed or supplemented reclaimed water is allowed during specific periods of time, and low-volume systems that apply water direct to root plant zones may be used provided no runoff is produced. Car and boat washing is allowed (recommended over non-paved, grassy or porous surfaces), and pressure washing is allowed, with runoff water channeled to grassy or porous areas.

6.5 Wildland Fire

Wildland fires are defined as an uncontrolled fire spreading through vegetative fuels that exposes and possibly destroys buildings. Wildfires are classified as either wildland (in relatively undeveloped areas, perhaps with some basic infrastructure such as roads, power

lines, and railroads) or an urban-wildland interface fire (areas with buildings and development).

Certain conditions must be present for a wildland fire hazard to exist: a large source of fuel; conductive weather (generally hot, dry, sunny, and windy) and lack of fire suppression capability due to remoteness or other limitations.

High values of the KBDI, described in Section 6.4.1, are an indication that conditions are favorable for the occurrence and spread of wildfires, but drought is not by itself a prerequisite for wildfires. Other weather factors, such as wind, temperature, relative humidity and atmospheric stability, play a major role in determining the actual fire danger.

High values of the drought index are associated with severe wildfire outbreaks such as occurred during 1998. However, no threshold point has previously been determined to indicate that conditions are far above normal and warrant concern. This work operates under the premise that wide spread drought is accompanied by severe wildfire outbreaks. The average KBDI is compared to recent levels of fire activity (1981-present) to determine threshold levels that indicate above normal fire activity

The Monroe County *Comprehensive Emergency Management Plan* notes that the extent of the brush and wildland fire threat is minimal for the majority of Monroe County. The exceptions are the Everglades National Park in mainland Monroe, and on Big Pine, No Name, Cudjoe, and Sugarloaf Keys in the Lower Keys where there are remnant tracts of native pine rockland forest.

A primary cause of fires is arson, especially vandalism by school age children and escaped campfires started by the homeless. Other factors that contribute to fires are high winds and droughts, lightening, carelessness, and accidents. Problems can also occur, especially in storms when downed utility lines may spark fires. Accumulated debris after hurricanes contributes to overall fire potential, including wildland fire potential. After Hurricane Georges in 1998, brush debris caught fire in Big Pine.

Information provided by the Florida Department of Forestry indicates that while wildland and brush fires occur infrequently and with little significant consequence in Monroe County, they may occur more often than many think. However, most wildfires are small and contained quickly. On rare occasion, incidents are more serious. For the most part, fires in the Everglades do not threaten residential properties although heavy smoke can lead to road closures.

Since 1987, there have been 38 unintentional wildfires on U.S. Fish and Wildlife Service lands in the National Key Deer Refuge. The largest occurred in 1992 when three wildfires burned over 50 acres. Of the 38 wildfires, 6 were caused by lightning and 15 by arson.

Fireworks have also played a role in wildland fire, indicated as the cause of 10 fires. Since 2000, an average of three wildland fires have occurred each year in the Lower Keys affecting an average of 1.27 acres. The largest potential wildfire in the Keys is approximately 500 acres, which is the largest contiguous block of vegetation on Big Pine Key. The extent of any given fire is limited by the size of vegetated areas and also effective response capabilities (described below in "Existing Mitigation Measures.")

In 2007, the Thunderstruck Fire burned 7 acres on Big Pine Key, affecting vacant property adjacent to residential and commercial structures. The Florida Division of Forestry brought in resources from Miami to assist in controlling the fire. The U.S. Fish and Wildlife Service provided helicopter water drops to help control the fire spread. During this event, firefighters from several stations worked in the yards of homes and several businesses to prevent damage. Flame lengths on this wildfire exceeded thirty feet, and nearly all the vegetation was killed as a result of the severity and intensity.

The Florida Department of Forestry reports that areas prone to wildland and brush fires in Monroe County include Everglades National Park, No Name Key, Big Pine Key, Grassy Key, Sugarloaf Key, Cudjoe Key, and Big Coppitt Key (including Geiger and Boca Chica). As an indicator of at-risk property in these areas, Table 6-6 indicates the total number of platted lots, the number of lots with improvements (primarily residences), and the value of those improvements. It is important to note that this summary of all properties does not imply that all properties would be vulnerable in any given wildfire outbreak.

Table 6-6. Summary of Wildfire Risk Areas*

Area	Total # Parcels	# Improved Parcels	Value of Improvements*
Mainland/Everglades	13,736	39	$1,987,917
No Name Key	504	43	$8,961,524
Big Pine Key	8,929	2,741	$444,130,421
Sugarloaf Key	2,284	1,033	$252,653,244
Cudjoe Key	2,952	1,521	$251,845,233
Big Coppitt Key (including Geiger and Boca Chica)	2,627	1,289	$258,465,919
Grassy Key (in Marathon & Key Colony Beach)	9,391	6,498	$1,562,786,704

* Data from Monroe County Property Assessment (June 2005)

Figure 6-4 depicts these areas in terms of potential fire behavior:

- Areas of low fire behavior potential are shown in green (flame lengths of less than 4 feet; relatively easy to control). Fires of this intensity would be most likely to occur in hardwood hammock areas or in areas where brush has been removed.
- Areas of moderate fire behavior potential are shown in yellow (flame lengths of 4-8 feet; difficult to control). These areas are characterized as marshes and areas transitioning out of marshes into uplands.
- Areas of high wildland fire behavior potential are shown in red (flame lengths exceeding 8 ft; very difficult to control, especially during the afternoon when solar radiation peaks). These areas would be characterized as the pine rockland uplands that are found on the islands in the Lower Keys, which is also where the concentrations of structures occur.

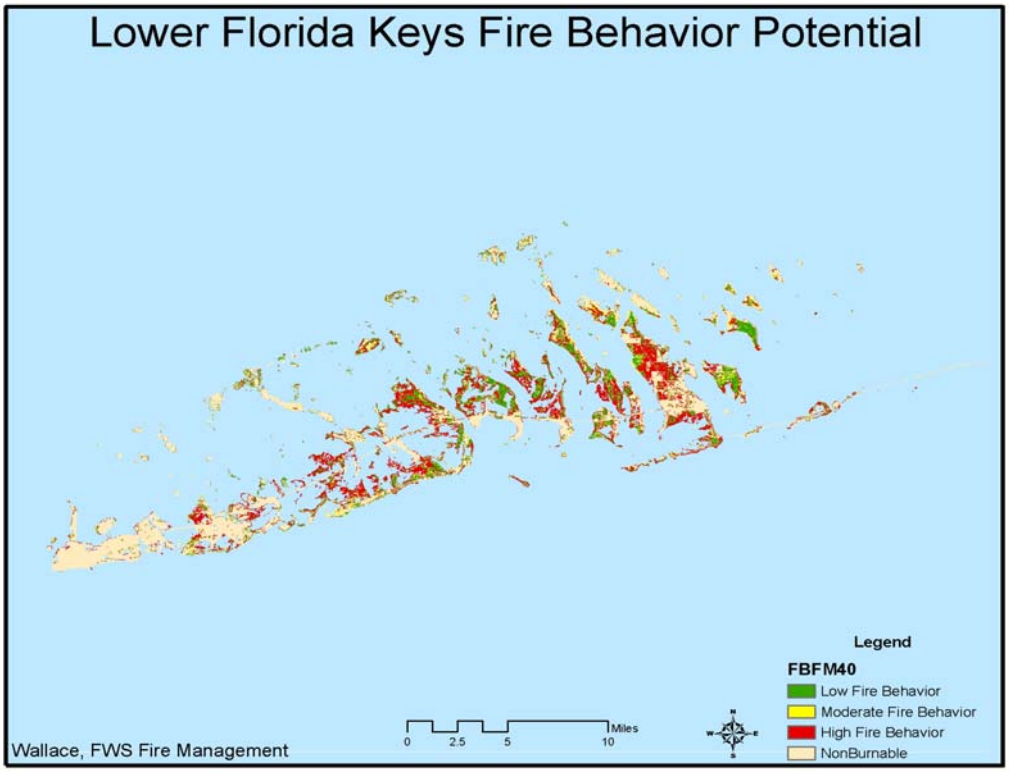


Figure 6-4. Lower Florida Keys Fire Behavior Potential.

Existing Mitigation Measures. Monroe County and Marathon have programs for training and certifying volunteer fire departments in wildland fire fighting. Although, the Department of Forestry in the Keys received new equipment in the late 1990s, staff levels have been reduced to only two rangers for all of Monroe County. The U.S. Fish and Wildlife Service National Key Deer Refuge has also received grant money to help train fire

department personnel in wildland fire control, fires in wildland urban interface areas, and the Incident Command System. The U.S. Fish and Wildlife Service has a full time prescribed fire specialist/firefighter on staff in Big Pine Key, along with a tracked wildland fire engine and a small wildland fire truck.

The following preventive measures are recommended by the Department of Forestry and the U.S. Fish and Wildlife Service:

- Educational programs, especially for children.
- Create defensible space around buildings by removing brush and burnable materials from around structure so that firefighters have easy access.
- Cleaning gutters to prevent build-up of burnable materials.
- Timely disposal of yard waste and household debris, particularly mattresses.
- Development of ordinances dealing with removal of brush and potentially dangerous vegetative materials, especially during dry spells and during hurricane season, and rapid removal of storm debris.
- When residential property is threatened by fire, the roof and yard should be wet down to provide protection.
- Selective prescribed burning by a state-certified burn manager, to reduce the quantities of fuel.

To deal with wildfire threats on Cudjoe Key, the Florida Division of Forestry added water supply wells and widened some roads to improve emergency vehicle access.

6.6 Coastal Erosion

Coastal erosion is the wearing away of land or the removal of beach or dune sediments by wave action, tidal currents, wave currents, or drainage. Waves generated by storms cause coastal erosion, which may take the form of long-term losses of sediment and rocks, or merely in the temporary redistribution of coastal sediments. The concept of probability of occurrence is not applicable because coastal erosion is a long-term, on-going process. Erosion in one location may result in accretion nearby.

The following definition has been adopted by the Florida Department of Environmental Protection (DEP), Bureau of Beaches and Coastal Systems, to identify areas of critical erosion:

> "Critical erosion area is a segment of the shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critical erosion areas may also include

peripheral segments or gaps between identified critical erosion areas which, although they may be stable or slightly erosional now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects."

Some erosion-related changes are slow, inexorable, and usually gradual. However the changes on a beach, in contrast, can happen literally overnight, at least during a storm. Even without storms, sand may be lost to longshore drift (the currents that parallel coastlines) or sand may be pulled to deeper water, essentially lost to the coastal system. DEP determines the geographic areas of the state that are at high risk of erosion. The Bureau develops and publishes an annual report on Critically Eroded Beaches Report. The State Hazard Mitigation Plan illustrates the critical and non-critical erosion areas in Figure 6-5.

- Red – Critical erosion beaches and inlets
- Blue – Non-critical erosion beaches and inlets

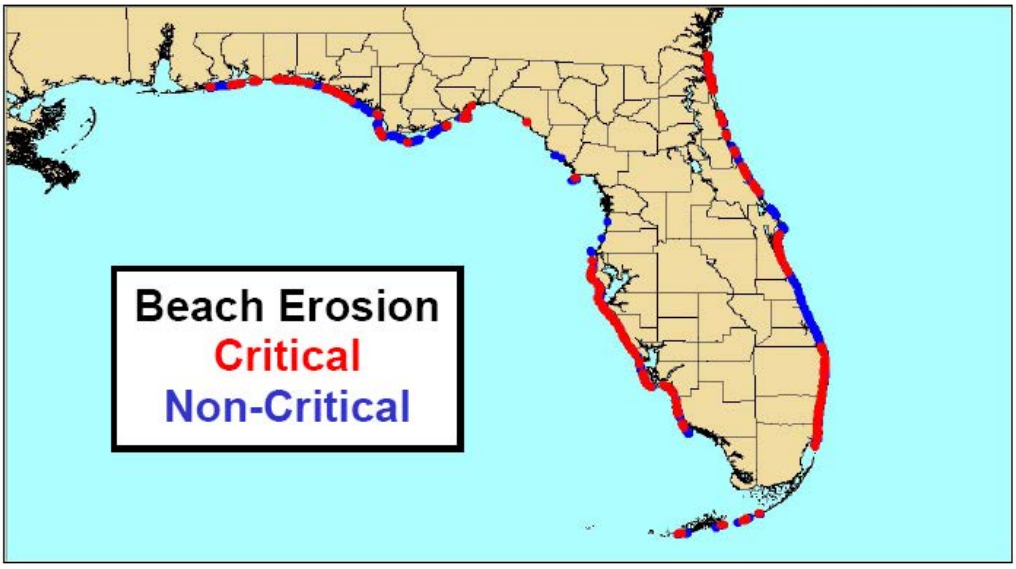


Figure 6-5. Critical and Non-Critical Beach Erosion (2007 SHMP).

During the 2005 hurricane season, hurricanes Dennis, Katrina, Rita, and Wilma caused erosion and flooding along the coastal barrier beaches of Dade County and the Florida Keys and mainland beaches of Monroe County. The State Hazard Mitigation Plan (2007) summarizes the number of critical and non-critical erosion areas by county. Using this characterization to estimate the extent of erosion vulnerability, Monroe County has 7.7 miles of shoreline designated in 8 critical areas, and 2.9 miles of shoreline designated in 3 non-critical areas (SHMP Table 3.3.13). The DEP's Strategic Beach Management Plan (2007) identifies erosion-prone beaches, but does not indicate the number and type of buildings and structures that may be at risk. In Monroe County, the locations include:

- Key West (2.8 miles)
- Bahia Honda State Park (2 miles)
- Long Key (1 mile)
- Key Colony Beach (0.9 mile)
- Fort Zachary Taylor (0.3 mile)
- Sombrero Beach (0.3 mile)
- Coco Plum Beach – West End (0.3 mile)
- Little Crawl Key (0.1 mile)

At the November 12, 2009 meeting, LMS Work Group members noted that the DEP Strategic Beach Management Plan appears to identify only public beaches that are experiencing erosion. In various locations in Monroe County privately-owned shorelines (not just beaches) are experiencing erosion. There is no known source that identifies all such eroding areas.

Two post-disaster projects to address beach erosion and loss of sand have been funded under FEMA's public assistance program. On these beaches and similar sandy beaches in the area are expected to see similar erosion in the future under similar storm conditions. Storms that do not move through the region quickly could result in even greater loss of sand:

- Smathers Beach in Key West has been renourished several times since the late 1980s. After Tropical Storm Ike (2008), an engineering investigation confirmed erosion of the permanent beach face of 2,453 cubic yards of sand.
- Coco Plum Beach in Marathon sustained loss of approximately 4,444 cubic yards of sand associated with Tropical Storm Fay (2008).

6.7 Overview of Monroe's Hazards & Risks

The descriptions of hazards, hazard histories, and impacts that are detailed in Chapter 5 and this chapter are summarized as "relative" vulnerabilities in Table 6-7. At its November 12, 2009 meeting, the LMS Work Group agreed to the following:

- Strong Storms/Tornadoes/Lightning: These hazards are related and are grouped based on the advice of the National Weather Service representative on the LMS. Because the relative vulnerability to strong storms is "moderate," the Working

Group decided that the hazard is not sufficiently distinct (especially compared the potential effects of hurricanes) to warrant separate and detailed profiles.

- Wildfire: Change the vulnerability ranking from "moderate" to "low," based on the recommendation of the NWS Weather Forecast Office.

- Coastal Erosion: Add as a hazard, with a "low" ranking to reflect that while erosion is a continual process, it is only locally significant.

Table 6-7. Hazards: Relative Vulnerability

Hazard	Vulnerability	Impact	Frequency	Distribution
Hurricane/Tropical Storm	High	Moderate to Severe	1-2 per year	Countywide
Flooding (rainfall ponding)	High (locally)	Moderate	6-12 times each year	Key West & Marathon
Strong Storms/ Tornado/Lightning	Moderate	Moderate	1-2 per year	Countywide
Wildfire	Low	Moderate	Less than 1 per year	Selected areas
Drought	Low	Low	1-2 per decade	Countywide
Coastal Erosion	Low	Low	1-2 per year (with coastal storms)	Limited selected areas

6.8 2010 Updates

The LMS Working Group reviewed and updated the pertinent sections. Some of the more significant changes include:

- Added explanation that the Working Group reconfirmed its 2005 assessment that, although prepared in 1999, the hazard identification and risk assessment are sufficient for the intended purpose (updated to reflect events).
- 6.1: Added summary of risk assessments.
- 6.2: Reorganized the section on strong storms to recognize that such storms include the related physical hazard of lightning, strong winds (including tornado) and hail. The Working Group decided that those hazards are not sufficiently distinct (especially compared the potential effects of hurricanes) to warrant separate and detailed profiles. Subsections describe tornadoes, lightning, and notable storms and to update event occurrences. Updated description and table about the Fujita (which no longer characterizes damage anticipated as a function of intensity).
- 6.3: Added potential depth of rainfall flooding in locations in Marathon and Key West.

- 6.4: Added late 2009 water restrictions.
- 6.4.1: Added description of the Keetch-Byram Drought Index (KBDI).
- 6.4.2: Added historical record of KBDI.
- 6.5: Added wildland fire incidents, relationship to KBCI, recent average number and size of fires, and description of U.S. Fish & Wildlife Service measures.
- 6.6: Added new section on coastal erosion, including evidence of beach erosion in two locations.
- 6.7: Changed table of relative vulnerabilities to assign a low ranking to wildland fire and to add coastal erosion.
- Added summaries from the State Hazard Mitigation Plan.

Chapter 7. Monroe County

This chapter contains an overview of Monroe County agencies and their functions as they relate to natural hazards and hazard mitigation. This plan summarizes the functions of Emergency Services Division, but does not characterize its functions that deal with emergency response and immediate post-event recovery. That information is found in the Monroe County *Comprehensive Emergency Management Plan.*

Chapters 8 through 12 describe the cities Key West, Marathon, Key Colony Beach, Layton, and Islamorada Village of Islands.

7.1 County Government Structure

Monroe County, created in 1823, is a political subdivision of the State of Florida. The powers and authority of the County emanate from the State Legislature.

The Board of County Commissioners (BOCC), which performs the legislative and executive functions, consists of five members elected at large. Each commissioner represents one of five districts and is elected for a term of four years. Pursuant to Florida Statute 252, the BOCC is responsible for safeguarding the life and property of the population of Monroe County, and to provide effective governmental control and coordination of emergency operations.

For administrative purposes and to conduct the work of the County, the Board of County Commissioners (BOCC) has organized County agencies into eight functional divisions, each with several departments (Table 7-1). Selected departments that have direct or indirect roles in addressing natural hazards are described below. Not shown are the Budget and Finance Division (Office of Management & Budget, Purchasing, and Grants Management), the Social Services Division (Bayshore Manor, In-Home Services, Nutrition, Transportation, and Community Support Services), and the Office of the County Attorney.

Table 7-1. Monroe County's Functional Divisions

Division	Departments Supervised	Mitigation Role	
		Direct	Indirect or None
County Administrator	Airports	X	
	Social Services	X	
	Library Services		X
	Extension Services		X
	Technical Services	X	
	Veteran's Affairs	X	
	Project Management		X
	Wastewater	X	
Emergency Services	Fire/Rescue	X	
	Emergency Medical Services	X	
	Emergency Management	X	
	Fire Marshall	X	
	Upper Keys Health Care Taxing District	X	
Public Works	Fleet Management	X	
	Facilities Maintenance	X	
	Detention Facilities	X	
	Unincorporated Parks & Beaches		X
	Higgs Beach & Martello Museums		X
	Engineering Services	X	
	Roads & Bridges	X	
	Solid Waste Mgnt & Recyling	X	
	Animal Control	X	
	Card Sound Toll Authority		X
Growth Management	Code Enforcement	X	
	Building Department	X	
	Planning & Environmental Resources	X	
	Marine Resources	X	
	Office of Housing & Community Development	X	
		X	
	GIS Department	X	
Employee Services	Human Resources		X
	Risk Management		X
	Safety Office	X	

7.1.1 Emergency Management Department

Chapter 252.38 of the Florida Statutes requires political subdivisions to develop emergency plans to provide for the safeguarding of life and property of its citizens.

The Monroe County Emergency Management Department has jurisdiction over the entire county and serves as liaison for, and coordinator of, municipalities' requests for State and Federal assistance during post-disaster emergency operations. By State rules, each municipal emergency management plan must be consistent with, and subject to, the county emergency management plan. Such consistency will be evidenced in the elements of their respective preparedness, response, recovery, and mitigation plans.

The Monroe County *Comprehensive Emergency Management Plan* (CEMP), establishes official emergency management policy for all agencies and municipalities for response to, recovery from, and mitigation of, emergencies and disasters within Monroe County. Examples of other planning and response plans are those pertaining to Hurricane Evacuation, Shelter, and Refuge of Last Resort Plan, Turkey Point Nuclear Power Plant Emergency Plan, Migration, and Terrorism, among other plans and procedures.

Included among the Department's many activities are the following:

- Emergency Management is the primary department responsible for training and public awareness as it relates to disaster preparedness; throughout the year, personnel conduct seminars and presentations, and meetings regarding emergency preparedness.
- Emergency Management conducts annual training programs for all county departments and other county entities participating in Emergency Operation Center and Shelter operations, and other emergency preparedness activities and needs.
- Emergency Management has established a number of public information and education programs regarding recovery efforts and available assistance.
- Hurricane preparedness information concerning mobile home, travel trailer and RV hurricane procedures and local shelter information is disseminated to the public via local television, radio, print media, and other media outlets, each year prior to Hurricane Season.
- Emergency Management personnel, as part of their professional development, are encouraged to attend State and FEMA courses.
- Local personnel are trained through programs of relief organizations (American Red Cross and HAM radio groups).
- Monroe County conducts annual drills and exercises in, but not limited to, hurricane response, nuclear power plant response, airport disaster response, mass migration, cruise ships emergencies, terrorism threats, and oil spill response. These exercises are scheduled in conjunction with the Florida

Division of Emergency Management, and various County, State, and Dederal agencies.

- All agencies with emergency response roles participate in annual exercises and drills. Drills and exercises test emergency systems such as the Emergency Alert System, HURREVAC, Hurrevac, ESATCOM, Webinar, GoToMeeting, NWS Chat, as well as SLOSH modeling software (Sea Lake Overland Surge from Hurricanes).

The Monroe County Emergency Management Department is charged with facilitating, developing, managing, monitoring and evaluating the Monroe County Local Mitigation Strategy Plan, in cooperation with the municipalities of Key West, Marathon, Key Colony Beach, Layton, and the Village of Islamorada. The agency coordinates with the Florida Department of Community Affairs to process applications for mitigation grant funds.

Projects funded with hazard mitigation funds, including funds that may be made available as part of FEMA reimbursements for damage to public facilities, must conform to established Monroe County codes and regulations.

7.1.2 Growth Management Division

The Growth Management Division recommends and implements policies provided in the County's Comprehensive Plan and the Land Development Regulations. The Building, Planning and Environmental Resources, Code Enforcement, and Marine Resources Departments are under the Division's jurisdiction. Planning staff assists in the development of the County's Comprehensive Plan.

The Planning and Environmental Resources, Building, and Code Enforcement Departments are responsible for reviewing construction plans, issuing building permits, assuring compliance with the floodplain regulations, and inspecting projects during construction. Enforcement of zoning and building standards are intended to safeguard public safety and to minimize damage associated with high winds and flooding. Table 7-2 shows the number of permits issued in calendar years 2007, 2008, and 2009. The Division serves as the coordinator for the National Flood Insurance Program and assists the public in identifying and implementing flood damage prevention measures (see Section 7.3.2).

Monroe County, Florida

- *Seven Inspectors*
- *Two Inspectors hold minimal standard certifications and five Inspectors are cross certified in each trade; plumbing, mechanical electrical and structural*
- *Building Code Effectiveness Grading Schedule rating:*
  - *3 for 1-2 Family Dwellings*
  - *3 for Commercial*

Table 7-2. Permits Issued in 2007, 2008, and 2009

Activity	CY2007	CY2008	CY2009
New single-family, detached	262	82	43
Multi-family (2 or more)	1	3	0
Non-residential (all types)	323	290	268
Residential (additions, alterations, repairs)	3,506	2,878	3,775
Non-residential (additions, alterations, repairs)	301	290	268
Demolition	284	232	226
Mobile home (permanent/temporary)	19	13	6
Total	4,696	3,788	4,586

In the event of a disaster, post-damage inspections are conducted to determine requirements that are applicable during repair and reconstruction. After a hazard event that prompts recovery, the Growth Management Division carries out the following specific duties:

- Collection of information for preparation of Damage Survey Reports is a joint effort of MC Emergency Management and MC Growth Management. The MC Growth Management Division surveys neighborhoods for structural damage. For the purpose of re-construction, damage to structures is categorized by “minor”, “major”, “uninhabitable” (major electrical, plumbing or roof damage), and “destroyed”.
- For substantially damaged buildings that also are insured by the NFIP, the Growth Management Division issues letters for application of Increased Cost of Construction (ICC) claims and requires re-construction through the permitting process to comply with all current codes.
- Mitigation activities in post-disaster situations will be handled through the Growth Management Division and the Department of Emergency Management.

- Planning Department policies ensure that mitigation related items in the Comprehensive Plan, such as floodplain and natural resource management, are followed and reflected in the County's Codes and Standards.
- Planning personnel participate in post-disaster appraisals and may formulate additional mitigation measures for use in the Comprehensive Plan. Personnel work closely with building and zoning staff to ensure coordination.
- Mitigation recommendations, especially those based on direct disaster experience will be reflected in the Evaluation and Appraisal Reports (EAR) required for the Comprehensive Plan.
- Environmental Resources monitors environmental provisions in regulations, codes, and plans and coordinates with other agencies as needed.

7.1.3 Public Works Division

The Public Works Division is responsible for overseeing the maintenance and operation of County facilities, including roads and bridges. From three locations (Key West, Marathon, and Plantation Key), the Division operates and maintains the County's heavy equipment, vehicles, repair shop, and fueling stations. The County's engineering operations function under the Public Works Division.

The Public Works Division is responsible for the following disaster and mitigation-related activities:

- Deploy protective measures at County's designated Shelter facilities (i.e., install shutters, position generators, etc.).
- Expedite debris clearance of Overseas Highway (US #1).
- Assist with re-entry and respond to assistance requests from municipal agencies.
- Secure environmental waivers and legal clearances for debris removal and disposal.
- Identify and report damage to public facilities and infrastructure, participate in preparation of documentation for State and federal reimbursements, and consider possible mitigation measures as part of repairs and reconstruction.
- Establish priorities regarding the repair and/or reconstruction of damaged transportation routes (roads, bridges, airfields, etc.).
- Coordinate emergency contracting and emergency repair of drainage and solid waste facilities.

7.1.4 Emergency Services Division

The Emergency Services Division has administrative responsibility for Fire Rescue, Emergency Medical Services, Emergency Management, the Fire Marshall, and the Upper Keys Health Care District. During an emergency these agencies are responsible for firefighting, medical services, and urban search and rescue.

The Division of Emergency Services (and its functional units) is responsible for the following disaster-related activities:

- Manage the Emergency Operations Center
- Coordinate with local hospitals
- Coordinate Special Medical Needs
- Coordination with Monroe County School District
- Manage in-county and out-of-county shelters
- Coordinate with the Florida Department of Forestry, U.S. Navy, Boca Chica, Florida Fish and Wildlife Conservation Commission, and other fire service resources to support emergency functions requiring fire-fighting capacity to perform emergency response, recovery and assistance missions.
- Coordinate search and rescue operations and resources; provide support to local agencies, locate missing persons, lost vessels, persons trapped in confined areas (including damaged/destroyed structures); locate downed aircraft, extricate, if necessary, and treat victims upon rescue.
- Monroe County Emergency Medical Services is responsible for reviewing and assessing health and medical needs of the county in the event of an emergency event and obtain resources to meet needs.
- Fire Marshall's Office coordinates and directs efforts to complement local emergency response actions in the aftermath of a hazardous material accident/incident; secures affected areas and coordinates removal and disposal of materials from the disaster location.

7.1.5 Monroe County Health Department

The Monroe County Health Department is an agency of the State that functions as the primary public health unit for the county and municipalities. The department's responsibilities include investigating and addressing public health threats, dealing with reportable and non-reportable diseases and environmental issues, regulation of biomedical waste, radiological incidents, child care facilities sanitation inspection, septic tank permitting, regulation of toxic and hazardous materials, locating/installing fuel storage tanks, and permitting of mobile home and RV parks. The Health Department operates from three locations in the Upper, Middle, and Lower Keys. Each office oversees health issues such as rabies and infectious disease control, and family planning and health services.

The Health Department is responsible for the following disaster-related activities:

- Disaster Community Health Assessment Teams conduct post-disaster assessments of public health risks.
- Following a disaster, the Health Department maintains surveillance of outbreaks of infectious diseases and takes necessary actions to address problems.

- May undertake event-specific activities; after Hurricane Georges the department reviewed performance of various kinds of septic and waste systems.
- Is responsible for the sheltering needs of the area's Special Needs Population in out-of-county hurricane sheltering operations at Florida International University.

7.1.6 Monroe County Budget and Finance

Budget and Finance includes the Office of Management and Budget, the Purchasing Department, and the Grants Department.

Budget and Finance is responsible for the following disaster-related activities:

- Give guidance to all departments to ensure they collect and maintain thorough documentation of disaster-related expenditures, the key element in the reimbursement process which requires maintenance of logs, records and file copies of all expenditures in order to provide clear accountability for reimbursement requests.
- Establishes financial management procedures in conformance with State and federal requirements specific to funding sources.

7.1.7 Monroe County School District

The Monroe County School District operates and maintains the school system in the County and municipalities. In addition to serving the student population, schools are a vital component of the County's Emergency Management Program. Selected school buildings may function as shelters, school personnel often serve as shelter staff, school buses are used in evacuations, and school personnel provide shelter support services.

The Monroe County School District mitigation and response activities include:

- The District construction standards among the strictest in the State; new construction is required to meet 150 mile per hour wind-load standards.
- The District and school system is a participating member on the Local Mitigation Strategy Working Group.
- The District and Monroe County government cooperate in many emergency-related efforts, including applying for grant funds to install hurricane shutters on several schools used as shelters.
- Enhanced Hurricane Protection Area (EHPA) construction upgrades were made possible through funding provide by County, municipality (City of Marathon), and the District. The following schools will benefit from the EHPA upgrades: Key West High School, Poinciana School, Marathon High School, and Key Largo School.

7.2 Regional Agencies & Organizations

7.2.1 South Florida Regional Planning Council

The South Florida Regional Planning Council plans for and coordinates activities of the South Florida Region (Broward, Miami-Dade, and Monroe Counties). State legislation passed in 1993 recognized that the regional planning councils are Florida's only multi-purpose regional entities that are in a position to plan for and coordinate intergovernmental solutions to growth-related problems on greater-than-local issues.

Regional planning councils are required to develop Strategic Regional Policy Plans. Emergency Preparedness is one of the six strategic subject areas addressed and goals and policies contain provisions relating to hazard mitigation. In addition, the other strategic areas (land use and public facilities, natural resources, economic development, transportation, and emergency housing), may provide recommendations related to mitigation. The Plan recognizes the critical link between land use and emergency preparedness. For example, management of growth in the region relates directly to emergency evacuation. Preservation of the environment reduces development or guides development in ways that maintain important natural areas that may buffer the effects of storms and other hazards.

The South Florida Regional Planning Council's mitigation and response activities include:

- During the development process for the Strategic Regional Policy Plan, the South Florida Regional Planning Council held workshops with regional agencies to acquire input. An Emergency Preparedness Workshop which included discussion of mitigation issues was held and provided an opportunity to interested agencies to identify their concerns and needs relating to mitigation.
- In its review of documents such as County Comprehensive Plans and Comprehensive Emergency Management Plans, the South Florida Regional Planning Council can recommend policies that enhance hazard mitigation.
- The South Florida Regional Planning Council conducts other projects that directly assist in effective emergency management and hazard mitigation, such as publication of the "Hurricane Survival Guide for Small Businesses, September 1995."
- After the unprecedented activity in the 2004 and 2005 hurricane seasons, the Florida Division of Emergency Management contracted with the Council to facilitate, in collaboration with local emergency management officials, consistent and integrated mapping and analysis of all-hazards evacuation across the State. This multi-year project will yield a comprehensive regional evacuation study that encompasses Miami-Dade, Broward, and Monroe counties.

7.2.2 South Florida Water Management District

The South Florida Water Management District, operating under the jurisdiction of the Florida Department of Environmental Protection, is responsible for overseeing the very complex system of waterways and canals that affect the water system throughout much of South Florida.

The Florida Keys of Monroe County does not contain a system of drainage canals under the supervision of the Water Management District, as do other counties. However, portions of the County on the mainland that are located in Everglades National Park and Big Cypress Basin are under the District's control. The County and incorporated municipalities may coordinate with the District to develop Storm Water Management Master Plans and policies to improve storm water management techniques and participation in the Surface Water Improvement Management Program.

The South Florida Regional Planning Council's mitigation and response activities include:

- Analyses and recommendations for water control measures to mitigate hazards such as floods and droughts.
- The District, with support of local governments and law enforcement agencies, enforces mandatory water shortage restrictions when such restrictions are activated.
- Implementation of storm water management measures advocated by the District, such as discouraging the use of impervious surfacing and filling and retention of natural drainage patterns and open space, could help decrease property damage from a major storm event.
- Through the planning and use of various water control techniques, the District's work can mitigate certain hazards such as those related to flooding and the mixing of fresh and salt water.

7.2.3 Florida Keys Aqueduct Authority

The Florida Keys Aqueduct Authority is an independent agency constituted by the State of Florida with the primary purpose and function to obtain, supply, and distribute an adequate water supply to the Florida Keys. The Authority manages the infrastructure used to supply water to the Florida Keys and provides service to the consumer, sets rates, and conducts billing.

The Florida Key's Aqueduct Authority's mitigation and response activities include:

- The Authority's pipeline originates in Florida City in south Miami-Dade County. It examines ways to protect the supply system from hazards and minimize the opportunities for disruption. The Authority works to find ways to deal with disruption, including identification of alternative sources when water cannot be supplied through the pipeline.

- The Authority participates in developing policies and procedures for responding to and recovering from shortages and disruptions in the supply and delivery of electricity, potable water, and other forms of energy and fuels which affect or threaten to affect significant numbers of citizens and visitors.
- The Authority has 100% redundancy with diesel-powered pumps to mitigate the loss of water flow to the Keys during electric service outages. The redundancy includes three desalinization plants: Stock Island (2 million gallons per day); Marathon (1 million gallons per day); and Florida City (xx million gallons per day).

7.2.4 Electric Utilities

The electric utilities that serve Monroe County are the Florida Keys Electric Cooperative (FKEC), the Keys Energy System (KEYS), and Florida Power and Light (FP&L). The mitigation and response activities of the utilities include:

- Establish policies and procedures for responding to and recovering from shortages and disruptions, including the supply and delivery of electricity, and other forms of energy and fuel, which affect or may affect significant numbers of citizens and visitors.
- Restoration of electric utility services which were interrupted due to major or catastrophic emergencies. Coordination of services and communications among utilities and local, state and federal agencies. Identification of emergency-related problems and development of remedial actions.
- FKEC completed its Operations Center in December 2009.

7.2.5 Habitat for Humanity of Key West and Lower Florida Keys

The mission of Habitat for Habitat for Humanity of Key West and Lower Florida Keys, Inc. is to eliminate substandard housing and provide post disaster recovery assistance to the community. The organization occupies a 13,000 square foot concrete facility located at 30320 Overseas Highway, Big Pine Key, behind Roger's Furniture. In the event of a disaster, Habitat is positioned to provide a staging area for post disaster operations including volunteer deployment, project coordination and supply distribution. Habitat works in partnership with federal, state, county and municipal disaster response teams as well as nonprofit organizations such as The American Red Cross, The Salvation Army, State, national and local ecumenical response groups, and the community at large.

7.3 Planning & Development Processes

7.3.1 Comprehensive Plan: Year 2010

The Monroe County Comprehensive Plan (Year 2010) consists of three parts: the Policy Document; the Technical Document; and the Map Atlas. The plan is available online at http://www.monroecounty-fl.gov/pages/MonroeCoFL_Growth/CompPlan2010/index. As of

mid-2010, the County is undertaking a significant update and revision of the Comprehensive Plan.

The Policy Document contains the goals, objectives and policies for each element, the capital improvements implementation program, and the monitoring and evaluation procedures. The Technical Document contains background information and support data and analyses for the elements of the plan. The Map Atlas contains maps depicting background information for the various elements (existing land use, natural features, existing, transportation, etc.). The County's commitment to implementing the Comprehensive Plan is "limited to its reasonable ability to fund only part of the cost of implementation." It is acknowledged that external funding is required for full implementation.

The Comprehensive Plan is framed as a series of goals, objectives, and policies that are organized under fourteen elements. Natural hazards, especially flooding and high winds associated with hurricanes and coastal storms, stormwater and drainage, and drought are incorporated throughout. The following are some of the more notable citations:

- **Goal 101:** Monroe County shall manage future growth to enhance the quality of life, ensure the safety of County residents and visitor, and protect valuable natural resources.
  - **Objective 101.2:** Monroe County shall reduce hurricane evacuation clearance times to 24 hours by the year 2010. This policy is implemented through the Permit Allocation System and consideration of the new hurricane evacuation transportation model in consideration of capital improvements.
  - **Objective 101.5:** Monroe County shall implement a Point System which directs future growth to encourage redevelopment and renewal of blighted areas, to maintain and enhance the character of the community, to protect natural resources, to encourage a compact pattern of development, and to encourage affordable housing.
  - **Objective 101.9:** Monroe County shall provide for drainage and stormwater management so as to protect real and personal property and to protect and improve water quality.
  - **Objective 101.14:** By January 4, 1997, Monroe County shall adopt Land Development Regulations which direct future growth away from areas subject to periodic flooding (with particular focus on the Coastal High Hazard Areas, in which mobile homes shall be prohibited except in existing parks or subdivisions).
- **Goal 102:** Monroe County shall direct future growth to lands which are intrinsically most suitable for development and shall encourage conservation and protection of environmentally sensitive lands.
  - **Objective 102.8:** Monroe County shall take actions to discourage private development in areas designated as units of the Coastal Barrier Resources System, including discouraging extension of facilities and services by providers of electricity and telephone service.
- **Goal 206:** The health and integrity of Monroe County's beach/berm resources shall be protected and, where possible, enhanced (through development

standards for siting structures, disturbances, setbacks, restoration of native vegetation).

- **Goal 211:** Monroe County shall conserve and protect potable water resources and cooperate with regional efforts to ensure the continued availability of quality potable water.
  - **Objective 212.2:** Monroe County shall adopt minimum performance standards designed to reduce the storm water runoff impacts, aesthetic impacts, and hydrologic impacts of shoreline development.
  - **Objective 212.**3: Permitted uses and performance standards within the shoreline setback are outlined.
- **Goal 216:** Monroe County shall provide for hurricane evacuation, shelters and refuges, and communication capabilities to promote safeguarding of the public against the effects of hurricanes and tropical storms. Among policies outlined are consideration of impact fees to offset the public costs of hazard mitigation, evacuation, reconstruction of public facilities, emergency communications equipment, and similar needs (Policy 216.1.15) and inclusion in the Post-Disaster Recovery Plan a structured procedure aimed at debris removal preparedness during hurricane evacuation and re-entry (Policy 216.1.14).
- **Goal 217:** Monroe County shall develop and implement a program of hazard mitigation and post-disaster redevelopment to increase public safety and reduce damages and public expenditures.
  - **Objective 217.1:** Monroe County shall develop and implement a program of hazard mitigation in the Coastal High Hazard Area which reduces floodplain alteration and damage or loss due to natural disasters. Policies address new or replacement sanitary sewage systems, supply of potable water, review of the building code, participation in the NFIP's Community Rating System, enforcement of setback and elevation requirements, and public acquisition decisions.
  - **Objective 217.2:** Monroe County shall develop a Post-Disaster Redevelopment Plan which addresses priorities for immediate recovery and long-term redevelopment including reducing exposure of human life to natural hazards. Policies address coordination of post-disaster recovery operations, damage infrastructure, FEMA-designated V Zones and repetitive loss areas, and limits on certain redevelopment.
  - **Objective 217.3:** Monroe County shall adopt Land Development Regulations which direct future growth away from the Coastal High Hazard Area. Policies include assigning a negative point rating to developments proposed within this area and prohibition on placement of mobile homes except on an approved lot within an existing mobile home park or subdivision zoned for such use.

- **Goal 701:** Monroe County shall support the Florida Keys Aqueduct Authority in the fulfillment of their statutory obligation and authority to provide for a safe, high quality and adequate supply, treatment, distribution, and conservation of potable water to meet the needs of present and future residents. Objectives include water conservation efforts.
- **Goal 1001:** Monroe County shall provide a storm water management system which protects real and person properties, and which promotes and protects ground and near-shore water quality.

- **Goal 1301:** Monroe County shall promote and encourage intergovernmental coordination between the County, the municipalities, the counties of Dade and Collier, regional state and federal governments and private entities in order to anticipate and resolve present and future concerns and conflicts.
- **Goal 1401:** Monroe County shall provide and maintain, in a timely and efficient manner, adequate public facilities for both existing and future populations, consistent with available financial resources and the other elements of the Comprehensive Plan. Considerations include elimination of public hazards, with limitations on public expenditures within the Coastal High Hazard Area.

7.3.2 Floodplain Management

Compliance with the NFIP

The County entered the National Flood Insurance Program in 1973 by adoption of an ordinance that complies with the requirements of the program. The County reviews all development proposals in special flood hazard areas and enforces the requirements of the ordinance. To ensure continued compliance with the NFIP, the County will continue to:

NFIP Flood Insurance Policies in Monroe County: 18,131

Claims paid since 1978: 8,002

http://www.fema.gov/nfip/pcstat.shtm
(as of December 31, 2009)

- Enforce the adopted floodplain management ordinance, including inspection of permitted development and unpermitted activities;
- Maintain records pertaining to floodplain development, including flood maps and Letters of Map Change, which shall be available for public inspection;
- Notify the public when there are proposed changes to the ordinance or Flood Insurance Rate Maps; and
- Promote the purchase of NFIP flood insurance policies as financial protection.

Monroe County administers the Floodplain Management Ordinance to regulate development within areas designated by National Flood Insurance Program (NFIP) as "areas as of special flood hazard." The purpose is to "protect the public health, safety and general welfare and to minimize public and private losses due to flood conditions". Areas of special flood hazard are identified as those expected to be inundated by the 1%-annual chance flood (commonly called the “100-year flood”).

The NFIP prepared a Flood Insurance Rate Map for Monroe County (current effective map is dated February 18, 2005). Special flood hazard areas are specified as “A/AE Zones” where waves are expected to be less than 3-feet high and V Zones where high velocity wave energies are expected. Most of the County’s land area is subject to flooding. The FIRMs show the anticipated flood elevations (referenced to mean sea level).

The County's Floodplain Management Ordinance specifies standards for residential and non-residential construction and water supply and sanitary sewer systems that are located in areas of special flood hazard. It prohibits the alteration of sand dunes, mangrove stands or wetlands if such alterations would increase the potential for flood damage. Placement of fill and obstructions is discouraged (structural fill is prohibited in V Zones).

Standards are set forth for residential, non-residential, and manufactured (mobile home) developments in special flood hazard areas. The dominant standard requires that the lowest floor of buildings (including manufactured homes) be elevated to or above base flood levels. Enclosures below the elevated lowest floor are allowed only if they meet requirements specific to the flood zone.

Enclosures Below Elevated Buildings

In 1995, FEMA notified Monroe County that the illegal conversion and occupancy of enclosures below elevated residential structures had resulted from a deficiency in the County's enforcement of its floodplain management regulations. The County was directed to correct the deficiency or face suspension from the National Flood Insurance Program.

The Board of County Commissioners responded by appointing a task force to address the problem, which is complicated by the fact that Florida law prevents on-site investigations. The task force, working with the State and FEMA, developed the concept that evolved into the "Flood Insurance Inspection Program." For the five-year period of 2002 to 2007, NFIP-insured homes with enclosures below the Base Flood Elevation must be inspected to identify deficiencies and deficiencies must be corrected in order for flood insurance policies to be written. As of December 31, 2009, over 2,000 properties had been inspected and approximately 1,600 had been brought into compliance.

Section 122-6 of the County's Floodplain Management Ordinance requires the County to provide an "inspection upon Transfer of Property." A report is provided to the new owner regarding any non-conformities associated with enclosures.

NFIP Repetitive Loss Properties

Data provided by FEMA to the Florida Division of Emergency Management identifies properties that are, or have been, insured by the National Flood Insurance Program and that have received two or more claims of at least $1,000. In 2005, the unincorporated Monroe County had only 161 properties that met this definition. As of February 28, 2010, 636 individual properties have received 1,356 claims, totaling $29.1 million (average payment of $21,400). Figures 7-1a to 7-1j (end of chapter) illustrate the areas subject to repetitive flooding based on NFIP repetitive claims data.

A subset of the NFIP's Repetitive Loss Properties includes those that meet the Federal definition for "severe repetitive loss." Seven properties in unincorporated Monroe County have received a total of 30 claims, totaling more than $760,000. The statutory definition is a residential property that is covered by an NFIP flood insurance policy and (a) that has at least four claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims exceeding $20,000; or (b) for which at least two separate claim payments (building only) have been made with the cumulative amount exceeding the market value of the building. For both (a) and (b), at least two of the qualifying claims must have occurred within any 10-year period.

In the summer of 2008, the County mailed letters to six owners of properties that FEMA identified as Severe Repetitive Loss Properties. Two owners responded and applications were submitted for funding to elevate the buildings in compliance with the County's requirements. As of early 2010, one project is 95% complete and a revised scope of work is under review by DEM and FEMA.

Coastal High Hazard Areas

Florida requires that local governments designate Coastal High Hazard Areas (CHHA) within their jurisdictions (FL Rule 9J5, F.A.C.). The CHHA must include areas designated on Flood Insurance Rate Maps as V Zones (areas subject to velocity hazard from wave action), areas that are seaward of the Coastal Construction Control Line (CCCL) established by the Florida Department of Natural Resources (DNR), and inlets which are not structurally controlled. The area subject to storm surge impact from a Category 1 Hurricane is considered to represent a good approximation of locations predicted to experience destruction or severe damage during storms and the Monroe County Comprehensive Plan, designates the CHHA as the "area subject to inundation by the SLOSH (model projections) associated with a Category 1 Hurricane."

Coastal High Hazard Area
Areas which have historically experienced destruction or severe damage, or are scientifically predicated to experience destruction or severe damage from storm surge, waves, erosion, or other manifestations of rapidly moving or storm-driven water.

Due to its low-lying terrain, approximately 80% of the County is located in the CHHA. Areas outside the CHHA are chiefly confined to a linear zone along much of U.S. 1 and some areas of higher elevation on various keys.

Coastal Barrier Resource System

The federal Coastal Barriers Resource Act (CBRA) of 1982 established the Coastal Barriers Resources System (CBRS). The purpose of the program is to restrict federally subsidized

development of undeveloped coastal barriers to minimize loss of human life, reduce wasteful expenditures of federal funds, and reduce damage to fish and wildlife habitat and other valuable natural resources of coastal barriers. The intent of the CBRA is to remove from undeveloped coastal barriers federal incentives for new development, such as National Flood Insurance, structural stabilization projects, and Federal assistance for construction of sewers, water supply systems, airports, highways, and bridges.

As of 1992, the Coastal Barrier Resource System applied to 15 units in the Florida Keys; since then, some units have been expanded and some areas have been noted exempt. These sites are located throughout the county and include areas such as the undeveloped portion of North Key Largo and sections of Sugarloaf Key. Most of the CBRS units are largely undeveloped. Protection of these areas is provided through land use policies in the Comprehensive Plan and related land development regulations. Among the policies advocated for these sites is public acquisition, especially portions of North Key Largo.

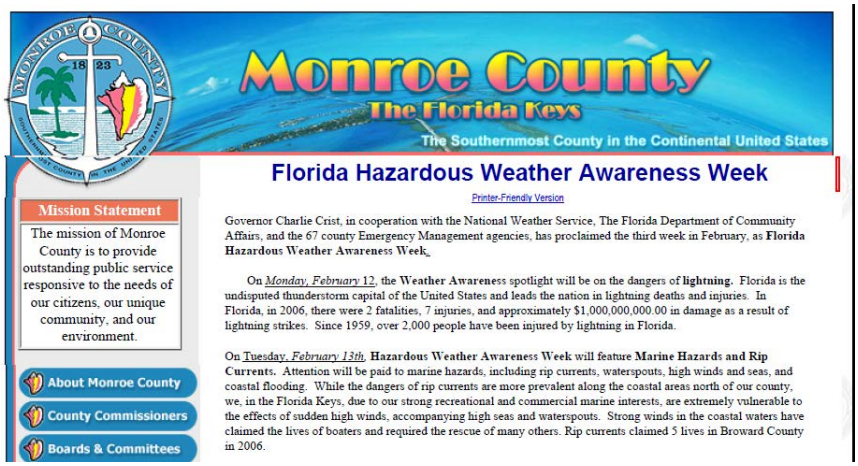
7.4 Communicating about Hazards

Monroe County and other organizations in the area recognize the importance of informing residents and visitors about hurricanes, evacuation, public safety, and minimizing damage. The following are some key ways that communications are undertaken:

- The front page of the Monroe County website has links for emergency management, emergency bulletins, and the Local Mitigation Strategy;
- The emergency management page offers information about hurricane preparedness, the Special Needs Registry, what to bring to shelters, and several links to pertinent sites;
- Emergency bulletins are posted on the webpage, information is scrolled on the Monroe County Government Television Channel (Channel 76), and the Emergency Management Hotline is activated (1-800-955-5504) when storm activity or other hazard events threaten;
- People can request e-mail notification whenever emergency bulletins are

issued or updated;

- Materials are provided in booths at local fairs;
- Presentations are offered to schools and other groups;
- Both electric companies provide information to property owners about tree trimming to reduce power outages;
- Public information and pre-recorded public service announcements are transmitted via local radio and television stations, including the County's cable channel;
- The Tourist Development Council is structured to transmit emergency information to the industry (e.g., blast FAX);
- The County's floodplain manager speaks before various professional organizations such as the Boards of Realtors and individual Real Estate companies;
- The County's web site has a page on floodplain management in the Florida Keys (see graphic, www.monroecounty-fl.gov/Pages/MonroeCoFL_Growth/floodplain);
- Sponsors and promotes Florida Hazardous Weather Awareness Week (see graphic); and
- American Red Cross does some public service announcements related to hazardous weather.



Hurricane wind and flood hazards are well-recognized throughout the Keys, but the importance of awareness is emphasized in the Floodplain Management Ordinance (at Section 9.5-317)(a)(13)) which states that:

> "All agreements for deed, purchase, agreements, leases or other contracts for sale or exchange of lots within areas of special flood hazard shall carry the following flood hazard warning prominently displayed on the document: FLOOD HAZARD WARNING This property may be subject to flooding. You should contact the County Growth Management Division and obtain the latest information regarding flood elevations and restrictions on development before making use of this property".

7.5 Recent and Near-Term Mitigation Actions

Improving resistance to the impacts of hurricanes is routine in Monroe County. Many actions are not dependant on external funding but are part of the normal course of business

and compliance with various regulations. As of mid-2005, the following characterize some of these activities:

- The Key West Airport Authority replaced a portion of the terminal. The replacement was designed and constructed to meet the wind resistance provisions of the Florida Building Code.
- The drawbridge at MM 107 on Jewfish Creek ("Goliath Bridge") was replaced with a fixed span bridge, helping to minimize traffic delays.
- One Federal mitigation grant for a repetitive loss property was approved in 2008, and one was approved in 2009. Both are single-family homes that were demolished and rebuilt elevated, in compliance with the building code and floodplain management regulations.

7.6 2010 Updates

Several County offices and other entities reviewed and updated the pertinent sections. Some of the more significant changes include:

- Section 7.1: Moved text describing the Emergency Management Department to Section 7.1.1. Updated text and table of the County's functional divisions
- Section 7.1.1: Updated description of the Emergency Management Department.
- Section 7.1.2: Updated description of the Growth Management Division and number of permits issued.
- Section 7.1.7: Reported on the Enhanced Hurricane Protection Area construction upgrades at four schools.
- Section 7.2.1: Added bullet about multi-year project to develop regional evacuation study.
- Section 7.2.3: Noted that the Florida Key's Aqueduct Authority has 100% redundancy with diesel-powered pumps.
- Section 7.2.4: Noted that Florida Keys Electric Cooperative has completed its Operations Center.
- Section 7.3.2: Added text about compliance with the NFIP. Updated NFIP policy and insurance data, data on enclosure inspection program, and data on the number of NFIP repetitive loss and severe repetitive loss properties. Added figures to show the locations of repetitive loss properties. Reported that letters were sent to owners of six severe repetitive loss properties.
- Section 7.4: Updated graphics.
- Section 7.5: Reported completion of the Key West International Airport Terminal; replacement of a bridge; and two on-going grants for private homes.

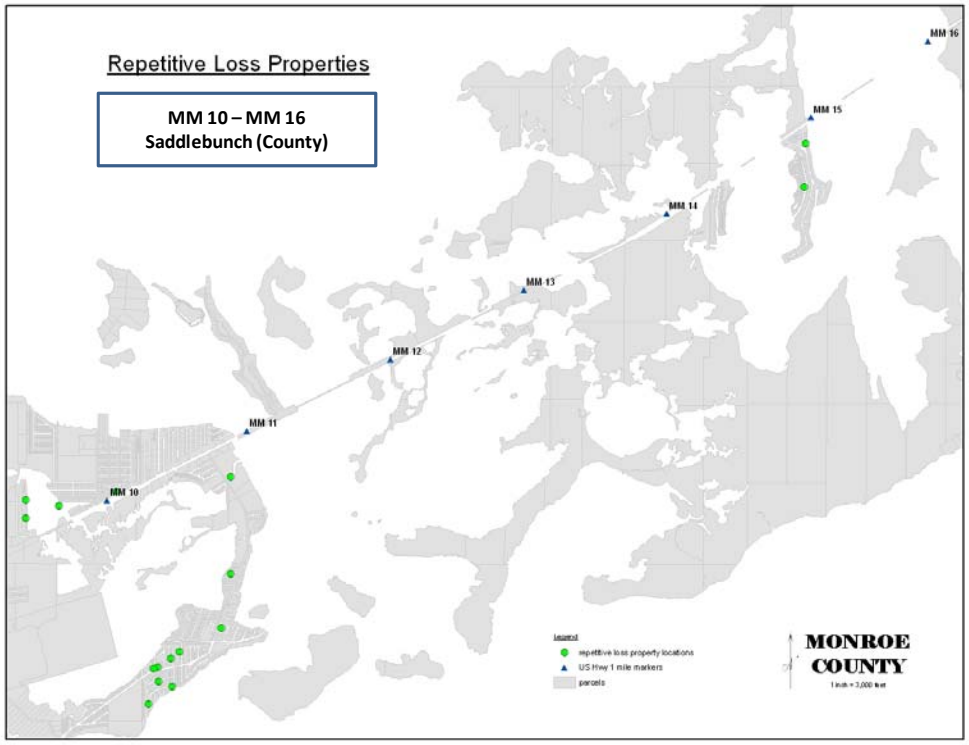


Figure 7-1a. Repetitive Loss Properties (MM 10 – MM 16).

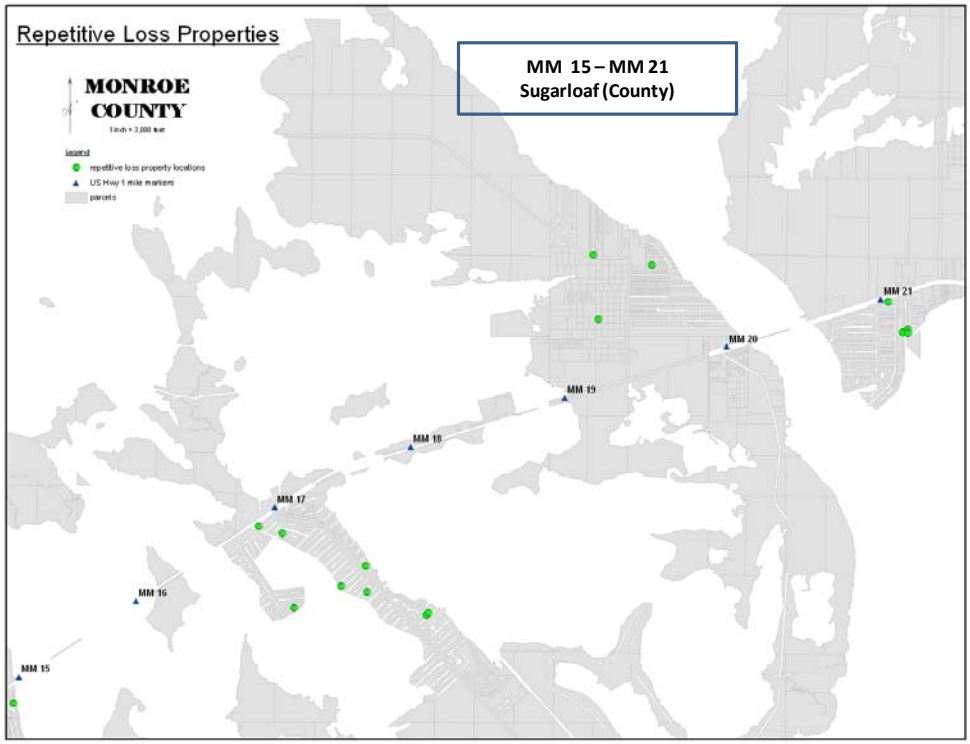


Figure 7-1b. Repetitive Loss Properties (MM 15 – MM 21).

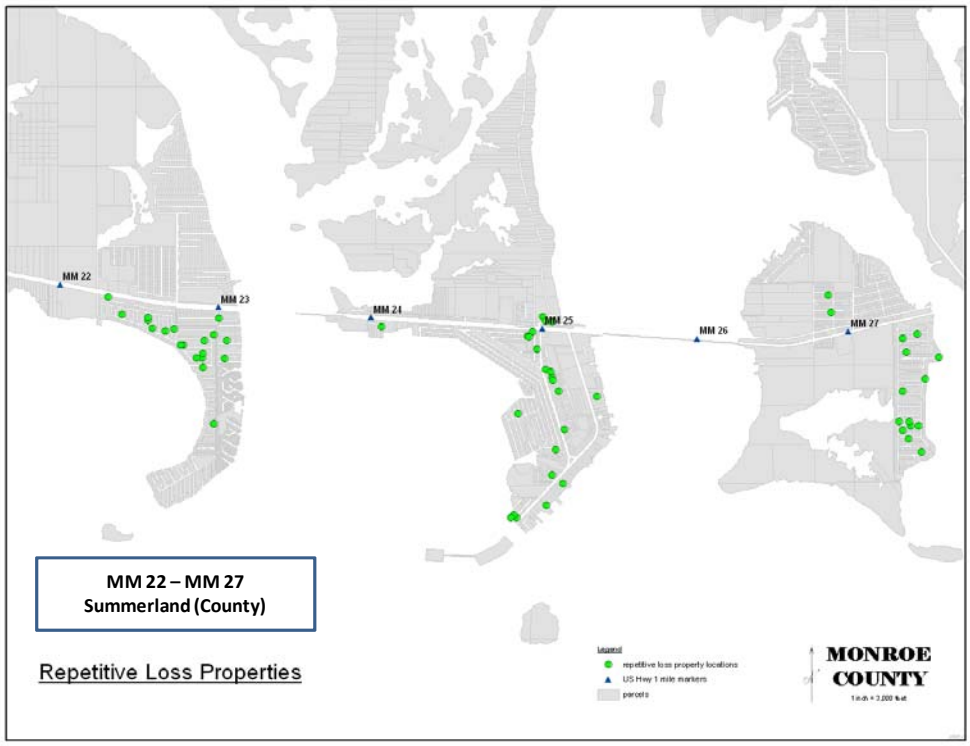


Figure 7-1c. Repetitive Loss Properties (MM 22 – MM 27).

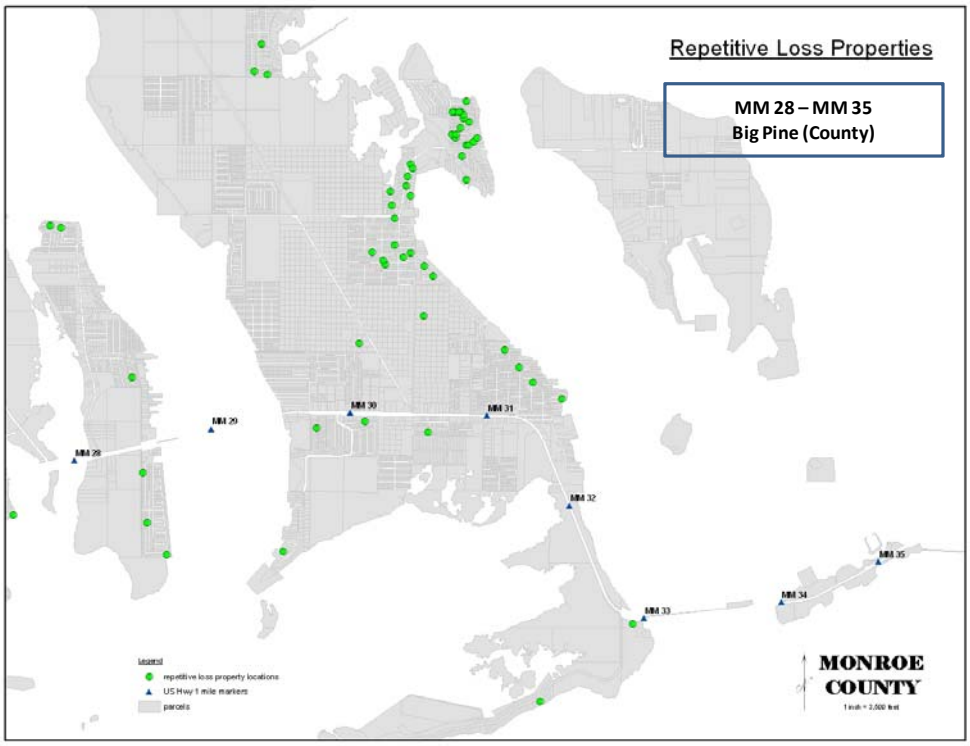


Figure 7-1d. Repetitive Loss Properties (MM 28– MM 35).

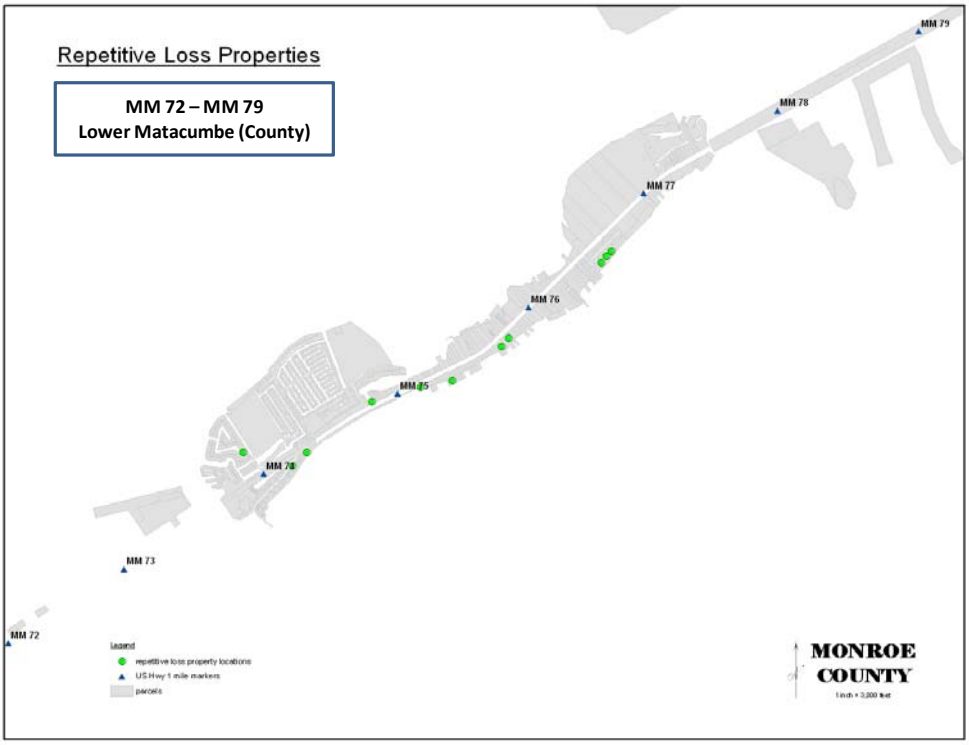


Figure 7-1e. Repetitive Loss Properties (MM 72 – MM 79).

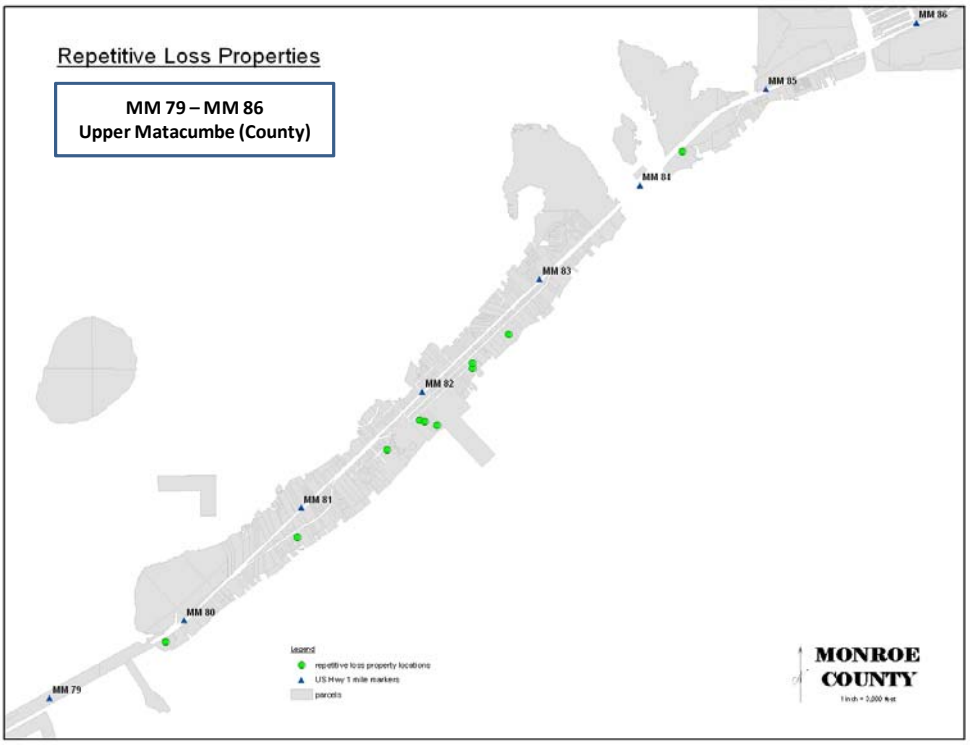


Figure 7-1f. Repetitive Loss Properties (MM 79 – MM 86).

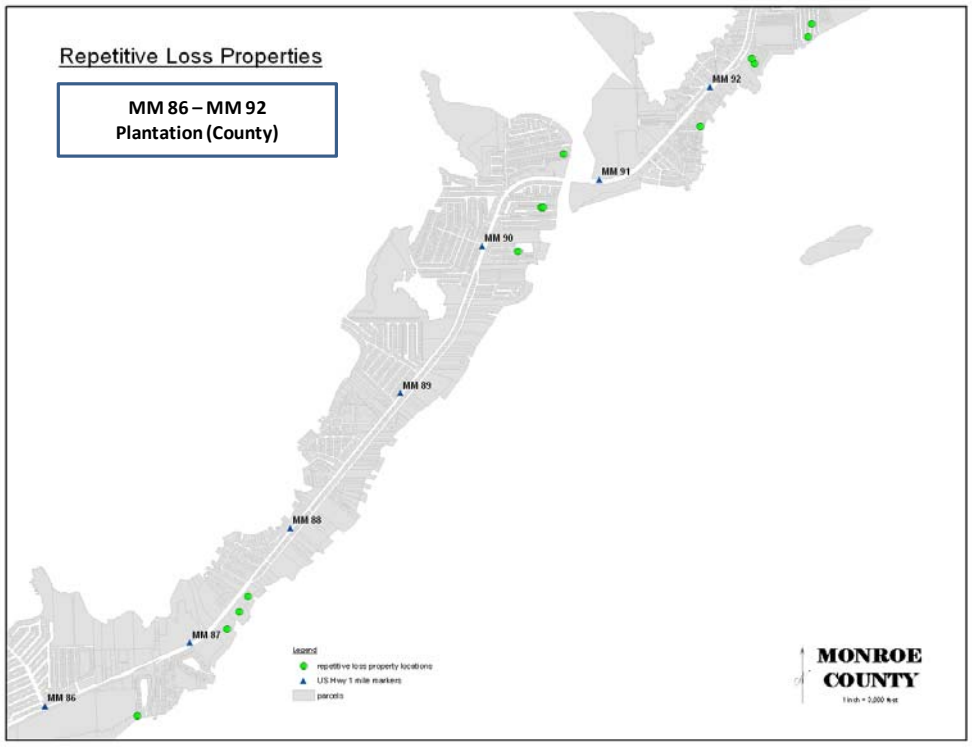


Figure 7-1g. Repetitive Loss Properties (MM 86 – MM 92).

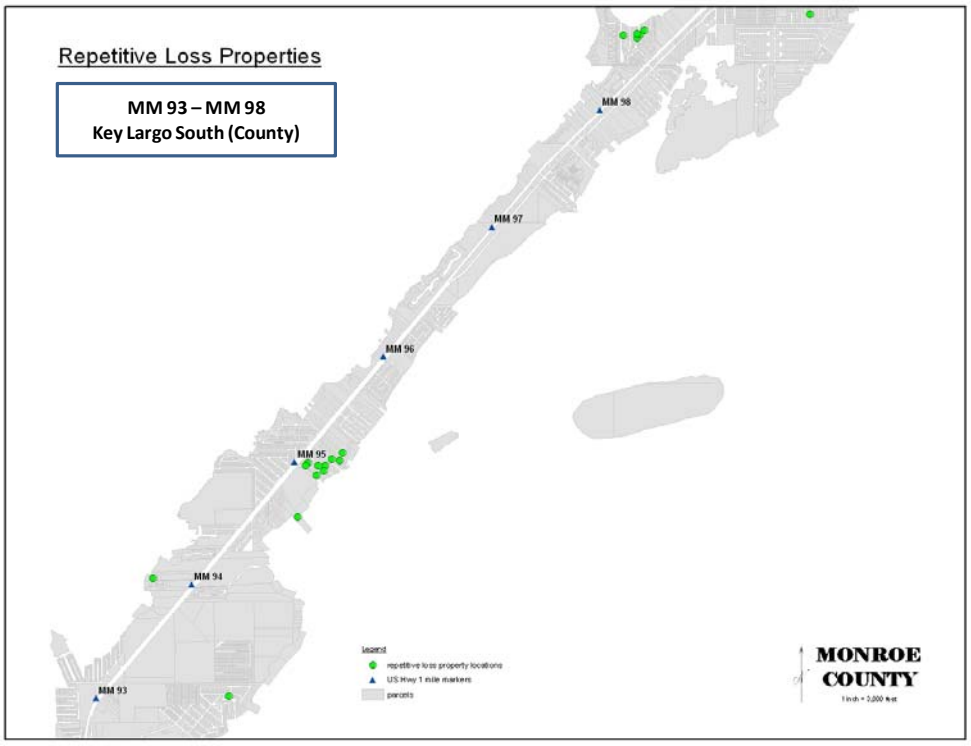


Figure 7-1h. Repetitive Loss Properties (MM 93 – MM 98).

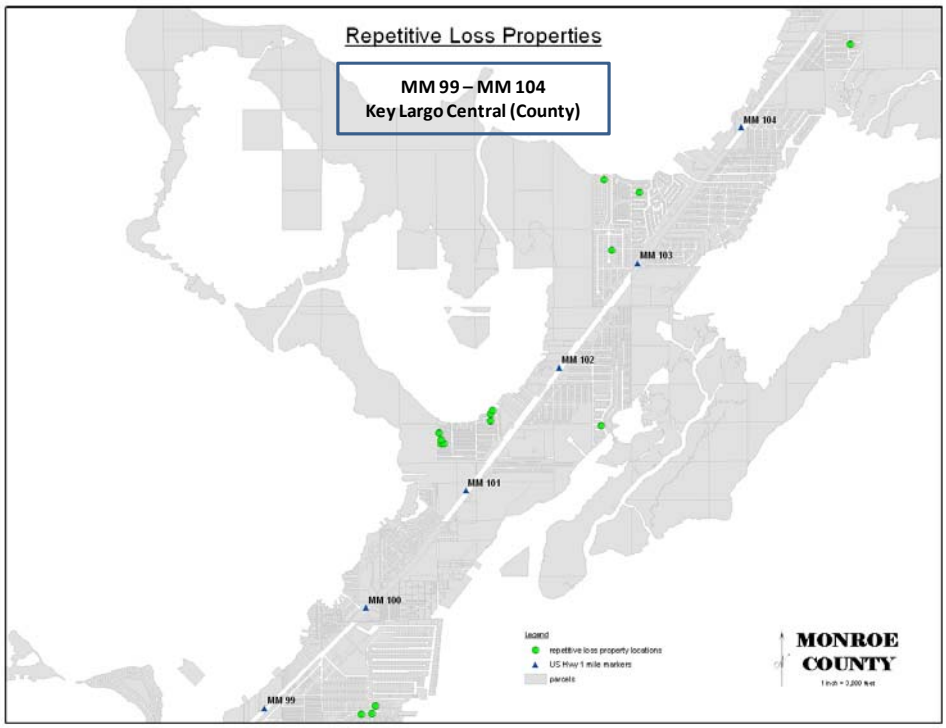


Figure 7-1i. Repetitive Loss Properties (MM 99 – MM 104).

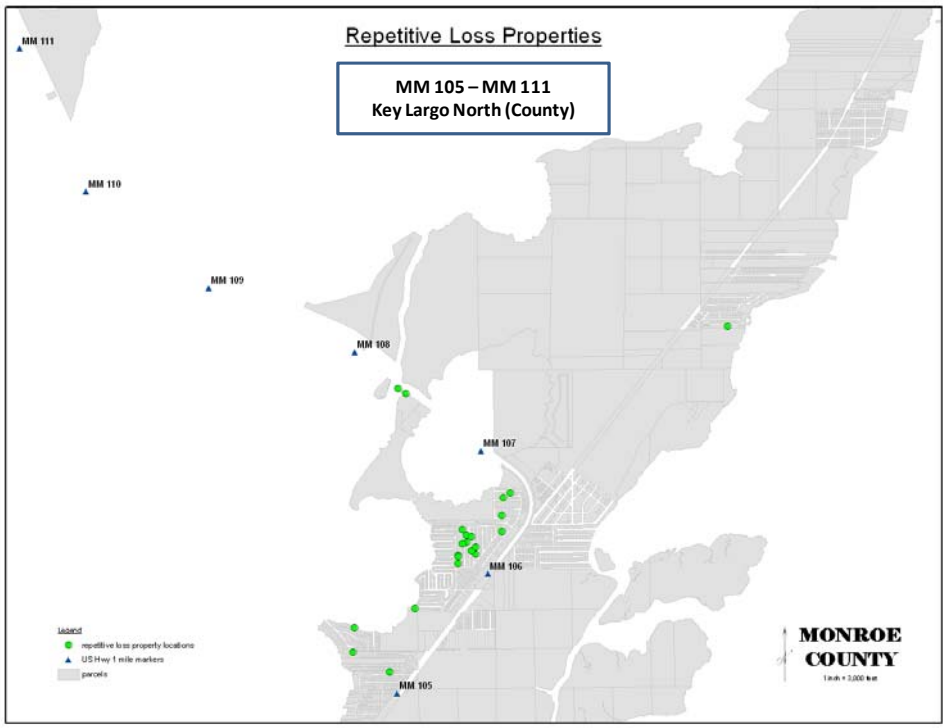


Figure 7-1j. Repetitive Loss Properties (MM 105 – MM 111).

Chapter 8. City of Key West

The City of Key West, the County seat of Monroe County, is located in the southernmost portion of the Lower Keys. Incorporated in 1832 and nicknamed the "Island City", the City is surrounded by the turquoise waters of the Gulf of Mexico and Atlantic Oceans. Aside from its natural beauty, Key West is noted for historic and cultural resources with over 2500 historic buildings and sites. The National Register Historic District is often referred to as "Old Town" and contains many unique frame vernacular architecture examples that are over 100 years old.

8.1 Overview of Key West

Geography

The island of Key West comprises just 3,370 acres in area. It is low-lying, rising from 2 feet along the shoreline near Rest Beach to 16 feet above mean sea level at Solares Hill. Other higher elevations are man-made and are the waste management area (landfill) and bridges such as Garrison Bight Causeway. Most of the newer development, built on fill material, and are raised buildings. While most of the "Old Town" section averages around 7-feet MSL, certain locations important for tourism, such as Front Street, Key West Bight, and Mallory Square are only at 3-feet MSL. Critical areas such as Key West Airport and South Roosevelt Boulevard are at very low elevations (approximately 3-feet MSL).

The City's few natural beaches have oolitic limestone outcrops or thin sand and shell over a rocky base; a low dune exists at Rest Beach. Although sandy beaches are present along the southern shore (e.g., Higgs Beach and Smathers Beach), some were artificially constructed. Mangroves are present along small sections of the island's northern shoreline. Beaches on the southern shoreline experience erosion due to coastal currents, tides, and wave impact. The rate of erosion accelerates during storm events. Shallow waters surrounding the island may contribute to increased storm surge height. Canals, cuts, and inlets experience flooding due to storm surges that may be higher than along flat shorelines.

Population

Information provided by the Key West Planning Department indicates that the City of Key West has a permanent resident population of approximately 23,000 (including military personnel). The seasonal population increases by as much as 16,000. On any given day the number of people in town can increase dramatically due to the number of tourists that arrive on cruise ships.

Land Use & Economy

Key West essentially is completely developed, with a mix of single family residences, multi-family dwellings, time-share and seasonal units, tourist lodgings (hotels, motels, inns, bed and breakfasts, etc.), tourist-oriented uses (museums, attractions), marine-related and recreational uses, commercial uses (restaurants, retail sales, banks, Realtors), medical facilities and offices, and government uses. Redevelopment and renovation are constant activities.

2010 Conformed Version of the Key West Comprehensive Plan

The 2008 Conformed Version of the Key West Comprehensive Plan consolidates the 1993 Plan and six subsequent amendments. In 2009, the City began preparations for a major update to the Plan.

Key West recognizes the natural hazards described in the LMS (Chapter 5 and 6) throughout the 2008 Conformed Version of the Plan, summarized in Table 8-1. The hazards not addressed in the Plan are tornado and wildfire (as noted in Chapter 6, the city has insufficient areas of vegetation to represent a risk).

Table 8-1. Selected Objectives and Policies in the 2008 Conformed Version of the Comprehensive Plan
Objective 4-3.1 Protect Natural Drainage Features
Policy 4-3.1.1 Ensure that Urban Lands Provide Adequate Drainage and Protection from Flooding and Manage the Retention of Ground and Surface Water at levels that Enhance Natural Storage Capacity of Watersheds and Promote Aquifer Recharge
Policy 4-3.1.6 Managing Land Use in the Floodplain
Policy 4-3.1.7 Implementing Stormwater Management Plan
Objective 4-4.1 Coordinate Issues Surrounding Aquifer
Objective 4-4.2 Conserving Potable Water Resources
Objective 5-1.1 Protect Coastal Resources, Wetlands, Estuarine Saltpond Enviornmental Qualify, Living Marine Resources, and Wildlife Habitats
Policy 5-1.1.3 Protect Stabilize, and Enhance the Coastal and Wetland Shorelines
Objective 5-1.3 Land Use Controls and Construction Standards for Protecting the Natural Shoreline and the Very Limited Beach/Dune System
Policy 5-1.3.1 Enforce Development Restrictions Seaward of the CCCL
Policy 5-1.3.2 Natural Shoreline and Beach/Dune Stabilization
Objective 5-1.4 Limiting Pubic Subsidy of Development in the Coastal High Hazard Area
Objective 5-1.5 Avoid Population Concentrations in Coastal High Hazard Areas
Objective 5-1.6 Hurricane Evacuation
Objective 5-1.7 Hazard Mitigation and Coastal High Hazard Areas
Objective 5-1.8 Post-Disaster Redevelopment
Objective 5-1.11 Public Facility Level of Service Standards in Coastal Area
Objective 6-1.3 Maintenance of Floodplains

Table 8-1. Selected Objectives and Policies in the 2008 Conformed Version of the Comprehensive Plan
Policy 6-1.3.1 Enforce Policies to Maintain Floodplain
Policy 6-1.3.2 Land Purchase through Save Our Rivers Program or Other Available State and Federal Programs
Objective 9-1.2 Limitation on Public Investment in the Coastal High Hazard Area

8.2 City Organization and Agencies

The Key West City Commission is composed of 7 members, including the Mayor who is elected specifically to that office. The Commission sets government policy and adopts guidance documents, such as the Comprehensive Plan and ordinances establishing various codes and standards.

Key West is organized into several agencies, each with some authorized responsibilities that, as described below, have bearing on how natural hazards are recognized and addressed.

City Manager. The City Manager of Key West implements the policies of the Commission and administers the overall operations of the City. Related to mitigation of the impacts of natural hazards, the City Manager:

- Participates in post-disaster assessment and may develop mitigation initiatives to address reduction of future loss.
- Participates in the Key West Emergency Operations Center (EOC) and coordinates with the County and other local governments.
- Works with the City's Post-Disaster Recovery Task Force which serves as the City's designated Public Facilities Review Committee. This group is charged with the responsibility for reviewing available alternatives for damaged public facilities following a hurricane or other disaster.
- May perform an analysis and provide recommendations to the City Commission for hazard mitigation options, including relocation and reconstruction of damaged public facilities.
- Participates in intra- and inter-governmental disaster planning efforts, including multi-agency Site Plan Review Committee and Hazard Mitigation.

Key West Planning Department. The Key West Planning Department is responsible for the development and maintenance of the City's Comprehensive Plan, land development regulations, and zoning ordinance. Department personnel support the City Commission, Planning Board, Historic Architectural Review Commission, Development Review Committee, Bahama Village Redevelopment Advisory Board, Housing Committee, and the Truman Waterfront Committee. Related to hazard mitigation, the department:

- Ensures that mitigation related items in the Comprehensive Plan, such as floodplain management and natural resource management, are followed and reflected in the City's Codes and Standards.
- Participates in post-disaster appraisals and may formulate additional mitigation measures for use in the Comprehensive Plan.
- Works closely with Building Department staff to maintain an accounting system of permits issued pursuant to ROGO and coordinates actions related to disaster planning, recovery, and mitigation.
- Conducts surveys for hurricane evacuation modeling (and in 2009, hired an expert on hurricane evacuation).
- Incorporates mitigation recommendations, especially those based on direct disaster experience, in the Evaluation and Appraisal Reports (EAR) required for the Comprehensive Plan.
- Maintains the Water Supply Plan.

Key West Building. The Building Department reviews construction plans, issues permits, and inspects projects for compliance (see Table 8-2). The staff includes one State Certified Building Code Administrator, one Building Inspector who is also a State Certified Code Enforcement Officer, and 3 Permit Technicians (two full time, 1 part-time). Specific to hazards, Department personnel:

- Enforce the City's floodplain management requirements designed to minimize damage to structures from wind and waves resulting from storms.
- Enforce the Florida Building Code requirements for wind loads and anchoring foundations into bedrock.
- Participates in the Post-Disaster Recovery Task Force.
- Proposes (in 2009) to improve public awareness of the Florida Building Code by conducting workshops and use public forums to educate the public about the need to obtain permits.
- Continues efforts to address and eliminate unsafe structures.

Table 8-2. Permits Issued in 2007, 2008, and 2009			
Type of Development	**CY 2007**	**CY 2008**	**CY 2009**
New single family	50	50	50
New other (commercial, industrial, religious, etc.)	50	40	30
New multi-family (2 or more)	12	15	20
Commercial (additions, renovation, conversions)	550	600	625
Residential (additions, renovation, conversions)	1,500	2,000	2,000
Other	2,500	2,000	2,500
Demolition	25	15	10
Relocation	0	0	0
Manufactured home (permanent, temporary)	6	3	7
Totals	4693	4723	5242

Key West Historic Architectural Review Commission (HARC). Key West includes numerous historic resources, including two historic districts listed in the National Register of Historic Places: Key West Historic District and the US Naval Station (known as Truman Annex). HARC reviews activities that impact historic structures and the historic district. The guidelines used by HARC incorporate the principles of the Secretary of the Interior's Standards for Rehabilitation, and including regulations that are unique to the historic fabric of Key West.

Because historic properties in Key West are significant locally and nationally, they require special attention and application of sensible reconstruction methodologies after damaging events. Doing so ensures adequate procedures that will preserve the historic quality and character found in Key West historic districts. In 2008, the Florida State Historic Preservation Office (*Florida SHPO*), Division of Historical Resources prepared a planning tool, *Disaster Mitigation for Historic Resources: Protection Strategies,* which will be adopted by HARC. Since 1991, the City of Key West is a Certified Local Government by the Secretary of the Interior and the Florida SHPO; therefore, the City needs to comply with all State and Federal regulations regarding protection of historic structures in order to maintain the certification.

Key West Finance Department. The Finance Department is responsible for overseeing the day-to-day financial requirements of the City, including establishment of purchasing procedures for all agencies. To expedite preparation for, response to, and recovery from disasters, the Finance Department may implement special emergency procedures to expedite necessary purchase and payment before, during, and after a disaster.

Key West General Services Department. The General Services (Utilities) Department includes Wastewater, Stormwater, Engineering Services, and Solid Waste, including the management of the City's waste removal contract with Waste Management. The Department also includes the Richard A. Heyman Environmental Pollution Control Facility (Wastewater Treatment Plant) which is operated by a private contractor.

Key West Utilities Manager. The Utilities Director is responsible for coordinating various utility resources in the city. These include the Richard A. Heyman Environmental Protection Facility (treatment Plant), Sewage Treatment System including pumping and lift stations, Garbage Collection Program, Waste Transfer Facility, and the Stormwater Utility. These facilities have specific written emergency plans and procedures designed for use in emergencies such as tropical cyclones, severe storms, flooding and tornadoes. A separate plan for hazardous materials is specific to the Sewage Treatment Plant. The Utilities Manager also directs the City's Transportation and Facilities Maintenance sections. The Facilities Maintenance section is responsible for maintenance and repairs on some government structures, and small new construction and additions.

When reviewing the physical plant of the City's utility facilities, the Utilities Manager evaluates vulnerabilities such as flood height, roof construction, and window protection. The Utilities Manager provides input in the Post-Disaster Recovery Task Force.

City Engineer. The Manager of the City Engineering Department is professionally qualified to review Civil Engineering plans to determine compliance with the Florida Building Code and construction requirements. The Engineer performs other responsibilities relating to the construction and technical needs of the City, including overseeing the engineering requirements of public facilities such as roads, bridges, sewer treatment facility, and other City buildings. The Engineer's office monitors public beaches for shoreline erosion and participates in grant applications for renourishment and mitigation activities.

After a damaging event, Engineering staff conduct damage assessments of public infrastructure and works with federal and state agencies such as FEMA and Florida DEM to develop scopes of work and to facilitate funding assistance for recovery operations. Under the federal Public Assistance Program, mitigation measures to reduce future loss to public facilities may be included in requests for recovery assistance. The City Engineer provides input to the Post-Disaster Recovery Task Force.

Key West Community Services Department. The Community Services Department is responsible for overseeing the maintenance and operation of all city facilities, including buildings, roads and bridges. The Public Works unit is responsible for coordination and provision of emergency public works, evaluation of infrastructure damage, and preparation of documentation required for federal reimbursement (including identification of mitigation components to be incorporated during recovery), and coordination of emergency debris clearance.

In executing its disaster and recovery responsibilities, Public Works coordinates with the Florida Department of Transportation (FDOT), Monroe County Department of Public Works, Florida Keys Aqueduct Authority, and Keys Energy System. The Department plans, coordinates and initiates restoration of the serviceability of transportation routes, bridges, and assurance as to the safety and affected public and private dwellings and structures.

Key West owns approximately 100 buildings; many are leased to commercial concerns. Some buildings have hurricane shutters; the presence of rooftop equipment and whether it is anchored to resist hurricane winds is not known at this time. All work on buildings must comply with the Florida Building Code and other pertinent requirements (such as floodplain management). The City maintains flood insurance policies on some buildings. For leased buildings, generally if one is damaged, the City provides some abatement of rent during the period of restoration. If one is destroyed, the lease would be terminated.

Key West Transportation Department. The Transportation Department provides for citywide and fixed route intra-county transportation services in the Lower Keys, operating a fleet of buses. It also assists in transportation and evacuation planning. The Department's Hurricane Plan and Procedures are designed to effectively implement its responsibility of moving civilians to shelters or, in the event of an out-of-county evacuation, to staging areas for school bus transport to the mainland shelter at Florida International University. The Department participates in the emergency after-action process and formulates measures to address future needs.

Key West Police Department. The Police Department is responsible for overall law enforcement and protection of residents and visitors in the City of Key West. The Department plays a key role in planning and response during emergencies. The permanent standing Hurricane Preparedness Committee reports to the Chief of Police and is responsible for preparation, review, and revisions of plans, procedures, operations and training materials relating to hurricane preparation, response, and recovery. The committee prepares after-action critiques of every implementation or exercise of any element of the disaster response and recovery plan and provides recommendations for addressing future problems.

The Police Department's preparedness and response activities include supervision of the Emergency Law Enforcement and Traffic Control plan, coordination with other City Departments, and outside agencies (Monroe County Sheriff's Office and the Florida Highway Patrol to promote speedy and safe evacuation), communications with base operations, field personnel, and emergency shelters.

Key West Fire Department. The Fire Department provides emergency management assistance and direction to the City of Key West in concert with other duties of fire control, fire prevention, and fire and hurricane public education. The Department plays a lead role in planning and response for emergencies. In March 2007, the Insurance Services Office evaluated and awarded the department an ISO Public Protection Classification Rating of 2. The Fire Department's preparedness and response mitigation activities include assisting Monroe County Emergency Management, directing the operations of the City's Emergency Operations Center, and contributing to pre-planning strategies and evacuation planning. The Department is responsible for planning for hazardous materials incidents, maintaining a hazardous materials inventory and response plan, and responding to hazardous materials incidents.

Key West Port Department. The City hosts many cruise ships through the year, serving approximately 1 million visitors a year. The Ports Director meets with the U.S. Coast Guard when impending weather conditions may prompt decisions regarding port operations and whether to close the Key West Harbor to cruise ships and other large vessels. Prior to storm conditions, the department coordinates preparation of private vessels in both the City Marina and Key West Bight Marina and secures the ports facilities.

8.3 Hazards and Risk in Key West

Historic Storms

From the wreck of the treasure-laden ship, Nuestra Senora de Atocha, destroyed by a hurricane in 1622 to the present, hurricanes have played a major role in the life of Key West. Some of the more significant events include:

- October 11, 1846. As one survivor commented, it was '"the most destructive of any that had ever visited these latitudes within the memory of man". Most of the damage was located in the north and west sides of the island, along Whitehead and Duval Streets to the Gulf (Bahama Village and Truman Annex) and the Key West Bight. Damage included buildings that were pulled off their foundations and swept out to sea, uprooted trees, destruction of a lighthouse, and the cemetery located along South Beach was washed away with the dead scattered in trees. Fort Zachary Taylor, which was under construction, was severely damaged.
- October 11 and 17, 1909. Listed by the National Hurricane Center as one of the most intense to affect the U.S., this storm was a Category 3 with a

barometric pressure of 957 millibars. According to the Key West Historic Districts Hurricane Guide, "the arrival of this hurricane caught residents completely unprepared . . . Seven factories, several churches, and much of the waterfront was destroyed. Afterwards, debris clogged the streets." To make matters worse, another Category 3 hurricane struck on October 17, 1910, causing 30 deaths and $300,000 in damage (not adjusted).

- September 9-10, 1919. One of the most deadly and intense hurricanes listed in the records of the National Hurricane Center, this Category 4 storm (927 millibars), this storm caused approximately 600 deaths. Key West recorded winds of 95 mph and flood levels were 5-7 feet above Mean Sea Level.

Other Notable Hurricanes that Affected Key West

Hurricanes Donna (1960), Betsy (1965), and Inez (1966), Tropical Storm Alberto (1982), Hurricanes Kate (1982), Hurricane Floyd (1987), and Hurricane Andrew (1992).

- November 11-12, 1980. The most notable flooding not produced by storm surge resulted from the 24-hour event known as the "Veteran's Day Storm". Nearly 23 inches of rain – the area's record – resulted from the influence of Tropical Storm Jeanne over Cuba and a stalled cold front. Widespread flooding affected streets and low-lying areas that were unable to drain due to the flat topography and continual rainfall. Reports indicate that 300 vehicles and 500 buildings were seriously damaged.
- September 24-26, 1998. Hurricane Georges (Category 2) made landfall in the Lower Keys. The entire county was affected to some extent (1 death and $300 million total damage). Maximum sustained winds at the Naval Air Station (Boca Chica) were 92 mph and the Monroe EOC in Marathon reported gusts to 110 mph. According to the Key West Weather Service, precipitation levels in the Lower Keys were identified as 8.65 inches on the south side of Sugarloaf Key, 8.38 inches at Key West International Airport, and 8.20 inches on Cudjoe Key.
- October 22, 1999. With little warning, Hurricane Irene suddenly altered its course and crossed near Key West.

Damage due to Hurricane Georges (1998)

Table 8-3 summarizes reimbursements received by the City from FEMA's disaster assistance program. These amounts underestimate the total cost of damage to public property and expenditures of manpower for recovery because they do not include the non-federal share nor do they include costs determined to be ineligible. Other than debris

removal and emergency work on beaches, the two most costly projects were the seawall replacement ($6.9 million) and repairs at the incinerator plant ($535,000).

The damage left after Hurricane Georges moved through the Keys illustrates the vulnerability and the types and magnitudes of damage and costs. Among the reported damage were the following:

- The Hemingway House, a historic property, was damaged by a 146 year old Banyan tree weakened by the winds and rain.
- The Key West International Airport's runway was flooded and one private plane was overturned.
- A number of roads and sites were covered in sand and debris.
- Houseboats were damaged.
- Waterfront businesses suffered damage including lost piers and decks.

Table 8-3. FEMA Reimbursements for Hurricane Georges (DR#1249)

FEMA Category of Damage	Amount of Reimbursements
A Debris Removal	$3,390,800
B Emergency Protective Measures	$1,925,900
C Roads and Bridges	0
D Water Control Facilities	0
E Buildings and Equipment (Public)	$792,800
F Utilities	0
G Parks, Recreational Facilities and Other	$7,597,500
Totals	$13,707,000

Damage due to Hurricane Wilma (2005)

Based on the Preliminary Damage Assessment for the City, more than 5,200 structures experienced flood depths ranging from 36" to 60" (1,477 structures), 12" to 36" (2,213 structures), and less than 12" (1,512 structures). Eighty-five structures were destroyed.

Table 8-4 summarizes reimbursements received by the City from FEMA's disaster assistance program. These amounts underestimate the total cost of damage to public property and expenditures of manpower for recovery because they do not include the non-federal share nor do they include costs determined to be ineligible.

Table 8-4. FEMA Reimbursements for Hurricane Wilma (DR 1609)

FEMA Category of Damage	Amount of Reimbursements
A Debris Removal	$3,506,346.19
B Emergency Protective Measures	$1,858,886.27
C Roads and Bridges	$0.00
D Water Control Facilities	$99,739.00
E Buildings and Equipment (Public)	$2,040,886.20
F Utilities	$596,150.92
G Parks, Recreational Facilities and Other	$1,573,849.36
Totals	$9,675,857.94

Hurricane Flooding as Predicted by SLOSH Modeling

The National Hurricane Center's surge model, called SLOSH (Sea, Lake, and Overland Surges from Hurricanes), estimates surges associated with different characteristics of tropical cyclones (track, forward speed, wind speed, etc.). The results can be combined with topographic mapping to delineate inland areas subject to flooding (with a margin of error of +/- 20).

Table 8-5. SLOSH Maximum Predicted Water Depths (ft above MSL)

Ocean Side						Bay Side					
Track Direction	Storm Categories					Track Direction	Storm Categories				
	1	2	3	4	5		1	2	3	4	5
WSW	3	4	9	9	10	WSW	4	6	9	10	10
W	4	6	8	9	10	W	4	7	8	10	10
WNW	4	6	8	9	10	WNW	4	7	8	10	10
WN	4	6	7	9	9	NW	4	6	7	9	9
NNW	4	5	7	9	9	NNW	4	5	7	9	9
N	4	5	7	9	9	N	4	5	7	9	9
NNE	4	5	7	9	9	NNE	4	5	7	9	9
NE	4	5	6	8	9	NE	3	5	6	8	9
ENE	4	5	6	8	10	ENE	4	5	6	9	10
E	3	5	7	8	10	E	4	5	7	9	10

Rainfall/Fresh Water Flooding in Key West

In several locations the City's storm drain system is inadequate to handle as little as three to five inches of rainfall, which happens several times each year. The types of damage caused by flooding of this nature include traffic rerouting, business closures, and flooding above finished floor height and above of homes and businesses. In just the Old Town area at North Duval, a typical storm can disrupt businesses causing losses of approximately $10,000 each

day. Damage to private structures and contents and the costs of clean up are not estimated. The most susceptible locations are listed in Table 8-6.

Table 8-6. Locations Susceptible to Rainfall/Fresh Water Flooding.

Location	Status (mid-2010)
The north section of Old Town bounded by the Gulf of Mexico and Whitehead and Green Streets, some buildings experience flooding above finished floor elevation flooding approximately twice a year.	Not completed.
Palm Avenue and Eaton Street (at White Street) which can reroute 5,000 vehicles per day during heavy rains, affects businesses, and causes stranding of residents of the adjacent housing authority homes.	Not completed.
Sirugo Avenue and Sunshine Drive, which has floods above finished floors in residences annually.	Plans are developed and in line for construction.
United Street and Thompson Street basin, which has causes flooding of residences finished floor.	Plans are developed and in line for construction.
North Roosevelt Boulevard (US Highway 1) which floods two outbound lanes completely during heavy rain storms 2 to 3 times each year, negatively impacting businesses and causing significant traffic rerouting.	Florida DOT project scheduled to being September 2011, including flood mitigation and stormwater run-off controls.
Fourth Street at Patterson Avenue floods frequently, causing commercial business and residential traffic disruptions.	Plans are developed and in line for construction.
Blanch, Dennis and Duncombe Streets causing school bus disruptions and flooding above finish floors of residences.	Plans in development.
Duck Street Ave.and 20th Street, causing traffic disruptions and flooding above finish floors of residences.	Not completed.
Various very localized flooding spots causing water infiltration into homes and businesses can be found around town.	Areas are being prioritized for possible plan development.

Floodplain Management & Compliance with the NFIP

The City entered the National Flood Insurance Program in 1971 by adoption of an ordinance that complies with the requirements of the program. The City reviews all development proposals in special flood hazard areas and enforces the requirements of the ordinance. To ensure continued compliance with the NFIP, the City will continue to:

NFIP Flood Insurance Policies in Key West: 8.521

Claims paid since 1978: 3,403

http://www.fema.gov/nfip/pcstat.shtm
(as of December 31, 2009)

- Enforce the adopted floodplain management ordinance, including inspection of permitted development and unpermitted activities;
- Maintain records pertaining to floodplain development, including flood maps and Letters of Map Change, which shall be available for public inspection;

- Notify the public when there are proposed changes to the ordinance or Flood Insurance Rate Maps; and
- Promote the purchase of NFIP flood insurance policies as financial protection.

NFIP Floodplain Mapping

Key West has participated in the National Flood Insurance Program (NFIP) since September 1971. The City's current Flood Insurance Rate Map, prepared by FEMA, is dated February 18, 2005. The FIRM delineates areas that have been determined to be subject to flooding by the "base flood," the flood that has a 1-percent-annual chance of flooding in any given year (commonly called the 100-year flood). Flooding of this frequency is not associated with a specific hurricane category. Key West has the following flood zones and flood elevations (above MSL) shown on the FIRM:

- VE Zones (coastal flood with velocity hazard wave action) of 11-13 feet are near the shoreline and in sections adjacent to Cow Key Channel on the border with Stock Island.
- AE Zones (areas subject to flooding but waves are predicted to be less than 3-feet in height) of mostly 7-9 feet are indicated for the newer sections of Key West and in areas of "Old Town" close to the shoreline.
- X Zones are delineated in most of the inland areas of the older, historic portion of the City. X Zones include areas determined subject to flooding by the 0.2-percent annual-chance flood (500-year) and areas that are outside the 500-year floodplain.
- AO Zones, where flood depths of 1-3 feet are predicted in sloping areas for Sunset Island offshore of the west side of Key West.

NFIP Repetitive Loss Properties

Data provided by the Florida Division of Emergency Management identifies properties that are, or have been, insured by the National Flood Insurance Program and that have received two or more claims of at least $1,000. In 2005, 51 properties met the definition. As of February 28, 2010, 216 individual properties have received 544 claims, totaling $24.6 million (average payment of $45,300). Figure 8-1 shows the locations of repetitive loss properties.

A subset of the NFIP's Repetitive Loss Properties includes those that meet the Federal definition for "severe repetitive loss." Seven properties in Key West are designated as Severe Repetitive Loss properties, having received a total of 38 claims totaling more than $1,252,200. A Severe Repetitive Loss Property is defined as a residential property that is covered by an NFIP flood insurance policy and (a) that has at least four claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims exceeding $20,000; or (b) for which at least two separate claim payments (building only) have been made with the cumulative amount exceeding the market value of the

building. For both (a) and (b), at least two of the qualifying claims must have occurred within any 10-year period.

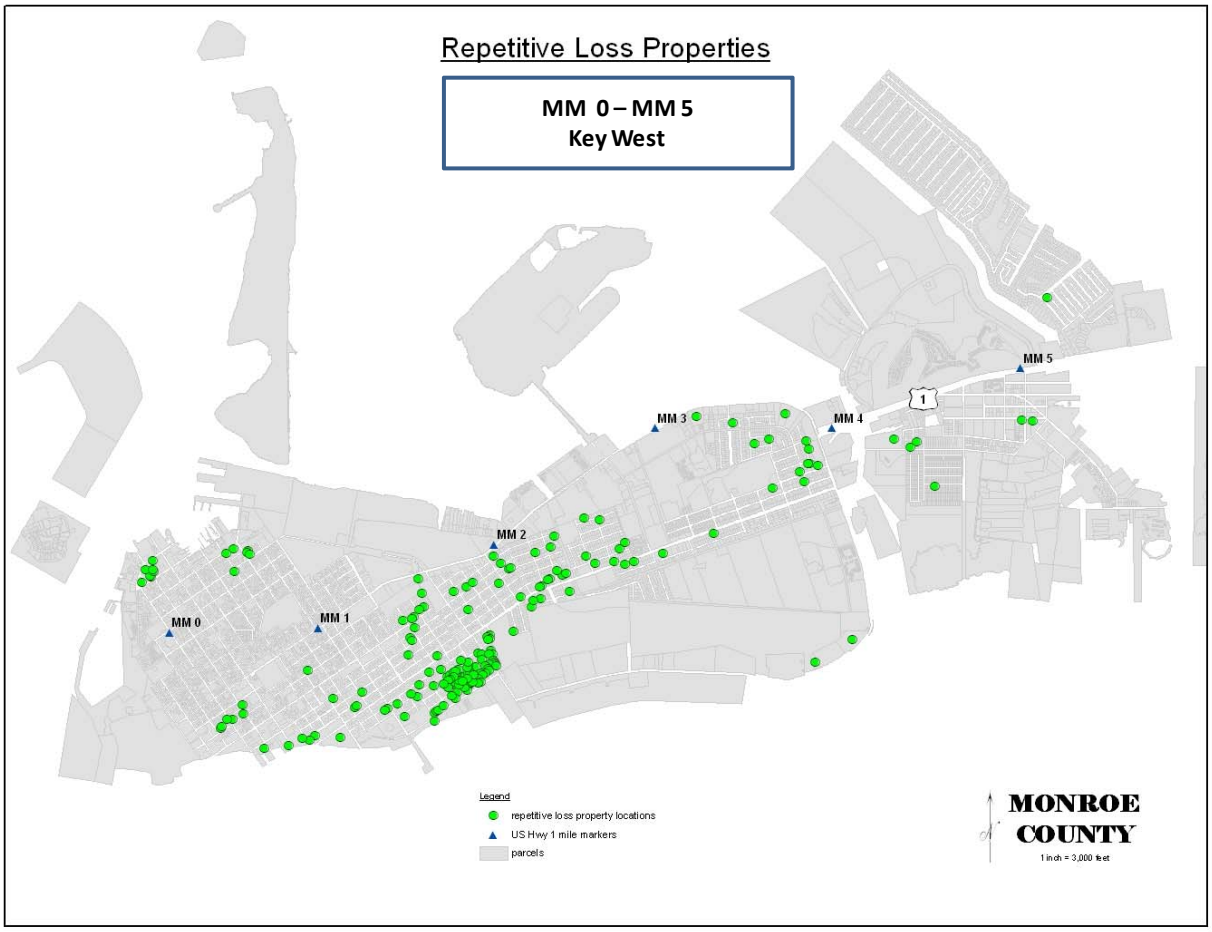


Figure 8-1. NFIP Repetitive Loss Properties (February, 2010).

Tornadoes in Key West

Table 8-7 includes information on tornadoes that have affected Key West since the late 1950s. Fortunately, no deaths or injuries have resulted.

Table 8-7. Tornadoes in Key West

Date	Fujita Scale	Damage (not adjusted)
July 1, 1959	F-0	$3,000
June 2, 1966	F-0	$25,000
June 18, 1972 (Hurricane Agnes)	F-2	$400,000
August 20, 1978	F-0	$25,000
June 28, 1979	F-0	$3,000
May 16, 1988	F-0	$1,000
May 3, 1989	F-0	Not reported
May 1999	F-0	Not reported
October 2000	F-0	Not reported
October 2003	F-0	Not reported
December 2009	F-0	$5,000

Source: NWS Key West Warning Meteorologist and NCDC

Drought Hazards

Drought hazards for the planning area are described in Section 6.4. Key West's risk due to drought is comparable the drought risk throughout the area.

Wildland Fire Hazards

The Florida Forestry Department has not indicated that areas in Key West are likely to experience significant risk of wildland or brush fires.

Key West's Important and Critical Facilities

Table 8-8 lists facilities that the City deems important and critical. Figure 8-2 at the end of this chapter shows the locations of the City's bridges, water treatment and sewer facilities, city buildings and emergency facilities.

Table 8-8. Important and Critical Facilities in Key West

Critical/Essential Facilities:	Other Public Facilities:
• bridges • 17 sewer lift stations and one Wastewater Treatment Plant • 2 stormwater lift stations • City buildings (Old City Hall, City Hall with Fire Facilities, City Hall Annex, City Hall Parking Garage, Old Town Garage) Planning dept, . • City Parks & Recreational Facilities: Martin Luther King Pool Building, Indigenous Park,	• Dee Poo Hospital • Lower Florida Keys Health Center • U.S. Naval Hospital • Key West International Airport • Florida Highway Patrol Substation South Roosevelt Boulevard • US Coast Guard Base • Military Fuel Storage Facility

Table 8-8. Important and Critical Facilities in Key West

Mallory Square, Douglas Gym, Clayton Sterling sports complex, Wickers Sports Complex, Bayview Park Recreational Center, Fire Station Museum • Emergency Operations Center (Public Safety Facility), Fire Station #3, • Key West DOT Building, Public Works Building, OMI Repair Building • Southernmost Transfer Station	• Keys Energy Services Main Office & Substation • Florida Keys Aqueduct (FKAA) Authority Main Office, Water Towers, Storage Facility, Pump Station
Hazardous Materials Sites (302 Facilities): • Bell South, 530 Southard Street • KES 1001 James Street • Key West Wastewater Treatment Plant, Trumbo Point Annex, Fleming Key • Naval Air Station, Trumbo Point	**Mobile Home and Recreational Vehicle Parks (as of October 1995):** • Key West Villas (Poinciana) LTD Mobile Home Park • Stadium Mobile Home Park • Key West Trailer Court • Mastic
Marinas: • A & B Marina • Galleon Marina • Garrison Bight Marina • Hilton Haven Marina • Key West Seaport • Key West Yacht Club Marina • Land's End Marina • Truman Annex Marina • City Marina • Ocean Key House	**Cruise Ship and Ferry Ports:** • Mallory Square • Outer Mole • Pier B • KW Ferry Terminal

8.4 Damage Reduction Activities

On-Going Activities

The City activates a Post-Disaster Recovery Task Force after a major damaging event has occurred. In addition to members from City departments, various neighborhood and interest-based groups are represented. A main focus of the task force is to encourage public participation in the post-storm redevelopment planning and review process, including historic preservation interests. The Task Force also analyzes the outcome of an event and makes recommendations for mitigation.

Between 1992 and 1999 the City of Key West participated in the NFIP's Community Rating System. The Key West Building Department lists obtaining CRS certification among its long-term goals.

Recent Projects

The City has undertaken various projects to reduce exposure to future damage, such as drainage improvements and retrofits of public buildings and facilities (with or without FEMA funding). Table 8-9 lists projects completed between 1999 and 2004.

Table 8-9. Key West Mitigation Projects (1999–2010)

	Mitigation Project Location and Notes on Activity
Storm Shutters	Key West Transfer/SWTE. Notes: Pending grant approval to redevelop the site as the Key West Department of Transportation / Monroe County School District Transportation Hub and Fleet Services Center.
	DOT Building
	FDS Gym. Notes: Seeking grants to enhance the structure to be used as a general population shelter and point of distribution.
	Fire Station #1 HMGP
Stormwater Improvements	Grinnell Street (Backflow preventers)
	William Street
	Elizabeth Street
	Green Street
	Duval Street
	Ashby Street Pump Station. Notes: Control panel was raised above BFE and provided elevated platform for portable electric generation. Seeking grants to install permanent emergency power for all pumping stations.
	Simonton Street (Duval/Front Pump Station)
	Major Pipe Cleaning Project. Notes: Ongoing.
Injection Well Projects	White Street
	Kamien Subdivision. Notes: Ongoing.
	Fort Street. Notes: Ongoing.
	Reynolds Street
	Searstown / Donald Ave
	2005 Project: 26 Locations
	Margaret Street
	Olivia Street
Berms & Beaches	Rest Beach Berm
	Dog Beach Berm
	South Beach Berm
	Simonton Beach Berm
	Smathers Beach Berm
	Seawall Additional Length
	South Beach Pier

8.5 2010 Updates

- 8.1: Revised to reflect the 2010 Conformed Version of the Key West Comprehensive Plan.
- 8.2: Updated agency descriptions and revised to reflect current organization and descriptions of functions related to hurricanes and hazard mitigation. Expanded text on historic properties.
- 8.3: Added text on Hurricane Wilma. Updated locations susceptible to rainfall flooding.
- 8.3: Added description of continued compliance with the NFIP. Expanded text on repetitive loss properties, severe repetitive loss properties, and added map of repetitive loss properties.
- 8.4: Added notes to the list of recent mitigation projects.

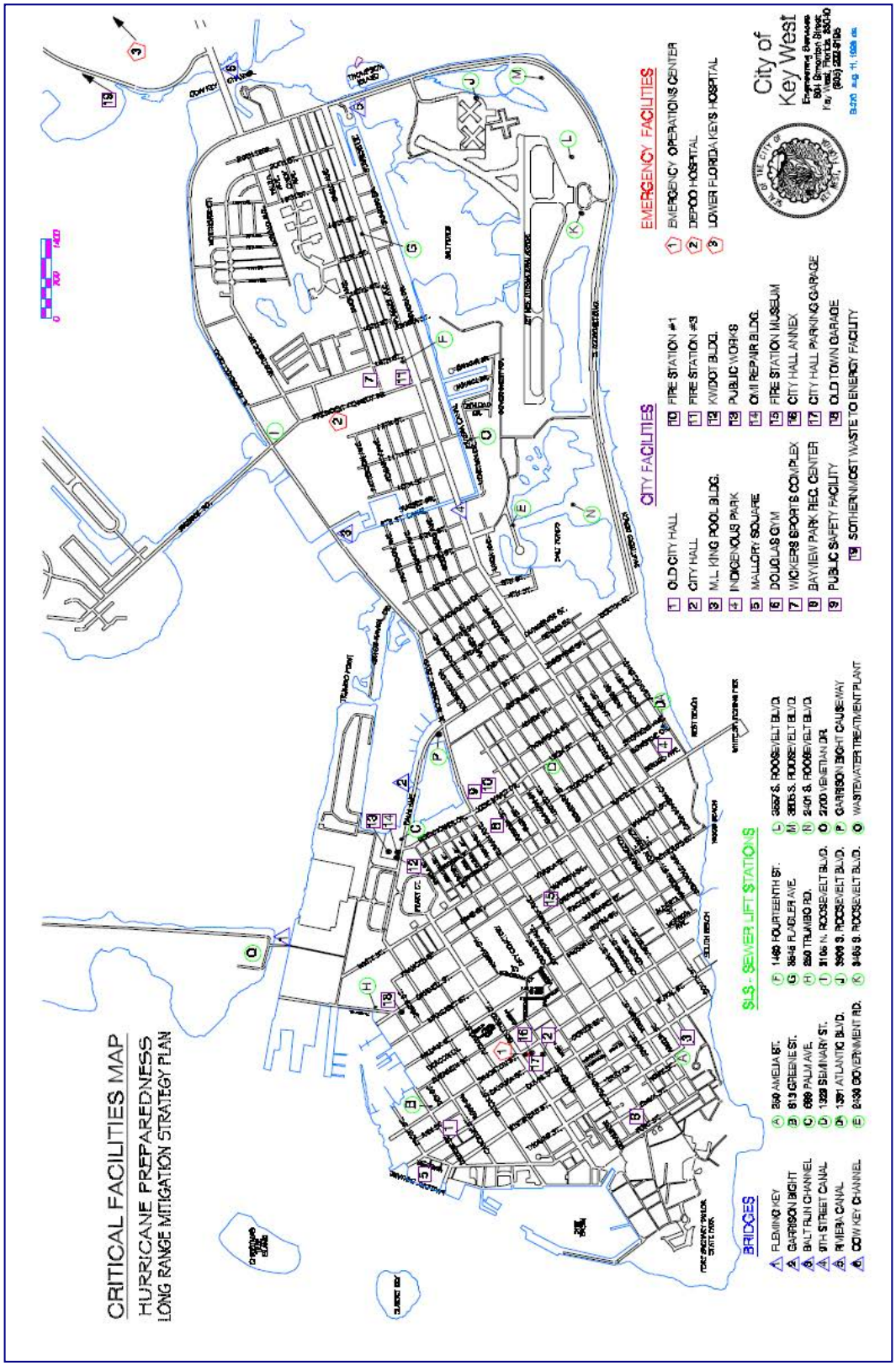


Figure 8-2. Key West's Critical Facilities Map.

Chapter 9. City of Layton

The City of Layton, incorporated in 1963, is located in the Middle Keys primarily on the east side of Overseas Highway, just north of Long Key State Park entrance.

9.1 Overview of Layton

Geography

Layton comprises just 85 acres in area. Layton is building almost entirely on waterfront property, mostly canals. It is low-lying, with all land below about 6 feet above mean sea (MSL).

Population

Layton has a permanent resident population of 200. The seasonal population increases to as much as 250. Current population projects indicate the permanent population may grow to 205 by 2010.

In 2004, the Monroe County Social Services registered just one person people in the Layton area as having special needs for hurricane assistance.

Land Use & Economy

Layton's development is primarily single family residences located along canals and small businesses (restaurants and convenience stores).

Future growth is limited through the Rate of Growth Ordinance to implement portions of the City's Comprehensive Plan. ROGO, as the ordinance is called, establishes a building permit allocation system for residential construction. The purpose is to encourage in-fill of platted lots served by existing infrastructure and to limit growth to enable safe and timely hurricane evacuation. Pursuant to ROGO and an agreement between the City, County and the department of Community Affairs, the annual allocation for Layton is three permits per year for residential dwelling units.

All new construction, reconstruction, and improvements to existing buildings must comply with the current building code requirements.

Layton joined the National Flood Insurance Program in July 1971 and administers a floodplain management ordinance that meets or exceeds the minimum federal requirements.

9.2 City Organization and Agencies

Layton's City Council is composed of 6members, including the Mayor who is elected specifically to that office. The City Council sets government policy and adopts guidance documents, such as the Comprehensive Plan (1996) and ordinances establishing various codes and standards.

Layton is organized into several agencies, each with authorized responsibilities that, as described below, have bearing on how natural hazards are recognized and addressed.

Mayor. The Mayor implements the policies of the Commission and administers the overall operations of the City, including hiring staff as funded by the Council and chairing the Council meetings.

City Clerk. The City Clerk is appointed by the City Council and is responsible for maintaining City records, publishing meeting notices, maintaining the financial records, and other duties as directed by the City Council.

Administrative Assistant to the Mayor. The Administrative Assistant is responsible for the daily activities of the City and in the absence of the Mayor, represents the Mayor at official meetings and functions.

Layton Planning Department. The Planning Department is responsible for the development and maintenance of the City's Comprehensive Plan.

City Building Official. The Building Official reviews construction plans, issues permits, and inspects projects for compliance. Layton has adopted the Florida State Building Code. The Department is responsible for enforcing zoning and building standards and the Land Development Regulations.

Layton , Florida

- *Building Department has 2 part-time staff members*
- *City Clerk has 1 part-time staff member*
- *Administrative Department has 1 part-time staff member*
- *Planning Department has 1 part-time staff member*
- *Code Enforcement Department has 1 part-time staff member and an appointed Code Enforcement Board*

Table 9-1. Layton: Permits Issued (2007, 2008, 2009).

	CY 2007	CY 2008	CY 2009
New single-family, detached	3	3	0
New single-family, attached	0	0	0
Multi-family (2 or more)	0	0	2
Non-residential (all types)	1	2	0
Residential (additions, alterations, repairs)	18	24	27
Non-residential (additions, alterations, repairs)	0	0	24
Demolition	0	4	0
Relocation	0	0	0
Mobile home (permanent/temporary)	0	0	0
Total Permits Issued	22	33	53

9.3 Hazards and Risk in Layton

Historic Storms

Hurricane Donna (August 29-September 19, 1960). A Category 4 hurricane, this storm is listed among the most intense in U.S. history. It curved northwestward over the Middle Keys before turning north towards the mainland at Naples and Fort Myers. Wind speeds of 128 mph and central pressure of 28.44 inches were measures. Tide levels ranged from 13.5 feet above MSL at Upper Matecumbe Key, +10 feet at Plantation Key, and 8.9 feet in Key Largo. The high water mark closest to Layton was nearly 8 feet (ocean side, Craig Key Mile Marker 72).

Hurricane Betsy (August 26-September 12, 1965). A Category 3 hurricane, Betsy passed over Marathon moving westward into the Gulf of Mexico. At Tavernier, central pressure was recorded at 18.12 inches and wind speeds were estimated at 120 mph. Flood levels were measures at 9 feet MSL in Key Largo.

Ground Hog's Day Storm (February 2, 1998). This severe weather system produced tornadic activity in the area.

Hurricane Georges (September 25, 1998). Near Layton at Mile-Marker 70, storm debris rendered U.S. 1 impassable to civilian vehicles. The high water marks closest to Layton were 4.6 feet at Mile-Marker 69.5 and 5.7 feet at Long Key State Park Mile-Marker 66.8.

Tropical Storm Mitch (November 4-5, 1998) affected the City of Layton.

Effect of Recent Hurricane Disasters

Damage from Hurricane Georges is representative of Layton's exposure:

- Damaged city property; a reimbursement of over $7,000 was received for damage to signs and streets, park cleanup, and EOC staffing.
- All private residences that were below the crown of the city's streets received flooding, and most roofs suffered wind damage (shingles). About 2% of homes sustained significant wind damage.
- Due to a 4-day power outage, all businesses were closed or experienced restricted operations.
- Lobster fishermen lost approximately 50% of their traps.

Damage from Hurricane Wilma

Although there was only minor damage to City property, there was severe water and wave action caused more than $1,000,000 in damage to the waterfront commercial and residential properties on the north side of the Overseas Highway as the surge from the storm exceeded 5.5 feet above Base Flood.

Hurricane Flooding as Predicted by SLOSH Modeling

The National Hurricane Center's surge model, called SLOSH (Sea, Lake, and Overland Surges from Hurricanes), estimates surges associated with different characteristics of tropical cyclones (track, forward speed, wind speed, etc.). The results can be combined with topographic mapping to delineate inland areas subject to flooding (with a margin of error of +/- 20%). The closest available predications are made for Conch Key Mile-Marker 63 and Islamorada Mile-Marker 82 (Table 9-2). Although storm surge flooding cannot be predicted simply at any given location, these charts can be used to approximate surge flooding in Layton.

Table 9-2. SLOSH Maximum Predicted Water Depths (ft above MSL)

Ocean Side Mile-Marker 63						Ocean Side Mile Marker 82					
Track Direction	Storm Categories					Track Direction	Storm Categories				
	1	2	3	4	5		1	2	3	4	5
WSW	4	6	8	9	9	WSW	4	5	7	8	9
W	4	6	7	8	9	W	4	6	7	9	10
WNW	4	5	7	8	9	WNW	4	6	7	9	10
WN	4	5	7	7	8	NW	4	6	7	9	10
NNW	4	5	6	7	8	NNW	4	5	7	8	10
N	3	5	6	7	8	N	4	5	7	8	9
NNE	3	4	6	7	8	NNE	4	5	6	8	9
NE	3	5	6	8	9	NE	4	5	6	7	8
ENE	4	6	8	10	11	ENE	3	5	6	7	8
E	5	8	10	11	12	E	3	4	6	7	8

Floodplain Management & Compliance with the NFIP

The City entered the National Flood Insurance Program in 1971 by adoption of an ordinance that complies with the requirements of the program. The City reviews all development proposals in special flood hazard areas and enforces the requirements of the ordinance. To ensure continued compliance with the NFIP, the City will continue to:

NFIP Flood Insurance Policies in Layton: 101

Claims paid since 1978: 8

http://www.fema.gov/nfip/pcstat.shtm
(as of December 31, 2009)

- Enforce the adopted floodplain management ordinance, including inspection of permitted development and unpermitted activities;
- Maintain records pertaining to floodplain development, including flood maps and Letters of Map Change, which shall be available for public inspection;
- Notify the public when there are proposed changes to the ordinance or Flood Insurance Rate Maps;
- Implement activities recognized by the NFIP's Community Rating System; and
- Promote the purchase of NFIP flood insurance policies as financial protection.

NFIP Floodplain Mapping

The National Flood Insurance Program (NFIP) prepared a Flood Insurance Rate Map for Monroe County and incorporated municipalities (current effective map is dated February 18, 2005). Layton has participated in the National Flood Insurance Program (NFIP) since July

1971. The FIRM delineates areas that have been determined to be subject to flooding by the "base flood," the flood that has a 1-percent-annual chance of flooding in any given year (commonly called the 100-year flood).

All land in Layton is subject to flooding; all buildings are subject to some degree of risk depending on type of construction and elevation above grade. Areas designated as VE Zones (coastal flood with velocity hazard wave action) are shown as exposed to flooding ranging from 11-13 feet above MSL. Areas delineated as AE Zones (areas subject to flooding but waves are predicted to be less than 3-feet in height) are exposed to flooding 8-9 feet above MSL.

NFIP Repetitive Loss Properties

Data provided by the Florida Division of Emergency Management identifies properties that are or have been insured by the National Flood Insurance Program and that have received two or more claims of at least $1,000. Based on data as of October 2009 there are no repetitive loss properties in Layton.

Severe Storms, Tornadoes, Water Spouts and High Winds (Other than Hurricane)

Layton, like the rest of the Keys, has low-lying terrain. Section 6.2 characterizes the entire area encompassed by Monroe County and the cities as having equal distribution of winds. The risk of severe storms, tornadoes, water spouts and high winds in Layton does not vary from the rest of the planning area. All new buildings, replacement buildings, and additions to existing buildings must comply with the Florida Building Code's wind load requirements.

Rainfall/Ponding Flooding

Layton does not have any identified areas where rainfall/ponding flooding is so severe or prolonged as to cause access problems or damage to buildings.

Drought Hazards

Drought hazards for the planning area are described in Section 6.4. Layton's risk due to drought is comparable the drought risk throughout the area.

Wildland Fire Hazards

The Florida Forestry Department has not indicated that areas in Layton are likely to experience significant risk of wildland or brush fires. The exception to this statement may be along the city's boundary with Long Key State Park where natural vegetation may increase fire hazards during some dry periods.

Risk: Layton's Critical and Important Facilities

Figure 2-2 shows the locations of the City's facilities that are listed in Table 9-3.

Table 9-3. Important and Critical Facilities in Layton

Critical/Essential Facilities: • City Hall/Fire Rescue Complex • Bell South Mobility Towner • Florida Keys Aqueduct Authority Pumping Station (Mile-Marker 70, Long Key)	**Other Facilities:** • Florida Keys Marine Laboratory • U.S. Post Office
Hazardous Materials Sites (302 Facilities): • None	**Mobile Home and Recreational Vehicle Parks (as of October 1995):** • None
Marinas: • KT's Marina	

9.4 Damage Reduction Activities

On-Going Activities

- The City's Comprehensive Plan policies include provisions for limiting densities in the Coastal High Hazard Area, improving hurricane evacuation timing, and protection of native vegetation and natural shorelines.
- Other measures dealing with hazard planning include the consideration of mobile home restrictions and the need to increase the availability of emergency generators for use in the City.
- The Building Department implements mitigation policies reflected in the Building Code and Land Development Regulations, including standards to reduce vulnerability to high wind load and enforcement of the "substantial improvements" rule.
- The Planning Department implements mitigation measures reflected in the Comprehensive Plan and Land Development Regulations, including regulations designed to minimize damage to structures from wind and waves resulting from storms and floodplain management controls.
- New construction must include storm shutters designed to resist design winds of 159 mph and debris impacts.
- The Comprehensive Plan calls for engineering and other analyses to be undertaken before post-disaster redevelopment is undertaken so that appropriate building regulations can be adopted and design guidelines established for replacement or repair of infrastructure.

Layton participates in the Community Rating System (CRS) of the National Flood Insurance Program. The CRS recognizes actions that exceed the minimum requirements. In return,

the City's property owners enjoy a 10% reduction in the cost of NFIP flood insurance. Actions undertaken by the City include:

- Maintains elevation certificates
- Makes NFIP map determinations
- Requires new buildings to be elevated 3 feet above the BFE
- Limits enclosures below elevated buildings to 300 square feet
- Sends annual NFIP mailings to all local lenders, realtors, and insurance companies
- Keeps NFIP library in City Hall
- Warns citizens of impending flooding

Recent Projects

In 2002, with a Federal-State Hazard Mitigation Grant, the City of Layton installed hurricane retrofit measures to the City Hall/Fire Station to meet the 159 miles per hour standards. The total cost was $75,000 (50% Federal, 25% State, 25% City).

Replacement culverts were installed under South Layton Drive to assist in tidal water flow in the canals. Rip-rap storm water retention swales and native plants were included in the project. The $60,000 project was funded locally.

9.5 2010 Updates

The City reviewed and updated the pertinent sections. Some of the more significant changes include:

- Section 9.2: Added City Clerk and Administrative Assistant to the Mayor. Reported on the number of issued permits.
- Section 9.3: Added description of damage from Hurricane Wilma. Added text related to compliance with the NFIP. Updated NFIP policy and claims data.
- Section 9.4: Added two bullets to list of activities credited under the CRS. Added recent project to replace culverts under South Layton Drive.

Chapter 10. City of Key Colony Beach

10.1 Overview of Key Colony Beach

Geography

Key Colony Beach, a man-made island community built in 1957, comprises just 285 acres in area. It is low-lying, with all land below about 5.5 feet above mean sea (MSL). The entire south shore faces the Atlantic Ocean and the west shoreline faces Vaca Cut, which connects the Atlantic to the Gulf of Mexico. The island, located approximately between Mile Marker 53 and Mile Marker 54, contains numerous dead-end canals, channels and bays that experience flooding due to storm surges that may be higher than along flat shorelines.

Population

Key Colony Beach has a permanent resident population of 836. The seasonal population increases by as much as 3,600. Current population projects indicate the permanent population may grow to about 950 by 2010.

In 2004, the Monroe County Social Services registered 12 people in the area between Mile Marker 53 and Mile-Marker 60 as having special needs for hurricane assistance.

Land Use & Economy

Key Colony Beach is a well-planned community comprised of single family, duplex, and multifamily dwellings. These uses are served by limited commercial development, including light retail, restaurants, offices and marinas. Just over 10% of the land area is used for recreational purposes.

The City joined the National Flood Insurance Program in July 1971 and administers a floodplain management ordinance that meets or exceeds the minimum federal requirements. About 40% of the buildings were constructed prior to 1971.

Comprehensive Plan

The City of Key Colony Beach adopted its Comprehensive Plan in February 1992. The plan includes nine elements pertaining to the future growth and development of the City. Throughout the plan are numerous goals, objectives and policies that acknowledge hurricane risks, especially related to evacuation, growth, ensuring safety, providing adequate facilities, managing storm water, working with providers of water supply and wastewater services, and requirement compliance with codes. The Infrastructure Element and the Conservation and Coastal Element contain specific policies relevant to mitigation of future risk and damage.

The Infrastructure Element includes:

- Complete a detailed engineering study of drainage and implement priority storm water projects. As of 2010, the construction is 70% construction complete with citywide storm water retention systems.
- On-site wastewater disposal facilities to minimize potential environmental impacts. The City's wastewater treatment plant was installed in 1970 and has been upgraded to 2010 standards.
- Establish and coordinate acquisition programs. The City has acquired several properties over the past ten years.

The Conservation and Coastal Element includes:

- New development encroaching into the 100-year floodplain shall incorporate elevation and flood protection measures sufficient to protect against the 100-year flood.
- The City shall maintain consistency with program policies of the National Flood Insurance Program.
- The City shall monitor new, cost-effective programs for minimizing flood damage.
- Such programs may include modifications to construction setback requirements or other site design techniques, as well as upgraded building and construction techniques.

10.2 City Organization and Agencies

The City of Key Colony Beach is a Commission Form of Government. The City Commission is composed of 5 members, including the Mayor who is selected by the Commission to that office. The City Commission sets government policy and adopts guidance documents, such as the Comprehensive Plan, the Land Development Regulation, and ordinances establishing various codes and standards.

Key Colony Beach is organized into several departments, each with authorized responsibilities that, as described below, have bearing on how natural hazards are recognized and addressed.

Mayor/City Administrator. The Mayor of Key Colony Beach implements the policies of the Commission and administers the overall operations of the City. With regard to floodplain management the Mayor (or designee) is appointed to administer and implement these provisions consistent with the requirements of the National Flood Insurance Program.

Key Colony Beach Planning and Zoning Committee. The Key Colony Beach Planning and Zoning Committee is responsible for the development and maintenance of the City's Comprehensive Plan and the Land Development Regulations. City personnel serve as staff to the Committee and are involved in the following related to hazard mitigation:

- Ensures that mitigation related items in the Comprehensive Plan, such as floodplain management and natural resource management, are followed and reflected in the City's Codes and Standards.
- Participates in post-disaster appraisals and may formulate additional mitigation measures for use in the Comprehensive Plan.
- Works closely with the Building, Code Enforcement, and Fire Department to ensure coordination of actions related to disaster planning, recovery, and mitigation.
- Reviews construction plans for compliance to the NFIP regulations.
- Responsible for enforcing planning and zoning standards.

Key Colony Beach Building Department. The Building Department is responsible for regulations of building construction pertaining to life safety, health, and environmental land use zoning regulations. The department is staffed by the Building Official, a Building Inspector, a Permit Clerk and an on-call State of Florida Registered Engineer. Related to mitigation of hazards, the department is responsible for the following:

- Review of construction plans and issuing building permits
- Inspection and enforcement during construction
- Designated as coordinator for the National Flood Insurance Program.

Table 10-1. Key Colony Beach Permit Statistics for 2007, 2008, 2009

Permits Issued	CY 2007	CY 2008	CY 2009
New single-family, detached	0	4	1
Duplexes	1	0	0
Multi-family (3 or more)	0	0	0
Non-residential (all types)	0	0	0
Residential (additions, alterations, repairs)	280	270	280
Non-residential (additions, alterations, repairs)	14	21	11
Demolition	0	1	1
Relocation	0	0	0
Number of inspections	615	624	616

Key Colony Beach Public Works Department. The Public Works Department works under the Building Official and is responsible for overseeing the maintenance of most city facilities, including buildings, roads, and bridges. It operates and maintains City vehicles.

Public Works is responsible for coordination and provision of emergency public works, initial evaluation of infrastructure damage and preparation of documentation required for federal reimbursement (including identification of mitigation components to be incorporated), and coordination of emergency debris clearing.

In executing its disaster recovery responsibilities, Public Works coordinates with the Florida Department of Transportation, Monroe County Department of Public Works, Florida Keys Aqueduct Authority, and Florida Keys Electric Co-op. The department plans, coordinates and initiates restoration of the serviceability of transportation routes, bridges, and assurance as to the safety of affected public and private dwellings and structures.

Key Colony Beach Code Enforcement Board and Officer. The Code Enforcement Board and Officer oversee after-the-fact code compliance issues pertaining to safety, health, and environmental land use zoning regulations. The department is staffed by a Code Enforcement Officer and an Administrative Assistant. Related to mitigation of hazards, the department is responsible for: working closely with the Building, Planning, and Fire departments to ensure coordination of actions related to disaster planning, recovery, and mitigation; and participating in post-disaster appraisals.

City Clerk/Finance Administrator. The Finance Administrator is responsible for overseeing the day-to-day financial requirements of the City, including establishment of purchasing procedures for all agencies. To expedite preparation for, response to, and recovery from disasters, the Finance Administrator may implement special emergency procedures to expedite necessary purchase and payment before, during, and after a disaster.

Key Colony Beach Police Department. The Key Colony Beach Police Department is responsible for overall law enforcement and protection of residents and visitors in the City of Key Colony Beach. The department plays a key role in planning and response during emergencies to include but not limited to: coordination with Florida Highway Patrol to promote speedy and safe evacuation, communicates with base operations, field personnel, and emergency shelters.

Marathon Fire Department. The City contracts with the Monroe County Fire Department to provide emergency management assistance and direction to the City of Key Colony Beach for all life safety in connection with other duties of fire control, fire prevention, and fire and hurricane public education. The department plays a lead role in planning and response for all emergencies. As required under U.S. Homeland Security Presidential Directive 5, has adopted and uses the National Interagency Incident Management System (NIIMS) and will adopt the National Fire Service Incident Management System (IMS) Incident Command System (ICS) as the baseline incident management system. ICS is

implemented for all fires, haz-mat incidents, rescues, structural collapse and urban search and rescue operations, manmade and natural disasters, and EMS responses that require two or more rescue companies.

10.3 Hazards and Risk in Key Colony Beach

Historic Storms that have affected the Key Colony Beach Area:

- 1929 Hurricane (September 22 to October 4) – The hurricane crossed over Key Largo on a northerly course. Key Largo reported winds estimated at over 100 mph, a central barometric pressure of 28 inches, and tide levels of 8-9 feet above MSL. Key West experienced tide levels of 5-6 feet above MSL and winds of 66 mph.
- 1935, Hurricane (August 29-September 10) - The small, extremely violent, Category 5 hurricane crossed the Florida Keys on a northwesterly track. The Tavernier-Islamorada area reported winds estimated at 120 mph with gusts from 190-210 mph. Tide levels in the Florida Keys ranged from 14 feet above MSL in Key Largo to 18 feet above MSL in Lower Matecumbe Key. The storm was so intense and tightly wrapped that Key West had tide levels of only 2 feet above MSL and average sustained winds of less than 40 mph. One of the most tragic aspects of the 1935 storm was the unfortunate death of many WWI veterans who were working on construction of the first Overseas Highway.
- Hurricane Donna, 1960 (August 29-September 19) – Hurricane Donna curved northwestward over the Middle Keys near Long Key/Layton and then traveled northward toward the Gulf Coast towns of Naples and Fort Myers. Areas in the vicinity of the storm experienced winds speed of 128 mph and a central pressure of 28.44 inches. The storm affected the Everglades with estimated winds of 150 mph. Tide levels were reported at Upper Matecumbe Key of 13.5 feet above MSL, at Plantation Key 10+ feet above MSL, and 8.9 feet above MSL in Key Largo. As of 1992 Hurricane Donna, a Category 4 storm is listed as the 6th most intense hurricane in the US.
- Hurricane Betsy, 1965 (August 26-Septmber 12) – Hurricane Betsy passed over Marathon while moving westward into the Gulf of Mexico. The lowest central pressure was measured in Tavernier at 28.12 inches and wind speeds were estimated to be 120 mph. Tide levels in Tavernier were 7.7 feet above MSL and Key Largo had tide levels of around 9 feet above MSL. Betsy was a Category 3 storm and is ranked 25th in intensity.
- Ground Hog's Day Storm (February 2, 1998) involved multiple F-2 tornado touchdowns resulting from severe thunderstorms characterized by dangerous cells with high, cold cloud tops affecting the Florida Keys. Areas most affected were primarily in the Middle Keys including Grassy Key and Valhalla Beach in the vicinity of Duck Key. Several buildings were damaged. Also significant problems occurred from the displacement of lobster traps that contributed to seaborne debris and navigational problems; the fishing industry suffered considerable loss of income.

- Severe thunderstorms (July 4, 1998). Severe thunderstorms with lightning and high winds came up quickly in the Middle Keys. The Weather Service Office in Key West recorded wind speeds up to 70 mph sustained. Because it was July 4th, many boats were offshore celebrating and waiting for the fireworks. Although, this event did not warrant a presidential disaster declaration, it did result in loss of life.
- Hurricane Georges, 1998 (September 25, 1998), a Category 2 when made landfall in the Lower Keys, affecting the entire county to some extent. Damage estimates approached $300 million, including insured and uninsured damage and infrastructure loss. Maximum sustained winds at the Naval Air Station (Boca Chica) near Key West were 92 mph; gusts up to 110 mph were reported by the Emergency Operations Center in Marathon. According to the Key West Weather Service, precipitation levels in the Lower Keys were as 8.65 inches on the south side of Sugarloaf Key, 8.38 inches at Key West International Airport, and 8.20 inches on Cudjoe Key. Tavernier in the Upper Keys recorded 8.41 inches. In Key Colony Beach storm surge flooding exceeded six feet over normal high tide. All city streets and many buildings were flooded, with approximately 125 damaged ground level dwelling units.
- Tropical Storm Mitch, 1998 (November 4 and 5). Feeder bands from Mitch containing dangerous super cells spawned several damaging tornadoes in the Upper Keys. Sections with mobile homes were especially hard hit. Islamorada experienced an F-1 tornado; Rock Harbor and Key Largo were hit by F-2 tornadoes. According to the Department of Community Affairs, damages were estimated at $11 million.
- Hurricane Irene, October 1999. Hurricane Irene hit the Florida Keys and Southeastern Florida. This Category 1 Hurricane dumped 10 to 20 inches of rain resulting in severe flooding in the Florida Keys and Southeastern Florida causing total damage estimated at $800 million
- Tropical Storm Gabrielle, September 2001. Although it did not reach hurricane strength, this storm hit the southwest coast of Florida and caused flooding problems; Marathon did see some effects from the storm.
- In 2005, the city was affected by Tropical Storm Dennis, Hurricane Katrina, and Hurricane Rita, each caused minor property damage, flooding, coastal erosion, and generated debris (largely landscaping materials).

Some Costs of Recent Hurricane Disasters

Damage from Hurricane Georges is representative of Key Colony Beach's exposure to tropical cyclones:

- Debris removal costs exceeded $300,000
- Repair of city street signage and parks cost $7,900
- Waterway cleanup, including buoy replacement, cost $8,300
- Manning the EOC, search and rescue, and emergency labor and supplies cost $8,600
- Contract for structural engineering support was $16,300

- Repairs to the wastewater treatment system cost $31,400
- Repairs to the storm water system cost $36,000

Damage sustained on private property included:

- Wind and flood damage was estimated at $4.4 million
- Approximately 10% of all residences were damaged, notably those that predated the City's floodplain management requirements
- Approximately 5% of fiberglass roof singles and concrete tile roofs were damaged
- 4% of all structures sustained significant flood, wave and wind damage
- All businesses were closed or severely restricted due to structural damage and power outages
- Tourist-based businesses were most affected

Hurricane Flooding as Predicted by SLOSH Modeling

The National Hurricane Center's surge model, called SLOSH (Sea, Lake, and Overland Surges from Hurricanes), estimates surges associated with different characteristics of tropical cyclones (track, forward speed, wind speed, etc.). The results can be combined with topographic mapping to delineate inland areas subject to flooding (with a margin of error of +/- 20%). The closest available predications are made for Marathon Mile-Marker 50 and Duck Key Mile-Marker 61 (Table 10-2). Although storm surge flooding cannot be predicted simply at any given location, these charts can be used to approximate surge flooding in Key Colony Beach.

Table 10-2. SLOSH Maximum Predicted Water Depths (ft above MSL)

Ocean Side Mile-Marker 50						Ocean Side Mile Marker 61					
Track Direction	Storm Categories					Track Direction	Storm Categories				
	1	2	3	4	5		1	2	3	4	5
WSW	4	5	6	7	8	WSW	4	5	6	7	8
W	4	5	7	8	9	W	4	5	7	8	9
WNW	4	6	7	8	9	WNW	4	6	7	9	10
WN	4	6	7	8	9	NW	4	5	7	8	10
NNW	4	5	7	8	9	NNW	4	5	7	8	9
N	4	5	7	8	9	N	4	5	6	8	9
NNE	4	5	6	7	9	NNE	4	5	6	8	9
NE	4	5	6	7	8	NE	4	5	6	7	9
ENE	3	5	6	7	8	ENE	3	5	6	7	8
E	3	4	5	6	7	E	3	4	5	6	8

Floodplain Management & Compliance with the NFIP

The City entered the National Flood Insurance Program in 1971 by adoption of an ordinance that complies with the requirements of the program. The City reviews all development proposals in special flood hazard areas and enforces the requirements of the ordinance. To ensure continued compliance with the NFIP, the City will continue to:

- Enforce the adopted floodplain management ordinance, including inspection of permitted development and unpermitted activities;
- Maintain records pertaining to floodplain development, including flood maps and Letters of Map Change, which shall be available for public inspection;
- Notify the public when there are proposed changes to the ordinance or Flood Insurance Rate Maps;
- Implement activities recognized by the NFIP's Community Rating System; and
- Promote the purchase of NFIP flood insurance policies as financial protection.

NFIP Flood Insurance Policies in Key Colony Beach: 1,227

Claims paid since 1978: 166

http://www.fema.gov/nfip/pcstat.shtm
(as of December 31, 2009)

NFIP Floodplain Mapping

The National Flood Insurance Program (NFIP) prepared a Flood Insurance Rate Map for Monroe County and incorporated municipalities (current effective map is dated February 18, 2005). The FIRM delineates areas that have been determined to be subject to flooding by the "base flood," the flood that has a 1-percent-annual chance of flooding in any given year (commonly called the 100-year flood).

The entire City is located in areas designated as VE Zones (coastal flood with velocity hazard wave action) and AE Zones. With land elevations averaging 4-7 feet, water depths associated with the 1%-annual chance flood can be expected to range from 4 to 9 feet. As indicated by the predicted storm surge flood depths, even deeper flooding will occur during more severe hurricanes. As such, all new development in the City is subject to the floodplain management standards established in the City's Land Development Regulations.

NFIP Repetitive Loss Properties

Data provided by the Florida Division of Emergency Management identifies properties that are or have been insured by the National Flood Insurance Program and that have received two or more claims of at least $1,000. In 2005, 9 properties met the definition. As of February 28, 2010, 15 individual properties have received 35 claims, totaling $1.8 million (average payment of $46,800). Figure 10-1 shows property locations of those records that were able to be plotted.

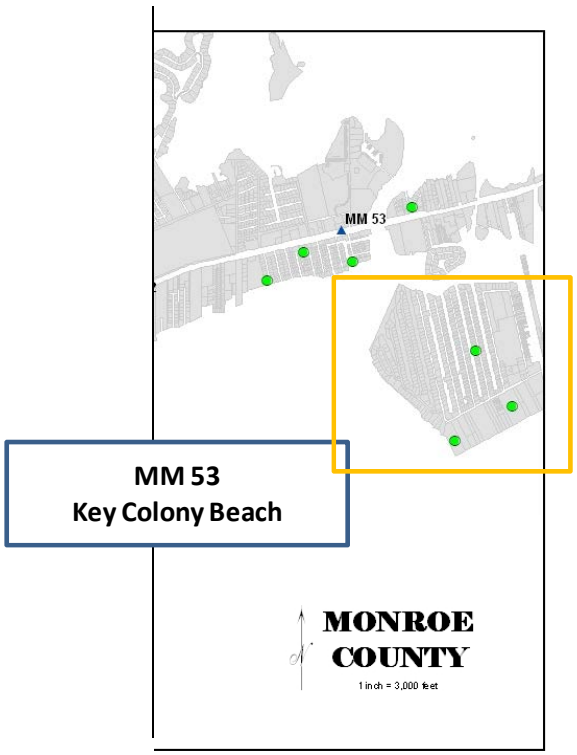


Figure 10-1. Repetitive Loss Properties (MM 48 – MM 53).

Stormwater Management & Rainfall/Ponding Flooding

Key Colony Beach's Stormwater Management Master Plan, prepared in 1995, identifies areas of localized flooding and specific engineered construction plans to minimize local flooding that includes closed drainage systems, open swales, retention ponds, covered trenches, and injection wells. This project is approximately 70% completed construction as of early 2010.

Severe Storms, Tornadoes, Water Spouts and High Winds (Other than Hurricane)

Key Colony Beach, like the rest of the Keys, has low-lying terrain. Section 6.2 characterizes the entire area encompassed by Monroe County and the cities as having equal distribution of winds. The risk of severe storms, tornadoes, water spouts and high winds in Key Colony Beach does not vary from the rest of the planning area. All new buildings, replacement buildings, and additions to existing buildings must comply with the Florida Building Code's wind load requirements.

Drought Hazards

Drought hazards for the planning area are described in Section 6.4. Key Colony Beach's risk due to drought is comparable to the drought risk throughout the area.

Wildland Fire Hazards

The Florida Forestry Department indicates that in the Key Colony Beach area, Grassy Key (including Geiger and Boca Chica) is the area most prone to wildland/brush fires. Based on data provided by Monroe County Property Appraiser, Grassy Key includes a total of 9,391 parcels of land of which 6,498 are improved. The total assessed value of improvements is $1,562,786,704. It is important to note that this summary is not to imply that all properties would be vulnerable in any given wildfire outbreak. Future development on Grassy Key is influenced by property owner choices; all new construction must comply with environmental restrictions.

Key Colony Beach's Important and Critical Facilities

Figure 2-2 shows the locations of the City's facilities that are listed in Table 10-3.

Table 10-3. Important and Critical Facilities in Key Colony Beach

Critical/Essential Facilities: • City Hall-Police/Auditorium/Post Office Complex • Wastewater Treatment Plant and System • Stormwater System • Public Works Building	**Other Public Facilities :** • Public Golf Courses • Public Tennis Courts • City Parks and Playground
Hazardous Materials Sites (302 Facilities): • Wastewater Treatment Plant (chlorine and sulfuric acid)	**Marinas:** • The Boat House (MM 53.5, Ocean side) • Key Colony Beach Marina (MM53.7, Ocean side)

10.4 Damage Reduction Activities

On-Going Activities

- Comprehensive Plan objectives and policies address the need to hold down densities so as not to increase hurricane evacuation times. A stated objective of the Plan is to: "Grant no land use amendments that would increase the land use density and intensity, in order to assure that the projected 'build-out' hurricane evacuation traffic entering on U.S. 1 will not increase. Concurrent policies address restrictions on population density "in order to avoid further burdens on the hurricane evacuation plan".
- Plan policies advocate no City expenditures for infrastructure in the V zone that would encourage increased private development.
- The City of Key Colony Beach Disaster Preparedness Committee, composed of residents and City representatives, coordinates with the County on emergency management activities such as planning, response, recovery, and mitigation. It provides its own public information program, disaster command center, and emergency supplies.

- Post-disaster redevelopment is addressed in the Coastal Management Element of the Comprehensive Plan, recognizing that redevelopment may require greater building setbacks and elevations, and installation of dunes rather than seawalls.
- The Building Code requires buildings to be designed to withstand the forces of 150 mph winds (assumed in any direction and without regard to the effects of shielding of other structures).
- Post-disaster assessments are required by the Building Department to determine whether demolition versus repairs are appropriate given the level of damage; buildings damaged more than 50% must be rebuilt to current codes, including elevation requirements for construction in the floodplain.
- The Land Development Code requires that all existing mangroves be maintained to state requirements; use of seawalls is restricted; new oceanfront development shall include dune planting plans.

Key Colony Beach participates in the Community Rating System (CRS) of the National Flood Insurance Program. The CRS recognizes actions that exceed the minimum requirements. In return, the City's property owners enjoy a 10% reduction in the cost of NFIP flood insurance. Actions undertaken by the City include:

- Maintains elevation certificates
- Makes NFIP map determinations
- Sends annual NFIP mailings to all local lenders, realtors, and insurance companies
- Keeps library of NFIP materials in City Hall
- Constructs stormwater facilities
- Warns citizens of impending flooding

Recent Projects

- Since Hurricane Georges, the City has replaced its causeway bridge to improve its ability to withstand storm surge.
- The City has its own sewage collection and treatment system, which is operated by the Wastewater Treatment Plant Operator. The sewage treatment plant is subject to storm surge flooding but has been recently retrofitted and operating at 2010 requirements. A generating system has been added for emergency operation and all of our effluent is converted to potable irrigation through our reverse osmosis and storage system. All lift stations and lines are continually being retrofitted and monitored for infiltration.
- The entire City Hall/Post Office complex has been retrofitted and floodproofed to current requirements.
- Several properties were purchased by the City and converted to open space.

- The City's master storm water control project includes swales, retention ponds, and deep injection wells which were designed, installed, and monitored by the South Florida Water Management District, FL Department of Environmental Protection, and the U.S. Environmental Protection Agency. As of early 2010, the citywide project is approximately 70% complete.

10.5 2010 Updates

The City reviewed and updated the pertinent sections. Some of the more significant changes include:

- Section 10.1 and 10.4: Updated the status of construction of storm water projects.
- Section 10.2: Added number of permits issued in recent years.
- Section 10.3: Noted minor damage from 2005 storms. Added text related to compliance with the NFIP. Updated NFIP policy and claims data. Updated information on repetitive loss properties and added figure to show location of those properties.

Chapter 11. Islamorada, Village of Islands

11.1 Overview of Islamorada

Early settlers came to the islands from the Bahamas and New England. These people raised and shipped thousands of pineapples to northern markets. One of these ships was named the "Island Home" which was built on Plantation Key by Johnny Brush Pinder. It was from this schooner that the Village took its name: "Isla Morada," which means Island Home in the Spanish language.

Islamorada, Village of Islands (the "Village"), located in the Upper Florida Keys of Monroe County, was incorporated as a municipality on December 31, 1997. House Bill No. 1265 created the Village and also gave the Mayor authority to sign and execute documents. Islamorada is known as the "Sport Fishing Capitol of the World."

Geography

The Village is located in the 822-island archipelago known as the Florida Keys, surrounded by the Atlantic Ocean and the estuarine waters of Florida Bay. The adjacent marine environments support rich biological communities possessing extensive conservation, recreational, commercial, ecological, historical, research, educational, and aesthetic values that give this area special national significance.

As a part of the Florida Keys chain of islands, the Village's municipal boundaries extend from Mile Marker 90.939 to Mile Marker 72.658 (along U.S. Highway 1), and consists of four islands: Plantation Key, Windley Key, Upper Matecumbe Key and Lower Matecumbe Key. The Village is approximately 18 linear miles long and no more than two or three blocks wide, encompassing 11,748 acres.

Population

Islamorada has a permanent resident population of 6,846 (2000 Census). Tourism sometimes doubles the population in the area. Current population projections indicate the permanent population may grow to 8,200 by 2010. However the most recent BEBRs estimation indicates a permanent population as of 2008 of 7,113 and a functional population of approximately 10,882.

The Village's Comprehensive Plan mandates that its government manage the rate of development and population growth to promote small-town ambiance, improve quality of life for residents, enhance and protect natural resources and environmental quality unique to the Florida Keys, comply with adopted level of service standards for public facilities, effectively time public infrastructure and services according to the availability of public funds and support safe and timely evacuation prior to a hurricane.

Land Use & Economy

A significant portion of the waters adjacent to the islands have been designated as Outstanding Florida Waters, and includes the 2,800-nautical square mile Florida Keys National Marine Sanctuary, the second largest in the United States. The extraordinary natural resources support the two primary industries of the Village—tourism and commercial fishing. Many residents earn their living through the fishing and diving industries and the tropical island atmosphere generates tourism from around the world. As a result, the health and welfare of the community are largely dependent upon the health of the surrounding environment. Therefore, the Village has a responsibility to protect and preserve its unique natural resources, which will in turn protect and foster its community character, maintaining the health safety and welfare of its citizenry.

Much of the Village is developed with a mix of single family residences, multi-family dwellings, tourist lodging (hotels, motels, inns), commercial retail, professional offices, marine uses including commercial fishing, tourist-oriented recreational uses, and government uses.

Three sites are listed by the Historic Florida Keys Foundation, Inc., or are listed on the National Register of Historic Places: Windley Key Fossil Reef State Geological Site; Hurricane Monument (MM 81.5); and LeBranch Fishing Camp (Upper Matecumbe) Indian Key.

11.2 Village Organization and Agencies

Islamorada, Village of Islands is a "city manager" form of municipal government. Appointed by the Village Council, the Village Manager (also Village Attorney) is responsible for the management of the Village, and reports directly to the Village Council. The governing body of the Village is the Village Council of Islamorada, Village of Islands. The Village Council is composed of five members, including the Mayor who is appointed by the Village Council body annually. Immediately after the initial election, the first Village Council went to work quickly and composed the following Vision:

To Protect the residents' right to quiet enjoyment of life
To Plan for enhancing the Village character
To Preserve our community resources . . . people, natural resources, pride and
To Provide basic service to support our quality of life.

The Village is a rural municipality, with 60 employees delivering basic services of government including:

- Fire protection, emergency management and emergency medical services;

- Planning and zoning;
- Building and Code Compliance (permitting, inspection and code enforcement);
- Public works;
- Waste collection;
- Parks and conservation lands; and
- Recreation services

Police enforcement services are provided contractually by the Monroe County Sheriff's Office. Solid waste services are also delivered contractually resulting from competitive bids and contract negotiations.

The departments with primary responsibility for identifying natural and manmade hazards are fire/rescue, planning, building and public works. These departments also take an active role in addressing mitigation of identified hazards and the protection of public facilities and infrastructure.

Table 11-1. Islamorada: Permits Issued (2007, 2008, 2009).

	CY 2007	CY 2008	CY 2009
New single-family, detached	32	68	23
New single-family, attached	0	0	0
Multi-family (2 or more)	7	2	6
Non-residential buildings (all types)	2	3	2
Residential (additions, alterations, repairs)	45	18	6
Non-residential (additions, substantial)	0	0	1
Demolition	1	2	3
Relocation	0	0	0
Mobile home (permanent/temporary)	3	0	0
Total Permits Issued	90	93	41
Total Inspections Conducted	6,077	3,268	3,532

11.3 Hazards and Risk in Islamorada

In the recent past, the Florida Keys has suffered from natural disasters of varying degrees. In September 25, 1998, Hurricane Georges inundated the Keys. Following this, on November 4-5, 1998, the Florida Keys suffered another blow from Tropical Storm Mitch. The tropical storm was more severe than originally anticipated and spawned several tornadoes. The Upper Keys, including the Village sustained serious amounts of damage. The two-year period of 2004-2005 included eight hurricanes that had varying degrees of impacts on the Village. Hurricane Wilma, (October 2005) had the most significant impact on the Village.

Historic Storms

The landfall location for the strongest hurricane recorded, the "Labor Day Storm" of 1935, made landfall at Islamorada. It is remains one of the most intense category 5 and deadliest hurricanes. Winds were estimated at 160 mph with gusts from 190-210 mph. Tide levels ranged from 14 feet above MSL in Key Largo to 18 feet above MSL at Lower Matecumbe Key. Despite its ferocity, it was a small storm causing water levels at Key West to rise only two feet above MSL and sustained winds of less than 40 mph.

Florida has been devastated by several flood-related events over the years, caused by heavy rainfall, tropical depressions and hurricanes. Between 1992 and 1994, the State of Florida received six Presidential Disaster Declarations for natural disaster events, four of which were flood related. Each year, there is a potential that Florida will suffer from tropical storms, severe rain events or hurricanes.
Other significant storms:

- Hurricane Donna (August 29-September 19, 1960). A Category 4 hurricane, this storm is listed among the most intense in U.S. history. It curved northwestward over the Middle Keys before turning north towards the mainland at Naples and Fort Myers. Wind speeds of 128 mph and central pressure of 28.44 inches were measures. Tide levels ranged from 13.5 feet above MSL ocean side at Islamorada (MM 80-83), +10 feet MSL ocean side Upper Matecumbe Key (MM 83-84) and 9-10 feet MSL Bay side.
- Hurricane Betsy (August 26-September 12, 1965). A Category 3 hurricane, Betsy passed over Marathon moving westward into the Gulf of Mexico. At Tavernier, central pressure was recorded at 18.12 inches and wind speeds were estimated at 120 mph. Flood levels were measures at 9 feet MSL in Key Largo.
- Hurricane Georges (September 25, 1998). Near Islamorada at Mile-Marker 76.8, water rose to 4.5 feet above MSL and 6.1 feet at Mile-Marker 77.8. Near Mile-Marker 84, the highway was affected by flooding, downed trees and damage to road signs. Some beach erosion occurred.

Effect of Recent Hurricane Disasters

Damage from Hurricane Georges is representative of Islamorada's exposure:

- Debris Removal: $2.5 million
- Emergency Labor and Supplies: $12,000
- Manning of EOC and Search and Rescue: $8,000
- Waste Water Treatment System Repairs: $10,000
- Storm Water Systems Repair: $10,000

Private property damage totaled approximately $5 million due to the effects of high winds, driven rain, and flooding. The following is an account of damage in Islamorada as reported in a special edition of the Miami Herald, September 27, 1998:

- Lower Matecumbe Key – Storm surge cut across U.S. 1 highway covering it with sand, chunks of concrete, seaweed, and wood pilings. Bulldozers have cleared a pathway for emergency vehicles. Water rose more than a foot high in some homes.
- Windley Key – Holiday Isle Marina undamaged, but oceanside docks and tiki huts were mostly destroyed. Rooftop air conditioning unit at the Dive and Swim Center was damaged.
- Islamorada – Shoreline Motel lost 50-foot section of aluminum facing from the roof. An oceanside cottage at Cheeca Lodge (MM 82) lost some roofing. At Island Christian School, a large ficus toppled and crushed a chain link fence.
- Plantation Key – Many mobile homes flooded at Ocean San Pedro Trailer Park.

Despite being only a category 2 hurricane, all businesses were closed or severely restricted from operating due to structural damage and power outages. Businesses related to tourism and fishing and marine activities were most affected by Georges.

Damage from Hurricane Wilma

Hurricane Wilma produced bayside flooding that had significant impacts on several marinas and notably the Village's administrative and planning departments that were located at Founders Park. The flooding forced Village Hall into temporary accommodations for a period of four years. Flooding was the primary impact although there was minimal wind-damage to structures and vegetation. The secondary impact was associated with the entire season of hurricanes (the most named storms in history) that destroyed or damaged hundreds of docks in the Village.

Hurricane Flooding as Predicted by SLOSH Modeling

The National Hurricane Center's surge model, called SLOSH (Sea, Lake, and Overland Surges from Hurricanes), estimates surges associated with different characteristics of tropical cyclones (track, forward speed, wind speed, etc.). The results can be combined with topographic mapping to delineate inland areas subject to flooding (with a margin of error of +/- 20%). Table 11-2 shows the storm surge predications for four locations in Islamorada (Islamorada MM82, Islamorada MM 83.5, Plantation Key MM 88.5, and Plantation Key MM 90).

Table 11-2. SLOSH Maximum Predicted Water Depths (ft above MSL)

Islamorada Mile-Marker 82 Ocean Side						Islamorada Mile-Marker 82 Bay Side					
Track	Storm Categories					Track	Storm Categories				
Direction	1	2	3	4	5	Direction	1	2	3	4	5
WSW	4	5	7	8	9	WSW	4	5	7	8	9
W	4	6	7	9	10	W	4	5	7	8	9
WNW	4	6	7	9	10	WNW	4	5	6	7	8
WN	4	6	7	9	10	NW	3	4	6	7	7
NNW	4	5	7	8	9	NNW	3	4	6	7	8
N	4	5	7	8	9	N	3	4	6	7	8
NNE	4	5	6	8	9	NNE	3	5	6	7	8
NE	4	5	6	7	8	NE	4	5	7	8	9
ENE	3	5	6	7	8	ENE	4	7	9	10	11
E	3	4	6	7	8	E	5	8	10	10	11

Plantation Key Mile-Marker 88.5 Bay Side						Plantation Key Mile-Marker 90 Ocean Side					
Track	Storm Categories					Track	Storm Categories				
Direction	1	2	3	4	5	Direction	1	2	3	4	5
WSW	4	6	8	9	10	WSW	4	5	7	8	10
W	4	5	7	8	9	W	4	6	8	9	11
WNW	3	5	7	7	8	WNW	4	6	8	9	11
WN	3	5	6	7	8	NW	3	4	6	7	7
NNW	3	5	6	7	9	NNW	4	6	7	9	10
N	3	5	7	8	9	N	4	5	7	8	9
NNE	3	5	7	8	9	NNE	4	5	7	8	10
NE	4	6	8	9	10	NE	4	5	6	8	9
ENE	5	8	10	12	13	ENE	4	5	6	8	9
E	6	10	11	12	13	E	3	5	6	7	8

Floodplain Management & Compliance with the NFIP

The Village entered the National Flood Insurance Program when it incorporated in 1997 by adoption of an ordinance that complies with the requirements of the program. The Village reviews all development proposals in special flood hazard areas and enforces the requirements of the ordinance. To ensure continued compliance with the NFIP, the Village will continue to:

NFIP Flood Insurance Policies in Islamorada 2,975

Claims paid since 1978: 163*

http://www.fema.gov/nfip/pcstat.shtm
(as of December 31, 2009)

*records prior to incorporation included in claims for Monroe County

- Enforce the adopted floodplain management ordinance, including inspection of permitted development and unpermitted activities;
- Maintain records pertaining to floodplain development, including flood maps and Letters of Map Change, which shall be available for public inspection;
- Notify the public when there are proposed changes to the ordinance or Flood Insurance Rate Maps; and
- Promote the purchase of NFIP flood insurance policies as financial protection.

NFIP Floodplain Mapping

The National Flood Insurance Program (NFIP) prepared a Flood Insurance Rate Map for the Monroe County and incorporated municipalities (current effective map is Monroe County's Flood Insurance Rate Map dated February 18, 2005). The FIRM delineates areas that have been determined to be subject to flooding by the "base flood," the flood that has a 1-percent-annual chance of flooding in any given year (commonly called the 100-year flood). The majority of land in Islamorada is subject to flooding. Areas noted as VE Zone, subject to high velocity wave action, are shown with flood levels ranging from 10 to 14 feet above MSL. Areas noted as AE Zone, where waves are expected to be less than 3-feet in height, flood levels are predicted to range from 6 to 10 feet above MSL.

The area along U.S. Route 1 and commercial properties that front on the highway, plus Plantation Key, Windley Key, and Upper Matecumbe Key, have some areas with ground elevations higher than the predicted 100-year flood elevation. Sections around Coral Shores High School are also shown as outside of the mapped floodplain.

NFIP Repetitive Loss Properties

Data provided by the Florida Division of Emergency Management identifies properties that are or have been insured by the National Flood Insurance Program and that have received two or more claims of at least $1,000. In 2005, only three properties met the definition. As of February 28, 2010, 14 individual properties have received 42 claims totaling $1.1 million

(average payment of $26,500). Figures 11-1 and 11-2 shows property locations of those records that were able to be plotted (end of chapter)

A subset of the NFIP's Repetitive Loss Properties includes those that meet the Federal definition for "severe repetitive loss." One property in Islamorada is designated as a Severe Repetitive Loss Property, having received 4 claims totaling $80,800. A Severe Repetitive Loss Property is is defined as a residential property that is covered by an NFIP flood insurance policy and (a) that has at least four claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims exceeding $20,000; or (b) for which at least two separate claim payments (building only) have been made with the cumulative amount exceeding the market value of the building. For both (a) and (b), at least two of the qualifying claims must have occurred within any 10-year period.

Severe Storms, Tornadoes, Water Spouts and High Winds (Other than Hurricane)

Islamorada, like the rest of the Keys, has low-lying terrain. Section 6.2 characterizes the entire area encompassed by Monroe County and the cities as having equal distribution of winds. The risk of severe storms, tornadoes, water spouts and high winds in Layton does not vary from the rest of the planning area. All new buildings, replacement buildings, and additions to existing buildings must comply with the Florida Building Code's wind load requirements.

Rainfall/Ponding Flooding

Islamorada does not have any identified areas where rainfall/ponding flooding is so severe or prolonged as to cause access problems or damage to buildings.

Drought Hazards

Drought hazards for the planning area are described in Section 6.4. Islamorada's risk due to drought is comparable to the drought risk throughout the area.

Wildland Fire Hazards

The Florida Forestry Department has not indicated that areas in Islamorada are likely to experience significant risk of wildland or brush fires.

Islamorada's Important and Critical Facilities

Table 11-3 lists the City's important facilities, some of which are shown in Figure 2-2.

Table 11-3. Important and Critical Facilities in Islamorada

Critical/Essential Facilities: • Village of Islands Government Center • Monroe Sheriff's Sub-Station (Roth Building) • Founder's Park • Islamorada Fire- Rescue HQ Station #20/EOC • Islamorada Fire Station #19 • Islamorada Fire Station #21 • Coral Shores High School (County) • Plantation Key Elementary School (County) • Monroe County Gov./Courthouse	**Other Facilities:** • U.S. Coast Guard Station • Florida Keys Electric Cooperative Sub-Station • Island Christian School • Florida Keys Children's Shelter • Comcast Cable • Bell South • Cingular Cell
Marinas: • Bud N Mary's Marina • Max's Marine, Inc. • Caribee Boat Sales and Marina • Cobra Marine, Snake Creek • Coconut Cove Resort and Marina • Coral Bay Marina • FWC Marina • Holiday Isle Resorts and Marina • Islamorada Boat Center • Islamorada Yacht Basin/Lorelei • La Siesta Marina • Matecumbe Yacht Club • Plantation Yacht Harbor Marina • Robbies Marina • Smuggler's Cove Marina • Whale Harbor Marina • World Wide Sportsmen Marina • Caloosa Cove Marina (Lower Matecumbe)	**Mobile Home and Recreational Vehicle Parks:** • Coral Bay Trailer Court • Harris Ocean Park Estates, 1st Addition • Key Lantern Travel MH Park • Peaceful Palms Mobile Homes (Windley Key) • Windley Key Trailer Park • Sea Breeze Trailer/RV Park (Plantation Key) • San Pedro Trailer Park (Plantation Key) • Plantation Tropical Park (Plantation Key) • Vacation Village • Village Mobile Park
Hazardous Materials Sites (302 Facilities): • Bell South Telecommunications Facility • Monroe County Plantation Key Public Works • Plantation Key Colony Water Treatment Plant • Islamorada Founder's Park Water Treatment Plant • North Plantation Key Wastewater Treatment Plant	

11.4 Damage Reduction Activities

On-Going Activities

- Continue the inspection of enclosures below elevated lowest floors, as required by FEMA.
- Continue to identify and implement hazard mitigation projects for critical infrastructure.

Projects Completed Before 2005

- Completed renovations to Islamorada Fire Station 20 which included an emergency operations center.
- Completed the Lower Matecumbe Stormwater Improvement Project which provided drainage infrastructure for flood mitigation and protection of a section of the island that experiences heavy flooding during mild storm events.
- Completed the Upper Matecumbe Stormwater Improvement Project which provided drainage infrastructure for flood mitigation and protection of a section of the island that experiences heavy flooding during mild storm events.

Projects Completed 2005-2009

- Completed the new Village Hall and the new Fire Station #21 and Islamorada Sheriff's Substation (one building).
- Completed North Plantation Key Wastewater Treatment Plant.
- Lower Matecumbe Key Fire Station #19.
- The Tollgate Shores Stormwater Improvement Project provides drainage infrastructure for flood mitigation and protection for households in a section of the Lower Matecumbe Key Island that experiences heavy flooding during mild storm events.
- Completed a study to mitigate the exposure and vulnerability of U.S. 1 located at Sea Oats Beach from the effects of a hurricane. This area will always be inundated by storm surge from any category hurricane and suffer significant damage resulting in segmentation of the Keys. This study resulted in some remedial action including the placement of artificial substrate and vegetation along the entire length of Sea Oats Beach to mitigate erosion.
- Permanently installed emergency generators in Coral Shores High School.
- The Village adopted a staged evacuation plan and coordinates implementation with Monroe County and other municipalities. The staged evacuation plan contains several strategies for facilitating evacuation, including two northbound lanes where possible, traffic control markers and revised timing for signals along U.S. 1.

Projects Planned or Under Way

- Provide a new LIDAR Mapping of the Village to update the flood base and storm surge vulnerability information. This should be a countywide project in conjunction with FEMA's Map Modernization effort. This is an on-going project with the goal of establishing a more accurate SLOSH model for the Village and Monroe County.
- Provide permanently installed emergency generators in Island Christian School (a primary shelter).

11.5 2010 Updates

The Village reviewed and updated the pertinent sections. Some of the more significant changes include:

- Section 11.1: Updated population
- Section 11.2: Reported on the number of issued permits.
- Section 11.3: Noted storms during 2004-05 and added description of damage from Hurricane Wilma. Added text related to compliance with the NFIP. Updated NFIP policy and claims data. Described repetitive loss properties and noted that one "severe repetitive loss" property is located in the Village; added figures to show location of these properties.
- Section 11.4: Updated projects completed between 2005 and 2009 and planned

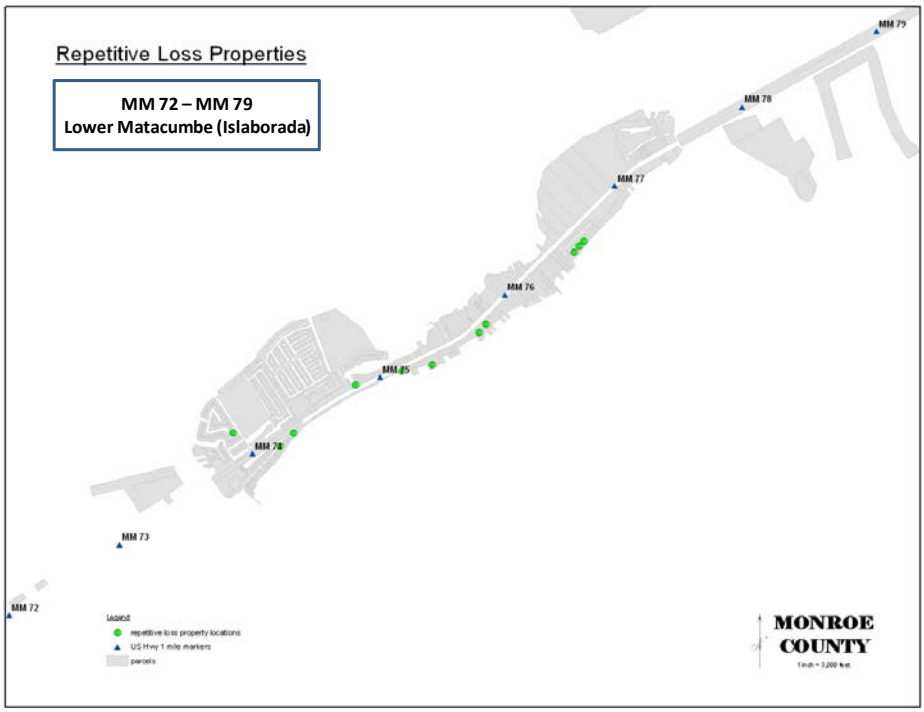


Figure 11-1. Repetitive Loss Properties (MM 72 – MM 79).

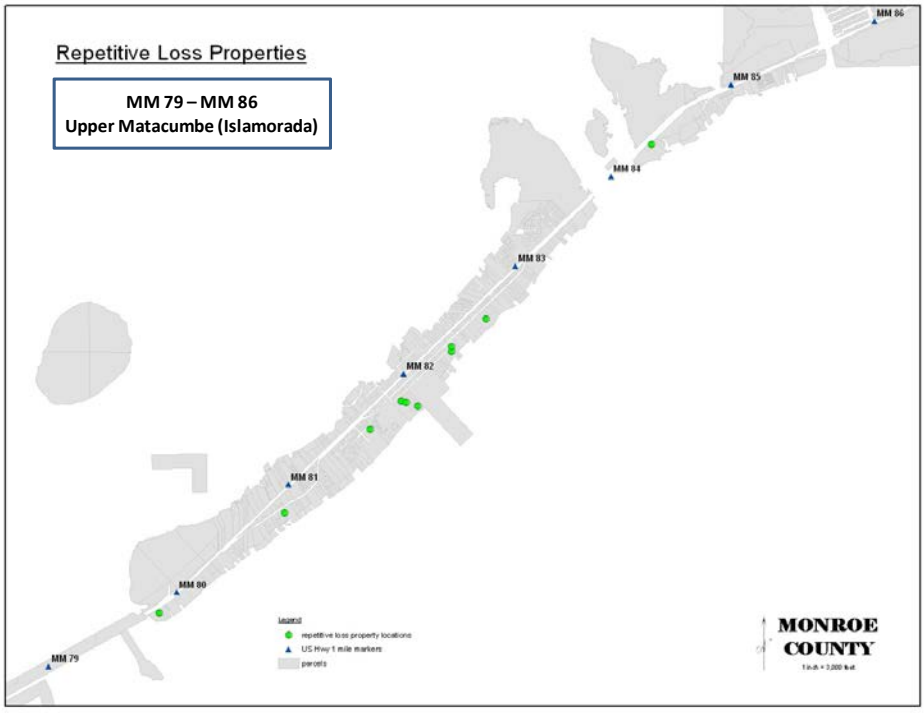


Figure 11-2. Repetitive Loss Properties (MM 79 – MM 86).

Chapter 12. City of Marathon

The City of Marathon, incorporated in November 1999, is located in the Middle Keys and consists generally of previously unincorporated areas of Monroe County known as Marathon, Marathon Shores, and Grassy Key. The corporate boundaries of the city are as follows:

> "from the East end of the Seven Mile Bridge (approximately Mile Marker 47) to the West end of the Tom's Harbor Bridge (approximately Mile Marker 60), including, but not limited to, the entire islands of Knight Key; Hog Key; Vaca Key; Stirrup Key; Boot Key; Crawl Key; East Sister's Island; West Sister's Island; Fat Deer Key; Long Point Key; Deer Key; Little Deer Key; Little Crawl Key; Grassy Key; the unincorporated areas of Monroe County commonly known as Marathon and Coco Plum; all land filled in between the islands, including all islands connected by U.S. 1, Overseas Highway and roadways connecting thereto; and all adjacent islands not connected by roadways within the boundaries of Monroe County between Mile Marker 47 and Mile Marker 60, specifically excluding all areas within the boundaries of the City of Key Colony Beach, all of the above being within the boundaries of Monroe County, Florida."

12.1 Overview of Marathon

Geography

Marathon is located between the Gulf of Mexico and the Atlantic Ocean. Marathon is approximately 8,320 acres consisting of a number of islands. Elevations in Marathon range from approximately 2 feet above mean sea level to approximately 7 feet above mean sea level.

Several keys make up the City and they vary greatly in size. Marathon is essentially a string of low coral islands with flat terrain. The long and narrow configuration creates a risk for storm surge from both sides of the island chain.
Marathon has no inland areas; all locations are equally vulnerable to high wind effects. The "friction factor", which causes winds from storms to decrease over land, does not apply in the Keys.

Population

According to the U.S. Census, The City Marathon has a permanent resident population of 10,255. The seasonal population increases by as much as 4,931, for a total "functional population" of 15,186 occupying 6,786 residential housing units of various configurations. Population estimates and projections to 2010 for the permanent residents estimate an increase to 10,496 and the seasonal population increase to 5,078 for a total of 15,574.

In 2009, the Monroe County Social Services registered 2 people as having special needs for hurricane evacuation assistance within the City of Marathon.

Land Use & Economy

Marathon's development is a mix of single family residences, multifamily dwellings, tourist lodgings (hotels, motels, and destination resorts), tourist-oriented uses (museums, research center, attractions), marine-related and recreational uses, commercial uses (restaurants, retail sales, banks, Realtors), medical facilities and offices, and government uses.

Future growth is limited through the Rate of Growth Ordinance (ROGO) adopted by Monroe County in 1992 to implement portions of its Comprehensive Plan. Within the City of Marathon, this is now known as the Building Permit Allocation System (BPAS). BPAS establishes a building permit allocation system for residential construction. The purpose is to encourage in-fill of platted lots served by existing infrastructure and to limit growth to enable safe and timely hurricane evacuation. Pursuant to the BPAS Ordinance and an agreement between the City, County and the department of Community Affairs, the annual allocation for Marathon is thirty (30) permits per year for residential dwelling units.

All new construction, reconstruction, and improvements to existing buildings must comply with the current building code requirements.

The City joined the National Flood Insurance Program in October 2000 and administers a floodplain management ordinance that meets or exceeds the minimum federal requirements.

Comprehensive Plan

The City of Marathon adopted its Comprehensive Plan in March 2005. The plan includes nine elements pertaining to the future growth and development the City. Throughout the plan are numerous goals, objectives and policies that acknowledge hurricane risks, especially related to evacuation, growth, ensuring safety, providing adequate facilities, managing stormwater, working with providers of water supply and wastewater services, and requirement compliance with codes. The Infrastructure Element and the Conservation and Coastal Element contain specific policies relevant to mitigation of future risk and damage:

- The Infrastructure Element includes such mitigation policies as:
- Completing a detailed engineering study of drainage and implement priority storm water projects.
- On-site wastewater disposal facilities to minimize potential environmental impacts.
- Establish and coordinate acquisition programs.

The Conservation and Coastal Element of the Comprehensive Plan includes such mitigation policies as:

- New development encroaching into the 100-year floodplain shall incorporate elevation and flood protection measures sufficient to protect against the 100-year flood.
- The City shall maintain consistency with program policies of the National Flood Insurance Program.
- The City shall monitor new cost effective programs for minimizing flood damage.
- Such programs may include modifications to construction setback requirements or other site design techniques, as well as upgraded building and construction techniques. The City discourages development in the High Velocity Area and regulates redevelopment of structures non-conforming to the required base flood elevation.

12.2 City Organization and Agencies

City of Marathon is a Council Form of Government. The City Council is composed of 5 members, including the Mayor who is selected by the Council to that office. The City Council sets government policy and adopts guidance documents, such as the Comprehensive Plan, the Land Development Regulation and ordinances establishing various codes and standards.

Marathon is organized into several departments, each with authorized responsibilities that, as described below, have bearing on how natural hazards are recognized and addressed.

City Manager. The City Manager of Marathon implements the policies of the Council and administers the overall operations of the City. With regards to the floodplain management, the City Manager has a FEMA Coordinator appointed to administer and implement the provisions consistent with the requirements of the National Flood Insurance Program.

Marathon Planning Department. The Marathon Planning Department is responsible for the development and maintenance of the City's Comprehensive Plan and the Land Development Regulations. Department personnel (Director, Planners, Planning Technician, Biologist) serve as staff to the City's Planning Commission and are involved in the following activities related to hazard mitigation:

- Ensures that mitigation related items in the Comprehensive Plan, such as floodplain management and natural resource management, are followed and reflected in the City's Codes and Standards.

- Participates in post-disaster appraisals and may formulate additional mitigation measures for use in the Comprehensive Plan.
- Works closely with the Building, Code Compliance, and Fire Department to ensure coordination of actions related to disaster planning, recovery, and mitigation.
- Reviews construction plans for compliance to the NFIP regulations.
- Responsible for enforcing planning and zoning standards.

Marathon Building Department. The Building Department is responsible for regulations of building construction pertaining to life safety, health, and environmental land use zoning regulations. The department is staff by the Building Official, a Building Inspector, and Permit Clerks. Related to mitigation of hazards, the department is responsible for the following:

- Review of construction plans and issuing building permits.
- Inspection and enforcement during construction.
- Designated as coordinator for the National Flood Insurance Program.
- Assist the public in identifying and implementing flood damage prevention measures.
- Participate in post-disaster appraisals.
- Work closely with the Planning, Fire, and Code Compliance Department to ensure coordination of actions related to disaster planning, recovery, and mitigation.

Table 12-1. Permits Issued & Inspections Conducted in 2008

	Fiscal Year 2008
New single-family (Market Rate & Affordable)	47
Transient Residential Use	(not reported)
Building Permits	285
Electric Permits	332
Plumbing Permits	184
Mechanical Permits	233

Marathon Code Compliance Department. The Code Compliance Department oversees after-the-fact code compliance issues pertaining to safety, health, and environmental land use and zoning regulations. The department is staffed by a Code Compliance Supervisor, Code Officers, and an Administrative Assistant. Related to mitigation of hazards, the department is responsible for: working closely with the Building, Planning, and Fire departments to ensure coordination of actions related to disaster planning, recovery, and mitigation; and participating in post-disaster appraisals.

Marathon Finance Department. The Finance Department (contracted) is responsible for overseeing the day-to-day financial requirements of the City, including establishment of purchasing procedures for all agencies. To expedite preparation for, response to, and recovery from disasters, the Finance Department may implement special emergency procedures to expedite necessary purchase and payment before, during, and after a disaster.

Marathon Community Services. The Community Services Department has a Director, a Community Services Coordinator, Grants Coordinator and houses the Parks and recreation Department. It provides technical assistance for City projects which require design, construction, and operation of economical and efficient structures, equipment, and systems.

Marathon Public Works Department. The Public Works Department works under the direction of the Public Works Director and is responsible for overseeing the maintenance of all city facilities, including buildings, roads, and bridges. The Department also operates and maintains City vehicles, with the exception of Fire Department vehicles.

Public Works is responsible for coordination and provision of emergency public works, initial evaluation of infrastructure damage and preparation of documentation required for federal reimbursement (including identification of mitigation components to be incorporated during recovery), and coordination of emergency debris clearing.

In executing its disaster recovery responsibilities, Public Works coordinates with the Florida Department of Transportation, Monroe County Department of Public Works, Florida Keys Aqueduct Authority, and Florida Keys Electric Co-op. The department plans, coordinates and initiates restoration of the serviceability of transportation routes, bridges, and assurance as to the safety of affected public and private dwellings and structures.

Monroe County Sheriff's Office: Marathon Division. The Sheriff's Office (contracted) is responsible for overall law enforcement and protection of residents and visitors in the City of Marathon. The department plays a key role in planning and response during emergencies to include but not limited to: coordination with Florida Highway Patrol to promote speedy and safe evacuation, communicates with base operations, field personnel, and emergency shelters.

Marathon Fire Department. The Fire Department is responsible for all life safety in connection with duties that include fire control, fire prevention, emergency medical services, emergency public education, and emergency management. Within the Department is the Emergency Management Division. It plays the lead role in planning and response for all emergencies. During a declared State of Local Emergency, the Emergency Management Director serves in the capacity of the Incident Manager under the direct control of the City

Manager. This holds true for all four phases of emergency management: Preparedness, response, recovery and mitigation. Additionally, the Emergency Management Director is responsible for the year round program management as well as development and maintenance of all emergency and/or disaster related plans and procedures, including this document.

12.3 Hazards and Risk in Marathon

Historic Storms that have affected the Marathon Area:

- 1929 Hurricane (September 22 to October 4) – The hurricane crossed over Key Largo on a northerly course. Key Largo reported winds estimated at over 100 mph, a central barometric pressure of 28 inches, and tide levels of 8-9 feet above MSL. Key West experienced tide levels of 5-6 feet above MSL and winds of 66 mph.
- 1935, Hurricane (August 29-September 10) - The small, extremely violent, Category 5 hurricane crossed the Florida Keys on a northwesterly track. The Tavernier-Islamorada area reported sustained winds estimated at 120 mph with gusts from 190-210 mph. Tide levels in the Florida Keys ranged from 14 feet above MSL in Key Largo to 18 feet above MSL in Lower Matecumbe Key. The storm was so intense and tightly wrapped that Key West had tide levels of only 2 feet above MSL and average sustained winds of less than 40 mph. One of the most tragic aspects of the 1935 storm was the unfortunate death of many WWI veterans who were working on construction of Henry Flagler's Overseas Railroad.
- Hurricane Donna, 1960 (August 29-September 19) – Hurricane Donna curved northwestward over the Middle Keys near Long Key/Layton and then traveled northward toward the Gulf Coast towns of Naples and Fort Myers. Areas in the vicinity of the storm experienced winds speed of 128 mph and a central pressure of 28.44 inches. The storm affected the Everglades with estimated winds of 150 mph. Tide levels were reported at Upper Matecumbe Key of 13.5 feet above MSL, at Plantation Key 10+ feet above MSL, and 8.9 feet above MSL in Key Largo. As of 1992 Hurricane Donna, a Category 4 storm is listed as the 6th most intense hurricane in the US.
- Hurricane Betsy, 1965 (August 26-Septmber 12) – Hurricane Betsy passed over Marathon while moving westward into the Gulf of Mexico. The lowest central pressure was measured in Tavernier at 28.12 inches and wind speeds were estimated to be 120 mph. Tide levels in Tavernier were 7.7 feet above MSL and Key Largo had tide levels of around 9 feet above MSL. Betsy was a Category 3 storm and is ranked 25th in intensity.
- Ground Hog's Day Storm (February 2, 1998) involved multiple F-2 tornado touchdowns resulting from a severe thunderstorms characterized by dangerous cells with high, cold cloud tops affected the Florida Keys. Areas most affected were primarily in the Middle Keys including Grassy Key and Valhalla Beach in the vicinity of Duck Key. Several buildings were damaged. Also significant problems occurred from the displacement of lobster traps which

contributed to seaborne debris and navigational problems; the fishing industry suffered considerable loss of income.

- Severe thunderstorms (July 4, 1998). Severe thunderstorms with lightning and high winds came up quickly in the Middle Keys. The Weather Service Office in Key West recorded wind speeds up to 70 mph sustained. Because it was July 4th, many boats were offshore celebrating and waiting for the fireworks. Although, this event did not warrant a presidential disaster declaration, it did result in loss of life.
- Hurricane Georges, 1998 (September 25, 1998), a Category 2 when made landfall in the Lower Keys, affecting the entire county to some extent. Damage estimates approached $300 million, including insured and uninsured damage and infrastructure loss. Maximum sustained winds at the Naval Air Station (Boca Chica) near Key West were 92 mph; gusts up to 110 mph were reported by the Emergency Operations Center in Marathon. According to the Key West Weather Service, precipitation levels in the Lower Keys were as 8.65 inches on the south side of Sugarloaf Key, 8.38 inches at Key West International Airport, and 8.20 inches on Cudjoe Key. Tavernier in the Upper Keys recorded 8.41 inches.
- Tropical Storm Mitch, 1998 (November 4 and 5). Feeder bands from Mitch containing dangerous super cells spawned several damaging tornadoes in the Upper Keys. Sections with mobile homes were especially hard hit. Islamorada experienced an F-1 tornado; Rock Harbor and Key Largo were hit by F-2 tornadoes. According to the Department of Community Affairs, damages were estimated at $11 million.
- Hurricane Irene, October 1999. Hurricane Irene hit the Florida Keys and Southeastern Florida. This Category 1 Hurricane dumped 10 to 20 inches of rain resulting in severe flooding in the Florida Keys and Southeastern Florida causing total damage estimated at $800 million
- Tropical Storm Gabrielle, September 2001. Although it did not reach hurricane strength, this storm hit the southwest coast of Florida and caused flooding problems; Marathon did see some effects from the storm.
- Hurricane Wilma, October 2005. During the night of October 23 to 24, Hurricane Wilma visited Monroe County, resulting in at least 2 injuries and at least $33 million in damage countywide. Over the Upper Keys from Craig Key to Ocean Reef, maximum winds were measured at 65 knots with gusts to 79 knots. Overall, average winds across the inhabited Lower Keys were estimated at 70 to 80 mph with gusts up to 90 mph with general Category 1 Saffir-Simpson Damage noted. Wilma primarily produced one storm tide along the bayside of the Upper Keys, ranging from 4 to 5 feet above sea level with the worst in Lower Matecumbe Key. U.S. Route 1 north of Key Largo was temporarily flooded at least 3 inches at maximum surge during the afternoon hours on October 24.

Hurricane Flooding as Predicted by SLOSH Modeling

The National Hurricane Center's surge model, called SLOSH (Sea, Lake, and Overland Surges from Hurricanes), estimates surges associated with different characteristics of tropical cyclones (track, forward speed, wind speed, etc.). The results can be combined with topographic mapping to delineate inland areas subject to flooding (with a margin of error of +/- 20%). The predicted storm surges that may affect the Marathon area for various storm categories and tracks are shown in Table 12-2.

Table 12-2. SLOSH Maximum Predicted Water Depths (ft above MSL)

Ocean Side Mile-Marker 50						Ocean Side Mile Marker 61					
Track Direction	Storm Categories					Track Direction	Storm Categories				
	1	2	3	4	5		1	2	3	4	5
WSW	4	5	6	7	8	WSW	4	5	6	7	8
W	4	5	7	8	9	W	4	5	7	8	9
WNW	4	6	7	8	9	WNW	4	6	7	9	10
WN	4	6	7	8	9	NW	4	5	7	8	10
NNW	4	5	7	8	9	NNW	4	5	7	8	9
N	4	5	7	8	9	N	4	5	6	8	9
NNE	4	5	6	7	9	NNE	4	5	6	8	9
NE	4	5	6	7	8	NE	4	5	6	7	9
ENE	3	5	6	7	8	ENE	3	5	6	7	8
E	3	4	5	6	7	E	3	4	5	6	8

Floodplain Management & Compliance with the NFIP

The City entered the National Flood Insurance Program when it incorporated in 2000 by adoption of an ordinance that complies with the requirements of the program. The City reviews all development proposals in special flood hazard areas and enforces the requirements of the ordinance. To ensure continued compliance with the NFIP, the City will continue to:

NFIP Flood Insurance Policies in Marathon 3,029

Claims paid since 1978: 800*

http://www.fema.gov/nfip/pcstat.shtm
(as of December 31, 2009)

*records prior to incorporation included in claims for Monroe County

- Enforce the adopted floodplain management ordinance, including inspection of permitted development and unpermitted activities;
- Maintain records pertaining to floodplain development, including flood maps and Letters of Map Change, which shall be available for public inspection;
- Notify the public when there are proposed changes to the ordinance or Flood Insurance Rate Maps; and

- Promote the purchase of NFIP flood insurance policies as financial protection.

NFIP Floodplain Mapping

The National Flood Insurance Program (NFIP) prepared a Flood Insurance Rate Map for Monroe County and incorporated municipalities (current effective map is dated February 18, 2005). The FIRM delineates areas that have been determined to be subject to flooding by the "base flood," the flood that has a 1-percent-annual chance of flooding in any given year (commonly called the 100-year flood).

The entire City is located in areas designated as VE Zones (coastal flood with velocity hazard wave action) and AE Zones (areas subject to flooding but waves are predicted to be less than 3-feet in height). As such, all new development in the City is subject to the floodplain management standards established in the City's Land Development Regulations.

NFIP Repetitive Loss Properties

Data provided by the Florida Division of Emergency Management identifies properties that are (or have been) insured by the National Flood Insurance Program and that have received two or more claims of at least $1,000. In 2005, no properties met the definition. As of February 28, 2010, 31 individual properties have received 67 claims, totally $3.6 million (average payment of $54,300). Figure 12-1 and Figure 12-2 (end of chapter) show property locations of those records that were able to be plotted. Some of the repetitive loss properties that are listed for Monroe County may fall within Marathon; because the data cannot be geocoded based on the addressing, the actual number is unknown.

Severe Storms, Tornadoes, Water Spouts and High Winds (Other than Hurricane)

Marathon, like the rest of the Keys, has low-lying terrain. Section 6.2 characterizes the entire area encompassed by Monroe County and the cities as having equal distribution of winds. The risk of severe storms, tornadoes, water spouts and high winds in Marathon does not vary from the rest of the planning area. All new buildings, replacement buildings, and additions to existing buildings must comply with the Florida Building Code's wind load requirements.

Rainfall/Ponding Flooding

Unlike most areas in Monroe County and the other cities, Marathon has areas that are subject to rainfall or ponding flooding. This type of flooding results from longer duration storms, which occur almost annually. As a result, residents experience access problems and water has damaged some older, non-elevated, buildings. The area with the most significant problem is 107th Street to 109th Street. Access to about 200 buildings is limited during heavy and prolonged storms. While many of the buildings are elevated, about 50 older

buildings are built on-grade and have experienced flooding. In Hurricane Georges, water up to one-foot deep caused damage.

Marathon's Stormwater Management Master Plan, prepared in 2002, identifies areas of localized flooding and a generalized overview of suggested methods to minimize local flooding such as closed drainage systems, exfiltration/slab covered trenches, and injection wells. The priority areas identified include 39th Street and Sombrero Boulevard.

Because all of Marathon is mapped as Special Flood Hazard Area, all new buildings and replacement buildings must comply with the floodplain management ordinance and be elevated or floodproofed (nonresidential only). Therefore, this type of flood damage is unlikely to affect buildings built in the future.

Marathon's Engineering Department, responsible for roads and drainage, designs all new and improved storm drainage facilities to hand the 25-year frequency rainfall.

Drought Hazards

Drought hazards for the planning area are described in Section 6.4. Marathon's risk due to drought is comparable the drought risk throughout the area.

Wildland Fire Hazards

The Florida Forestry Department indicates that in Marathon, Grassy Key is the area that is most prone to wildland/brush fires.

The Florida Forestry Department indicates that in Marathon, Grassy Key is the area that is most prone to wildland /brush fires. Based on data provided by Monroe County Property Appraiser in 2005, Grassy Key includes a total of 9,391 parcels of land of which 6,498 are improved. The total assessed value of improvements is $1,562,786,704. It is important to note that this summary is not to imply that all properties would be vulnerable in any given wildfire outbreak. All new construction must comply with environmental restrictions.

Marathon's Critical and Important Facilities

Figure 2-2 shows the locations of the City's facilities that are listed in Table 12-3.

Table 12-3. Critical and Important Facilities in Marathon

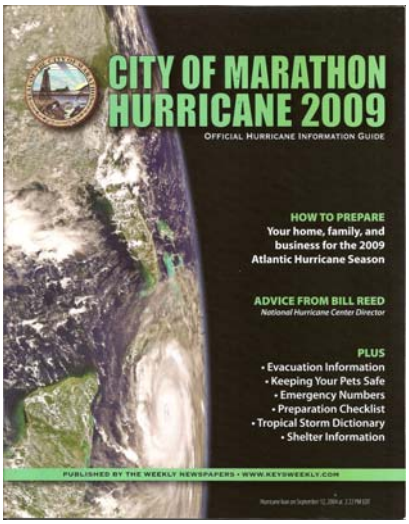
Critical/Essential Facilities:	Marinas: (from the draft Marine Siting Plan)
• City Hall • Fisherman's Hospital • Florida Keys Electric Co-op • Schools (Stanley Switlick, Marathon Middle, and Marathon High) • Marathon Airport • City Marina • Florida Keys Aqueduct Authority • Crawl Key Sewer Treatment Plant (future) • Fire Station #14 and #15 (completed 2008) • 33rd Street Fire Station (future) • Monroe County Operation Center • Little Venice Sewer Treatment Plant	• 7 Mile Grill • Abaco Sails & Marine • Banana Bay Marina • Blackfin Resort and Marina • The Boat House • Bonefish Bay Motel • Bonefish Yacht Club and Marina • Boot Key Harbor City Marina • Border Patrol • Burdines Water Front • Cannon Marine & Harbor Point • Captain Hook's Marina • Captains Three Fisheries • Coco Plum Marina & Storage, Inc. • Coconut Cay Resort & Marina
Hazardous Materials Sites (302 Facilities): • Monroe County Mosquito Control • Florida Keys Aqueduct Authority	

Table 12-3. Critical and Important Facilities in Marathon

Mobile Home and Recreational Vehicle Parks (as of January 2008): • Aloha Trailer Park • Farnsworth Trailer Park • Galway Bay RV and Mobile Home Park • Jolly Roger Travel Park • Key RV Park • Knights Key Campground • Lion's Lair Travel Park • Ocean 25 Company, Inc. • Ocean Breeze Park West • Ocean Breeze Trailer Park • Old Towne Village • Palms Subdivision Trailer • Pelican Motel & Trailer Park • Sundance • Terra Marine Park • Trailer Ranch by the Sea • Trailerama Park • Whispering Pines • Trailers by the Sea	• Coconut Palmas, Inc. • Coral Island Yachts • Crystal Bay Resort & Marina • D & D Seafood • Driftwood Marina & Storage • Faro Blanco Resort Gulfside • Faro Blanco Resort Oceanside • Galway Bay Trailer Park and Marina • Grassy Key Marina of Marathon • Hidden Harbor • Holiday Inn • Jolly Roger RV Park • Keys Boat Works, Inc. • Keys Fisheries Market & Marina • Keys Fisheries (Joe's Stone Crab) • Kingsail Resort Motel • Knight's Key Campground • Lion's Lair RV Park • Marathon Marina & Boat Yard • Marathon Yacht Club • Marie's Yacht Harbor & Marina • Ocean Breeze RV Park & Marina • Oceanside Marine Service, Inc. • Outta The Blue Marina • Pelican Resort • Pancho's Fuel Dock • Rainbow Bend Resort & Marina • Royal Hawaiian Motel/Botel • Sea Cove Motel • Seascape Resort • Seven Mile Marina • Shelter Bay Marine • Sombrero Marina & Dockside • Sombrero Resort Lighthouse Marina • Vaca Key Marina • Valhalla Beach • Yardarm Motel

12.4 Damage Reduction Activities

On-Going Activities



- Participate in public awareness activities, including distribution of the "Official Hurricane Information Guide."
- Administer the stormwater utility that was implemented as part of construction in six wastewater management service areas. Tax revenues received by the utility have been utilized to construct a stormwater management system for all streets within the City. This system was installed simultaneously with the wastewater management system.

On-Going Stormwater and Wastewater Initiatives

In July 2005 the City of Marathon entered into an agreement with Weiler Engineering for design of the City's wastewater treatment system. The proposed project provides an affordable, long-term solution to meeting the City's 2010 wastewater treatment goals. Weiler examined various technologies and service areas within the City of Marathon and determined that no single type of system was best for the entire City. Instead, the recommendations addressed the most practical and cost effective system for various neighborhoods. As a result, projects will be implemented in seven separate Service Areas.

- Service Area 1: Knight's Key (Entire Island)
- Service Area 2: Boot Key (Entire Island)
- Service Area 3: Vaca Key West (11th St to 39th St)
- Service Area 4: Vaca Key Central (39th St to 60th St)
- Service Area 5: Vaca Key East (60th St to Vaca Cut)
- Service Area 6: Fat Deer Key West–Coco Plum (Vaca Cut to Coco Plum)
- Service Area 7: Grassy Key (Fat Deer Key East through Grassy Key)

Concurrent with the City's wastewater project construction, the City is also constructing stormwater management facilities and repaving City roads in these seven areas. A water re-use component is included for large users.

Past and Recent Projects

These projects are intended to reduce rainfall/ponding flooding and improve overall drainage and water quality of stormwater runoff:

- Sombrero Beach Injection Well: under drain in the park area leading to a 24' injection well in the parking lot. (Completed September 2004)
- 39th Street Drainage Improvements: was designed to improve existing drainage conditions at the location of 39th Street (2nd Ave), which will provide a means for discharge through two drainage wells and thereby allow bleed-

down of the ponding areas. Because the wells will serve as a source for discharge during storm events, the proposed system will help to alleviate the extent of ponding. Runoff will be collected through a series of inter-connected swales, ditches and bubble up structures and converged to two drainage wells. (Completed March 2005)

- 20th Street Gulf (Boot Key Road): designed to improve existing drainage conditions on 20th Street Gulf. The work included grading shoulders, grading the drainage swales at north end of the project, place drainage structures on both sides of the road and 100 linear feet of French Drain. (Completed March 2005)
- 4th Ave Gulf Drainage: designed to improve existing drainage conditions on 4th Ave Gulf. The work included installing a catch basin at the low point of the intersection; 15" pipe installed across 4th Ave to 24" injection well. (Completed March 2005)
- 46th Street Gulf: designed to improve existing drainage conditions on 46th Street Gulf. The work included installing a catch basin and 150 linear foot French drain at the low point of the road. (Completed March 2005)
- 42nd Street Gulf: designed to improve existing drainage conditions on 42nd Street Gulf. The work included installing a catch basin and 150 linear foot French drain. (Completed March 2005)
- Ave D Drainage: designed to improve existing drainage conditions on Ave D. The work included installing a 24" Injection well and one double chamber Baffle Box. (Completed March 2005)
- 107th to 109th Street Stormwater Improvement Project: includes the installation of drainage and retention structures to minimize the impacts from rainfall/flood events with a 25-year frequency. (Completed 2006/07)
- West 105th to 116th Street Stormwater Improvement Project: includes the installation of drainage and retention structures to minimize the water quality impacts from rainfall/flood events with a 25-year frequency. (Completed 2006/07)

12.5 2010 Updates

The City reviewed and updated the pertinent sections. Some of the more significant changes include:

- Section 12.1: Updated population. Revised reference to the Building Permit Allocation System.
- Section 12.2: Reported on the number of issued permits. Added description of Community Services and revised descriptions of Public Works and the Fire Department.
- Section 12.3: Added description of damage from Hurricane Wilma. Added text related to compliance with the NFIP. Updated NFIP policy and claims data. Updated text on repetitive loss properties and added location figures.

Added identification of areas prone to wildland/brush fires. Updated the critical facilities list.

- Section 12.4: Updated ongoing outreach activity. Noted implementation of storm water utility. Reported on on-going storm water and wastewater initiatives. Updated completed projects.

References:

City of Marathon, Comprehensive Plan (2005).

City of Marathon, Stormwater Management Master Plan (October 2002).

City of Marathon Comprehensive Emergency Management Plan (June 2008)

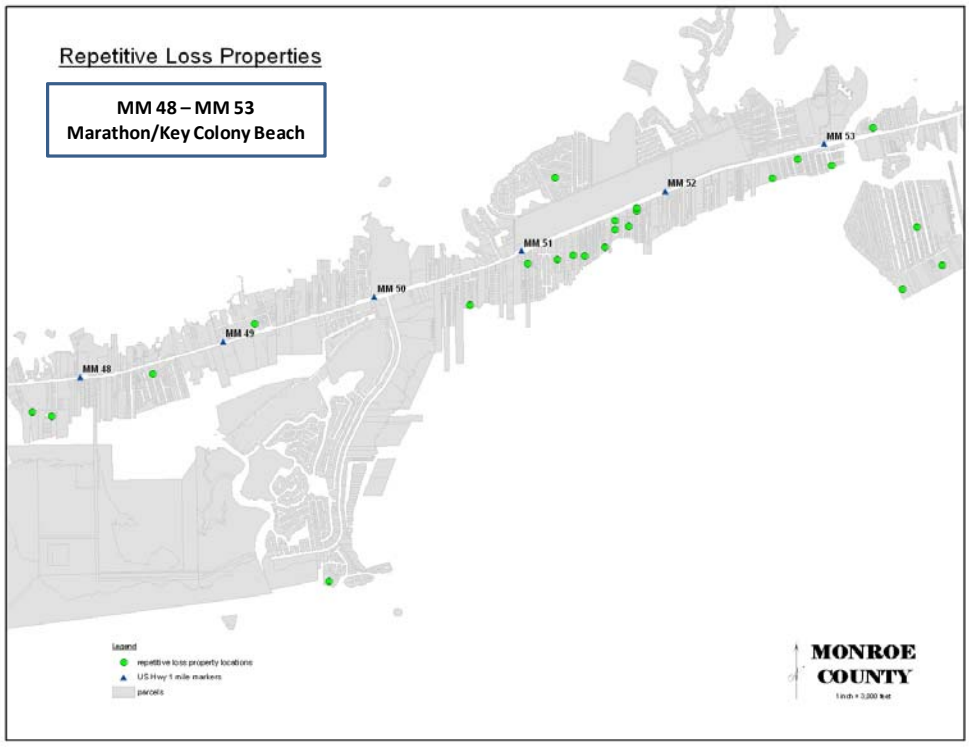


Figure 12-1a. Repetitive Loss Properties (MM 48 – MM 53).

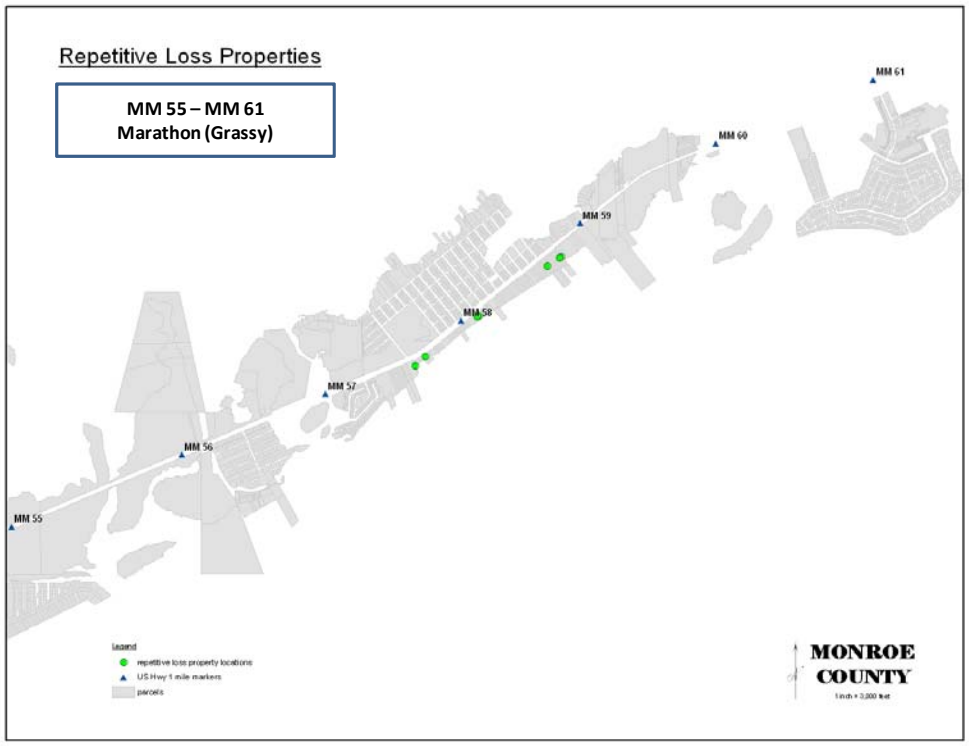


Figure 12-1b. Repetitive Loss Properties (MM 55 – MM 61).

Chapter 13. Mitigation Initiatives

13.1 LMS Goals and Priority Hazards

Earlier chapters describe Monroe County and its incorporated municipalities, identify hazards and characterize risk, summarize how the local governments address hazards in their development processes and other functions, and establish mitigation goals:

Monroe County Local Mitigation Strategy Goals

1. *Preservation of sustainability of life, health, safety and welfare.*
2. *Preservation of infrastructure, including power, water, sewer and communications.*
3. *Maintenance and protection of roads and bridges, including traffic signals and street signs.*
4. *Protection of critical facilities, including public schools and public buildings.*
5. *Preservation of property and assets.*
6. *Preservation of economy during and after disaster, including business viability.*
7. *Preservation and protection of the environment, including natural and historic resources.*

Hurricanes and their associated hazards (high wind and surge flooding) are described in Chapter 5 and other hazards are overviewed in Chapter 6 (strong storms, tornadoes and water spouts; rainfall/fresh water flooding; drought; wildland fire; and coastal erosion). For the purposes of actively pursuing damage reduction activities, the Monroe County LMS Work Group focuses on initiatives that address one or more of the mitigation goals and that address the hazards that have relative vulnerability ranking of “high” and “moderate” (Table 13-1, which is identical to Table 6-7).

Table 13-1. Hazards: Relative Vulnerability

Hazard	Vulnerability	Impact	Frequency	Distribution
Hurricane/Tropical Storm	High	Moderate to Severe	1-2 per year	Countywide
Flooding (rainfall ponding)	High (locally)	Moderate	6-12 times each year	Key West & Marathon
Strong Storms/ Tornado/Lightning	Moderate	Moderate	1-2 per year	Countywide
Wildfire	Low	Moderate	Less than 1 per year	Selected areas
Drought	Low	Low	1-2 per decade	Countywide

Table 13-1. Hazards: Relative Vulnerability

Hazard	Vulnerability	Impact	Frequency	Distribution
Coastal Erosion	Low	Low	1-2 per year (with coastal storms)	Limited selected areas

13.2 Range of Mitigation Initiatives

Six general categories or approaches to mitigation are described in Table 13-2. The list is not intended to be exhaustive; other activities may meet the intent but not be listed. The members of the Monroe County LMS Working Group consider these categories when identifying initiatives within their jurisdictions. Each participating local government undertakes a number of these activities on an ongoing basis.

Table 13-2. Categories of Mitigation Initiatives.

PREVENTIVE MEASURES keep problems from getting started or getting worse. When hazards are known and can be factored in to development decisions early in the process, risks are reduced and future property damage is minimized. Building, zoning, planning, and/or code enforcement officials usually administer these activities: • Planning and zoning • Open space preservation • Building codes and enforcement • Infrastructure design requirements • Clear defensible space for wildfire
PROPERTY PROTECTION measures are actions that go directly to permanently reducing risks that are present due to development that pre-dates current codes and regulations and include: • Property acquisition in floodplains • Relocation out of hazard-prone areas • Elevation of structures in floodplains • Demolition and reconstruction of structures in floodplains • Retrofit of structures in high wind zones and/or floodplains • Safe rooms and shelter hardening
EMERGENCY SERVICES MEASURES are taken immediately before or during a hazard event to minimize impacts. These measures are the responsibility of city or county emergency management staff, operators of major and critical facilities, and other local emergency service organizations and include: • Alert warning systems • Hazard/weather monitoring systems • Emergency response planning • Evacuation • Critical facilities protection • Preservation of health and safety

Table 13-2. Categories of Mitigation Initiatives.

STRUCTURAL PROJECTS are usually designed by engineers and managed and maintained by public entities. They are designed to reduce or redirect the impact of natural disasters (especially floods) away from at-risk population areas: • Levees, floodwalls, dunes and berms • Drainage diversions • Storm water management facilities, including injection wells • Shoreline protection against erosion
NATURAL RESOURCE PROTECTION projects preserve or restore natural areas or their natural functions. Park and recreation organizations, conservation agencies or wildlife groups may implement such measures: • Wetland protection or restoration • Beach and dune protection • Erosion and sediment control
PUBLIC INFORMATION PROGRAMS advise property owners, potential property owners, and others of prevalent hazards and ways to protect people and property. A public information office usually implements these activities, often with private partner support: • Flood maps and data • Public information, brochures, and outreach • Technical assistance for property owners • Real estate disclosure information • Environmental education programs

13.3 Mitigation Initiatives

Elements of the Monroe County LMS Goals highlight the importance of reducing potential damage to critical facilities such as public schools and public buildings, infrastructure (power, water, sewer, communications, roads and bridges), and the economy, including damage to privately owned homes and businesses. Progress is made toward those goals through implementation of ongoing actions and responsibilities of local governments as well as through initiatives undertaken explicitly to reduce future impacts.

It is important to recognize and acknowledge that Monroe County and the municipalities all have on-going programs and activities that contribute to disaster resistance even if those actions were not initiated in response to the Local Mitigation Strategy process. Examples include:

- Every jurisdiction issues building permits and administers a floodplain management ordinance. New buildings and infrastructure must comply with the Florida Building Code and other regulations; those regulations are deemed to be sufficient to minimize future damage to due hurricanes, high winds and flooding.
- Every jurisdiction maintains its roads, which reduces the likelihood of washout damage.

- Every jurisdiction cooperates with water suppliers during periods of drought and issues notices about water restrictions.
- Key West and Marathon pursue projects to improve drainage in areas subject to rainfall flooding.

Monroe County and the municipalities participate in public information and outreach, encouraging residents and visitors to be aware of the potential for hurricanes and actions to take both to reduce property damage and to facilitate safe evacuation.

Similarly, the utilities have on-going responsibilities intended to reduce the impacts of natural hazards. The Florida Keys Aqueduct Authority has contingencies for drought. The Florida Keys Electric Cooperative, the Keys Energy System, and Florida Power and Light take steps to minimize damage to their infrastructure and distribution systems to be able to recover as quickly as possible after hurricanes.

13.4 Initiatives for Working Group as a Whole

13.4.1 Working Group Initiatives: 2010

At the April 26, 2010 meeting, three possible new initiatives for the Working Group "as a whole" were discussed. Two initiatives were accepted and are shown in Table 13-3, along with one that is an ongoing effort to verify NFIP data.

After discussion, it was decided that the third suggestion should not be identified as a separate initiative because it is part of the ongoing work of the LMS Working Group members. The suggestion was: "The Working Group will do a comprehensive review of the websites of all local jurisdictions to identify content related to natural hazards (hurricane, flood, tornado, drought, and wildfire. Recommend revisions to improvement content and for consistency. Explore whether a single site would be more effective, with other webpages linked to it."

Table 13-3. High Priority Mitigation Initiatives: Working Group

Initiative 2010-001	**Establish LMS Working Group Procedures**
Jurisdiction/Entity	Monroe County and municipalities
Description	The Working Group will review how at least two other LMS Working Groups manage their regular business (e.g., written procedures / by-laws), determine if it is appropriate for the Monroe LMS Working Group to develop operating procedures, and if determined appropriate, develop such procedures. Operating procedures might address such items as posting public notices of meetings, basis for not holding a required quarterly meeting, basis for determining when a meeting may be held by conference call, location and scheduling of meetings, composition of the project ranking subcommittee, submission of updates to the LMS coordinator to compile for

Table 13-3. High Priority Mitigation Initiatives: Working Group

	the State-required annual report, etc. Concurrently, review how other LMS WG handle requests from private property owners. The Working Group will talk with DEM and other counties to determine how they prioritize and process many requests. Monroe County has a checklist that homeowners use to gather building-specific information; this checklist will be reviewed and modified if appropriate.
Hazards	All
Potential Funding Sources	Staff time
Estimated Time Frame	2011-2012
Initiative 2010-002	**Evaluate Hazard Identification and Risk Assessment Tools**
Jurisdiction/Entity	LMS Working Group
Description	The Working Group will evaluate the Hazard Identification and Risk Assessments that were prepared for at least two other counties and determine whether using different tools (e.g., FEMA's Hazards US) would significantly improve the outcomes reflected in the 2010 Update. The anticipated update of the Sea, Lake, and Overland Surge from Hurricanes (SLOSH) projections may also influence future updates of the HIRA.
Hazards	All
Potential Funding Sources	Staff time to evaluate (external funding will be required if it is determined appropriate to undertake new HIRA analyses)
Estimated Time Frame	2011-2014
Initiative 2010-003	**Continue to Verify and Improve Repetitive Flood Loss Data**
Jurisdiction/Entity	Monroe County and municipalities
Description	The National Flood Insurance Program maintains records of past flood insurance claims and tracks properties that have received multiple claims (referred to as "repetitive loss" properties). These properties present likely opportunities for mitigation, such as elevation-in-place, and FEMA funding may be available to support cost-effective measures. The NFIP records date to the mid-70s and are known to contain inconsistencies. Verifying the data serves two purposes: it helps the NFIP improve its records, and it results in an accurate list of the area's most flood-prone properties. Owners of these properties may be interested in reducing their exposure and working with the communities to seek mitigation funds.
Hazards	Flooding (coastal surge and ponding)
Potential Funding Sources	Staff time for data verification
Estimated Time Frame	Annually (if new properties added to FEMA's list)

13.4.2 Status of Working Group Initiatives 2005

In 2005, the Monroe County LMS Work Group identified four initiatives for the Work Group as a whole. Table 13-4 describes those initiatives and reports on their status as of early 2010.

Table 13-4. 2005 – High Priority Mitigation Initiatives: Work Group

Initiative 2005-001: Complete Critical Facilities Spreadsheet The Work Group determined the nature of data that, ideally, is valuable to have to help identify facilities that are expected to perform well and to identify vulnerabilities that may indicate opportunities for mitigation. The spreadsheet (Appendix A) is designed to help entities collect the data. As part of the annual LMS update, participants will review and update the data to reflect changes.	**Status as of 2010: Completed** The LMS Work Group Coordinator maintains a secure list of selected critical facilities. Changes to the list are required to be reported to DEM (9G-22). At the end of each jurisdiction's chapter is a list of facilities that it deems to be critical or essential – this list may vary from the secure list maintained by the LMS Work Group Coordinator.
Initiative 2005-002: Revise Scheme to Prioritize Initiatives The Work Group's experience with the previously-adopted process for the 2005 HMGP applications indicated a need to modify the process by which potential mitigation initiatives are submitted and, when funding becomes available, how the Work Group establishes priorities among the initiatives that proponents wish to submit for funding. At the May 24, 2005 Work Group meeting it was determined appropriate to develop a 2 or 3-step process. This initiative will complete development of the forms and scheme that will be used to prioritize initiatives when future funding becomes available (which will be inserted in Appendix D). This initiative includes revising and updating the spreadsheet included in Appendix C [in 2005, this appendix contained "Appx_C_Mitigation Initiatives.xls"]	**Status as of 2010: Completed** The process described in the 2010 Update reflects the revised process and the forms are included in Appendix E. The LMS Work Group Coordinator maintains a master spreadsheet of initiatives. The list of initiatives may change at least quarterly, when entities have the opportunity to "bank" projects. The list of prioritized initiatives is revised after major disasters and when NOFAs are issued. The list of completed (or removed) initiatives is updated at least annually.
Initiative 2005-003: Verify and Improve Repetitive Flood Loss Data The National Flood Insurance Program maintains records of past flood insurance claims and tracks properties that have received multiple claims (referred to as "repetitive loss" properties). These properties present likely opportunities for mitigation, such as elevation-in-place, and FEMA funding may be available to support cost-effective measures. The NFIP records date to the mid-70s and are known to contain inconsistencies. Verifying the data serves two purposes: it helps the NFIP improve its records, and it results in an accurate list of the area's most flood-prone properties. Owners of these properties may be interested in reducing their exposure and working with the communities to seek mitigation funds.	**Status as of 2010: Ongoing**

Initiative 2005-004: Request FEMA staging of emergency roofing materials	Status as of 2010: Completed
Recovery activities after hurricanes have indicated that the limitations on transportation into the Keys can cause lag time getting roofing repair materials into affected areas. Because of typical weather during hurricane season, lack of emergency roofing materials means buildings that have sustained roof damage continue to be exposed to further damage. Low income families can be particularly impacted when available supplies of emergency roofing materials are limited.	In 2007, Habitat for Humanity coordinated with the LMS to provide pallets of tarps (three sizes) at three locations: ▪ KW: 5701 College Road ▪ Middle Keys: Habitat for Humanity ▪ Upper Keys: Magnolia Blvd., Key Largo (Conex in Recycling Yard)

13.5 Community-Specific Initiatives

13.5.1 Community-Specific Initiatives: 2010

In 2010, the County and municipalities did not identify any community-specific "programmatic" initiatives that are not already listed in the initiatives list (see Section 13.6).

13.5.2 Status of Community-Specific Initiative 2005

In 2005, the City of Key West identified one programmatic initiative, to seek reinstatement in the NFIP's Community Rating System. It was subsequently determined that the City did not have sufficient staff capacity to complete this initiative.

13.6 Site-Specific Initiatives

Mitigation projects or initiatives are actions that focus on specific locations such as public buildings, public infrastructure, or privately-owned property. Examples of project initiatives that have been or are likely to be implemented in Monroe County and the municipalities include, but are not limited to:

- Wind retrofit of public buildings and facilities.
- Wind retrofit of private non-profit buildings and low income homes.
- Installation of storm drainage improvements.
- Floodproofing or mitigation reconstruction of public buildings and facilities.
- Elevation, mitigation reconstruction, or acquisition of private homes in floodplains.

The Monroe County LMS Work Group maintains an evolving list of project initiatives that includes many site-specific initiatives (Appendix E, as of mid-July, 2010). This list may be modified periodically. The list has three distinct "tabs" that result from distinct steps in the process (illustrated below and described in more detail in Section 13.7):

- **Step One: Preliminary Identified Mitigation Initiatives – Notice of Intent** (initiatives may be placed on the list with a minimum amount of information).

- **Step Two: Prioritized Mitigation Initiatives** (when an entity is prepared to seek funding and has sufficient detail, the Characterization Form is completed and the LMS Ranking Subcommittee develops the prioritization ranking).
- **Step Three: Completed/Removed/Unconfirmed Mitigation Initiatives (**initiatives that have been completed, with or without external funding, or which have been removed/dropped, or for which the entity has not provided sufficient information to keep it on one of the other lists).

Quarterly
- Step One: Accept NOIs to "bank" projects
- LMS WG Coordinator updates spreadsheet (Tab One)

Post-Disaster or When NOFA Issued
- Step Two: Entities electing to move projects from the "bank" to the prioritized list submit Characterization Forms
- Ranking Subcommittee reviews Characterization Forms and completes Prioritization Form
- LMS WG Coordinator updates Prioritized list (Tab Two)

Annually
- Step Three: Entities asked to review lists (Tab One and Tab Two) to identify projects that are completed, to be removed, or to be retained
- LMS WG Coordinator updates spreadsheet (all tabs)
- LMS WG Coordinator reports to DEM (9G-22)

13.7 Prioritizing Mitigation Initiatives

Florida Rule 9G-22 delegates to the LMS Work Group the authority to set priorities and identify projects. The Florida Division of Emergency Management encourages Work Groups not only to pre-identify (and "bank") projects, but to gather initial data to facilitate the priority setting process in part to help with more rapid consideration in the post-disaster period. As indicated in Step One (NOI), detailed cost estimates and engineering are not necessary in order to bank potential projects because long periods of time may elapse between initial identification of an initiative and actual application for funds (Step Two). Initiative proponents are responsible for providing information on which the prioritizations are based.

The Monroe LMS does not outline how each jurisdiction or non-profit organization decides to prioritize its own projects. It is expected that initiatives will be identified based on available hazard information, past hazard events, the number of people and types of property exposed to those hazards, and the feasibility and cost-effectiveness of the measure. Initiatives are expected to be consistent with current policies and regulations, technically feasible, likely to have high political and social acceptance, and be achievable using existing authorities and staff.

The Work Group adopted the phased process described here for identification and prioritization of mitigation initiatives The process results in the evolving list of initiatives in Appendix E, which also includes the forms. This list is maintained by Monroe County Emergency Management on behalf of the Work Group.

Step One: Preliminary Identified Mitigation Initiatives (Notices of Intent)

Initiatives may be placed on the list by any eligible entity that provides minimum information. The Work Group anticipates allowing submission on at least a quarterly basis so that eligible entities are not constrained by an annual opportunity to identify and pursue projects and funding. Initiative proponents are encouraged to bank initiatives by submission of notices of intent. The NOI form (Appendix E) requires the following minimum information:

- Name of owner/entity;
- Name of the initiative/project ;
- Brief description of initiative/project, project type, and any special considerations ;
- "Best estimate" of project costs; and
- Identification of the mitigation goal(s) and the hazards addressed.

Step Two: Prioritized Mitigation Initiatives (Characterization Form)

Implementation of site-specific mitigation initiative usually is dependant upon the availability of funding (see Section 13.7 for sources of funding). A project that is on the Step One (NOI) list is moved to the Step Two (Prioritized) list when the owner/entity anticipates developing and submitting the formal application to DEMA and FEMA, and when the Work Group is charged with prioritizing projects for available funding. Notices of Funding Availability (NOFA) may be issued annually (e.g., for FEMA's Flood Mitigation Assistance Program or the Pre-Disaster Mitigation Program) or after disasters that yield Hazard Mitigation Grant Program (HMGP) funds, in which case NOFAs usually are issued within 90 days. Whether on an annual basis or post-disaster, the Work Group members

would be notified and eligible entities would then decide whether they are prepared to formalize initiatives that are on the Step One (NOI) list.

Pursuant to State requirements (Chapter 9G-22.006) the LMS Work Group is charged with developing a prioritized list of initiatives. At any given time, priorities may change due to various factors such as recent damage, availability of non-federal cost share, or changes in priorities of the funding agency.

When a NOFA is anticipated or received, the LMS Coordinator will notify entities that have initiatives in the Step One (NOI) list. In order to have an initiative forwarded to the funding agency, detailed data specified in the Characterization Form (Appendix E) are required so that the Work Group's Ranking Subcommittee can process and determine priorities (Step Two list). The following minimum information will be required:

- Name of owner/entity and the point of contact responsible for providing the detailed information;
- Initiative/project title, description of the project, whether it benefits a critical facility; and whether the applicant has the legal authority to undertake the project;
- Estimate of how quickly the project could be started and how long it would take to complete;
- The LMS goals addressed a(scope of work) and need, and the hazard(s) and problem(s) it would address;
- Identification of the mitigation goal(s) and the hazards addressed;
- Description of general benefits, including number of people impacted, economic benefits, social benefits, environmental benefits, and whether historic resources are affected;
- Estimated total project costs and whether a formal Benefit-Cost Analysis has been prepared or if the estimated benefits are based on the worksheet to approximate a Benefit-to-Cost Ratio;
- Statements regarding feasibility; consistency with other plans, policies, codes and ordinances; permits and approvals necessary; level of effort to implement; and likely reception by the community (i.e., the public);
- Identification of potential funding sources; and
- An attachment to approximate benefits and costs.

Step Three: Completed/Removed/Unconfirmed Mitigation Initiatives

In order to maintain records that demonstrate progress towards the Mitigation Goals, the Work Group recognizes that it is important to track completed initiatives, as well as initiatives that are completed or removed from the list, including those for which sufficient information was not provided in order to retain on one of the other lists. At least once a year

entities that have undertaken mitigation initiatives (regardless of source of funding) will report to the Work Group. At any time, entities may request that an initiative be removed from the Step One (NOI) list or the Step Two (Prioritized) list, in which case it is moved to the Step Three list.

13.8 Potential Funding for Selected Initiatives

Funding to support mitigation initiatives may be available from several sources, each with its own timing and requirements. The list in Table 13-5 is not intended to be exhaustive, but to characterize the variety of funding. The State Hazard Mitigation Plan includes a more detailed list of potential funding sources. The LMS Work Group will endeavor to maintain familiarity with funding sources and availability. The Florida Division of Emergency Management is the primary contact for notifications and processing of federal funds, especially those that derive from the U.S. Department of Homeland Security (FEMA). FEMA publishes annual guidance for its programs. The guidance summarizes programmatic changes and limitations which may vary from year to year.

Table 13-5. Primary Potential Funding for Mitigation

Program	Fund Source Contact
Hazard Mitigation Grant Program (HMGP) To prevent future losses of lives and property due to disasters; to implement State or local hazard mitigation plans; to enable mitigation measures to be implemented during immediate recovery from a disaster; and to provide funding for previously identified mitigation measures to benefit the disaster area. Eligible projects include but are not limited to: • Property acquisition or relocation • Structural and non-structural retrofitting (e.g. elevation, storm shutters and hurricane clips) • Minor structural hazard control (e.g. culverts, floodgates, retention basins) • Localized flood control projects that are designed to protect critical facilities and are not part of a larger flood control system • Other feasible and cost-effective measures Ineligible activities include: • Major flood control projects • Engineering designs not integral to a proposed project • Feasibility and drainage studies that are not integral to a proposed project • Flood studies that are not mapping • Response and communication equipment (e.g., warning systems, generators that are not integral to a proposed project)	Source: FEMA Contact: Florida Division of Emergency Management (DEM)
Pre-Disaster Mitigation (PDM) Competitive Grants The PDM program was authorized by Section §203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended by Section §102 of the Disaster Mitigation Act of 2000, to assist communities to implement hazard mitigation programs designed to reduce overall risk to the population and structures before the next disaster occurs. Annual guidance is issued and may include national priorities. See HMGP for eligible activities.	Source: FEMA Contact: DEM

Table 13-5. Primary Potential Funding for Mitigation

Program	Fund Source Contact
Flood Mitigation Assistance Program To fund cost effective measures implemented by States and communities to reduce or eliminate the long term risk of flood damage to buildings, manufactured homes, and other structures uninsurable by the National Flood Insurance Program. See flood-related activities under PDM.	Source: FEMA Contact: DEM
Severe Repetitive Loss Program To fund cost effective measures to reduce or eliminate the long-term risk of flood damage to specific buildings that qualify under the federal statutory definition for "severe repetitive loss" properties. SRL properties are primary residences that are covered by an NFIP flood insurance policy, that have received 4 or more claims of at least $5000 or at least 2 claims that exceed the value of the property. Eligible activities include elevation, relocation, demolition, and floodproofing (non-residential only), demolition and rebuilding (also called "mitigation reconstruction"), and minor physical localized flood control projects.	Source: FEMA Contact: DEM
Repetitive Flood Claims Program To fund cost effective measures to reduce or eliminate the long-term risk of flood damage to individual properties for which one or more NFIP flood insurance claim has been paid, provided FEMA determines the activity is in the best interest of the NFIP and cannot be funded under the Flood Mitigation Assistance Program.	Source: FEMA Contact: DEM
Residential Construction Mitigation Program (RCMP) Funds from the Florida Hurricane Catastrophe State to harden homes and tie-down mobile homes.	Source/Contact: DEM
Community Development Block Grant The Community Development Block Grants (CDBG) provide for long-term needs, such as acquisition, rehabilitation or reconstruction of damaged properties and facilities and redevelopment of disaster-affected areas. Funds may also be used for emergency response activities, such as debris clearance and demolition, extraordinary increases in the level of necessary public services. Eligible projects include: • Voluntary acquisition or if appropriate, elevation of storm damaged structures (can be used as match for FEMA mitigation projects in low income areas) • Relocation payments for displaced people and businesses • Rehabilitation or reconstruction of residential and commercial buildings • Assistance to help people buy homes, including down payment assistance and interest rate subsidies • Improvement to public sewer and water facilities	Source: HUD Contact: Community Planning and Development
Community Facilities Loan Program (10.423) To construct, enlarge, extend, or otherwise improve community facilities providing essential services to rural residents.	Source/Contact: Florida Rural Economic and Community Development
Conservation and Recreation Lands (CARL) This grant program is intended to conserve environmentally endangered lands and provide resource conservation measures for other lands.	Source/Contact: Florida Department of Environmental Protection, Division of State Lands
Florida Communities Trust (FCT) Facilitates the purchase of lands for conservation and/or recreation purposes by local governments; helps to implement conservation, recreation, open space, and coastal elements of local comprehensive plans. The Board of Florida Communities Trust has latitude to consider innovative financing arrangement, loans, and land swaps. However, most of the Trust's funding is for land acquisition. Land acquisition projects in which matching funds are available will receive more favorable consideration, although a portion of	Source/Contact: Florida Department of Community Affairs, Communities Trust

Table 13-5. Primary Potential Funding for Mitigation

Program	Fund Source Contact
available funds may be awarded as outright grants.	
Community Development Block Grants/Entitlement Grants To develop viable urban communities by providing decent housing and a suitable living environment, and by expanding economic opportunities, principally for low to moderate income individuals.	Source: HUD Contact: Office of Block Grant Assistance
Community Development Block Grants/State Program To develop viable urban communities by providing decent housing and a suitable living environment, and by expanding economic opportunities, principally for low to moderate income individuals.	Source: HUD Contact: Small Cities Division, Office of Block Grant Assistance
Economic Injury Disaster Loans (EIDL) To assist business concerns suffering economic injury as a result of certain presidential, Secretary of Agriculture, and/or Small Business Administration declared disasters.	Source: SBA Contact: Office of Disaster Assistance
Emergency Shelter Grants Program (ESG) To provide financial assistance to renovate or convert buildings for use as emergency shelters for the homeless. Grant funds may also be used to operate the shelter (excluding staff) and pay for certain support services.	Source/Contact: Florida Housing & Urban Development; Community Planning & Development
Physical Disaster Loans (Business) To provide loans to businesses affected by declared physical type disasters for uninsured losses; may include costs to mitigate future damage.	Source: SBA Contact: Office of Disaster Assistance
Post-Disaster Public Assistance Program To provide supplemental assistance to States, local governments, and certain private non-profit organizations to alleviate suffering and hardship resulting from major disasters or emergencies declared by the President. Costs for feasible and cost-effective mitigation can be included.	Source: FEMA Contact: DEM
Flood Plain Management Services To promote appropriate recognition of flood hazards in land and water use planning and development through the provision of flood and flood plain related data, technical services (such as floodproofing evaluations of public buildings), and guidance.	Source: U.S. Army Corps of Engineers Contact: Jacksonville District COE

13.9 LMS Actions to Support Grant Applications

Table 13-6 illustrates that certain mitigation grant programs require that projects "be in conformance with" or be "consistent with the goals and objectives" in local hazard mitigation plans (regulations cited below the table). Specific actions are required when post-disaster Hazard Mitigation Grant Program funds become available and if an eligible subapplicant elects to submit an application for FEMA's Pre-Disaster Mitigation grant program.

Table 13-6. LMS Actions to Support Grant Applications

Program	State Requirement	Federal Requirement
Hazard Mitigation Grant Program (FEMA)	• LMS WG to prioritize projects [9G-22.006(1)(a)] • LMS WG to provide endorsement letter [9G-22.007(4)]	• Subapplicant to provide evidence of consistency with LMS [§ 206.435]
Pre-Disaster Mitigation (FEMA)	• None	• LMS WG coordinator to provide endorsement letter with ranking [HMA Guidance]
Flood Mitigation Assistance (FEMA)	• None	• Subapplicant to provide evidence of consistency with LMS [§ 79.6 and HMG Guidance]
Severe Repetitive Loss (FEMA)	• None	• Subapplicant to provide evidence of consistency with LMS [§ 79.6 and HMA Guidance]
Repetitive Flood Claims (FEMA)	• None	• Subapplicant to provide evidence of consistency with LMS [HMA Guidance]
Residential Construction Mitigation Program (State)	• None	• Not applicable (State program)

State Regulations:

9G-22.006 County Allocations and Project Funding.

(1)(a) Eligible and submitted projects for each county included in the relevant presidential disaster declaration will be funded in order of priority as outlined in the LMS until the allocated funds are exhausted, or all eligible projects are funded, whichever occurs first.

9G-22.007 Application.

(4) A letter shall accompany each application from the Chairperson or Vice-Chairperson of the LMS Working Group endorsing the project. The endorsement shall verify that the proposed project does appear in the current LMS and state its priority in relation to other submitted projects. Applications without this letter of endorsement will not be considered.

Federal Regulations & Guidance:

HMGP: § 206.435 Project identification and selection criteria.

(a) Identification. It is the State's responsibility to identify and select eligible hazard mitigation projects. All funded projects must be consistent with the State Mitigation Plan. Hazard Mitigation projects shall be identified and prioritized through the State, Indian tribal, and local planning process.

FMA & SRL: § 79.6 Eligibility.
(d) Minimum project criteria. In addition to being an eligible project type, mitigation grant projects must also:

(1) Be in conformance with mitigation plans approved under part 201 of this chapter for the State and community where the project is located;

HMA Guidance (FY2010): D.5.1 Conformance with Hazard Mitigation Plans
Projects submitted for consideration for HMA funding must be consistent with the goals and objectives identified in the current, FEMA-approved State or Tribal (Standard or Enhanced) Hazard Mitigation Plan and local or Tribal hazard mitigation plan for the jurisdiction in which the activity is located.

13.10 2010 Updates

- Section 13.1: Added the Mitigation Goals for easy reference. Added Table 13-1, the updated the list of hazards covered in Chapter 6 (identical to Table 6-7).
- Section 13.3: Added that every jurisdiction cooperates with water suppliers during periods of drought.
- Section 13.4: Added new initiatives for the Work Group as a whole and reported on the status of the Work Group's 2005 initiatives.
- Section 13.5: Added new community-specific initiatives and reported on the status of Key West's 2005 initiative.
- Sections 13.6 and 13.7: Revised the text to be consistent with the revised forms used by the Work Group to submit projects for the initiatives list.
- Section 13.8: Added FEMA's Severe Repetitive Loss and Repetitive Flood Claims grant programs to the list of funding sources. Noted that FEMA publishes annual guidance for mitigation grant programs.
- Section 13.9: Added new section to summarize LMS Working Group actions required to support grant applications.

Chapter 14. Evaluation, Updates & Revisions

14.1 Distribution

Upon adoption, the LMS 2010 Update will be posted on the Monroe County Emergency Management Department's web site and notices of its availability will be distributed to the federal and state agencies that were notified and the organizations, agencies, and elected officials who received notices of public meetings.

14.2 Annual Evaluation & Updates (Monitoring)

As required by State statute (Chapter 9G-22) and to ensure that the Local Mitigation Strategy is current and continues to serve the interests of residents and visitors, the LMS Working Group will perform an evaluation and, if appropriate, prepare revisions every year. Minor revisions may be handled by addenda. If revisions are prepared they are to be submitted to the Florida Division of Emergency Management no later than the last workday of each January.

The Monroe County Emergency Management Department, the LMS Coordinator, will monitor hazard events, reports of damage, and progress on implementation of projects that Working Group members report are undertaken. The LMS Coordinator will coordinate the annual review and preparation of revisions that may be identified. The participating Working Group members are responsible for recommending revisions pertinent to their jurisdiction or organization. Revisions may be appropriate due to:

- Hazard events that have occurred that prompt a change in the characterization of risk.
- Significant changes to the critical facilities list (addition or deletion of facilities).
- Changes to the NFIP's list of Repetitive Loss Properties (if the list is provided for this purpose).
- Changes in knowledge and understanding of the people and property that are at risk which may be reflected in hazard maps.
- Changes to the list of mitigation initiatives (addition of new initiatives, deletion or completion of previously-listed initiatives).
- Changes in department organization, regulations, comprehensive plans, and the like.
- Changes necessary to comply with State and federal program requirements.

The following monitoring schedule will be followed (subject to changes as a function of hazard events):

- By the end September of each year, the LMS Coordinator will notify Working Group members of the need to review the LMS and identify revisions; Working Group members will submit proposed revisions to Emergency Management which will be discussed at a Working Group meeting. Emergency Management will compile the proposed revisions and, with Working Group approval, will forward the revisions to the Department of Community Affairs by the last working weekday of January.
- On a quarterly basis the Working Group will report on the status of active initiatives in order to maintain currency of the list.
- On a quarterly basis the Working Group will accept new initiatives to be placed on the list of Preliminary Identified Mitigation Initiatives.

Between 2005 and 2010, the Monroe County LMS Working Group coordinator submitted annual reports as required. A number of facilities were added to the list of critical facilities and progress was noted on some grant-funded projects to mitigate repetitive loss properties.

14.3 Five-Year Revision

The LMS Working Group will conduct a comprehensive review of and revisions to the LMS on a five-year cycle. In part, this revision will be to incorporate the material collected for the previous four annual updates. Because the LMS is adopted in 2010, it will enter the next evaluation and review cycle sometime in 2014, with adoption and publication anticipated in 2015.

Based on the mitigation planning process outlined in Section 3.2, the LMS Working Group anticipates the following activities will be undertaken as part of the 2015 Update:

- An evaluation to determine whether newer, GIS-based risk assessment tools should be used to update the information about the impacts of hurricanes and coastal storms, or existing knowledge about the nature, extent, and magnitude of potential building damage is sufficient for the purposes of the LMS.
- The LMS Coordinator will notify the LMS Working Group and All interested parties on the e-mail listserve when the five-year revision cycle is initiated and when each subsequent meeting or conference call is scheduled.
- An initial meeting to review the update process, State and federal requirements, and the major steps, assignments, and schedule. All members will contribute to updating hazard information and events. Each local government member will be responsible for ensuring that their chapters are reviewed and reflect current organization and procedures.
- The mitigation initiatives lists will be reviewed and revised (if not already accomplished in the annual reports and updates).
- The Working Group will review all changes and concur with making the Public Review Draft available for public review. The LMS will be made

available for public review and citizens will be encouraged to comment. A public meeting will be held.

- The Working Group will review and address public comments and comments received from DEM and FEMA review.
- Each local jurisdiction will formally adopt the LMS Update.

14.4 Incorporating Mitigation Plan Requirements into Other Local Planning Mechanisms

The effects of high winds and storm surge flooding associated with hurricanes are recognized by everyone in Monroe County as significant hazards. All local governments acknowledge those risks in all local plans. Chapters 7 through 12 describe how Monroe County and the cities of Key West, Marathon, Key Colony Beach, Layton, and Islamorada address hazards as part of their current planning mechanisms and processes, including comprehensive plans, land development, infrastructure design, and public outreach. The 2010 Update of the LMS did not reveal any significant gaps in how hazards are addressed in existing planning mechanisms and processes.

To assure continued incorporation of the goals of the LMS, the LMS Working Group members from the local jurisdictions will participate in the internal processes that each jurisdiction will follow to review and revise its comprehensive plan, comprehensive emergency management plans, and wildfire protection plans.

Many mitigation initiatives are capital projects. Implementation of site-specific projects usually is dependant upon the availability of funding (see Section 13.7 for sources of funding). When those initiatives are prioritized and funding is sought, each jurisdiction will comply with its existing rules regarding inclusion of projects in its Capital Improvement Plan or other budget and planning document or process.

14.5 2010 Update

The LMS Working Group reviewed and updated the pertinent sections. Some of the more significant changes include:

- Section 14.2: Noted that annual reports were submitted.
- Section 14.3: Outlined steps in the update process.
- Section 14.4: Noted the LMS Working Group members will contribute to their respective comprehensive planning processes to ensure that hazards and mitigation objectives are incorporated.

APPENDIX A: LMS Working Group Agendas & Meeting Minutes

MEMORANDUM

TO: Monroe County LMS Workgroup

FROM: Jerry O'Cathey, Chair, Monroe County LMS
Rebecca Quinn, planning consultant

DATE: August 3, 2009

RE: LMS Update Memo #1
LMS 5-Year Update Process

As we discussed at the last meeting, this year we need to start the process to update the LMS. The current LMS was approved by FEMA on November 16, 2005. The State of Florida requires counties and municipalities to develop local mitigation strategies to be eligible for various mitigation grant funds, including all of FEMA's mitigation grant programs. The Federal statutory authorities for those programs also require that local mitigation plans be updated every five years in order to maintain specifies that to continue eligibility.

FEMA's guidance for local mitigation planning offers the following summation (online at http://www.fema.gov/library/viewRecord.do?id=3336):

Plan Updates

The mitigation planning regulations at *§201.6(d)(3)* directs the update of Local Mitigation Plans:

> *A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.*

Local Mitigation Plans must be updated and resubmitted to FEMA for approval every five (5) years in order to continue eligibility for FEMA hazard mitigation assistance programs. Plan updates must demonstrate that progress has been made in the past 5 years for Local Mitigation Plans to fulfill commitments outlined in the previously approved plan. This involves a comprehensive review and update of each section of the Local Mitigation Plan and a discussion of the results of evaluation and monitoring activities detailed in the *Plan Maintenance* section of the previously approved plan. Plan updates may validate the information in the previously approved plan, or may involve a major plan rewrite. A plan update is NOT an annex to the previously approved plan; it stands on its own as a complete and current plan.

Section 14.3 of the LMS is shown below; it anticipates the Work Group will begin the evaluation and review 2009. Further below is an overview of the update process and a target schedule. Attachment A shows the Scope of Work for consultant services. We're pleased to announce that Rebecca Quinn will once again work with us to revise and update the LMS.

14.3 Five-Year Revision

A comprehensive review of and revisions to the LMS will be conducted on a five-year cycle. In part, this revision will be to incorporate the material collected for the annual updates. Because the LMS is adopted in 2005, it will enter the next evaluation and review cycle sometime in 2009, with adoption and publication anticipated in 2010.

The Monroe County LMS Work Group will involve the public in the LMS revision process in the same manner used during the 2005 revision. The public will be notified when the revision process is started and provided the opportunity to review and comment on changes to the LMS. It is expected that a combination of informational public meetings, surveys and questionnaires, draft documents posted on the web site, and/or public Council meetings may be undertaken.

Overview of LMS Update Process and Requirements (summarized from FEMA's plan review crosswalk):

1. Follow the same multi-step process.
2. Extend opportunity for "agencies, businesses, academia, nonprofits, and other interested parties to be involved."
3. Update the hazard history to capture events that occurred since the previous plan. Andrew Devanas with the National Weather Service Office Key West has offered assistance.
4. Determine whether the risk assessment is adequate for the specific purposes of the LMS (FEMA encourages – but does not require – risk assessments to "describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities . . . in terms of an estimate of the potential dollar losses").
5. Explicitly "document how the planning team reviewed and analyzed each section of the plan and whether each section was revised."
6. Update description of each jurisdiction's participation in the NFIP and "identify, analyze and prioritize actions related to continued compliance with the NFIP."
7. Include content for each community to "describe vulnerability in terms of the types and numbers of repetitive loss properties."
8. Identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged/deferred, describe why no changes occurred.
9. Extend opportunity to the public to comment on the plan during drafting and prior to approval.
10. Adopt the revised plan (required, even if only minor revisions are made).

Target Schedule for the LMS Update (also refer to Attachment A):

- **August Meeting**: Review schedule for the update; discuss the update process and requirements (see below); and make initial assignments.
- **September:** Workgroup members will review existing content (Chapter 5 and Chapter 6); local government members will review the "Hazards and Risk" sections in their specific chapters. Discuss with and report to consultant.
- **October:** Local government members will review their specific chapters (Chapter 7 through Chapter 12). Discuss with and report to consultant.
- **November Meeting:** Discuss Mitigation Goal Statement. Review and discuss revisions to Chapters 1 through 12 resulting from reviews. Discuss progress on mitigation actions and identification of new actions to consider.
- **December/January:** Circulate draft for review and comment.
- **February Meeting:** Final discussion and prioritization of mitigation actions.
- **March:** Make draft updated plan available for public comment; hold public meeting.
- **April 1, 2010:** Target date to deliver the updated plan to DEM for review (while resolutions of adoption are being processed).
- **June 1, 2010:** Target date to deliver updated plan to FEMA for review and approval.
- **November 16, 2010:** Deadline for receipt of FEMA's approval.

Assignments for the Work Group:

Assignments will be distributed according to the Target Schedule. The first assignment will be distributed before September 1, 2009. Work Group members will work directly with Rebecca on these assignments, leading the drafts and decision items that we will take up at future meetings.

RQ

Attachment A

Monroe County Local Mitigation Strategy Update

Consultant's SOW Tasks	Status Notes (as of xx/xx/09)
Task 1 – Hazard Identification and Risk Analysis (HIRA) 1. Review the HIRA and identify areas that need revision 2. Collect events since adoption of the LMS 3. Consider whether need to expand content about technological hazards 4. Determine if the HIRA inventory adequately captures historic and cultural resources 5. Determine if aspects of the risk assessment need to be updated (performing GIS-based updates is not anticipated)	
Task 2 – Capability Assessment & Other Plans 1. Review capability assessments that describe agency functions and how hazard are addressed, interview appropriate county and city staff, identify changes in programs and policies, review other plans of the county and cities 2. Review LMS annual reports for revisions to incorporate 3. Review State Hazard Mitigation Plan to identify updates appropriate for consistency 4. Draft revisions to pertinent sections of the LMS	
Task 3 – LMS Work Group Meeting #1 & Mitigation Actions 1. Work Group meeting #1: review HIRA and revisions; review Mitigation Goal Statement; review changes in capability assessment 2. Review progress on mitigation actions 3. Incorporate revisions in the LMS and circulate for comment	
Task 4 – LMS Work Group Meeting #2 & Draft LMS Revisions 1. Work Group meeting #2: review all revisions; summarize substantive comments; consider new programmatic actions and prioritize 2. Prepare final draft revised LMS 3. Make LMS available for public review and solicit comments 4. Hold public meeting, report comments to LMS and address, if necessary	
Task 5 – Final Draft LMS and LMS Adoption 1. Prepare LMS for submission to the Board of County Commissioners and City Councils for adoption. 2. Submit LMS to Florida DEM for review and comment; incorporate 3. Initiate adoption process; submit to FEMA for review and approval 4. Deliverables: digital and hardcopies	

RE: Minutes of the August 20 Conference Call
Monroe County LMS

Participants:

Jerry O'Cathey:	Monroe County Emergency Management
Lisa Watson:	City of Marathon Fire Rescue / Emergency Management
Jerry Buckley:	Village of Islamorada, Principal Planner
Dianne Bair:	Monroe County Growth Management, Flood Plain Mgr.
Laura Herbert:	FDEM, Mitigation- Planner IV
Rebecca Quinn:	RC Quinn, Inc., LMS consultant

This conference call was scheduled to review the LMS Update Memo #1 distributed on August 4. The memo provides an overview of the LMS update process, a target schedule, and the form that Rebecca will submit to Jerry to track progress. The following items were discussed:

1. Both FEMA and State regulations require that local mitigation strategies be updated every 5 years. The work group must examine each section, and a summary of the update process must be included. The entire updated plan must be adopted by every jurisdiction, not just a summary of the updates.
2. FEMA's guidance for updates is available on the Monroe County webpage, @ (http://monroecofl.virtualtownhall.net/Pages/MonroeCoFL_Emergency/LMS) along with the plan review crosswalk that both DEM and FEMA use.
3. A new requirement is to address "continued compliance with the NFIP." DEM distributed a memo that offers suggestions for addressing this requirement.
4. FEMA puts emphasis on the requirement for public notice and involvement. Jerry will assure that notice of the November LMS meeting is made public through print media dissemination. Rebecca suggests that the government members submit a notice to their councils to advise the public that the update process has been initiated and how to get more information (a draft of this item will be offered).
5. Rebecca will soon distribute the first assignments for the government work group members, requesting that they review their specific chapters (chapters 7 through 12). This should be done in September.
6. Jerry noted that Andy Devanas of the Key West National Weather Service office offered to help. He is reviewing Chapter 5 (Hurricanes & Coastal Storms), Chapter 6 (Other Hazards & Risks), and subsections ".3" in each of the community chapters. His suggested changes will be provided for review by the work group, which will be the second assignment, which should be done in October.

7. Dianne and Jerry will check that the County's GIS will provide support for maps. We will reexamine hazard information that is available and that can be displayed on a map (e.g., FEMA flood maps). We will have maps that show the locations of properties that FEMA identifies as "repetitive loss" properties (have received 2 or more flood insurance claim payments).
8. Appendix A of the 2005 LMS lists the data fields to be completed for "critical facilities." At some point, the government members will need to review whatever data have been input to that spreadsheet and the maps in the 2005 LMS will be updated (Figs 2.2a-f).
9. Rebecca will work with Jerry and DEM to obtain data on events that have occurred since 2005.
10. The next LMS Work Group meeting has been confirmed to be:

Thursday, November 12, 2009 - 9:30 AM to Noon	Local Mitigation Strategy Working Group (LMSWG) Meeting	This meeting will be at the Marathon Fire Station, Department Meeting Room, 8900 Overseas Highway (Bayside), Marathon

11. The target schedule as outlined in the August 4 memo anticipates having a final draft available for public comment and a public meeting in March 2010, with delivery to DEM by April 1, 2010.
12. LMS Working Group members who were unable to participate in this conference call will be contacted by Rebecca Quinn on another scheduled conference call or on an individual basis.

These minutes will be distributed to the LMS Working Group for their edification and reference.

Monroe
County
Emergency
Management

490 63rd Street
Ocean Suite 150
Marathon, FL 33050

Bus: (305) 289-6018
Fax: (305) 289-6333

MINUTES

Local Mitigation Strategy Working Group Meeting

Marathon Fire Station
8900 Overseas Highway
Marathon

Thursday, November 12, 2009
9:30AM - NOON

Working Group Discussion consisted of the following:

- Introductions
- Purpose of meeting, i.e., 2010 LMS update / revision
- Importance of LMS WG participation and contribution was stressed
- Importance of LMS WG members to inform their respective commissioners, or boards, that the LMS Plan is currently undergoing its FEMA required 5-year revision and that their participation and contributions are important to future HMGP applications. It was suggested that for those that have not already done so, the date at which the notification was to be presented to these entities be forwarded to Rebecca Quinn, LMS Consultant, for inclusion in the LMS updated plan.
- The date, place, and time of the next, and future, LMS WG meetings, will be placed, not only on the Monroe County Emergency Management Website (http:monroecofl.virtualtownhall.net /Pages/MonroeCoFL_Emergency/LMS) as a Public Notice, but also, in the local print media as a public service.
- LMS approval process: Formal adoption of the plan may be completed prior to submission to FEMA for review, by formal resolution, or some other approved documentation indicating adoption, and then submitted to FEMA and DEM with Letters of Approval. If approved, a signed FEMA approval letter will follow.

- WG was cautioned about accurately identifying hazards or vulnerabilities within their jurisdiction(s) and the new FEMA requirement identifying the actions which have been taken to counter, or mitigate, these threats, e.g. Wildfire vulnerability.
- Request of the Working Group, particularly the jurisdictions, to review the Chapter 5 & 6 homework "strikethroughs" and provide, to Rebecca Quinn, the appropriate and correct input
- It was noted that while 9G-22 (Hazard Mitigation Grant Program) requires "A list of repetitive loss structures," this directive is, in fact, prohibited by the Privacy Act.
- In the next 5 years, newly evolving FEMA derived Risk Assessment Models will be used for LMS Working Group planning and analysis.
- For Tables 5-9 to 5-17 (TAOS Damage Projections) it was recommended, for purposes of clarity and illustration, that a breakdown be requested from the County Tax Assessors Office by which to provide the conversion from numerical values to percentage representations. *Table 5-9, SMHP Summary: Impacts of Hurricanes in Monroe County (2007)* and *Figure 5-3, Single Family Home Values in Monroe County* needs the inclusion of Hurricane Wilma figures.
- Where appropriate (in Chapters 5 & 6) include the effects of 2005 Hurricane Wilma on incorporated and unincorporated Monroe County, e.g. utilities, communication, transportation, etc.
- The accuracy of selected Coastal Erosion (6.6) locations is questioned, regarding DEP selective input vs. more realistic, all-county exposure and vulnerability. Further inquiry by RC Quinn Consulting will follow.
- Questions regarding Public Assistance (PA) data should be directed to the FDEM, Monroe Coordinator, Ms. Lorraine Foley Stuart @ Office: 407-790-6590 / E-mail: lorraine.foley-stuart@em.myflorida.com
- In response to questions regarding current Monroe County Water Restrictions please reference attached November 2009 Restriction Guidance.

PLEASE FIND ATTACHED A ROSTER OF THOSE WHO WERE ABLE TO ATTEND THIS MEETING. THE EFFORT TAKEN TO ATTEND, AND THE PARTICIPATION PROVIDED, IS MOST APPRECIATED AND NECESSARY TO OUR MITIGATION FUNDING INITIATIVES.

MONROE COUNTY EMERGENCY MANAGEMENT

EVENT: Local Mitigation Strategy Meeting
DATE: 11.12.09
TIME: 0930 to 1200

NAME (Print)	SIGNATURE	ORGANIZATION	PHONE #	E-Mail
J.L. O'Cathey		MC Office of Emergency Management	305-289-6012	Ocathey-jerry@monroecounty-fl.gov
Alary Luttazi		MC Office of Emergency Management	305-289-6018	Luttazi-alary@monroecounty-fl.gov
Jose Tezanos		MC Office of Emergency Management	305-289-6325	Tezanos-jose@monroecounty-fl.gov
Gary Bowman		City of Key West	305-809-3901	gbowman@keywestcity.com
Lisa Watson		City of Marathon	305-743-5266	Watson@marathonfire.net
George Garrett		City of Marathon	305-743-0033 X4111	Garrettg@ci.marathon.fl.us
Ed Borysciewcz		City Key Colony Beach	305-289-1212	cityclerk@keycolonybeach.net
Skip Haring		City of Layton	305-664-4667	skipharing@juno.com
Jerry Buckley		Village of Islands, Islamorada	305-664-6423	Jerry.buckley@islamorada.fl.us

NAME (Print)	SIGNATURE	ORGANIZATION	PHONE #	E-Mail
CRAIG MARSTON		KWFD	305. 809.3942	CMarston@KeyWestCity.com
Rebecca Quinn		Consultant	434-296-1349	rcquinn@earthlink.net
MARY WINGATE		Monroe County	D. BAIR 305 289 2518	For D. BAIR BAIR-DIANNE@MonroeCounty-FL.gov
BOB STONE		MCPW	289-6077	STONE-BOB@MONROECOUNTY-FL.GOV

MEMORANDUM

TO: Monroe County LMS Working Group

FROM: Jerry O'Cathey, Chair, Monroe County LMS
Rebecca Quinn, planning consultant

DATE: April 19, 2010

RE: Agenda for LMS Working Group meeting on April 26

The Monroe County LMS Working Group will meet on April 26, 2010 at 9:30 a.m. at the Marathon Regional Government Center, 2798 Overseas Highway.

Please review the Draft Chapter 13 that was distributed with the announcement of the meeting. Also please review the following agenda before the meeting:

(A) Review draft Chapter 13, which describes the process used to maintain the list and also lists actions for the Working Group as a whole.

(B) Review status of 2005 Mitigation Actions reported in Chapter 13.

(C) Discuss possible new actions for the Working Group as a whole (please review the suggestions below before the meeting).

(D) Review the revisions to the two forms that we use to put projects on the list and the "LMS Project Prioritization Form." The most significant changes are in the "Characterization Form" which we're proposing be simplified considerably, especially for projects that don't yet have a computed Benefit to Cost Ratio, the form is set up so that an approximate B:C is estimated.

(E) Review the instructions to update the current mitigation projects lists. Hardcopies of the initiatives list (and instructions) will be distributed and updates should be returned by May 7.

(F) Review schedule to complete the LMS Update by the deadline: Must be adopted and approved by FEMA before mid-November

1. Return comments on today's assignments and incorporate into the document. 2 weeks
2. Distribute the entire LMS with major changes shown in <track changes>; convene a conference call of LMS WG members to concur with release of the update for public review. 1 week
3. Place the Public review Draft on the County's webpage and send hardcopies to the County & cities to make available for public review. 1 week
4. Send to DEM for initial review.

5. Select date of public meeting; publish availability of the Public Review Draft in local papers; issue press release. How much lead time? Usually 2 weeks
6. Hold public meeting; collect all comments from public review. 1 week
7. Respond to public comments and DEM comments; prepare final LMS. 1 week (3 weeks)
8. Submit to FEMA for review (FEMA will review and may tentatively approve pending final adoption by all jurisdictions).
9. County and cities to determine when to initiate formal process for adoption (draft resolutions of adoption to be provided).

(G) Comments by the public.

THE FOLLOWING SUGGESTIONS for the Working Group as a whole are phrased as actions for the purpose of discussion. The Working Group will decide whether to accept any specific action.

1. The Working Group will review how at least two other LMS Working Groups manage their regular business (e.g., written procedures), determine if it is appropriate for the Monroe LMS Working Group to develop operating procedures, and if determined appropriate, develop such procedures. Operating procedures might address such items as posting public notices of meetings, basis for not holding a required quarterly meeting, basis for determining when a meeting may be held by conference call, location of meetings, composition of the project ranking subcommittee, submission of updates to the LMS coordinator to compile for the State-required annual report, etc.

2. The Working Group will do a comprehensive review of the websites of all local jurisdictions (and nonprofit?) to identify content related to natural hazards (hurricane, flood, tornado, drought, and wildfire. Recommend revisions to improvement content and for consistency. Explore whether a single site would be more effective, with other webpages linked to it. *[NOTES: This would make a good project for a college intern.]*

3. The Working Group will evaluate the Hazard Identification and Risk Assessments that were prepared in at least three other counties and determine whether using different tools would likely significantly improve the outcomes reflected in the 2010 Update, which continues to use the TAOS results from 1999. *[NOTES: Keep in mind the purpose of the hazard identification and risk assessment – largely to help prioritize efforts. The rationale we've used to retain the previous HIRA is found in text proposed for chapter 5, which states that* "The Working Group discussed the fact that the hurricane "risk assessment" information in this Chapter is based on the 1998 TAOS damage projections and concluded that those estimates remain acceptable for the purpose of indentifying and prioritizing mitigation actions. It was also noted that the results of the update of the hurricane storm surge modeling (SLOSH) are expected some time in 2010."

MINUTES

Local Mitigation Strategy Working Group Meeting

Marathon Fire Station
8900 Overseas Highway
Marathon

April 26, 2010
9:30AM - NOON

Working Group Discussion consisted of the following:

- Draft Chapter 13 (Initiatives) was distributed with the announcement of the meeting. Chapter 13describes the process used to maintain the mitigation initiatives lists which includes initiatives submitted by Working Group members and also lists actions for the Working Group as a whole.

- Reviewed the status of 2005 Mitigation Actions reported in draft Chapter 13.

- Discussed possible new actions for the Working Group as a whole (see below for suggestions discussed).

- Reviewed the revisions to the two forms that we use to put projects on the list and the "LMS Project Prioritization Form." The most significant changes are in the "Characterization Form" which we're proposing be simplified considerably, especially for projects that don't yet have a computed Benefit to Cost Ratio, the form is set up so that an approximate B:C is estimated.

- Reviewed the instructions to update the current mitigation projects lists. Excel files with each members initiatives will be distributed.

- Discussed mitigation grants, noting that HMGP is post-disaster, FMA and SRL are funded each year, and PDM is annual but extremely competitive (only 5 projects from Florida are submitted by the State;, of those, at least one project is funded).
- Recent "repetitive loss property" data from the NFIP were shared. In the County and towns, a total of 912 properties, of which 289 currently are not insured by the NFIP. To be eligible for FEMA grants, properties must have a federal flood insurance policy at the time the grant is submitted.
- A question about including individual properties on the Initiatives List was discussed. The County, and municipalities, may submit individual properties to the Initiatives Lists. However, only for projects submitted for the HMGP and PDM grant programs is the Working Group required to indicate that the project is ranked, and consistent, with the LMS Goals.
- Reviewed schedule to complete the LMS Update by the deadline. The LMS must be adopted and approved by FEMA before mid-November. The major steps include:

1. Return comments on today's assignments and incorporate into the document.
2. Distribute the entire LMS with major changes shown in <track changes>; convene a conference call of LMS WG members to concur with release of the update for public review.
3. Place the Public review Draft on the County's webpage and send hardcopies to the County & municipalities to make available for public review.
4. Concurrent with making it available for public review, send to DEM for review.
5. Select date of public meeting; two weeks in advance, and, publish availability of the Public Review Draft in local papers and issue press release to that effect.
6. Hold public meeting; collect all comments from public review.
7. Respond to public and DEM comments; prepare final LMS.
8. Submit to FEMA for review (FEMA will review and may tentatively approve pending final adoption by all jurisdictions).
9. County and municipalities will determine when to initiate formal process for adoption (draft resolutions of adoption to be provided).

- Comments by the public (Mr. John November and Mr. Mike Stazzone) included questions about specific properties and eligibility under specific grant programs. Subsequent to the LMS Working Group meeting County staff met with two citizens to address their respective inquiries

THE FOLLOWING SUGGESTIONS for the Working Group as a whole are phrased as **Actions** for the purpose of discussion. The Working Group discussed as follows:

1. The Working Group will review how at least two other LMS Working Groups manage their regular business (e.g., written procedures / by-laws), determine if it is appropriate for the Monroe LMS Working Group to develop operating procedures, and if determined appropriate, develop such procedures. Operating procedures might address such items as posting public notices of meetings, basis for not holding a required quarterly meeting, basis for determining when a meeting may be held by conference call, location and scheduling of meetings, composition of the project ranking subcommittee, submission of updates to the LMS coordinator to compile for the State-required annual report, etc. CONCLUSION: Agreed. The discussion also covered the need to address establishing a procedure to handle many requests for private property owners. The Working Group will talk with DEM and other counties to determine how they prioritize and process many requests. Monroe County has a checklist that homeowners use to gather building-specific information; this checklist will be reviewed and modified if appropriate.

2. The Working Group will do a comprehensive review of the websites of all local jurisdictions (and nonprofit?) to identify content related to natural hazards (hurricane, flood, tornado, drought, and wildfire. Recommend revisions to improvement content and for consistency. Explore whether a single site would be more effective, with other

webpages linked to it. CONCLUSION: Do not call out as separate action because this is part of ongoing work by all LMS members.

3. The Working Group will evaluate the Hazard Identification and Risk Assessments that were prepared in at least three other counties and determine whether using different tools would significantly improve the outcomes reflected in the 2010 Update, which have continued to use the TAOS results from 1999. The 2010 Update will, per the National Weather Service Office, Key West, Science and Operations Officer, Andrew Devanas, reflect the fact that all future hurricane "risk assessment" information in this Chapter will be based on the updated *Sea, Lake, and Overland Surge from Hurricanes* (SLOSH) damage projections for the purpose of indentifying and prioritizing mitigation actions.

From: Ocathey-Jerry
To: Ocathey-Jerry
Date: 7/13/2010 2:05:09 PM
Subject: LMS Government Working Group Members

LMS Working Group Partners,

We are nearing the end of the 2010 LMS Update process - which must be completed before November in order to maintain eligibility for certain FEMA funding.

We have scheduled a conference call of the LMS Working Group government members for Friday, July 23rd at 9:30 am. The call-in number is 213-289-0500 PIN 513989. The purpose of the call is to discuss any substantive changes you may have to the Public Review Draft, and to get concurrence for releasing the draft for public review. Please plan to join the call - we must have at least four of the 6 local governments participate before we can take the next step. Download the LMS by clicking here {NOTE - this file will be available for only one week - please download it now!} http://www.floodmaps.net/eftp/files/898294067_MC-LMS_2010_Update_PublicReviewDraft_071310.pdf

The Public Review Draft of the LMS shows the more significant new/revised texts in underlined and red text. If you have minor, editorial comments, or substantive comments please email them to Rebecca Quinn at rcquinn@earthlink.net. or FAX to (320) 514-3513. She will compile the substantive comments for discussion on the 23rd. After the Working Group approves making it available to the public, we will accept all changes to create a "clean" document. For public review, the LMS Update will be posted on the County's webpage. Hardcopies will be placed in the public libraries and each city will receive a hardcopy to have available to any citizen who wishes to view it in person.

The public meeting will be during the week of August 16. We will distribute the specifics when we have them.

Thank you,

Jerry

Jerald L. O'Cathey, FPEM, CPM, MA
Emergency Management Administrator

Office:(305) 289-6012
Cell: (305) 797-1167
E-Mail: Ocathey-jerry@monroecounty-fl.gov

MINUTES

Local Mitigation Strategy Working Group Meeting

Conference Call

July 26, 2010
9:30AM

Representatives on the call:

Monroe County (Emergency Management & Growth Management)
Islamorada
Key Colony Beach
Layton

This call was originally scheduled for July 23; representatives not able to join the call because of pending emergency situation: Marathon, Key West.

Working Group Discussion consisted of the following:

- The "Public Review Draft" was circulated to the LMS WG about a week before the call. Two members identified minor changes.
- There will be another chance to make changes, because (a) we'll consider comments submitted by the public; and (b) we'll get comments from DEM.
- The Public meeting is scheduled for August 16 at 3:30pm at the Monroe County EOC in Marathon. The presentation will be brief.
- Press release will be posted on the County's webpage and distributed to news papers, who will be asked to run the announcement.
- Hardcopies will be provided to each government member to make available for public comment.
- Hardcopies will be sent to the five public libraries; Jerry O'Cathey has asked that they be accessible to the public.
- The Public Review Draft will be accessible online.
- Next steps:
  1. Print the hardcopies and deliver; post on the web
  2. Send to DEM for review.
  3. Hold public meeting and receive comments no later than August 20
  4. Address comments; LMS concurrence
  5. Deliver to DEM to transmit to FEMA for review
  6. Provide government members the draft resolution for adoption; initiate adoption process
  7. Receive and address FEMA comments
  8. LMS WG concurrence with changes
  9. Adoption & final approval by FEMA

From: Tezanos-Jose
To: Ron Sutton; marstonc@keywestcity.com; Haring-Skip; cherylcioffari; Watson, Lisa MARFR
Cc: Ocathey-Jerry; rcquinn@earthlink.net
Date: 9/28/2010 10:43:34 AM
Subject: FW: For LMS conf call - to be scheduled

Dear LMS Working Group:

We are coming to the end of the planning process to update the LMS by mid-November 2011. The draft update you saw last was provided to DEM for review and we have received DEM's comments. The attached PDF includes only the chapters that have suggested edits prepared to address those comments. The edits are shown in <track changes>. The edits in Chapter 11 were made at the request of Cheryl Cioffari.

Please attend a brief conference call on **Wednesday October 6th, 2010 at 9:30 a.m., DIAL-IN 1-213-289-0500, CODE 513989**. The purpose of this call is to allow you to ask questions about the proposed changes and to approve the changes for the purpose of forwarding the LMS to FEMA for review. During the call we will also review the draft resolution of adoption, which I'll send in a separate email.

Thank you,

Jose and Jerry

Please take a moment to complete our Customer Satisfaction Survey: http://monroecofl.virtualtownhall.net/Pages/MonroeCoFL_WebDocs/css Your feedback is important to us!

Please note: Florida has a very broad public records law. Most written communications to or from the County regarding County business are public record, available to the public and media upon request. Your e-mail communication may be subject to public disclosure.

MINUTES

Local Mitigation Strategy Working Group Meeting

Conference Call

October 6, 2010
9:30AM

Representatives on the call:

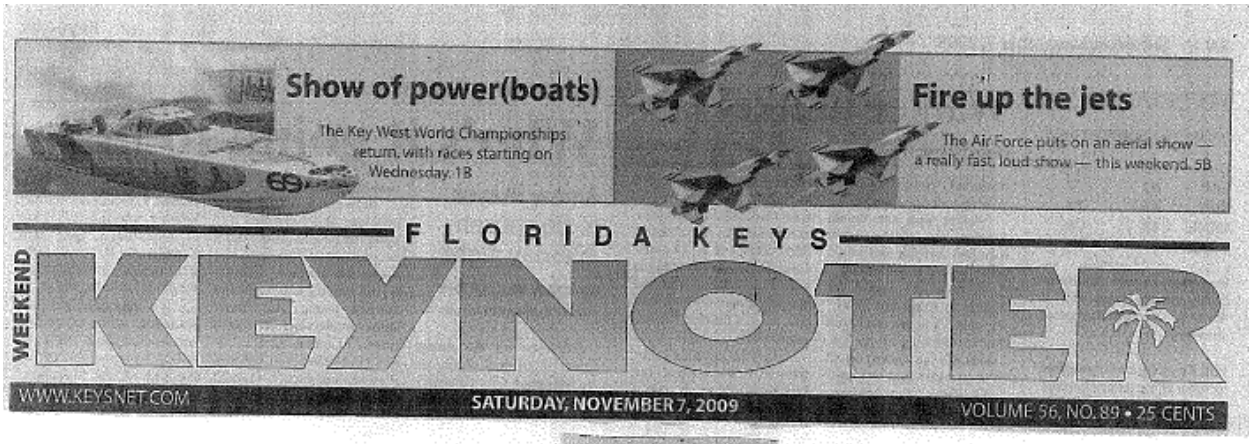
Monroe County (Emergency Management & Growth Management)
Islamorada
Key Colony Beach
Key West
Layton

Working Group Discussion consisted of the following:

Prior to the conference call the government members were provided a copy of the LMS with all proposed changes shown in <track changes> and a draft resolution of adoption.

- The revisions prepared in response to comments and recommendations made by the Florida Division of Emergency Management were explained. The revisions are essentially non-substantive and do not change the priority hazards identified by the LMS.
- A minor duplication of text was pointed out and corrected.
- The members present concurred with the changes.
- Pending receipt of one piece of information on average acreage of wildfires experienced since 2000 and largest area affected since 2000, the LMS will be finalized and provided to the Working Group for moving forward with adoption.
- The draft resolution of adoption was reviewed and no questions were asked.
- Regarding initiating adoption:
  - Monroe County will initiate the adoption process when the final LMS is provided
  - Key Colony Beach is scheduled to adopt on October 14
  - Layton is scheduled to adopt on November 4
  - Islamorada will initiate the adoption process when the final LMS is provided
  - Key West will parallel the County's adoption process
  - Marathon was not present
- Next steps:
  1. Finalize the LMS and deliver to the Working Group for adoption
  2. Transmit the LMS to DEM to forward for FEMA review
  3. Incorporate signed resolutions of adoption as they are received
  4. Receive and address FEMA comments, if necessary before FEMA issues final approval letter.

APPENDIX B: PUBLIC NOTICES



Show of power(boats)

The Key West World Championships return, with races starting on Wednesday. 1B

Fire up the jets

The Air Force puts on an aerial show — a really fast, loud show — this weekend. 5B

FLORIDA KEYS
WEEKEND
KEYNOTER
WWW.KEYSNET.COM SATURDAY, NOVEMBER 7, 2009 VOLUME 56, NO. 89 • 25 CENTS

Mitigation plan up for discussion

The Monroe County Local Mitigation Strategy Working Group meets in a public-forum format at 9:30 a.m. Nov. 12 at the fire station at Florida Keys Marathon Airport.

Discussion will focus on the federally required five-year update of the county's and Keys municipalities' strategy to develop and adopt a plan to mitigate against possible damage from disasters.

From: Ocathey-Jerry
Date: 4/15/2010 9:40:29 AM
Subject: Monroe County LMS Press Release Request

Media partners,

It will be greatly appreciated if, as a public service, you would publish the following announcement in your respective publications.

If there is any further information you would like to have regarding this request, or the Local Mitigation Strategy revision process, please contact me at the enclosed telephone number or email address.

We thank you in advance for your continued assistance regarding these necessary media releases.

Jerry

Message will read:

The Monroe County Local Mitigation Strategy Working Group will be convening at the following location, date, and time, in order to review, for update purposes, our FEMA required, 2010 LMS Revision:

Location: Marathon Regional Government Center
2798 Overseas Highway
Second Floor, EOC
Marathon, FL

Date: Monday, April 26, 2010

Time: 9:30 AM to 12 Noon

As noted, this meeting will be held for the primary purpose of addressing the remaining, required, steps for the LMS update process. Following receipt of the requested information, a "public review" LMS draft will be created to be followed by a meeting to solicit input from the public at large.

For further information, please contact Jerry O'Cathey, Administrator, Monroe County Emergency Management Department, at (305) 289-6012 or, Ocathey-jerry@monroecounty-fl.gov.

PRESS RELEASE

For immediate release:
Resend: August 10, 2010

For more information, contact:
Jerald L. O'Cathey
490 63rd Street, Ocean, Ste. #150
Marathon, FL.
Office: (305) 289-6012
E-mail: Ocathey-jerry@monroecounty-fl.gov

Public Meeting to Review and Comment on Draft Local Mitigation Strategy

MARATHON, FL – The Monroe County Local Mitigation Strategy Working Group invites citizens and residents to attend a public meeting to review and comment on the draft Local Mitigation Strategy. The meeting will be on August 16, 2010, 3:30 p.m. to 5 p.m., at Marathon Board of County Commissioners conference room located bayside, at the Regional Government Center, 2798 Overseas Highway, Marathon, Florida.

The draft strategy is required by the State and the Federal Emergency Management Agency. It is an update to the strategy that was adopted in 2005. The strategy was prepared by a working group of County agencies and officials from Islamorada, Key Colony Beach, Key West, Layton, and Marathon that are involved in various facets of hazard mitigation, disaster response and recovery operations. Copies of the draft document will be available for review at the Monroe County Emergency Management Department, located at 490 63rd Street, Ocean, Suite #150, Marathon, and in the city hall or administrative building of each city. Copies will also be placed in the County's five public libraries. It may also be viewed on the County's homepage at http://monroecofl.virtualtownhall.net/Pages/MonroeCoFL_Emergency/LMS, from this point, scroll down to LMS Toolbox and select the last item and look under LMS 2010 Update Public Review Draft 072610.

Please submit comments by August 20, 2010. Comments may be submitted by FAX to RCQConsulting at (320) 514-3513 or, by sending an e-mail to at Rebecca C. Quinn at rcquinn@earthlink.net.

Keys Life
Florida Keys Keynoter
Sports & Outdoors • Fishing
Community • Lifestyle
B
WWW.KEYSNET.COM
WEDNESDAY, JULY 28, 2010
CLASSIFIEDS INSIDE 4B

Opinion & Editorial

NEWS BRIEFS

Mitigation plan up for review

What's called the Monroe County Local Mitigation Strategy Working Group hosts a public meeting from 3:30 to 5 p.m. Aug. 16 at the Marathon Government Center to review and comment on the draft local mitigation strategy.

That strategy to deal with hazard mitigation, disaster response and recovery operations is required by the state and the Federal Emergency Management Agency. The strategy was prepared by a working group of county agencies and officials from Islamorada, Key Colony Beach, Key West, Layton and Marathon, and adopted in 2005. It now needs to be updated.

Copies of the draft document are available for review at Monroe County Emergency Management, 490 63rd St. ocean, Suite 150, Marathon; and in the administrative building of each Keys municipality. Copies will also be placed in the county's five public libraries.

Submit comments by Aug. 20 to RCQConsulting. The fax number is (320) 514-3513. Or send an e-mail to Rebecca C. Quinn at rcquinn@earthlink.net.

Revising the Local Mitigation Strategy For 2010

Public Meeting Agenda

- Planning Process
- Identified Hazards
- Proposed Mitigation Actions
- Opportunity to Comment

What is Mitigation?

- Actions taken to reduce or eliminate the long-term risk to life and property from hazards.
- Actions intended to reduce the need for emergency response – as opposed to improving the ability to respond.

Why Mitigation Planning?

- Required by State rules
- Build on federal and State support
  - Reduce impacts of disasters
  - Prepare now for future disasters
  - Qualify for programs and funding

LMS Work Group Members

- Work Group includes:
  - Monroe County
  - Key West, Key Colony Beach, Layton, Marathon and Islamorada
  - Electric utilities
  - FL Keys Aqueduct Authority
  - Several non-profit organizations

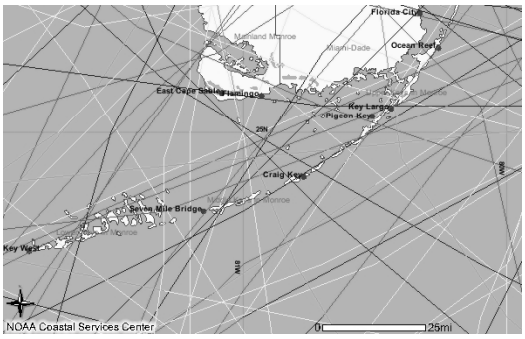
The Planning Process

- Identify hazards
- Identify at-risk people & property
- Evaluate what we're doing now to reduce future damage
- Consider alternatives – what else can be done?
- Get input from citizens

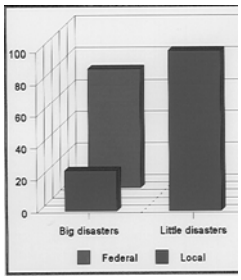
Notable Hazard Events (48 yrs)

2008: Tropical Storm Fay
2005: Hurricanes Dennis, Katrina, Wilma
2004: TS Bonnie, Hurricanes Charley, Ivan
2003: Severe Cold Weather
2000: Storms & Flooding
1998: Hurricane Georges & TS Mitch
1998: Fire Hazard
1998: Tornadoes & Flooding
1992: Hurricane Andrew
1972: Tropical Storm Agnes
1965: Hurricane Betsy
1960: Hurricane Donna

Hurricanes since 1950



Public Costs of Big Disasters



- Local government covers up to 25% of costs to clean-up, repair damage, and overtime
- County & City employees tied up by recovery
- Federal & state taxes help pay for recovery

Uncounted Costs of Disasters

- "Little" events don't qualify for federal assistance
- Home and business disaster grants don't cover all costs
- Lost tourism income
- Environmental damage

Monroe/Keys Hazards

- Area-wide:
  - Wind (Hurricane, Tornado)
  - Surge Flooding
- Localized Impacts:
  - Drainage problems
  - Wildland fire

For Each Hazard . . .

- We look at what is being done now to reduce future damage – and what else might we do?

Wind Hazards

- Every building in the Keys is exposed to high winds
- Code requirements for new buildings:
  - Requires design for 159 mph wind speed
  - Impact resistant windows & doors
  - Manufactured home tie-downs

Wind Generated Missiles

Example of Wind Mitigation

- Install window protection (shutters, barriers, impact resistant assemblies
- Improve “load path” (roof-building-foundation)
- Anchor roof-mounted equipment

Flood Hazards

- What do we know about flood-prone people and property?
  - The majority of buildings in the Keys are in the mapped floodplain
  - About 36,700 are covered by Federal flood insurance
  - Worst-case storm surge would likely affect nearly every part of the Keys

Surge Affects Everyone

Flood Hazards

- Monroe County & Cities administer floodplain management regulations
  - New construction & major improvements/additions must meet code
  - Elevation above predicted flood level
  - Special requirements for enclosures

Victims of Storm Surge

Examples of Flood Mitigation

- Elevate older homes, or build new 2nd floor and convert ground level
- Minor measures (relocate utilities, change use of flood-prone space, replace with flood resistant materials)
- Retrofit floodproof non-residential (not V Zone)
- Stormwater/drainage improvements

Flood Insurance, Mitigation & You

Increased Cost of Compliance (ICC)

- Triggered by Substantial Damage (50%)
- $30,000 is a lot of money
- You are already paying for this coverage

LMS Goals

1. Preservation of sustainability of life, health, safety and welfare.
2. Preservation of infrastructure, including power, water, sewer and communications.
3. Maintenance and protection of roads and bridges, including traffic signals and street signs.

LMS Goals (continued)

4. Protection of critical facilities, including public schools and public buildings.
5. Preservation of property and assets.
6. Preservation of economy during and after disaster, including business viability.
7. Preservation and protection of the environment, including natural and historic resources.

Proposed Work Group Initiatives

- Work Group Initiatives:
  1. Establish LMS Working Group Procedures
  2. Evaluate Hazard Identification and Risk Assessment Tools (plan for 2015 update)
  3. Continue to Verify and Improve Repetitive Flood Loss Data

List of Initiatives

- LMS participants submit possible projects
- LMS Work Group maintains list
- Many initiatives deal with public buildings, non-profit buildings
- Some initiatives anticipate projects for private buildings

List of Initiatives

- Certain Federal funding sources require projects to be "consistent" with the LMS
- Presence on the list does not guarantee funding

Finishing The Plan

- What comes next:
  - Consider public comments
  - Seek State & FEMA approval
  - Finalize the LMS
  - County and municipalities adopt the LMS before mid-November

Wrap Up

- Questions? Comments?
- Submit by August 20
  - Leave with us tonight
  - E-mail: rcquinn@earthlink.net
  - FAX: (320) 514-3513

Comments & Questions

- Public Review Draft copies are available for review
- Submit comments by August 20, 2010

2010 Local Mitigation Strategy Update

Comments Due August 20, 2010

PLEASE LET US KNOW YOUR THOUGHTS AND COMMENTS

Thank you for taking the time to join us to review the *Local Mitigation Strategy (2010 Update).* We believe the plan not only satisfies state and federal requirements, but it will help us achieve goals while reducing future damage.

Copies of the draft document are available for review at the Monroe County Emergency Management Department, located at 490 63rd Street, Ocean, Suite #150, Marathon, and in the city hall or administrative building of each city. Copies are also available in the County's five public libraries. It may also be viewed on the County's homepage at http://monroecofl.virtualtownhall.net/Pages/MonroeCoFL_Emergency/LMS, from this point, scroll down to LMS Toolbox and select the last item and look under LMS 2010 Update Public Review Draft 072610.

_____

_____

_____

_____

_____

_____

_____(attach additional pages if needed)

OPTIONAL:

Name: _____

Address: _____

Phone # and/or email: _____

EMAIL COMMENTS TO: rcquinn@earthlink.net

FAX TO: 320-514-3513

MAIL TO: Monroe LMS c/o RCQuinn
104 4th St NE #2
Charlottesville, VA 2290

APPENDIX C: RESOLUTIONS OF ADOPTIONS

Monroe County (adopted January 19, 2011)
Islamorada Village of Islands (adopted January 13, 2010)
Key Colony Beach (adopted October 14, 2010)
Key West (adopted March 15, 2011)
Layton (adopted November 4, 2010)
Marathon (adopted November 9, 2010)

Emergency Management

RESOLUTION NO. 030-2011

APPROVAL OF A RESOLUTION TO ADOPT THE 2010 FINAL DRAFT UPDATE OF THE LOCAL MITIGATION STRATEGY AS REQUIRED BY STATE AND FEDERAL REGULATIONS TO QUALIFY FOR CERTAIN MITIGATION GRANT FUNDING.

WHEREAS, Monroe County adopted a Local Mitigation Strategy (LMS) in 1999 and an update of the LMS in 2005; and

WHEREAS, Monroe County and the cities of Key West, Key Colony Beach, Layton, Islamorada, and Marathon, have experienced hurricanes and other natural hazard events that pose risks to public health and safety and which may cause serious property damage; and

WHEREAS, the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by the Disaster Mitigation Act of 2000, require local jurisdictions to adopt a mitigation plan in order to be eligible for post-disaster and pre-disaster grants to implement certain mitigation projects; and

WHEREAS, pursuant to Florida Administrative Code Section 9G-22, the County must have a formal LMS Working Group and the LMS Working Group must review and update the LMS every five years in order to maintain eligibility for mitigation grant programs; and

WHEREAS, the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004 require local jurisdictions to adopt a mitigation plan in order to be eligible for grants to implement certain flood mitigation projects; and

WHEREAS, the planning process required by the State of Florida and the Federal Emergency Management Agency offers the opportunity to consider natural hazards and risks and to identify mitigation actions to reduce future impacts of such hazards; and

WHEREAS, the State of Florida has provided federal mitigation funds to support the development of the Local Mitigation Strategy; and

WHEREAS, the 2010 Monroe County LMS has been revised by the LMS Working Group composed of representatives of Monroe County, the cities of Key West, Key Colony Beach, Layton, Islamorada, and Marathon, and a number of nonprofit organizations have reviewed and updated the LMS; and

WHEREAS, the 2010 LMS Final Draft Update identifies mitigation initiatives that will improve the process used to identify and manage mitigation initiatives intended to minimize and reduce safety threats and damage to private and public property; and

WHEREAS, the 2010 LMS Final Draft Update was made available to the public and a public meeting was held on August 16, 2010, to solicit questions and comments and to present the LMS; and

WHEREAS, the 2010 LMS Final Draft Update has been submitted to the Florida Division of Emergency Management and FEMA for final review; final approval by FEMA will be withheld until the LMS is adopted.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF MONROE COUNTY, FLORIDA, that:

1. The 2010 LMS Final Draft Update is adopted as an official plan of Monroe County, Florida, contingent upon approval by the State and FEMA.

2. The Monroe County Emergency Management Department is directed to report at the earliest possible meeting to the Board of County Commissioners of Monroe County when final State and FEMA comments are received, and whether such comments require significant modification of the revised LMS.

3. The Monroe County Emergency Management Department is directed to provide, at any meeting where staff reports that State or FEMA comments require changes to the strategy, to the Board of County Commissioners such revisions as staff proposes be incorporated to address those comments.

4. Any initiative identified in the LMS shall be subject to, and contingent upon, budget approval, if required, which shall be at the discretion of the Board of County Commissioners, and this resolution shall not be interpreted so as to mandate any such appropriations.

5. The Monroe County Emergency Management Department is directed to coordinate with appropriate County departments and to perform the annual report requirements set forth in the Florida Administrative Code Chapter 9G-22.

The Clerk is directed to mail copies of this resolution to the Florida Division of Emergency Management, the Federal Emergency Management Agency, and the mayors of municipalities within Monroe County.

This Resolution shall become effective upon the date of its adoption herein.

PASSED AND ADOPTED by the Board of County Commissioners of Monroe County, Florida, at a regular meeting of said board held on January 19, 2011.

Mayor Heather Carruthers	Yes
Mayor Pro Tem David Rice	Yes
Commissioner Kim Wigington	Yes
Commissioner George Neugent	Yes
Commissioner Sylvia Murphy	Yes

(SEAL)

BOARD OF COUNTY COMMISSIONERS OF MONROE COUNTY FLORIDA

By: _____
MAYOR

ATTEST
DANNY L. KOLHAGE, CLERK
By: _____
Deputy Clerk

FILED FOR RECORD
2011 JAN 26 AM 9:02
DANNY L. KOLHAGE
CLERK CIR. CT.
MONROE COUNTY, FL

MONROE COUNTY ATTORNEY
APPROVED AS TO FORM:
_____
CYNTHIA L. HALL
ASSISTANT COUNTY ATTORNEY
Date 12-10-2010

RESOLUTION NO. 11-01-02

A RESOLUTION OF THE VILLAGE COUNCIL OF ISLAMORADA, VILLAGE OF ISLANDS, FLORIDA, APPROVING THE ADOPTION OF THE 2010 UPDATE OF THE LOCAL MITIGATION STRATEGY AS REQUIRED BY STATE AND FEDERAL REGULATIONS TO QUALIFY FOR CERTAIN MITIGATION GRANT FUNDING; AND PROVIDING FOR AN EFFECTIVE DATE

WHEREAS, the Village Council of Islamorada, Village of Islands, (the "Village") adopted a Local Mitigation Strategy (LMS) in 1999 and an update of the LMS in 2005; and

WHEREAS, the Village has experienced hurricanes and other natural hazard events that pose risks to public health and safety and which may cause serious property damage; and

WHEREAS, the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by the Disaster Mitigation Act of 2000, as amended, requires local jurisdictions to adopt a mitigation plan in order to be eligible for post-disaster and pre-disaster grants to implement certain mitigation projects; and

WHEREAS, the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004 require local jurisdictions to adopt a mitigation plan in order to be eligible for grants to implement certain flood mitigation projects; and

WHEREAS, pursuant to Florida Administrative Code Section 9G-22, the County must have a formal LMS Working Group and the LMS Working Group must review and update the LMS every five years in order to maintain eligibility for mitigation grant programs; and

WHEREAS, the 2005 Monroe County LMS has been revised by the LMS Work Group composed of representatives of Monroe County, the cities of Key West, Key Colony Beach, Layton, Islamorada and Marathon, and a number of nonprofit organizations; and

WHEREAS, the draft 2010 LMS Update identifies mitigation initiatives that will improve the process used to identify and manage mitigation initiatives intended to minimize and reduce safety threats and damage to private and public property; and

WHEREAS, the draft 2010 LMS Update was made available to the public and a public meeting was held on August 16, 2010, to solicit questions and comments and to present the LMS; and

WHEREAS, the draft 2010 LMS Update has been submitted to the Florida Division of Emergency Management and FEMA for final review; and

WHEREAS, final approval by the State and by FEMA will be withheld until the LMS is adopted.

NOW, THEREFORE, BE IT RESOLVED BY THE VILLAGE COUNCIL OF ISLAMORADA, VILLAGE OF ISLANDS, FLORIDA AS FOLLOWS:

Section 1. The above recitals are true and are correct and are incorporated herein by this reference.

Section 2. The 2010 LMS Update (Exhibit "A") is adopted as an official plan of the Village.

Section 3. The Village Fire Chief, acting as the Village Emergency Manager, is directed to report to the Village Council when final State and FEMA comments are received and whether such comments require significant modification of the revised LMS.

Section 4. Any initiative identified in the LMS shall be subject to and contingent upon budget approval, if required, which shall be at the discretion of the Village Council, and this Resolution shall not be interpreted so as to mandate any such appropriations.

Section 5. The Village Emergency Manager is directed to coordinate with Monroe County Emergency Management and to perform the annual report requirements set forth in the Florida Administrative Code Chapter 9G-22.

Section 6. The Clerk is directed to mail copies of this Resolution to the Monroe County Emergency Management Department and the Florida Department of Community Affairs.

Section 7. This Resolution shall be effective immediately upon its adoption.

Motion to adopt by Vice Mayor Achenberg, second by Councilman Purdo.

FINAL VOTE AT ADOPTION
VILLAGE COUNCIL OF ISLAMORADA, VILLAGE OF ISLANDS:

Mayor Michael Reckwerdt	YES
Vice Mayor Don Achenberg	YES
Councilman Ted Blackburn	YES
Councilman Ken Philipson	YES
Councilman Dave Purdo	YES

PASSED AND ADOPTED THIS 13TH DAY OF JANUARY, 2011.

MICHAEL RECKWERDT, MAYOR

ATTEST:

VILLAGE CLERK

APPROVED AS TO FORM AND LEGALITY
FOR THE USE AND BENEFIT OF
ISLAMORADA, VILLAGE OF ISLANDS ONLY

VILLAGE ATTORNEY

This Resolution was filed in the Office of the Village Clerk of this 18 day of January, 2011.

Beverly Raddatz, Village Clerk

Cc: Department of Community Affairs
Monroe County Emergency Management Department

RESOLUTION 2010 - 09

A RESOLUTION OF THE CITY OF KEY COLONY BEACH, FLORIDA, TO ADOPT THE 2010 UPDATE OF THE LOCAL MITIGATION STRATEGY AS REQUIRED BY STATE AND FEDERAL REGULATIONS TO QUALIFY FOR CERTAIN MITIGATION GRANT FUNDING

WHEREAS, the City of Key Colony Beach adopted a Local Mitigation Strategy (LMS) in 1999 and an update of the LMS in 2005; and

WHEREAS, Monroe County and the cities of Key West, Key Colony Beach, Layton, Islamorada and Marathon have experienced hurricanes and other natural hazard events that pose risks to public health and safety and which may cause serious property damage; and

WHEREAS, the Robert T. Stafford Disaster Relief and Emergency Assistance Act as amended by the Disaster Mitigation Act of 2000, as amended, require local jurisdictions to adopt mitigation plans in order to be eligible for post-disaster and pre-disaster grants to implement certain mitigation projects; and

WHEREAS, the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004 require local jurisdictions to adopt a mitigation plan in order to be eligible for grants to implement certain flood mitigation projects; and

WHEREAS, pursuant to Florida Administrative Code Section 9G-22, the County must have a formal LMS Working Group and the LMS Working Group must review and update the LMS every five years in order to maintain eligibility for mitigation grant programs; and

WHEREAS, the LMS Working Group composed of representatives of Monroe County, the cities of Key West, Key Colony Beach, Layton, Islamorada and Marathon, and a number of nonprofit organizations have reviewed and updated the LMS; and

WHEREAS, the 2010 LMS Update identifies mitigation initiatives that will improve the process used to identify and manage mitigation initiatives intended to minimize and reduce safety threats and damage to private and public property; and

WHEREAS, the draft 2010 LMS Update was made available to the public and a public meeting was held by the Local Mitigation Strategy Working Group in Marathon, Florida, on August 16, 2010, to solicit questions and comments and to present the LMS; and

WHEREAS, the draft 2010 LMS Update has been submitted to the Florida Division of Emergency Management and FEMA for final review; final approval by FEMA will be withheld until the LMS is adopted.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COMMISSION OF THE CITY OF KEY COLONY BEACH, FLORIDA, that:

1. The 2010 LMS Update is adopted as an official plan of the City of Key Colony Beach, Florida.
2. The City staff is directed to report at the earliest possible meeting to the City Commission when final State and FEMA comments are received and whether such comments require significant modification and the proposed changes that staff recommends be incorporated into the 2010 LMS Update to address those comments.
3. Any initiatives identified in the LMS shall be subject to, and contingent upon, budget approval, if required, which shall be at the discretion of the City Commission, and this resolution shall not be interpreted so as to mandate any such appropriations.
4. The City staff is directed to coordinate with appropriate County departments and to perform the annual report requirements set forth in the Florida Administrative Code Chapter 9G-22.

The Clerk is directed to mail a copy of this resolution to the Monroe County Emergency Management LMS Administrator, 490 63rd Street, Ocean, Suite 150, Marathon, FL 33050.

This Resolution shall become effective upon the date of its adoption herein.

PASSED AND ADOPTED by the City Commission of the City of Key Colony Beach, Florida at its regular meeting held on October 14, 2010.

Ronald A. Sutton, Mayor

Attest: Vickie L. Bollinger, City Clerk

RESOLUTION NO. 11-073

A RESOLUTION OF THE CITY COMMISSION OF THE CITY OF KEY WEST, FLORIDA, ADOPTING THE 2010 UPDATE OF THE MONROE COUNTY AND INCORPORATED MUNICIPALITIES LOCAL MITIGATION STRATEGY (LMS) AS REQUIRED BY STATE AND FEDERAL REGULATIONS TO QUALIFY FOR CERTAIN MITIGATION GRANT FUNDING; PROVIDING FOR AN EFFECTIVE DATE

WHEREAS, Monroe County and incorporated municipalities in Monroe County adopted a Local Mitigation Strategy (LMS) in 1999 and revised it in 2005; and

WHEREAS, Key West, Monroe County, and other municipalities in Monroe County have experienced hurricanes and other natural hazard events that pose risks to public health and safety and that may cause serious property damage; and

WHEREAS, the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by the Disaster Mitigation Act of 2000, requires local jurisdictions to adopt a mitigation plan in order to be eligible for post-disaster and pre-disaster grants to implement certain mitigation projects; and

WHEREAS, the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004 require local jurisdictions to adopt a mitigation plan in order to be eligible for grants to implement certain flood mitigation projects; and

WHEREAS, pursuant to Florida Administrative Code Section 9G-22, the County must have a formal LMS Working Group and the LMS

Working Group must review and update the LMS every five years in order to maintain eligibility for mitigation grant programs; and

WHEREAS, the LMS Working Group composed of representatives of Monroe County, the cities of Key West, Key Colony Beach, Layton, Islamorada and Marathon, and a number of nonprofit organizations have reviewed and updated the LMS; and

WHEREAS, the 2010 LMS Update identifies mitigation initiatives that will improve the process used to identify and manage mitigation measures intended to minimize and reduce safety threats and damage to private and public property; and

WHEREAS, the draft 2010 LMS Update was made available to the public, and a public meeting was held on August 16, 2010, to solicit questions and comments and to present the LMS; and

WHEREAS, the draft 2010 LMS Update has been submitted to the Florida Division of Emergency Management and FEMA for final review, and final approval by FEMA will be withheld until the LMS is adopted.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COMMISSION OF THE CITY OF KEY WEST, FLORIDA, AS FOLLOWS:

Section 1: That the 2010 LMS Update is adopted as an official plan of Key West, Monroe County, Florida.

Section 2: That the Office of Emergency Management is authorized to report to the City Commission when final State and FEMA comments are received and to report whether such comments require significant modification and the proposed changes that staff recommends be incorporated into the 2010 LMS Update to address those comments.

Section 3: That any initiative identified in the LMS shall be subject to, and contingent upon, budget approval, if required, which shall be at the discretion of the City Commission, and this resolution shall not be interpreted so as to mandate any such appropriations.

Section 4: That the Office of Emergency Management is hereby authorized to coordinate with appropriate County and City of Key West departments and to perform the annual report requirements set forth in the Florida Administrative Code Chapter 9G-22.

Section 5: That the City Clerk is hereby authorized to transmit certified copies of this Resolution to the Board of County Commissioners of Monroe County, the Florida Division of Emergency Management, the Federal Emergency Management Agency, and the mayors of all municipalities within Monroe County.

Section 6: That this Resolution shall go into effect immediately upon its passage and adoption and authentication by the signature of the presiding officer and the Clerk of the Commission.

Passed and adopted by the City Commission at a meeting held this 15 day of March, 2011.

Authenticated by the presiding officer and Clerk of the Commission on March 16, 2011.

Filed with the Clerk March 16, 2011.

CRAIG CATES, MAYOR

ATTEST:

CHERYL SMITH, CITY CLERK

RESOLUTION NO. 2010-11-01

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LAYTON, FLORIDA, ADOPTING A REVISED LOCAL MITIGATION STRATEGY

WHEREAS, the City of Layton adopted a Local Mitigation Strategy (LMS) in June of 2005; and

WHEREAS, Monroe County and the cities of Key West, Key Colony Beach, Layton, Islamorada and Marathon have experienced hurricanes and other natural hazard events that pose risks to public health and safety and which may cause serious property damage; and

WHEREAS, the Robert T. Stafford Disaster Relief and Emergency Assistance Act as amended by the Disaster Mitigation Act of 2000 require local jurisdictions to adopt a mitigation plan in order to be eligible for post-disaster and pre-disaster grants to implement certain mitigation projects; and

WHEREAS, the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004 require local jurisdictions to adopt a mitigation plan in order to be eligible for grants to implement certain flood mitigation projects; and

WHEREAS, the planning process required by the State of Florida and the Federal Emergency Management Agency offers the opportunity to consider natural hazards and risks, and to identify mitigation actions to reduce future impacts of such hazards; and

WHEREAS, the State of Florida has provided federal mitigation funds to support the development of the Local Mitigation Strategy; and

WHEREAS, the 2005 Monroe County LMS has been revised by the LMS Work Group composed of representatives of Monroe County, the cities of Key West, Key Colony Beach, Layton, Islamorada and Marathon, and a number of nonprofit organizations; and

WHEREAS, the revised LMS identifies mitigation initiatives that will improve the process used to identify and manage mitigation initiatives intended to minimize and reduce safety threats and damage to private and public property; and

WHEREAS, the LMS draft revisions was made available to the public in July 2010 and a public hearing was held on November 04, 2010 to solicit questions and comments and to present the LMS.

WHEREAS, the County's ability to access hazard mitigation grant funds is limited until the revised LMS is adopted; and

WHEREAS, the revised LMS has been submitted to the State and FEMA for final review; final approval by the State and FEMA will be withheld until the LMS is adopted.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF LAYTON IN MONROE COUNTY, FLORIDA, that:

1. The Office of Emergency Management is directed to report to the City Council of the City of Layton when final State and FEMA comments are received and whether such comments require significant modification of the revised LMS.

2. Any initiative identified in the LMS shall be subject to and contingent upon budget approval, if required, which shall be at the discretion of the City council of the City of Layton, and this resolution shall not be interpreted so as to mandate any such appropriations.

3. The Office of Emergency Management is directed to coordinate with appropriate City of Layton departments and to perform the annual report requirements set forth in the Florida Administrative Code Chapter 9G-22.

The City Clerk is directed to mail copies of this resolution to the Florida Department of Community Affairs, the Federal Emergency Management Agency, the Mayor of Monroe County and the Mayors of municipalities within Monroe County.

This Resolution shall become effective upon the date of its adoption herein.

PASSED AND ADOPTED by the City Council of the City of Layton, Monroe County, Florida at a regular meeting of said Council held on November 04, 2010.

Seat 1- Councilman John Cromartie	YES
Seat 2- Councilman Snow	YES
Seat 3- Vice Mayor Dilley	YES
Seat 4- Councilwoman Katie Scott	YES
Seat 5- Councilman Philip Porter	Absent

BY

Norman Anderson, Mayor
On Behalf of the Council

ATTEST:

Marjorie Parmenter, City Clerk

(Seal)

Sponsored by: Hernstadt

CITY OF MARATHON, FLORIDA
RESOLUTION 2010-117

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MARATHON, FLORIDA ADOPTING A MULTI-JURISDICTIONAL LOCAL MITIGATION STRATEGY PLAN AS REQUIRED BY THE FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS AND THE FEDERAL EMERGENCY MANAGEMENT AGENCY IN ORDER TO BE ELIGIBLE FOR CERTAIN STATE AND FEDERAL ASSISTANCE; AND PROVIDING FOR AN EFFECTIVE DATE

WHEREAS, Monroe County and the cities of Key West, Key Colony Beach, Layton, Islamorada, and Marathon have experienced hurricanes and other natural hazard events that pose risks to public health and safety and which may cause serious property damage; and

WHEREAS, the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by the Disaster Mitigation Act of 2000, require local jurisdictions to adopt a mitigation plan in order to be eligible for pre-disaster and post-disaster grants to implement certain mitigation projects; and

WHEREAS, the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004 require local jurisdictions to adopt a mitigation plan in order to be eligible for grants to implement certain flood mitigation projects; and

WHEREAS, the planning process required by the State of Florida and the Federal Emergency Management Agency offers the opportunity to consider natural hazards and risks, and identify mitigation actions to reduce future impacts of such hazards; and

WHEREAS, the State of Florida has provided Federal Mitigation funds to support development of the Local Mitigation Strategy (the "LMS"); and

WHEREAS, the 2005 Monroe County LMS has been revised by the LMS Work Group composed of representatives of Monroe County, the cities of Key West, Key Colony Beach, Layton, Islamorada, and Marathon, and a number of nonprofit organization; and

WHEREAS, the 2010 LMS identifies mitigation initiatives that will help minimize and reduce safety threats and damage to private and public buildings; and

WHEREAS, a public meeting was held on August 16, 2010 to present the LMS and to solicit questions and comments concerning its contents.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF MARATHON, FLORIDA, THAT:

Section 1. The above recitals are true and correct and are incorporated herein

Section 2. The 2010 Multi-jurisdiction LMS Plan, a copy of which is attached as Exhibit "A," is hereby approved and adopted by the City.

Section 3. Any initiative identified in the LMS Plan shall be subject to and contingent upon budget approval, if funding is required, and this resolution may not be interpreted so as to mandate any such appropriations.

Section 4. The City Manager or his designee is directed to coordinate with other offices and entities and shall periodically report on the activities, accomplishments, and progress in implementing the LMS Plan, and shall prepare an annual update to the LMS Plan as required by the Florida Department of Community Affairs.

Section 5. This resolution shall take effect immediately upon its adoption.

PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF MARATHON, FLORIDA, THIS 9th DAY OF NOVEMBER, 2010.

THE CITY OF MARATHON, FLORIDA

GSnead

Ginger Snead, Mayor

AYES:
NOES:
ABSENT:
ABSTAIN:

ATTEST:

Diane Clavier

Diane Clavier, City Clerk

(City Seal)

APPROVED AS TO FORM AND LEGALITY FOR THE USE AND RELIANCE OF THE CITY OF MARATHON, FLORIDA ONLY:

City Attorney

APPENDIX D: NWS Hurricane Wilma in the Florida Keys

Hurricane Wilma in the Florida Keys

KENNARD "CHIP" KASPER

National Oceanic and Atmospheric Administration (NOAA)/National Weather Service (NWS) Weather Forecast Office (WFO) Key West, Florida

1. Introduction

Hurricane Wilma was the 25th tropical cyclone and 12th hurricane of the hyperactive 2005 season, and the fifth tropical cyclone in as many months to have a significant impact on the Florida Keys. Hurricane Wilma moved across the extreme southeastern Gulf of Mexico and southern Florida peninsula during the morning hours of Monday, 24 October 2005, bringing hurricane-force winds to the Florida Keys and the highest storm surge observed in the Keys since Hurricane Betsy, on 8 September 1965. Figure 1 shows inundation of North Roosevelt Boulevard in Key West near the time of peak storm tides. The core of category-three Hurricane Wilma passed just north of the Florida Keys (Fig. 2), sparing the Keys island chain from the highest winds and heaviest rain. However, the ocean surrounding the Keys archipelago rose rapidly on the morning of the 24th, inundating many island communities, and causing millions of dollars in property damage.

Fig. 1. North Roosevelt Boulevard, Key West, FL, inundated by a storm tide of near 6 feet (ft) above mean sea level, at approximately 0900 Eastern Daylight Time (EDT), 24 October 2005. The boulevard runs east to west, parallel to the line of coconut palm trees, on the north side of Key West (photograph by Mike Hentz of *The Key West Citizen*).

Fig. 2. Hurricane Wilma's track across the southeastern Gulf of Mexico and south Florida. The lighter red track indicates Saffir/Simpson category two intensity (maximum sustained winds 83-95 knots), and the darker red track indicates Saffir/Simpson category three intensity (maximum sustained winds 96-113 knots). Hurricane Wilma made landfall near Cape Romano, Florida as a Saffir/Simpson category three hurricane, with maximum sustained winds in the hurricane core near 105 knots (Image courtesy of the NOAA Coastal Services Center).

2. Storm History

Hurricane Wilma grew from a rather nondescript area of surface low pressure that was first evident near Jamaica on 14 October. The area of low pressure became sufficiently organized to be classified as a tropical depression by 1400 EDT, 15 October. Slow strengthening ensued over the next day and a half, and the depression was upgraded to Tropical Storm Wilma at 0200 EDT, 17 October. Further strengthening occurred, and the storm was upgraded to a hurricane at 0800 EDT, 18 October. After several days of slow, meandering motion over the western Caribbean Sea southwest of Jamaica, the system began moving northwestward.

Explosive intensification took place late on 18 October, with Wilma transforming from a 60-knot tropical storm to a 150-knot category five hurricane in less than 24 hours. A minimum central pressure of 882 millibars (26.04 inches of mercury) was measured by reconnaissance aircraft at 0800 EDT, 19 October over the northwestern Caribbean Sea. This surface pressure is the lowest ever observed in the Atlantic Basin, breaking the previous record set by Hurricane Gilbert (888 millibars or 26.22 inches of mercury) in 1988.

Hurricane Wilma moved northwestward over the next few days, weakening slightly before making landfall as a category four hurricane around 1700 EDT, 21 October at Cozumel, Mexico. The storm slowed down and spent over a day moving across the extreme northeastern portion of the Yucatan peninsula, producing torrential rains and extensive damage. Finally, a weakened

(category one) Hurricane Wilma emerged off the north coast of the Yucatan peninsula around 2000 EDT, 22 October. Wilma then turned northeast, accelerated, and intensified as it moved across the southeastern Gulf of Mexico toward the southern Florida peninsula. Figure 3 is a radar image of Hurricane Wilma at 0219 EDT, 24 October from the Key West (KBYX) Weather Surveillance Radar 1988-Doppler (WSR-88D). Note the large eye (approximately 50-60 nautical miles in diameter). Hurricane Wilma made landfall as a category three hurricane near Cape Romano in Collier County on the southwestern coast of the Florida peninsula at 0630 EDT, 24 October. Figure 4 shows the complete track of Hurricane Wilma.

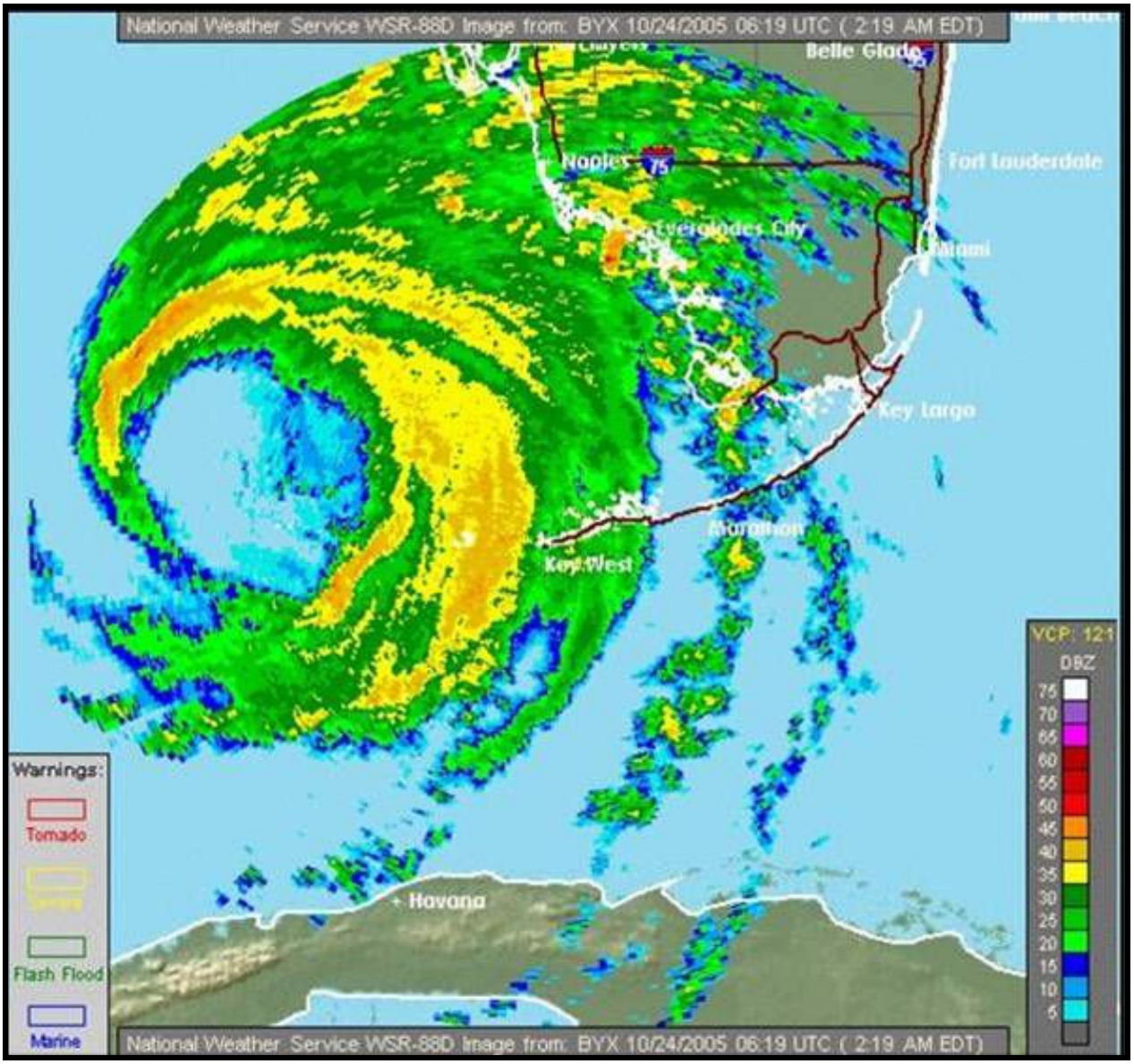


Fig. 3. KBYX WSR-88D composite reflectivity image of Hurricane Wilma at 0219 EDT, 24 October 2007.

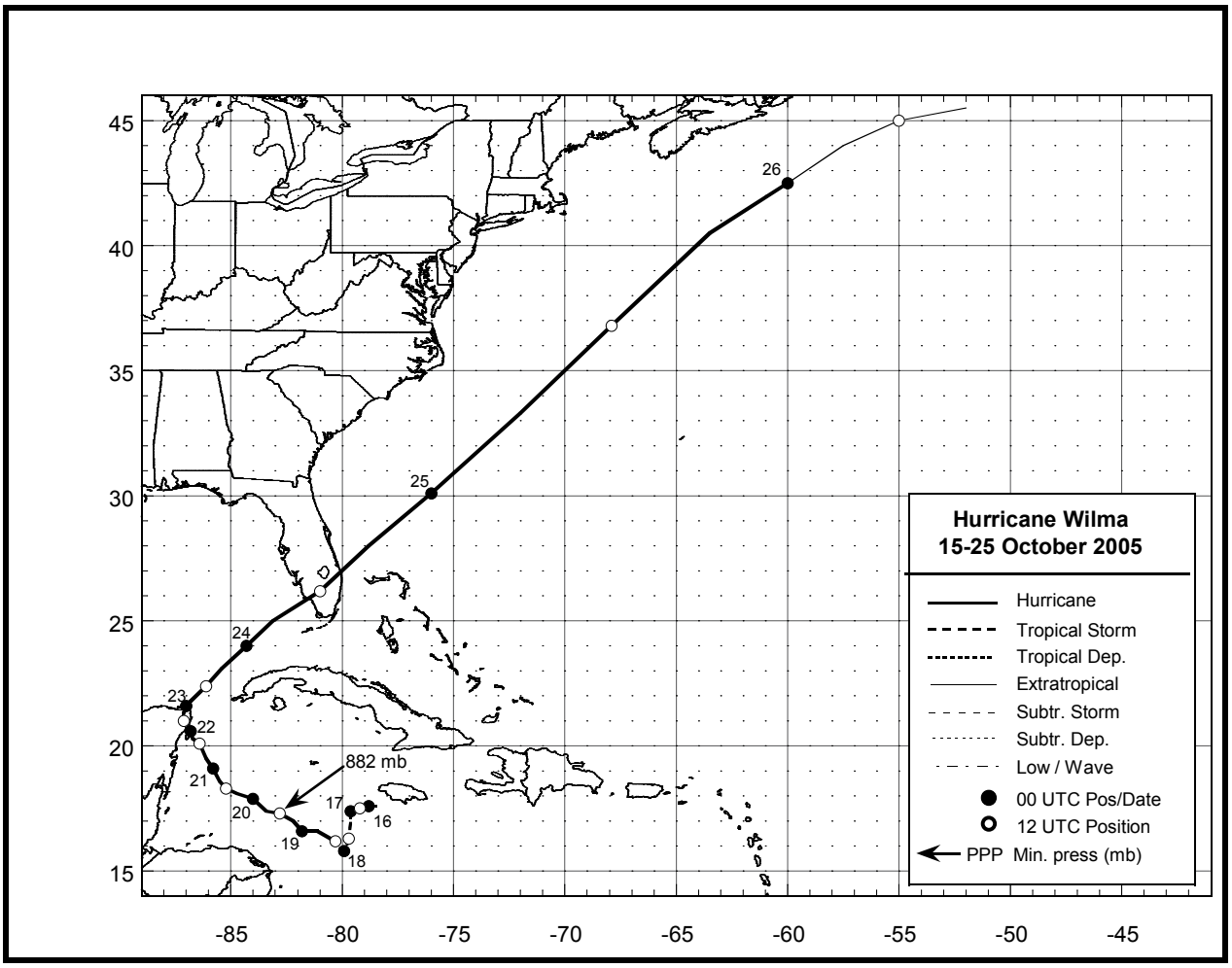


Fig. 4. Best track positions for Hurricane Wilma, 15-26 October 2005 (Pasch et al. 2006)

3. Evacuations, Local Preparedness Actions

A local state of emergency was declared by Monroe County Emergency Management officials at 0800 EDT, Wednesday, 19 October, followed by a mandatory evacuation order for all Florida Keys visitors and non-residents at 1200 EDT, due to the threat posed by Hurricane Wilma. During the next couple of days, Monroe County Emergency Management officials encouraged all Florida Keys residents to evacuate the island chain voluntarily. At 1100 EDT, Saturday, 22 October, a Hurricane Watch was issued for all of the Florida Keys and adjacent waters, including the Dry Tortugas, and a mandatory, phased evacuation of residents commenced at 1200 EDT. The Hurricane Watch was upgraded to a Hurricane Warning at 2300 EDT, 22 October.

4. Meteorological Observations

The weather across the Florida Keys and adjoining waters during the daylight hours on Sunday, 23 October was characterized by increasing high cloudiness and scattered showers. Fresh to strong southeast breezes of 20-30 knots (kt) prevailed over the lower Florida Keys and adjacent waters, whereas moderate to fresh breezes of 10-20 kt prevailed over the middle and upper Florida Keys and adjacent waters. By 1100 EDT, Hurricane Wilma was centered north of the Yucatan Channel, and was moving northeastward at 7 kt. Maximum sustained winds were 85 kt with gusts to 105 kt. Figure 5 is a satellite image of Hurricane Wilma taken at 1215 EDT by the

Moderate Resolution Imaging Spectroradiometer (MODIS) instrument aboard the Terra satellite. An outer spiral rainband can be seen approaching the lower Florida Keys from the southwest. A long-lived mesocyclonic waterspout developed a few hours later from a convective cell associated with this rainband, and moved within a few miles west of Key West around 1600 EDT.

Winds began to exceed tropical storm force (34 kt) in squalls over portions of the lower Florida Keys shortly after 1600 EDT, 23 October. Sustained tropical storm-force winds developed from west to east over the entire Keys archipelago and surrounding waters between 1900 EDT, 23 October and 0100 EDT, 24 October. Hurricane-force winds then developed from west to east across the Keys island chain between 0100-0600 EDT, 24 October, and ended, again from west to east across the island chain, between 0700-1200 EDT.

a. Wind

Peak recorded wind speeds across the Florida Keys during Hurricane Wilma varied according to instrument location, exposure, height, and averaging period (see Table 1). In addition, several instrument systems failed before or during the period of highest winds. Figure 6 is a wind analysis graphic from the NOAA/Atlantic Oceanographic and Meteorological Laboratory (AOML) Hurricane Research Division (HRD), valid at 1030 UTC (0630 EDT), 24 October. This analysis shows sustained (one-minute average), 10-meter wind speeds of 60-80 kt across the Florida Keys near the time of landfall (on the southwest Florida coast) and closest approach of the hurricane core to most of the Keys. The HRD analysis was produced by compositing all available observations relative to the storm center, including Air Force and NOAA aircraft, ships, buoys, Coastal-Marine Automated Network (C-MAN) platforms, and surface airways. (Powell et al., 1998). All data were quality controlled and then processed to conform to a common framework for height, exposure, and averaging period. Therefore, the HRD hurricane wind analysis is an excellent product for attaining a realistic, comprehensive view of the surface wind field across the Florida Keys during Hurricane Wilma.

b. Atmospheric Pressure

Minimum mean sea level (MSL) pressure reports were unavailable from the Automated Surface Observing System (ASOS) platforms at Key West International Airport (KEYW), Boca Chica Naval Air Station (KNQX), and Florida Keys Marathon Airport (KMTH), due to storm surge flooding-induced communications failures. Fortunately, however, the National Ocean Service (NOS) tide gages at Key West Harbor and Vaca Cut remained operational throughout the storm, and provided minimum sea level pressure readings of 977.2 millibars (28.86 inches of mercury; 0418 EDT) and 983.0 millbars (29.03 inches of mercury; 0524 EDT), respectively, on 24 October. In addition, minimum MSL pressure readings of 983.4 millibars (29.04 inches of mercury; 0600 EDT), 982.2 millibars (29.00 inches of mercury; 0700 EDT), and 982.3 millibars (29.01 inches of mercury; 0800 EDT) were recorded at the C-MAN platforms at Sombrero Key, Long Key, and Molasses Reef, respectively.

c. Rainfall

Storm total rainfall was quite low for a tropical cyclone across the Florida Keys, averaging only 1-2 inches. The low rainfall amounts can primarily be attributed to the rapid acceleration of Hurricane Wilma as it approached Florida. Much larger storm total rainfall amounts were

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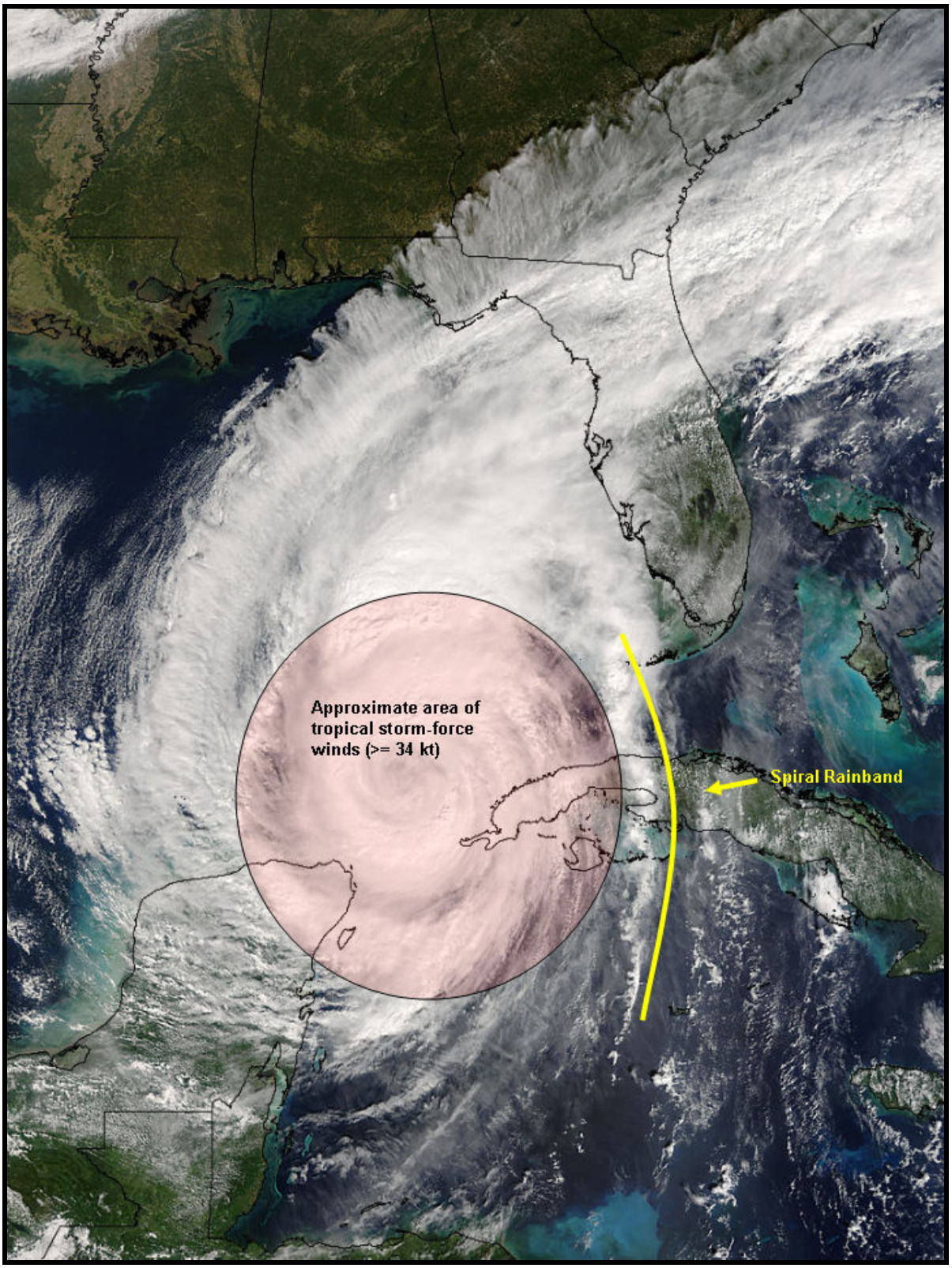

Fig. 5. Satellite image of Hurricane Wilma at 1215 EDT, 23 October 2005. Approximate area of tropical storm-force winds (one-minute average, 10-meter wind speeds greater than or equal to 34 kt) shaded in red; an outer spiral rainband denoted by bold yellow line east of storm center. Image courtesy of MODIS Rapid Response Project at NASA/GSFC.

observed over central Florida (see Fig. 7) where rich tropical moisture from Wilma interacted with a frontal system.

TABLE 1. Surface wind observations in the Florida Keys, 24 October 2005.

Location	Source	Peak Wind (kt)	Date/Time (EDT)	Peak Gust (kt)	Date/Time (EDT)
Garden Key, Dry Tortugas	National Park Service [a]			116	24/0115
Key West Harbor	NOS Tide Gage [b]	51 [c]	24/0436	74	24/0436
Key West International Airport	NWS ASOS [d]	62 [e]	24/0216 [f]	72 [g]	24/0216
Cudjoe Key	Bela Zeky [h]			107	24/0513
Sombrero Key	NWS C-MAN platform [i]	76 [j]	24/0540	91 [g]	24/0522
Duck Key	William A. Wagner, Jr. [k]			75	Unknown
Long Key	NWS C-MAN platform [l]	57 [j]	24/0650	76 [g]	24/0527
Upper Matecumbe Key	Islamorada Fire Rescue Station [m]			94	24/0526
Molasses Reef	NWS C-MAN platform [n]	66 [j]	24/0820	81 [g]	24/0834

[a] Anemometer height 75 ft above MSL, located at Fort Jefferson National Monument
[b] Anemometer height 21 ft above MSL
[c] 6-min average
[d] Anemometer height 44 ft above ground level (AGL)
[e] 2-min average
[f] Communication line to ASOS failed before maximum winds
[g] 5-s average
[h] Anemometer (Davis Vantage Pro 2) height 25 ft AGL
[i] Anemometer height 159 ft above MSL
[j] 10-min average
[k] Anemometer height 30 ft AGL
[l] Anemometer height 23 ft above MSL
[m] Anemometer (R.M. Young Model 05103 Wind Monitor) height 50 ft AGL
[n] Anemometer height 52 ft above MSL

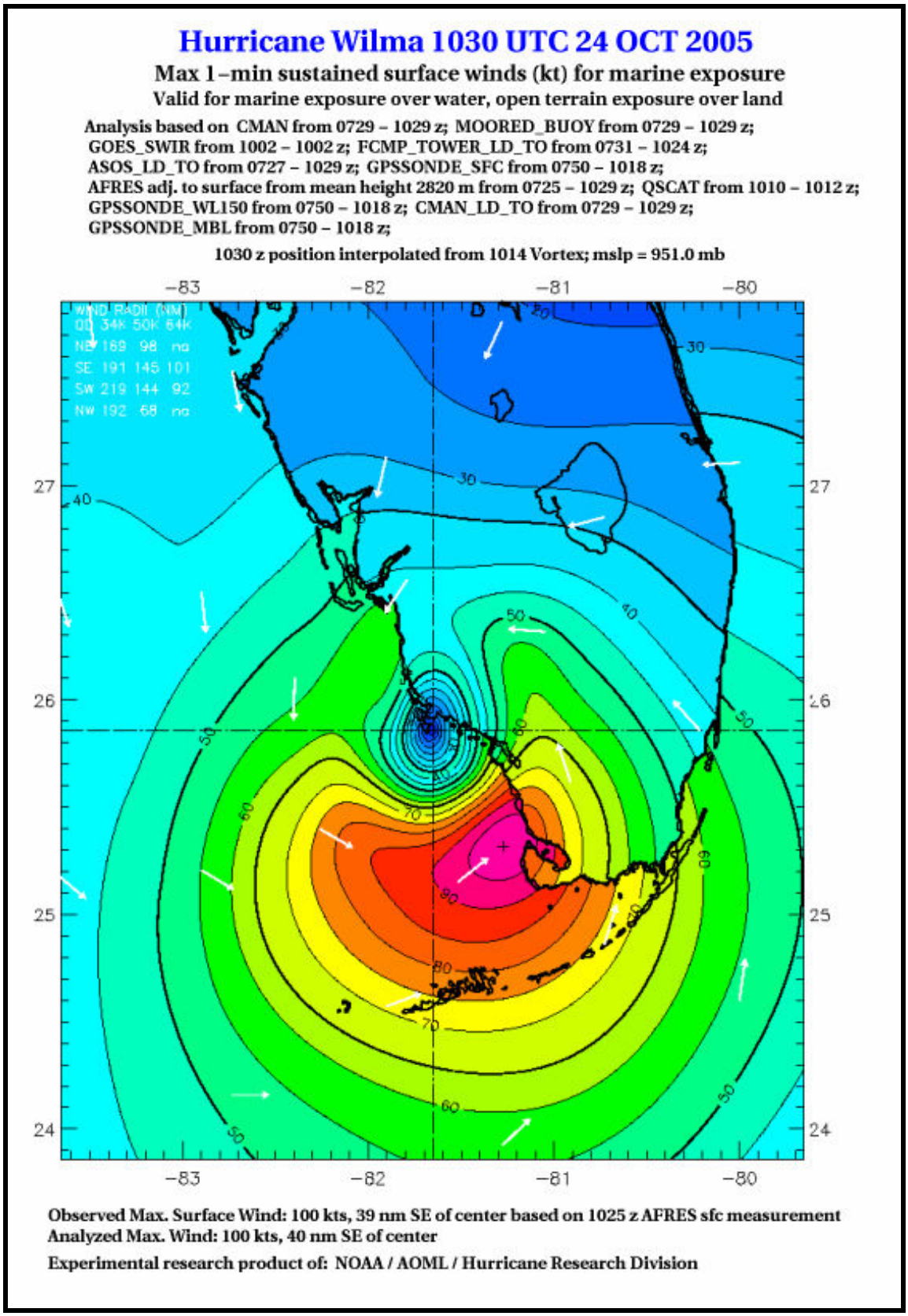

Fig. 6. Experimental surface wind analysis from NOAA/Hurricane Research Division, 0630 EDT, 24 October 2005.

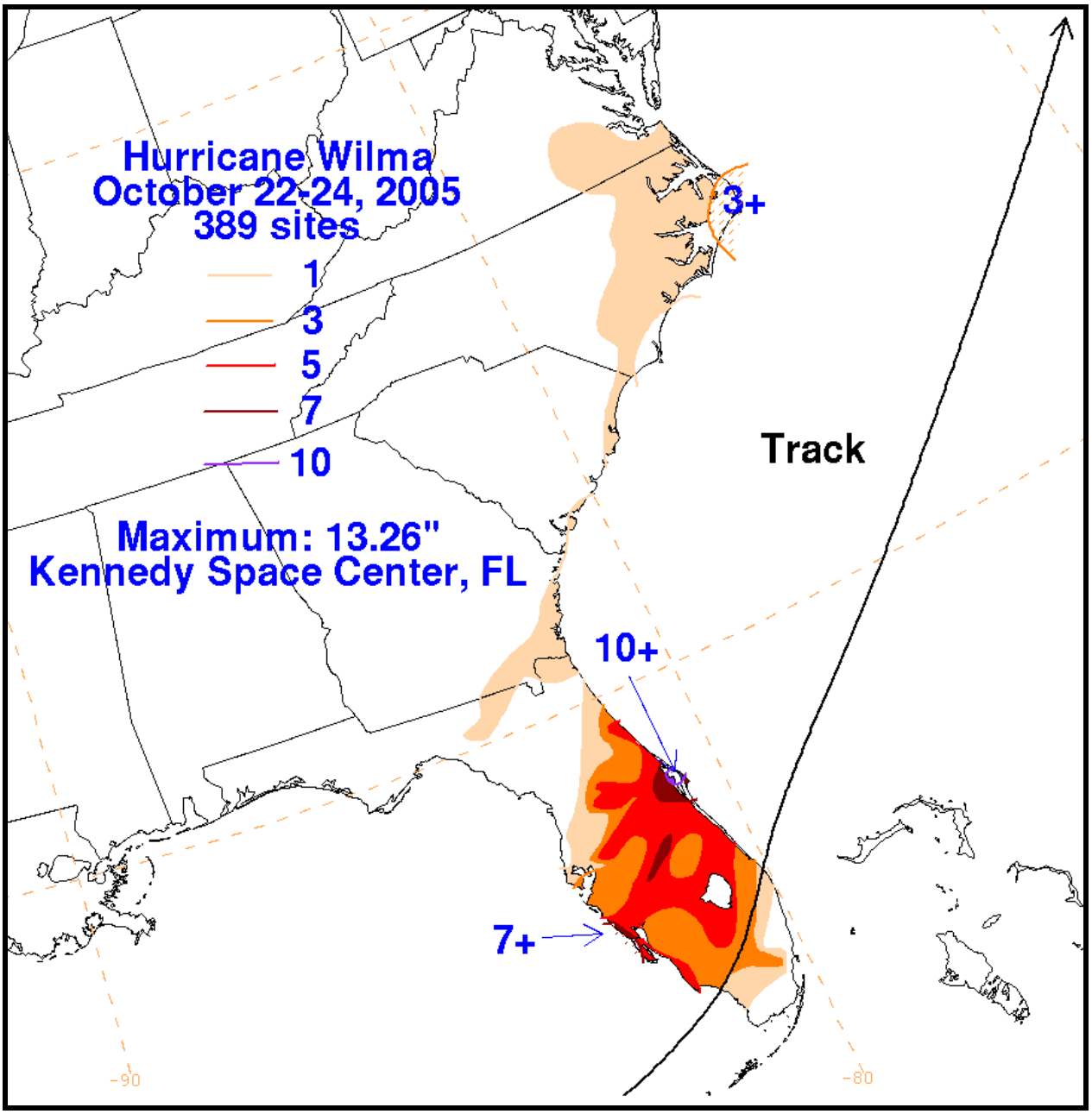

Fig. 7. Hurricane Wilma storm total rainfall map (22-24 October 2005), constructed using data provided by NWS River Forecast Centers and WFOs. (Image courtesy of NOAA/NWS/Hydrometeorological Prediction Center).

5. Storm Surge

Real-time observations and post-storm high water mark surveys throughout the Florida Keys revealed two storm surge events associated with the passage of Hurricane Wilma (FEMA 2006). The first event occurred mainly along southern shores of the Keys as Hurricane Wilma approached the island chain from the southwest. The second event occurred with the onset of westerly winds as Hurricane Wilma made landfall along the southwestern coast of the Florida peninsula. The second event was more severe, and resulted in the worst storm surge inundation throughout most of the Florida Keys since Hurricane Betsy on 8 September 1965.

a. First storm surge event

Water levels along the southern and western shores of the lower Florida Keys first rose significantly above astronomically predicted values around 2000 EDT (Sunday evening), 23 October. Figure 8 is a water level plot from a tide gage located on the west side of Key West. Coastal flooding in Key West typically commences when water levels reach 3 ft above MSL. This threshold was met just after 0100 EDT according to Figure 8. Indeed, WFO Key West received its first report of coastal flooding at 0131 EDT (City of Key West officials reported flooding of South Roosevelt and Atlantic Boulevards on the south side of Key West). By 0230 EDT, Key West International Airport was flooded, with the runway complex inundated and the airport terminal flooded with six inches of salt water. At 0252 EDT, communications to the KEYW ASOS platform (located on the east end of the airport runway complex) were rendered inoperable due to storm surge flooding. At 0301 EDT, Flagler Avenue east of First Street was flooded with 1-2 ft of salt water. Parking lots on the southeast side of Key West were flooded with 2-3 ft of salt water. Some homes on the south side of Stock Island, as well as the intersection at U.S. Highway 1 and Cross Street, were flooded with up to 4 ft of water. At 0330 EDT, a report was received indicating that the NOAA Weather Radio transmitter on Sugarloaf Key had ceased operation (it was later discovered that the generator fuel tank floated away). At 0526 EDT, Sea Oats Beach at mile marker 74 was inundated. Canals throughout the lower Florida Keys began overflowing between 0500 and 0600 EDT.

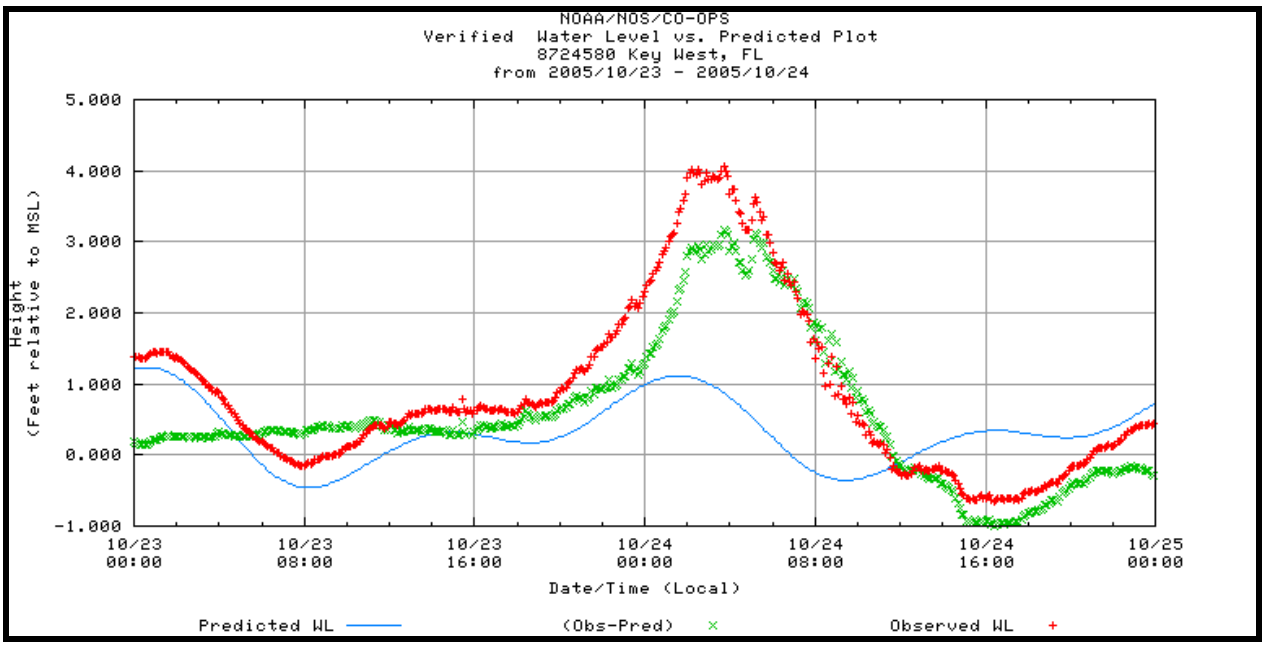

Fig. 8. Plot of predicted (blue), observed (red), and difference between observed and predicted (green) water level in feet relative to MSL from 0000 EDT, 23 October 2005 to 2400 EDT, 24 October 2005 at the NOAA/NOS tide gage, Key West Harbor.

For the first event, maximum storm tides of 5-6 ft above MSL were estimated in Key West, 4-5 ft above MSL throughout the rest of the lower Florida Keys, 3 ft above MSL in Marathon and the middle Florida Keys (numerous streets flooded, but water did not reach U.S. Highway 1), and 2-3 ft above MSL in the upper Florida Keys.

This first storm surge event was enhanced by strong southerly winds producing wave setup in Hawk Channel and wave run-up along the southern shores of the Keys.

b. Second storm surge event

Observations from NWS forecasters and spotters, City of Key West and Monroe County officials, and the public indicated that the second storm surge event began in northern sections of Key West around 0700 EDT, 24 October. However, an analysis of data from the Key West Harbor tide gage (Fig. 8) reveals that peak storm tides occurred around 0400 EDT, with a gradual drop in water levels thereafter. In addition, residents on Waddell Street near South Beach reported peak storm tides early in the morning (prior to sunrise), with falling tides thereafter. These observations suggest that the higher elevation areas on the western side of Key West (elevations above 8 ft MSL throughout much of Old Town; see Fig. 9) blocked southward-moving sea water from reaching areas to their immediate west and south. Peak storm tides, up to 6.5 ft above MSL in parts of Key West, occurred around 0900 EDT. Inundation originated along the Old Town Key West waterfront, Garrison Bight, and North Roosevelt Boulevard (see Fig. 1). Flooding crossed the island from north to south, meeting Hawk Channel (Atlantic side) at the west end of South Roosevelt Boulevard. Figure 10 shows storm surge flooding in southern portions of Key West just after its peak. City of Key West officials estimated that about 60 percent of Key West was inundated, and up to 35 percent of municipal vehicles were flooded.

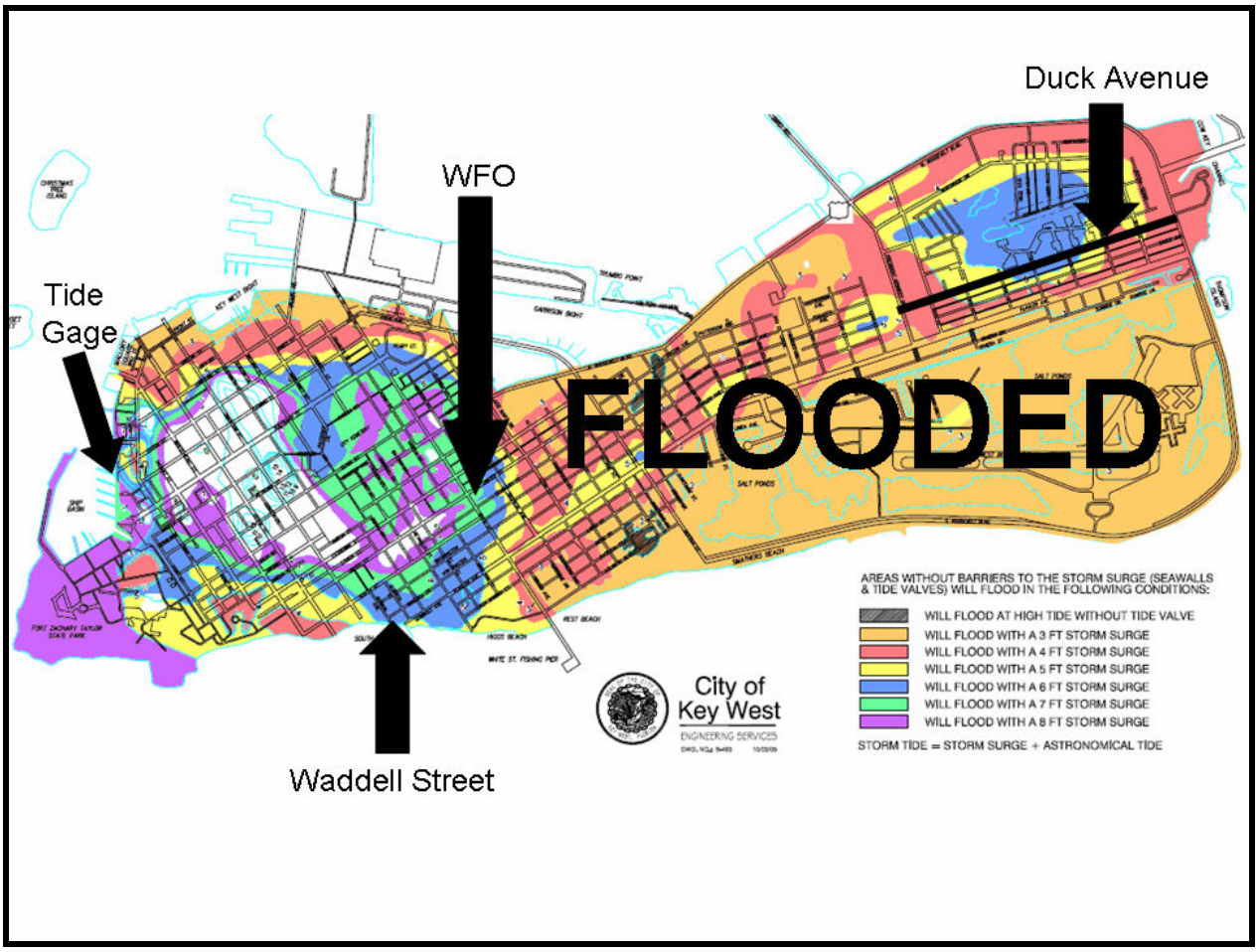

Fig. 9. Storm surge flood potential map of Key West, FL. Areas shaded in orange, red, yellow, blue, green, and purple are likely to flood with storm surges of 3, 4, 5, 6, 7, and 8 ft, respectively. During Hurricane Wilma, storm *tides* peaked at 4.5-6.5 ft above MSL throughout Key West. Predicted astronomical tides at Key West Harbor during Hurricane Wilma ranged from 1.1 ft above MSL (0234 EDT, 24 October) to 0.4 ft below MSL (1027 EDT, 24 October), and peak storm surge values across Key West ranged from 4.0-6.0 ft above MSL, resulting in the inundation of more than 50 percent of the island. The NOS tide gage, Waddell Street, NWS WFO, and Duck Avenue are indicated by black arrows and referenced in the text (map courtesy of City of Key West Department of Engineering Services).

Fig. 10. Storm surge flooding around 1030 EDT, 24 October, Bertha Street and Atlantic Boulevard intersection, Key West, FL (photograph by Chip Kasper)

The author finished his operational shift at WFO Key West around 0800 EDT, 24 October, and subsequently observed the second storm surge event at its peak in portions of Mid Town Key West, between United Street and Atlantic Boulevard, and between White Street and First/Bertha Streets. The WFO Key West is located on a compound bordered by United Street on the north, White Street on the west, and Seminary Street on the south. The main building is within 50 ft of White Street, at an elevation of 7 ft above MSL (the operational floor of the building is raised to an elevation of approximately 15 ft above MSL). By 0900 EDT, sea water had moved inland to a point on United Street at 6 ft above MSL, less than 15 ft from the northeastern boundary of the WFO Key West compound. At this time, most of Key West east of White Street was inundated (greater than 50 percent of the island surface area). Waters rose very quickly, 2-3 ft in less than 15 minutes. Island terrain significantly modulated water levels and currents over the island. Floating debris, tree branches, and household goods were ubiquitous, and accumulations of debris and other flotsam caused constrictions in the current resulting in very turbid flow locally, some of which was reminiscent of river rapids (see Fig. 11). In shallower depths, fish and other marine wildlife were visible swimming beneath the water surface, and numerous island residents reported dead fish and eels for days after the flood waters receded.

Major flooding occurred on Stock Island where sea water up to 3 ft deep was reported in the residential streets of the Key West Golf and Country Club. Maximum storm tides of 5-8 ft above MSL were estimated throughout most of the lower Florida Keys, between Boca Chica Key and Big Pine Key. Numerous homes were flooded, and thousands of vehicles were total losses. U.S. Highway 1 flooded in the Saddlebunch Keys.

Fig. 11. Photograph of South Roosevelt Boulevard-Bertha Street intersection in Key West, FL around 1100 EDT, 24 October 2005. Note water flowing toward Hawk Channel (Atlantic Ocean) through large slabs of asphalt (photograph by Chip Kasper).

Maximum storm tides of 5-8 ft above MSL were estimated between 1100-1300 EDT in Marathon and throughout the middle Florida Keys. Figure 12 shows a water level plot recorded by the NOS tide gage at Vaca Cut (about one mile east of KMTH) during 23-24 October. U.S. Highway 1 was flooded at several locations. In addition, numerous homes, businesses, and Florida Keys Marathon Airport were flooded (see Figure 13 for a picture of storm surge inundation in Marathon).

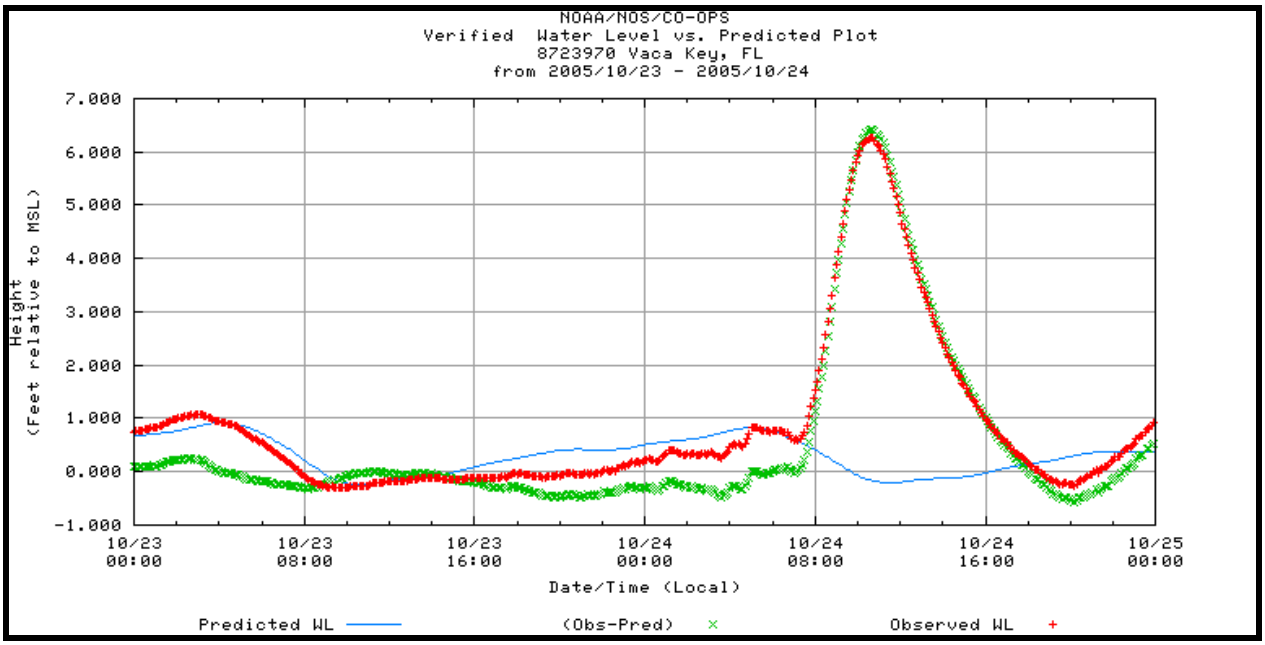

Fig. 12. Plot of predicted (blue), observed (red), and difference between observed and predicted (green) water level in feet relative to MSL from 0000 EDT, 23 October 2005 to 2400 EDT, 24 October 2005 at the NOAA/NOS tide gage, Vaca Cut, Marathon, FL.

Maximum storm tides of 5 ft above MSL were estimated around 1500 EDT in Islamorada with most homes along Florida Bay flooded. In the upper Florida Keys, maximum storm tides of 4.5 ft above MSL were estimated at U.S. Highway 1 near Jewfish Creek, and at mile marker 110 where the road was flooded with several inches of water.

Fig. 13. Storm surge flooding around 1100 EDT, 24 October, Keys Fisheries on Gulf View Avenue in Marathon, FL (photograph by Carmen Watmuff, image courtesy of Keynoter Publishing Company, Inc.)

6. Tornadoes

Hurricane Wilma produced 10 tornadoes over the Florida peninsula on 23-24 October, but there were no confirmed tornadoes in the Florida Keys. However, a long-lived, mesocyclonic waterspout associated with a supercell thunderstorm was visible from Key West by NWS forecasters and other residents during the afternoon of 23 October (Fig. 14). This violent waterspout moved within three miles of the west end of Key West at closest approach, around 1600 EDT. Waterspout movement was estimated by Doppler radar to be near 40 kt toward the north-northwest. The parent convective cell of this vortex was associated with a large outer spiral rainband of Hurricane Wilma. This waterspout would have resulted in significant property damage, had the path tracked just a few miles farther east, over Key West or an adjacent island community in the lower Florida Keys.

Fig. 14. Photograph of a violent waterspout, located over Hawk Channel about four miles southwest of Key West, FL at approximately 1600 EDT, 23 October 2005. The man standing is near a seaweed patch on Smathers Beach, seaward of the coconut palm trees. White Street Pier is visible in the background, in front of the waterspout (image courtesy of Keynoter Publishing Company, Inc.).

7. Casualties and Damage

No fatalities directly related to storm conditions were reported. However, one fatality occurred during the evacuation of a special needs patient. No major injuries were reported to the NWS.

a. Wind damage

Scattered trees and numerous large branches were blown down throughout the Florida Keys. General damage was reported to shingles, lightweight material roofing, vinyl membrane roofing, and foam-board roof coverings. Isolated damage was reported to exterior wall coverings. An unknown number of mobile or prefabricated houses were damaged or destroyed. Naval Air Station Key West reported roof damage to an aircraft hanger and a technology building. A prefabricated office building housing a commuter airline collapsed at Key West International Airport, and metal siding was torn off the Air Traffic Control Tower. Widespread loss of cable-hung traffic signals was reported. Most commercial signs of various sizes were either knocked down or blown out. Extensive power outages occurred to distribution circuits and secondary lines, and complete power failure occurred throughout all of the lower Florida Keys, including Key West. However, power was restored quickly by utility crews (within 36 hours at most locations).

The vegetation in the Florida Keys looked "scorched" for several months after Hurricane Wilma owing to a combination of wind damage, salt damage, and the onset of a record-breaking dry season. In addition, during the next spring, most of the Royal Poinciana trees in the Keys failed to bloom. Usually, these trees begin flowering in April, peaking in late May and early June, rendering a spectacular display of orange-red flowers.

b. Storm surge damage

The primary damage throughout the Florida Keys from Hurricane Wilma was from storm surge flooding. Numerous vessels broke loose from moorings with losses in numerous marinas, including Boca Chica Marina. Several sailboats grounded on the shoulder of U.S. Highway 1 on Big Pine Key. Numerous ground-floor slab or block homes and businesses flooded throughout the Keys. Downstairs storage enclosures, sheds, and utility rooms of elevated stilted homes also flooded. Some complete home and business losses occurred. The propane tank for the NOAA Weather Radio transmitter generator fuel tank on Sugarloaf Key floated away (the supports were either blown off or collapsed in the storm surge). Several medium to large boats washed ashore along the Saddlebunch Keys. Thousands of vehicles were rendered permanently inoperable by the high storm tides. In addition, numerous house and vehicle fires occurred throughout the Florida Keys for several days after Hurricane Wilma, owing to electrical malfunctions. Clothes washing and drying machines and other appliances lined driveways and roadways throughout the Florida Keys for many weeks after the storm.

Significant damage occurred to the Florida Keys commercial fishing industry, particularly to the spiny lobster and stone crab trappers. The strong winds and rough seas destroyed or scattered hundreds of thousands of traps. Those traps that were recovered soon acquired abnormal accumulations of barnacles, apparently due to the mixing of fresh water from the Everglades with salt water from the Gulf of Mexico and Straits of Florida. Many of the remaining traps were thus locked shut by the barnacles, and extra labor was then required to access the catch, with the traps in many cases being subsequently destroyed.

The high winds, seas, and currents associated with Hurricane Wilma pushed most marine navigational buoys out of position. Subsequently, the Port of Key West was closed, and recreational boating remained hazardous for several days after Hurricane Wilma.

Key West International Airport and Florida Keys Marathon Airport were both closed for several days after Hurricane Wilma, with reduced operations lasting well into November 2005.

c. Beach erosion

Severe beach erosion occurred along the Atlantic shores of the Florida Keys, with severe erosion noted on Gulf side beaches in Key West as well. Most beaches were completely inundated near time of maximum storm tide. Breaking waves of six feet were estimated along the upper Florida Keys. South Roosevelt Boulevard in Key West was closed to traffic for nearly three weeks, while crews removed tons of sand and large pieces of seawall from the road (see Fig. 15).

Fig. 15. Photograph of South Roosevelt Boulevard near Smathers Beach in Key West, FL during the late afternoon of 24 October 2005, looking toward the east (photograph by Jim Lee).

d. Economic impacts

Total insurance claim payments made totaled $208,810,412 for Hurricane Wilma in Monroe County, Florida (Florida Office of Insurance Regulation Hurricane Summary Data, 2006). In addition, Hurricane Wilma occurred just days before the height of "Fantasy Fest", Key West's annual autumn street festival, attended by up to 100,000 people. The event was postponed until December. However, attendance was less than a third of the normal October attendance, and the local economy lost millions of dollars in hotel, restaurant, and retail revenues. The Florida Keys tourism economy suffered for several months after Hurricane Wilma. Finally, the commercial fishing industry also suffered huge economic losses.

Acknowledgements
Monroe County Emergency Management provided information regarding both wind and storm surge damage from Hurricane Wilma. The U.S. Coast Guard Sector Key West provided information regarding damage to marine navigational aids. Many thanks go to General Forecasters Jim Lee, Laura Kasper, and Senior Forecaster William South of WFO Key West for their reviews of the draft versions of this report. Their reviews improved the substance and the clarity of the final draft. In addition, helpful discussions with WFO Key West Science and Operations Officer Andrew Devanas and Warning Coordination Meteorologist Jonathan Rizzo improved the paper as well. Finally, WFO Key West Meteorologist-in-Charge Matt Strahan is acknowledged for his support and interest in this publication.

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Corresponding author address: Kennard "Chip" Kasper, NOAA/National Weather Service, 1315 White Street, Key West, FL 33040
E-mail: kennard.kasper@noaa.gov

APPENDIX E: MITIGATION INITIATIVES – FORMS AND TRACKING SPREADSHEETS

Step One: Preliminary Identified Initiative (Notice of Intent)

Step Two: Characterization Form

LMS Project Prioritization Form

2010 Update: Initiative Tracking Spreadsheets

MONROE COUNTY 2010 LMS
STEP ONE: PRELIMINARY IDENTIFIED INITIATIVE
(NOTICE OF INTENT)

Name of Entity: **Date Submitted:**

Contact Name: **Phone:**

E-mail:

Initiative/project title:

Initiative/project description:

Type of Project

☐ Acquisition ☐ Elevation ☐ Relocation ☐ Drainage
☐ Reconstruction ☐ Retrofit (wind) ☐ Retrofit (flood)
Other:

Special Consideration:

☐ V Zone ☐ Special Needs Population
Other:

Best Estimate of Total Project Cost: $

2010 Mitigation Goals addressed by the initiative *(select all that apply)***:**

☐	1. Preservation of sustainability of life, health, safety and welfare.
☐	2. Preservation of infrastructure, including power, water, sewer and communications.
☐	3. Maintenance and protection of roads and bridges, including traffic signals and street signs.
☐	4. Protection of critical facilities, including public schools and public buildings.
☐	5. Preservation of property and assets.
☐	6. Preservation of economy during and after disaster, including business viability.
☐	7. Preservation and protection of the environment, including natural and historic resources.

Hazards addressed by the initiative *(select all that apply)***:**

	Natural Hazards		***Technological Hazards***		***Societal Hazards***
☐	Hurricane/tropical storm (winds & surge flooding)	☐	Hazardous materials	☐	Transportation
☐	Flooding (rainfall ponding)		Utility outage or disruption	☐	Terrorism/civil disturbance
☐	Severe Storm/tornado	☐	- Loss of electric service	☐	Economic crisis
☐	Wildfire	☐	- Loss of water service	☐	Military conflict
☐	Drought	☐	- Loss of wastewater service	☐	Mass immigration
☐	Coastal erosion	☐	- Communications	☐	Epidemiological emergency
		☐	Oil spill		
		☐	Radiological accident		

Received By: **Date:**

MONROE COUNTY 2010 LMS
STEP TWO: CHARACTERIZATION FORM

This form is used to submit information necessary for the LMS Work Group to score and prioritize an initiative relative to other initiatives and projects. It is to be completed by the entity or owner who is responsible for the project when that entity or owner is prepared to move a project forward and seek funding.

When the Florida Division of Emergency Management issues a Notice of Funding Availability (NOFA) for Hazard Mitigation (HMGP) and Pre-Disaster Mitigation (PDM) funds, the LMS Work Group's Ranking Subcommittee is charged with developing a list of prioritized initiatives using the LMS Project Prioritization Form. The more complete the information, the better the basis for ranking this initiative relative to other initiatives.

Name of Entity: **Date Submitted:**

Contact Name: **Phone:**

E-mail:

Is the initiative/project on the Step One (NOI) list? Yes ☐ No ☐

Initiative/project title:

Initiative/project description:

Does the initiative/project benefit a "critical facility"? Yes ☐ No ☐

Location map is attached? Yes ☐ No ☐

Does the applicant have the legal authority to under take the project? Yes ☐ No ☐

If no, describe coordination necessary in order for the project to move forward

How quickly could the initiative be <u>started</u> after award?

☐ Six months or less ☐ Six months to one year ☐ One to two years

How long after award would it take to <u>complete</u> the initiative?

☐ Less than two years ☐ Two to three years ☐ More than three years

Describe the problem the Initiative/project will solve and the direct and indirect impact on the facility, system, or community if a "worst case" hazard scenario occurs.

2010 Mitigation Goals addressed by the initiative *(select all that apply)***:**

☐	1. Preservation of sustainability of life, health, safety and welfare.
☐	2. Preservation of infrastructure, including power, water, sewer and communications.
☐	3. Maintenance and protection of roads and bridges, including traffic signals and street signs.
☐	4. Protection of critical facilities, including public schools and public buildings.
☐	5. Preservation of property and assets.
☐	6. Preservation of economy during and after disaster, including business viability.
☐	7. Preservation and protection of the environment, including natural and historic resources.

Hazards addressed by the initiative *(select all that apply)***:**

	Natural Hazards		***Technological Hazards***		***Societal Hazards***
☐	Hurricane/tropical storm (winds & surge flooding)	☐	Hazardous materials	☐	Transportation
☐	Flooding (rainfall ponding)		Utility outage or disruption	☐	Terrorism/civil disturbance
☐	Severe Storm/tornado	☐	- Loss of electric service	☐	Economic crisis
☐	Wildfire	☐	- Loss of water service	☐	Military conflict
☐	Drought	☐	- Loss of wastewater service	☐	Mass immigration
☐	Coastal erosion	☐	- Communications	☐	Epidemiological emergency
		☐	Oil spill		
		☐	Radiological accident		

GENERAL BENEFITS

Use this section to provide a "big picture" description of the benefits of the initiative. These general benefits are not the same quantifiable benefits that are determined using FEMA's formal Benefit-to-Cost Analysis tools.

How many people might be injured, sickened or killed in the "worst case" scenario without this initiative? _____ injured _____ sickened _____ killed ☐ don't know ☐ not applicable

What percentage of the jurisdiction's permanent population is served by the Initiative/project?

☐ Up to 10% ☐ 26 to 40% ☐ 66 to 80%
☐ 11 to 25% ☐ 41 to 65% ☐ 81 to 100%

Describe the economic benefits of the project. _____

Describe the social benefits of the project. _____

Describe whether the project protects cultural or historic resources.

Describe the environmental benefits of the project.

COMPARISON OF BENEFITS TO COSTS

The worksheet in Attachment A may be used to approximate a Benefit-to-Cost Ratio for the purposes of moving a project to the Prioritized List. The worksheet can also be used to characterize the benefits and costs of initiatives that are not traditional "FEMA-eligible" projects (e.g., structure elevation, facility retrofit, drainage improvement).

IMPORTANT NOTE: An initiative that is expected to be submitted for FEMA funding can be put on the Prioritized List based on an approximate Benefit-to-Cost Ratio. However, as part of a formal application, applicants for traditional "FEMA-eligible" projects will be required to satisfy all application requirements, including development of a Benefit-to-Cost Ratio using FEMA's Benefit-Cost Analysis tools.

Estimate the total cost to implement (e.g., including design, construction, construction management, purchase of equipment, etc.). $

Has a formal Benefit-Cost Analysis been prepared? Yes ☐ No ☐

If yes, what is the computed Benefit-to-Cost Ratio?

If no, use the worksheet in Attachment A and insert the Approximate Benefit-to-Cost Ratio:

FEASIBILITY

Check the statement that most applies to this project regarding its consistency with other applicable plans, programs, policies, ordinances and codes of the jurisdiction or proposing entity.

- ☐ The proposal is highly consistent (e.g., listed in multiple other documents)
- ☐ The proposal is consistent (e.g., listed in at least one other document)
- ☐ The proposal is not listed in other documents, but is consistent with intent
- ☐ The proposal conflicts with other documents or policies
- ☐ The proposal may be in conflict, needs more analysis

Permits and approvals likely to be needed for implementation.

- ☐ Zoning approval/change
- ☐ Concurrence/budget approval by local jurisdiction
- ☐ Building permit
- ☐ State permits (list)
- ☐ Federal permits (list)
- ☐ None required

☐ Other (list)

Check the statement that most accurately describes technical feasibility.

☐ No engineering is necessary to document technical feasibility (e.g., buyouts)

☐ An engineer has preliminarily determined that the project is technically feasible (e.g., based on similarity with similar projects)

☐ An engineering analysis will have to prepared to document technical feasibility

Check the statement that most accurately describes implementation effort.

☐ The proposal would be relatively easy to accomplish

☐ The proposal is not anticipated to be difficult to accomplish

☐ The proposal will be somewhat difficult to accomplish

☐ The proposal will be difficult to accomplish

☐ The proposal will be very difficult to accomplish

Check the statement that most accurately describes how the community would likely react to implementation.

☐ The proposal is likely to be endorsed by the entire community

☐ The proposal would benefit those directly affected; minimal adverse reaction from others

☐ The proposal would be somewhat controversial

☐ The proposal would be strongly opposed by some

☐ The proposal would be strongly opposed by most

If the proposal is expected to be generally acceptable, are there special interest groups or stakeholders that would likely oppose the initiative? Yes ☐ No ☐

<u>FUNDING SOURCE(S)</u>

Check the statement that most accurately defines the funding situation:

☐ No potential funding source (federal or non-federal) has been identified

☐ The only source of funding is federal mitigation grant programs

☐ Partial funding could be accomplished with local matching funds (budget or grants)

	Federal/State Mitigation Grant Source		***Non-Federal Source***
☐	Hazard Mitigation Grant Program (HMGP)	☐	Local government funds
☐	Pre-Disaster Mitigation (PDM)	☐	Non-profit funds
☐	Flood Mitigation Assistance (FMA)	☐	Private owner funds
☐	Severe Repetitive Loss (SRL)	☐	CDBG
☐	Repetitive Flood Claim (RFC)	☐	Other:
☐	Residential Construction Mitigation (RCMP)		
☐	Other:	☐	Other:
☐	Other:		

ATTACHMENT A – APPROXIMATION OF BENEFITS AND COSTS

Do not use this worksheet if a formal Benefit-to-Cost Ratio has been developed.

This simplified method to approximate benefits and costs is intended to be used if a formal Benefit-to-Cost Analysis has not been prepared and for initiatives other than traditional FEMA-eligible projects. The result of this approximation can help entities determine whether to pursue grant funding. The result can be used by the LMS Ranking Subcommittee to prioritize initiatives in Step Two (to put initiatives on the "Prioritized" list). Acceptance by the LMS Ranking Committee does not indicate acceptance by FEMA and this approximation does substitute for a formal analysis.

COSTS

For FEMA-eligible projects, see FEMA's Hazard Mitigation Guidance (published every year) for guidance on project costs and eligibility. In the total cost to implement a project, include all reasonably anticipated costs. For example, retrofitting a facility can reasonably be expected to have costs associated with design (architect/engineer), permits, construction and materials and, depending on the size of the project, construction management. FEMA's guidance indicates typical "useful life" for many types of projects. Recipients of federal grants are expected to maintain grant-funded projects. The "annual cost to maintain the project" are those costs necessary to ensure the project functions as intended. Thus, costs to maintain a retrofitted facility might include the annual check of windows/shutters, anchored roof-mounted equipment, and roofing.

Estimate the total cost to implement the initiative/project. $

What is the anticipated useful life of the project (see FEMA guidance) years

What is the anticipated annual cost to maintain the project. $

Multiple the useful life (in years) by the annual cost to maintain (to estimate the total cost to maintain the project). $

Add the total cost to implement and the total cost to maintain the project. $ Use this number as the "Total Project Cost" in the section below, COMPARISON OF BENEFITS TO COSTS

BENEFITS

For FEMA-eligible projects, see FEMA's Hazard Mitigation Guidance (published every year) for guidance on project benefits. The most basic benefits of an initiative/projects are avoided damage (if damage is avoided, then repair costs are avoided, disruption of facility use is avoided, etc.). One way to estimate avoided direct loss (physical damage) is to imagine a "worst case" event and estimate how much damage would occur (where the amount of damage is measured in terms of how much it would cost to repair). Similarly, consider the less tangible effects of a "worst case" event to come up with an estimate of indirect losses.

Describe the total direct loss (physical damage) to the facility, system, or community if a "worst case" hazard scenario occurs and estimate the dollar value of that loss.

What is the estimated the dollar value of that total direct loss $

Describe the total indirect loss (other costs associated with damage, e.g., cost to rent replacement facility, lost services, loss of jobs, etc.) if a "worst case" hazard scenario occurs.

What is the estimated dollar value of that total indirect loss $

Combine the total direct loss and the total indirect loss $ Unless modified by the next question, use this number as the "Total Project Benefits" in the section below, APPROXIMATING THE BENEFIT-TO-COST RATIO.

Will the initiative avoid or prevent all of the direct and indirect losses? Yes ☐ No ☐

If yes, the combined total direct loss and the total indirect loss is the estimate of total benefits.

If no, describe anticipated losses that will be avoided:

Based on the description of anticipated losses that will be avoided, estimate what percentage of all direct and indirect losses would be avoided:

Multiply the percentage of losses that would be avoided by the combined total direct loss and the total indirect loss: $ Use this number as the "Total Project Benefits" in the section below, APPROXIMATING THE BENEFIT-TO-COST RATIO.

APPROXIMATING THE BENEFIT-TO-COST RATIO

What are the "Total Project Benefits" from above? $

What is the "Total Project Cost" from above? $

Divide the benefits by the costs to get the "Approximate Benefit-to-Cost Ratio" Use this number as the "Approximate Benefit-to-Cost Ratio" in the main section, COMPARISON OF BENEFITS TO COSTS.

LMS PROJECT PRIORITIZATION FORM (2010R)		
Used by the LMS Ranking Subcommittee to review Characterization Forms to rank initiatives for placement on the Tab Two "Prioritized" list.	**Points**	**Award**
A. Meeting LMS Goals and Objectives		
1. Preservation & Sustainability of Life Health, Safety & Welfare	**50**	
2. Preservation of infrastructure from hazard-related damage	**30**	
3. Minimize damage & maintain roads & bridges during a disaster	**30**	
4. Protection of critical facilities from hazard-related damage	**10**	
5. Preservation of property & assets from future losses	**10**	
6. Preservation of economy during times of disaster	**10**	
7. Preservation and protection of the environment	**10**	
B. Percentage of permanent population served by the project:		
1. Up to 10%	**20**	
2. 11 to 25%	**40**	
3. 26 to 40%	**60**	
4. 41 TO 65%	**80**	
5. 66 to 80%	**100**	
6. 81 to 100%	**130**	
C. Type and number of hazards addressed:		
1. Hurricanes and other severe weather	**20**	
2. Utility outages or disruption	**15**	
3. Transportation disruption	**10**	
4. Economic Emergencies	**10**	
5. Communications disruption	**10**	
6. Mass immigration	**5**	
7. Hazardous materials incidents	**5**	
8. Coastal oil spills	**5**	
9. Radiological emergencies	**5**	
10. Epidemiological emergencies	**5**	
11. Drought	**5**	
12. Wildland fires	**5**	
13. Terrorism/Civil disturbance	**5**	
14. Military conflict	**5**	
D. Cost effectiveness based on Cost/Benefit Analysis:		
1. Ratio of 1 to 1	**10**	
2. Ratio of 1 to 2	**20**	
3. Ratio of 1 to 3	**30**	
4. Ratio of 1 to 4 etc.	**40**	
E. Economic Benefits		
1. If economic benefit demonstrated	**30**	
F. Social Benefits		
1. If social benefit is demonstrated	**20**	
G. Environmental Benefits		
1. If environmental benefit demonstrated	**20**	
H. Time Frame		
1. Six (6) months or less	**20**	
2. Six (6) months to one year	**10**	
3. One to two years	**5**	
I. Financially feasible?	**YES**	**NO**
J. Technically feasble?	**YES**	**NO**
K. Funding Available?	**YES**	**NO**
L. Have legal authority:	**YES**	**NO**
M. Consistency with Plans, Codes, Ordinances, Policies, etc.	**YES**	**NO**
TOTAL (Possible) POINTS	**895**	

Monroe County LMS Mitigation Initiatives: NOTICES OF INTENT

Project #	Project Owner / Sponsor	Project Title/ID	Project Location (County or city?)	Brief Description of Project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	Estimated Cost	BLANK	BLANK	BLANK	BLANK	BLANK	Date submitted	Last date confirmed to remain on list	NOTES
10	Monroe County & State Health Department	EOC	Plantation Key	2005-DOH has identified the need to operate its own EOC at a facility in the Tavernier area close to their Special Needs Shelter		Hurricane / Tropical Storm - Tornado	1,2,4,5	$100,000						Jan-06		DOH has occupied the Plantation Key Roth Building with no indicated costs. This facility may serve as an EOC.
50	Monroe County & State Health Department	Emergency power for Ruth Ivans Clinic / State Agency	Marathon	Installation of a drop switch for emergency generator at Ruth Ivans Clinic in Marathon. Possible installation of propane generator.	Bob Stone, Monroe County Public Works	Hurricane / Tropical Storm - Tornado	1,2,4,5	$10,000						16-Mar-06		MCPW's indicated that the building does have a generator back up with no indication of drop switch installation.
43 (Check)	Monroe County Housing Authority	Affordable Rentals, Phase III (elderly, New Construction)	Key West	New construction of affordable housing units. Continuation of project funded under prior Unmet Needs Funding. New construction of 14 affordable rental unit elderly persons. Permits and land in place.	Mr. J.E. Castillo, Sr., Executive Director	Hurricane- Tropical Storm / Flooding / Tornado	1,2,4,5	$2,000,000								Awaitning response from Mr. J.E. Castillo, Sr. (296-5621)
60 (Check)	Monroe County	Wind Mitigation of Commercial and Residential Properties	Monroe Co	Shutter per 09 Fl. Building Code, Install gable end bracing, corner hurricane bracing, attic gable end bracing (where approp.), addtl. Nailing of metal roofs @ corners/edges.	Lisa Tennyson, Monroe County Grants Administrator	Hurricane / Tropical Storm - Tornado	1,2,4,5	1,500,00.00						07.06.09		L. Tennyson, MC Grants Coordinator
61	Monroe County	Higgs Beach (KW) Seawall Replacement Project	Monroe Co	Seawall for flood water protection of the Historic West Martello Towers Fort	John King, Monroe County Public Works	Hurricane / Flooding / Tropical Storm - Tornado	1,2,4,5, 7	1,050,00.00						07.06.09	J. King, Sr. Dir.,MC Public Works	07.07.09 / Ongoing
47	Monroe County	Elevate property at 19421 Canal dr. Sugarloaf Key, Fl. (Rea)	Monroe Co	To elevate private residence to above base level flood .	Diane Bair, FEMA Flood Plain Manger	Hurricane / Flooding / Tropical Storm - Tornado	1,2,4,5	$50,000						9-Feb-06		ONLINE RECORD INDICATES REPLACED SIDING 2007 (WILMA)
	Monroe County	Elevate home at 234 W Seaview	Monroe Co	To elevate private residence to above base level flood .	Diane Bair, FEMA Flood Plain Manger	Hurricane / Flooding / Tropical Storm - Tornado	1,2,4,5	$120,000						2010 June		
69	Islamorada	Emergency Communications System, including communication and notification system comprised of video and cable components to augment the local cable system, local municipal radio communications systems, and satellite communications.	Islamorada	The project will provide a comprehensive communication and notification system comprised of video and cable components to enhance local and satellite communications capabilities. It will assist in providing continuity of communications during an emergency.	William Wagner, 305-664-6490	Hurricane	1,2						255			

Project #	Project Owner / Sponsor	Project Title/ID	Project Location (County or city?)	Brief Description of Project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	Estimated Cost	BLANK	BLANK	BLANK	BLANK	BLANK	Date submitted	Last date confirmed to remain on list	NOTES
23	Islamorada	Islamorada Village of Islands Records Management Backup	Islamorada	In the event of a disaster or serious emergency valuable Village records and data could be lost. It is necessary to develop a program to determine the best ways to ensure that records are not lost. Such as project would include evaluating status of existing data, determining whether to convert hard copy data to computer format, protection of computer files, and remote data back up. The project could include a plan to secure paper files, computer data and equipment, and establishing a remote location for data beck-up, storage and retrieval in the event of a disaster.	Beverly Raddatz, 305-664-6412	Hurricane	5,6,7						315			Pending.
	Historic Florida Keys Foundation	Old City Hall Flood Retrofit	Key West	Install flood panel systems for double doors on Ann Street and single door on Greene Street	Diane Silva 304-1453	Hurricane, flooding	1, 4, 5, 7	$15,000						2010 July		
49	Key West	Wind retrofit of homes	Key West	The City will manage a project to examine homes and provide recommendations to homeowners for wind retrofit and fund the structural retrofit.	City General Services, City Engineer	Hurricane, Tornado	1, 5,	$100,000						16-Mar-06	4/30/2010	
5	Key West	Electronic connection of the NWS to KW EOC	Key West	2006-Connecting the Key West EOC to the National Weather Station in Key West	City Information Technology Dept Directo City General Services, City Engineer	Hurricane, Tornado	1, 2, 3, 4, 5, 6, 7	$50,000							4/30/2010	
12	Key West	Shutter Lift Station A	Key West	Install Dade county approved shutter system and retrofit roof to 150 mph, Thomas St.	City General Services, City Engineer	Hurricane, Torndao	1, 2, 4, 6, 7	$5,000							4/30/2010	
15	Key West	Shutter Clayton Sterling Complex boys & girls	Key West	Install two buildings with dade County approved shutter system and retrofit roof for 150 mph	City General Services, City Engineer	Hurricane, Torndao	2, 4, 5	$20,000							4/30/2010	
16	Key West	Shutter Easter Seals Center of Key west	Key West	Install shutter system on Easter Seals Center	City General Services, City Engineer	Hurricane, Torndao	1, 2, 4, 5, 6	$12,000							4/30/2010	
17	Key West	Shutter Fire Station #3	Key West	Install Dade county approved Fire Truck garage Doors.	City General Services, City Engineer	Hurricane, Torndao	1, 2, 4, 5, 6,	$40,000							4/30/2010	
18	Key West	Shutter Fire Station Museum	Key West	Install Dade county approved shutter system on structure.	City General Services, City Engineer	Hurricane, Tornado	4, 5, 7	$30,000							4/30/2010	

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19	Key West	Elevate Two Friends Patio	Key West	This is a repetitive loss/flood commercial structure. Raise structure above flood elevation (AE7)	City General Services, City Engineer	Hurricane, Flooding	5, 6	$230,000							4/30/2010	
20	Key West	Elevate City Cemetery Sexton's office.	Key West	Raise the City Cemetery Sexton's office above flood level. Install shutters.	City General Services, City Engineer	Hurricane, Flooding	2, 4, 5, 7	$50,000							4/30/2010	
21	Key West	Flood Control Flagler Avenue	Key West	Install nine wells to intercept water from Flagler Avenue and put tide valves to stop storm surge	City General Services, City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7	$560,000							4/30/2010	
22	Key West	Shutter Bayview park Scorebox	Key West	Install Dade county approved shutter system on Bayview Park Scorebox..?	City General Services, City Engineer	Hurricane, Tornado	2, 4, 5	$4,000							4/30/2010	
23	Key West	Flood Control East Front Street	Key West	Install six wells and inlet structures to intercept water prior to flooding Front St.	City General Services, City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7	$550,000							4/30/2010	
24	Key West	Flood Control Mallory Square	Key West	Install tide valve to slope tide water and wells to intercept storm water from getting to front street (a flood area) (6 weeks / one valve)	City General Services, City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7	$600,000							4/30/2010	
25	Key West	Construction of EOC Hurricane Shelter	Key West	Place a second story hurricane shelter on a Cat 5 Fire Department structure adjacent to the EOC (also Cat 5) to allow for sleeping and feeding and shower facilities for EOC occupants. Relocate City computer center to that location.	City General Services, City Engineer	Hurricane, Flooding	1, 4, 5, 6	$1,871,200							4/30/2010	
26	Key West	Pre-Disaster Employee Response Plan	Key West	Create an Emergency Management pre-disaster/disaster response plan to ensure the best practices are in place prior to a disaster and after.	City General Services, City Engineer	Hurricane, Flooding, Tornado, Wildfire, Drought, Coastal Erosion	1, 2, 3, 4, 5, 6, 7	$100,000							4/30/2010	
27	Key West	Sister City Computer Backup	Key West	Develop a relationship and create a duplicate system for the City's computer hardware required to operate the City of Key West; pre & post disaster.i.e. (Building, Planning, Files and Finance).	City General Services, City Engineer	Hurricane, Flooding, Tornado, Wildfire, Drought, Coastal Erosion	1, 2, 3, 4, 5, 6, 7	$800,000							4/30/2010	
28	Key West	Relocation of City Records	Key West	Relocate the City's record storage system to a facility that is designed for 150 mph storm and above flood level.	City General Services, City Engineer	Hurricane, Flooding, Tornado, Wildfire, Drought, Coastal Erosion	1, 2, 3, 4, 5, 6, 7	$800,000							4/30/2010	

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29	Key West	Hurricane Mitigation Community Training Program.	Key West	Develop and implement (1st year) a community training program to assist homeowners and businesses in preparing for disaster.	City General Services, City Engineer	Hurricane, Flooding, Tornado, Wildfire, Drought, Coastal Erosion	1, 2, 3, 4, 5, 6, 7	$20,000							4/30/2010	
30	Key West	Emergency Warning Phone Call System	Key West	Install a computerized telephone call system to call each phone to indicate emergency operations warnings.	City Information Technology Dept Directo City General Services, City Engineer	Hurricane, Flooding, Tornado, Wildfire, Drought, Coastal Erosion	1, 2, 3, 4, 5, 6, 7	$600,000							4/30/2010	
31	Key West	Planning/Development of Sister City EOC	Key West	Develop a plan & implement a Sister City Emergency Operations Ceneter for large scale pre & post disaster situations.	Director of Emergency Management	Hurricane, Flooding, Tornado, Wildfire, Drought, Coastal Erosion	1, 2, 3, 4, 5, 6, 7	$40,000							4/30/2010	
32	Key West	Emergency warning Signal	Key West	Install a siren or message device to be heard all across the City.	City Information Technology Dept Directo City General Services, City Engineer	Hurricane, Flooding, Tornado, Wildfire, Drought, Coastal Erosion	1, 2, 3, 4, 5, 6, 7	$200,000							4/30/2010	
33	Key West	Shutter Park-N-Ride	Key West	Shutter the parking garage to storage of City Emergency vehicles and equipment; post disaster relief site.	City General Services, City Engineer	Hurricane, Flooding, Torndao	1, 2, 3, 4, 5, 6, 7	$250,000							4/30/2010	
34	Key West	Shutters on Old City Hall	Key West	Install Dade county approved shutter system on historic structure which is owned by the State of Florida, but leased by the City of Key West.	City General Services, City Engineer	Hurricane, Torndao	1, 2, 4, 5, 6	$40,000							4/30/2010	
35	Key West	Shutter YMCA	Key West	Install shutter system on YMCA	City General Services, City Engineer	Hurricane, Torndao	4, 5, 6	$20,000							4/30/2010	
36	Key West	Shutter City Hall	Key West	Install Dade county approved shutter system on structure.	City General Services, City Engineer	Hurricane, Tornado	1, 2, 3, 4, 5, 6, 7	$60,000							4/30/2010	
37	Key West	Shutter Wickers Field concession 1,2 & 3 & Restrooms & Office	Key West	Install buildings with dade County approved shutter system and retrofit roof for 150 mph	City General Services, City Engineer	Hurricane, Tornado	4, 5, 6	$15,000							4/30/2010	
38	Key West	Elevation of Public Works Facility	Key West	Raise the Public Works Office, equipment storage & repair facilities. Two structures.	City General Services, City Engineer	Hurricane, Flooding, Tornado	1, 2, 3, 4, 5, 6, 7	$373,000							4/30/2010	
53	Key West	United St. / Jose Marti Drainage Improvements	Key West	Install drainage systems and pump to protect the drainage basin from flooding due to rain and stormsurge.	City General Services, City Engineer	Hurricane, Flooding, Coastal, Erosion	1, 2, 3, 4, 5, 6, 7	$2,300,000						13-Apr-06	4/30/2010	

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40	Key West, Housing Authority of	Rehabilitation and Retrofit of George Allen Apartments	Key West	Rehabilitation, window replacement & retrofit shutters Miami Dade County approved wind resistance of 117 public housing project units.	Manual Castillo, Director, KWHA	Hurricane, Torndao	1, 4, 5, 6	$550,000							4/30/2010	
42	Key West, Housing Authority of	Reconstruction of Key Plaza Site B	Key West	Demolition and reconstruction of 50 affordable apartment units.	Manual Castillo, Director, KWHA	Hurricane, Torndao	1, 4, 5, 6	$6,775,000							4/30/2010	
	City of Layton	Harden Administratice Ofice	City of Layton	Replace windows and doors, tie in roof	305-664-4746	Hurricane, Tornado	1,2,4,5,6,7	30,000						1-Apr-10	Jun-10	
11	Marathon	Sombrero Beach Rd Stormwater Mitigation Project	Marathon	Purchase of Generators, retro-fit of storm shutters on designated shelters, construction of County EOC, Storm Water Mitigation Project.		Hurricane, Flooding	1, 2, 3	$3,306,505								
55	Marathon	Cathy Cone Elevation	Marathon	To elevate private residence to above base level flood and bring roof up to current code.		Hurricane, Flooding	1, 5, 6	$50,000						13-Apr-06		
58	Marathon	City Hall location	Marathon	Replace infrastructure at temporary City Hall		Hurricane, Flooding, Tornado, Wildfire, Drought, Coastal Erosion	1, 3, 4, 6	$60,000.00						9-Nov-07		Not submitted in person (e-mailed)
54	Marathon	Meagan Sayer Elevation	Marathon	Elevation and second floor conversion of 1958 SFR		Hurricane, flooding	1, 5, 6	$300,000						13-Apr-06		
New	Marathon	Area 3 Stormwater/Wastewater Project	Marathon	2009 - Installation of drainage and retention structures to minimize the impacts from rainfall/flood events with a 25-year frequency.		Flooding/drainage	2, 3									
New	Marathon	Area 5 Stormwater/Wastewater Project	Marathon	2009 - Installation of drainage and retention structures to minimize the impacts from rainfall/flood events with a 25-year frequency.		Flooding/drainage	2, 3									
New	Marathon	Area 7 Stormwater/Wastewater Project	Marathon	2010 - Installation of drainage and retention structures to minimize the impacts from rainfall/flood events with a 25-year frequency.		Flooding/drainage	2, 3									
New	Marathon	Hurricane Shelter	Marathon	Increase the shelter spaces available during hurricane emergencies		Hurricane	1, 4									
39	US Fellowship of Florida	Peacock Apartments Rehabilitation Project		Rehabilitation and retrofit of 24 unit special needs housing property. Serves very low income mentally ill adults		Hurricane/Tropical Storm	1,5, 6	$150,000							06.29.10	Information / reply pending.
62	St. Marys Star of the Sea Parish	1010 Windsdor Lane, Key West, FL 33040		Structural retrofitting of Existing Auditorium Building		Hurricane/tropical storm	1, 5, 6	To be determined						14-Sep-09	06.29.10	Submitted by Kevin Beede on behalf of Fr. John Baker - no action.

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44	Mel Fisher Maritime Museum	Capital Improvement Project - Windows and Doors.		The window and doors project is a subset of an overall capital improvement project designed to protect and preserve a historically significant building, located in a historic district and housing a priceless and unique historical collection.		Hurricane/tropical storm	1, 5, 6, 7	$250,000							06.29.10	Information / reply pending.

Monroe County LMS Mitigation Initiatives : PRIORITIZED

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2	Monroe Co	Construct a new County Emergency Operations Center (EOC) Facility or Upgrade Existing Facility located on the second floor of the Marathon Government Complex.	Marathon, Monroe County	1999-During the operation for Hurricane Georges several issues arose that identified problems with the existing County Emergency Operations Center located in the County Commission Chambers in the Marathon Government Center. The current facility is shared with the County Commission. This can present problems when a Commission meeting is scheduled during a time when an emergency event may be threatening the County. It may inhibit the ability of emergency managers to ready the EOC well in advance of a potential threat.	DR1561 Jerry OCathey	Hurricane / Tropical Storm, Flooding, Tornado	1,2,4,5,6	$7,240,000		2 yrs	EMPG		425		Reviewed 06.29.10	submit under Wilma - Ongoing
17	Monroe Co	Emergency Management Training Programs	Monroe Co	1999-Conduct regular training for Emergency Operations Center (EOC) personnel. Conduct training for all emergency response personnel, including County officials. Provide orientation and training for all designated EOC personnel, including procedures, technology, communications, facility layout, etc. Plan and improve hurricane drills with more realistic scenarios.		All Hazards	1,2,4,5,6			1 yr	None	Staff	320		06.29.10	On-going
18	Monroe Co	Review and study of sewage and septic systems to determine the most effective method for use in the Florida Keys	Monroe Co	1999-During Hurricane Georges some problems occurred with private aerobic systems which are currently the recommended systems in the Keys. The study would review problems that occurred following Hurricane Georges and analyze various aspects of different sewer systems. The project would include recommendations for the best systems to meet the unique and varied conditions in Monroe County.		Hurricane / Tropical Storm, Tornado	1,2,4,5,6			5 yrs	Health		320		Reviewed 06.29.10	ONGOING: The State of Florida has granted Monroe County an extension for sewering until 2015.

Monroe County LMS Mitigation Initiatives : PRIORITIZED

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31	Monroe Co	Replacement of storm damaged wastewater treatment facilities	Monroe Co	1999-Locations could include package treatment plants that serve small communities and businesses within the County.Hurricane Georges demonstrated the need to address replacement of storm damaged wastewater treatment plants and to upgrade these facilities to better withstand potential storm effects.	ck w eng,doh,pw	Hurricane / Tropical Storm, Tornado	1,2,4,5,6			3 yrs	Public Works		270		Reviewed 06.29.10	ONGOING: The entire Keys are CURRENTLY undergoing a large scale sewering program for which the deadline has been extended by the state until 2015.
14	Multijurisdictional	Comprehensive hazard mitigation (prevention) education and outreach program targeted to government employees, the construction industry and trades, and the general public.		1999-During the development of the Local Mitigation Strategy the Working Group identified the need to provide information about the mitigation concept and how to use it. To address educating government employees about the benefits of mitigation awareness, training programs and materials will be developed. Through this training, agencies' staff will understand the concept of reduction of loss and risk and be able to apply it at their jobs and homes. The project would involve the construction industry by developing educational materials and arranging for seminars through the private sector. Businesses such as private contractors and building supply companies would help arrange for and participate in the programs. Groups such as building officials and public works and construction staff could participate. Local governments will be encouraged to allow their personnel to attend. In addition, the programs would be submitted to the appropriate authorities to determine eligibility for CEU credits. Finally, a mitigation brochure will be produced and distributed to the public. I	LMSRC needs to discuss this issue	All Hazards	All Goals Addressed			2 yrs	None	Staff	330		Reviewed 06.29.10	ALM discusses FIU Meeting (FIRM Windstorm Mitigation) which addressed shuttering, hurricane clips, metal roofs. Idea proposed to have an entity (pol. or pvt.) sponsor Hurricane. Mitigation Educational Initiative. Need to make this knowledge available to public. Sam Coskey, suggests representative of Dept. of Fl. Financial Services (My Safe Florida Rooms) to sponsor a speaker to present these ideas publically. **Ongoing for the WG. LMSRC needs to discuss this issue in our next meeting**

Monroe County LMS Mitigation Initiatives : PRIORITIZED

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81	Multijurisdictional	Production of a Mitigation Program Technical Assistance and Resource Manual.		1999-During the Working Group's activities and discussions it was determined that their was a need for an assistance manual to identify mitigation assistance programs and provide direction on how to apply for funds and grants such as the federal Hazard Mitigation Grant Program. This manual would be especially useful to small agencies and private non-profits that are invited to apply for state and federal grants, but may not have the technical knowledge to complete the application process. The manual would also include a listing and description of various government and/or private programs that could apply to mitigation efforts.	advent of website access, applicant briefings, etc. may be unnecessary further development of HMGP EM website to enhance informational outreach.	Hurricane / Tropical Storm, Tornado	All Goals Addressed			2 yrs	None	Growth Management			Reviewed 06.29.10	DCA and FEMA materials may be sufficient . **DISCUSS @ next LMS WG Meeting.**
65	Monroe Co	Demolish and Elevate second home 144 Sea Lane, Geiger Key (McDonald)	Monroe Co	Replaced existing mobil home at 144 Sea Lane Geiger Key, Fl. 33040 and elevate new modular home to meet current code. Permit # 2007.	David McDonald 813-287-1712	Hurricane / Tropical Storm, Tornado	1,2,4,5,6	$70,000		6 mos or less	FMA	Owner	140	7-Sep-06	Reviewed by D. Bair, 06.29.10	submit under Wilma / Ongoing with state inquiry NOT FOUND IN APPRAISER'S ONLINE RECORDS
66	Monroe Co	Elevate property at lot 15, block 41 (31332 Ave G, Big Pine Key), sands Sub-Division (Grimes)	Monroe Co	2006-To elevate private residence to 8 feet above base level flood .	Mary A Grimes	Hurricane / Tropical Storm, Tornado	1,2,4,5,6	$300,000		6 mos to 1yr	FMA	Owner	120		Reviewed by D. Bair, 06.29.10	No change. Still ground level structure.
64	Monroe Co	Elevation of residence 240 Lincoln Ave., Key Largo (Miklas)	Key Largo	2006-Proposal to elevate ground level home (24x30). Suffered claims from Irene, Georges and Kathrina.	Joseph Miklas	Hurricane / Tropical Storm, Tornado	1,2,4,5,6	$30,000		6 mos to 1yr	FMA	Owner	140		Reviewed by D. Bair, 06.29.10	No change. Still ground level structure.

Monroe County LMS Mitigation Initiatives : PRIORITIZED

Project #	Project Owner / Sponsor	Project Title/ ID	Project Location (County or city?)	Brief Description of Project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	Project Cost (in Char. Form)	Benefits (in Char. Form)	Est time to complete (IF FUNDED)	Expected F/S Grant Fund	Likely Source of Match	Rank (by SubC)	Date submitted	Last date confirmed to remain on list	Notes
33	Islamorada	Pilot project to determine actual first floor elevations of all structures in the Village of Islamorada to determine the effectiveness of the NHC SLOSH storm surge model and damage prediction tool	Islamorada	A problem exists in determining the effectiveness of the National Hurricane Center's SLOSH model due to the lack of complete and accurate information about actual first floor elevations of structures in affected areas. Since Islamorada is a new community of manageable size, it would be an ideal place to serve as a pilot for an elevation study. The National Hurricane Center recommends the project which will enable planners to determine real risk as opposed to perceived risk and could help greatly in determining the validity of current hurricane damage predictions. Information obtained from this study could also be applied to the State of Florida Department of Community Affairs TAOS prediction model.	Ed Koconis, 305-664-6420	Hurricane, Flooding	5			2 yrs	NWS		270			In Process
	Layton	Retrofit City Administration Building	Layton	Retrofit City Admin builidng with windows and doors for +170 mph winds	Skip Haring	Hurricane/Tropical Storm	1, 4, 6	$35,000	6.7	6 mos	HMGP	City		2010 June		Used new Characterization Form
21	Key Colony Beach	Provide back-up systems for the Marathon-KCB Florida Keys Electric Cooperative (FKEC) generation system and the Marathon-KCB Florida Keys Aqueduct Authority (FKAA) generation system.	Key Colony Beach	1999-The project would include a study to identify the best means to back-up loss of generating systems of the FKAA and the FKEC. It also includes purchase and installation of appropriate back-up systems	ck w Ed Borciewicz	Hurricane/Tropical Storm	1, 2, 4, 6			1 yr	None	City	320			
77	Key Colony Beach	Retrofit the entire Key Colony Beach City Hall/ Post Office Complex to be flood-proof, wind resistant, and properly equipped to ensure continuity of government operations and for use as a hurricane refuge of last resort.	Key Colony Beach	1999-The project would include an engineering study to determine what improvements to make for flood-proofing and wind resistance. A determination would be made of items needed to prepare the building for use as a hurricane shelter.	Ck w Ed Borciewicz	Hurricane/Tropical Storm	1, 2, 4, 6			1 yr	None	City				

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78	Key Colony Beach	City of Key Colony Beach Records Management Backup	Key Colony Beach	1999-In the event of a disaster or serious emergency valuable City records and data could be lost. It is necessary to develop a program to determine the best ways to ensure that records are not lost. Such as project would include evaluating status of existing data, determining whether to convert hard copy data to computer format, protection of computer files, and remote data back up. The project could include a plan to secure paper files, computer data and equipment, and establishing a remote location for data beck-up, storage and retrieval in the event of a disaster.	Ck w Ed Borciewicz	Hurricane/Tropical Storm	2, 6			1-2 yrs	None	City				"Check with I.Toner as to COOP plan and related multi-jurisdictional accomplishments"
80	Key Colony Beach	Upgrade and retrofit the Key Colony Beach Wastewater Treatment Plant and R/O Emergency Generating System.	Key Colony Beach	1999-The project would identify items required to retrofit these critical city facilities and construct the necessary improvements. This includes floodproofing 12 lift stations and 1 lab	ck w Ed Borciewicz	Hurricane/Tropical Storm	1, 2, 4, 6			6 mos	None	City				
5	Key West	Retrofit the entire City Hall Complex/Police Department headquarters including EOC, fire station, police department, ambulance services, 911/emergency dispatch, and records storage, to be flood-proof, wind resistant, and properly equipped for use in all categories of storms.	Key West	1999-The project would include an engineering study to determine what improvements to make for flood-proofing and wind resistance. A determination would be made of items needed to bring the buildings up to Category 5 hurricane standards. The City Hall Complex and Police Station are the heart of the City's business and emergency activities. Maximum protection for these facilities would ensure continuity of emergency and government services, including fire and police, and 911 dispatch, records maintenance, and operational capability for many other city services and departments that are housed at this location.	City General Services, City Engineer	Hurricane/Tropical Storm	1, 2, 4, 6			6 mos	None	City	385			2006-City Councilmen considering demo-rebuilding a new facility. PENDING 07.22.08 ALM requests left on list

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9	Key West	Development by the Key West Police Department of a Hurricane / Emergency response Plan for the City that will include items relating to experiences from Hurricane Georges.	Key West	1999-Subsequent to Hurricane Georges, the Police Department performed a thorough review and analysis of their existing hurricane procedures. Sections of the plan and procedures were re-written and recommendations made to upgrade and improve the current document. The Key West Police Department is revising their emergency plans and procedures accordingly. Through the auspices of the Police Department, the City also wishes to develop a Comprehensive Hurricane Response Plan for all city agencies and activities.	Chief Donie Lee * Craig Marston, Division Chief	All Hazards	1			1 yr	None	City	360			Completed 9To have been done by June, 08) * CEMP with Hurricane Annex and Debris Management Plan completed 4/10. CEMP include COOP and COG. To be presented to City Commission for approval 6/10. * Individual department plans will be completed FY 10 - 11 * IMT plans, policies, and procedures to be completed FY 10 - 11.
12	Key West	Retrofit City Buildings with Storm Shutters, Roof Improvements, etc.	Key West	1999-The project would include an engineering study and selection of the most appropriate window protection for all City facilities. This would protect the integrity of the contents of the building and strengthen the envelope from storm hazards. It would contribute greatly to reduction of future loss. In addition, expedient preparedness of City buildings allows employees to get home to prepare their homes and evacuate in a safe time frame. The project will be phased with applications for individual projects submitted separately for grant funding. Buildings to be included: • Wastewater Treatment Plant Storm resistance modifications including shutters for exit doors. – Estimated Cost: $15,000.00 (Pending as of 5/18/06) (Completed) • City of Key West Waterfront Market and Restrooms – Estimated Cost - $68,850.00 (Pending as of 5/18/06) (Completed)	Annalise Mannix Lachner reported two of the projects were completed and were transferred to removed list as instructed by JOC.	Hurricane/Tropical Storm	2, 4, 6			18 mos	None	City	335			City Hall project : incomplete Other buildings: status unknown. * Demolition and construction of City Hall complex under City Commission review. Action to be taken FY 10 - 11.

Monroe County LMS Mitigation Initiatives : PRIORITIZED

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19	Key West	Ashby St Pump Assist Storm Water Outfall	Key West	2006-Install pump and piping and all appearances to protect the drainage basin from rain and flood (storm surge)	City General Services Dep City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7	$1,700,000		6 mos to 1yr	HMGP	City	320	13-Apr-06	**4/30/2010**	Submit under Wilma / design was awareded to pump the water overboard during hurricanes
25	Key West	White St. Pump assist Stormwater Outfall	Key West	2006-Install pump and piping and all appurtances to protect the drainage basin from rain and flood (storm surge)	City General Services Dep City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7	$2,400,000		6 mos to 1yr	HMGP	City	290	13-Apr-06	**4/30/2010**	Submit under Wilma / AML leave =on list
26	Key West	Flagler Avenue Tide Valves	Key West	Storm water injection wells and trench-draining systems are part of the City's storm water improvement plan. This work is vital to prevent storm related environmental and health problems. The project is composed of the following components. It may be phased for component projects submitted separately for grant programs. City of Key West Storm Water Projects include:	City General Services Dep City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7	$560,000		1-2 yrs	HMGP	City	290		**4/30/2010**	Submit under Wilma / AML leave =on list
29	Key West	First Street / George Street stormwater pump station.	Key West	Install pump and piping and all appurtances to protect the drainage basin from rain and flood (storm surge)	City General Services Dep City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7	$3,000,000		1 or 2 yr	HMGP	City	285	9/11/2006	**4/30/2010**	Submit under Wilma / FEMA authorizes Phase 1 Designs (AML) * Check with Utilities

Monroe County LMS Mitigation Initiatives : PRIORITIZED

Project #	Project Owner / Sponsor	Project Title/ ID	Project Location (County or city?)	Brief Description of Project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	Project Cost (in Char. Form)	Benefits (in Char. Form)	Est time to complete (IF FUNDED)	Expected F/S Grant Fund	Likely Source of Match	Rank (by SubC)	Date submitted	Last date confirmed to remain on list	Notes
32	Key West	Planning for Sister City EOC	Key West	1999-After a disaster event the City of Key West may not be able to operate from its existing emergency operations centers located at the Bell South Building and City Hall. The purpose of the project is to identify a "Sister City" located in an area that would not be affected by the same disaster. Key West would then use their Emergency Operations Center and service capabilities, as a remote-operating center from which to conduct emergency and other City of Key West operations until re-entry was possible. The project includes identifying an appropriate municipality that would be willing to cooperate with Key West in this effort. In addition, it involves logistical planning for transportation, communications, operations, food and lodging, etc. A written agreement would be needed to assign responsibilities for various functions during the emergency. These include financial liability, insurance and risk considerations, equipment use and maintenance, etc	City General Services Dep City Engineer	Hurricane, Flooding, Tornado, Wildfire, Drought, Coastal Erosion	1, 2, 3, 4, 5, 6, 7			1 or 2 yr	None	City	270		**4/30/2010**	KW promoting / initiating for COOP and IMT (Incident Management Teams) and IT agreements with a sister city. * Plans targeted for completion FY 10 - 11. * Existing plans complement Monroe County CEMP for activation at Homestead Air National Guard Base and Homestead Race Park
38	Key West	Sixth to Eight street stormwater pump station.	Key West	Install pump and piping and all appurtances to protect the drainage basin from rain and flood (storm surge)	City General Services Dep City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7	$2,700,000		1 or 2 yr	HMGP	City	245	9/11/2006	**4/30/2010**	Submit under Wilma / LM keep on list
40	Key West	Fourth Street stormwater pump station	Key West	Install pump and piping and all appurtances to protect the drainage basin from rain and flood (storm surge)	City General Services Dep City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7	$2,500,000		1 or 2 yr	HMGP	City	235	9/11/2006	**4/30/2010**	Submit under Wilma / LM keep on list
46	Key West	Elevate or Demo-Rebuild Key West Homes Structures	Key West	2006-Elevate flood prone structures to limit future flood losses at various locations	City General Services Dep City Engineer	Hurricane, Flooding	1, 5, 6	$2,250,000		6 mos <	FMA	City	200	13-Apr-06	**4/30/2010**	Remains Open? Projects pending? AML leave on list -she will address

Monroe County LMS Mitigation Initiatives : PRIORITIZED

Project #	Project Owner / Sponsor	Project Title/ ID	Project Location (County or city?)	Brief Description of Project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	Project Cost (in Char. Form)	Benefits (in Char. Form)	Est time to complete (IF FUNDED)	Expected F/S Grant Fund	Likely Source of Match	Rank (by SubC)	Date submitted	Last date confirmed to remain on list	Notes
52	Key West	Determine or verify elevations at various locations in Key West and erect permanent elevation benchmarks	Key West	1999-Many of the benchmark indicators throughout the city have been damaged or lost through time and weather. Hurricane Georges destroyed several of the markers. As such, critical information about elevations in the city are missing. This data is necessary when planning engineering, housing, and commercial projects. The purpose of would be to conduct an engineering study to determine where markers are missing and evaluate the condition of existing markers. It may require re-measuring grades at various locations. Elevation markers would then be installed at necessary locations. The markers would be constructed in such a way as to provide permanent indicators that would not be lost due to time and weather.	City General Services Dep City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7			2 yrs	None	City	190		**4/30/2010**	leave per AM 7/22/08. * Concurrance
59	Key West	Elevation of E Carie Noda residence	key west	2006-Elevate Home at 1716 Duncan St. KW	City Planner / City General Services Dep City Engineer	Hurricane/Tropical Storm	1, 5, 6	$170,000		6 mos <	FMA	City	170	13-Apr-06	**4/30/2010**	Needs checking on
62	Key West	Stadium Mobile Home Park	Key West	1999-	AML requested leave	Hurricane/Tropical Storm	1, 5, 6			2 yrs	FMA	City	155		**4/30/2010**	AML wants to leave

Project #	Project Owner / Sponsor	Project Title/ ID	Project Location (County or city?)	Brief Description of Project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	Project Cost (in Char. Form)	Benefits (in Char. Form)	Est time to complete (IF FUNDED)	Expected F/S Grant Fund	Likely Source of Match	Rank (by SubC)	Date submitted	Last date confirmed to remain on list	Notes
70	Key West	Develop a program to address problems related to emergency manpower.	Key West	1999-The project will include the following components: Conduct a survey of City employees to determine their plans in the event of an emergency. Identify key personnel who would remain on duty Address factors that would prevent employees from working during emergencies: Develop incentives for employees to work during emergencies e.g.: Establish emergency contact procedures for personnel and their families Provide all employees with personal/family and workplace emergency checklists.	City Planner / City General Services Dep City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7			1 to 2 yr	None	City	225		**4/30/2010**	leave AM - Pending as part of the COOP * To be completed FY 10 - 11
72	Key West	Project to investigate structural requirements for essential buildings and identify retrofitting requirements.	Key West	1999-Buildings such as the Fifth Street Baptist Church (critical facility) and Salvation Army are examples of essential buildings. Other possibilities include the. The PATA transportation building and the Southernmost Waste to Energy Facility may also be suitable as refuges if properly retrofitted. Retrofitting would not only be valuable for the shelter potential but for protecting the entire facility to reduce operational loss.	Annalise Mannix-Lachner	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7			1 - 2 yr	None	City	195		**4/30/2010**	Pending

Project #	Project Owner / Sponsor	Project Title/ ID	Project Location (County or city?)	Brief Description of Project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	Project Cost (in Char. Form)	Benefits (in Char. Form)	Est time to complete (IF FUNDED)	Expected F/S Grant Fund	Likely Source of Match	Rank (by SubC)	Date submitted	Last date confirmed to remain on list	Notes
74	Key West	Installation of hurricane shutters at the City's Park-N-Ride facility.	Key West	1999-The project would include an engineering study and installation of effective window protection for the City's Park-N-Ride garage. This project would enable the facility to be used as a storage area for Police and other emergency and construction equipment. It will provide a safe location for emergency vehicles and prevent salt-water intrusion into vehicles (salt content of rain during a hurricane is high). This would protect the integrity of the contents of the building as well strengthening the envelope from storm hazards. It is very cost effective as it would preserve both the building and vital equipment and vehicles. It would provide for speedy resumption of emergency response after a threat has passed.	ck w AML	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7			18 mos	HMGP	City	120		**4/30/2010**	Leave AM - Pending as part of the COOP * To include Douglass School Gymnasium
75	Key West	Develop a program to address problems relating to construction site clearance for emergencies,	Key West	1999-Construction sites that were not properly maintained and prepared added to the problems of flying debris during Hurricane Georges and contributed to disaster loss. The program would develop procedures to address the construction site debris problem and recommend legislative and punitive measures to ensure compliance. It will have a substantial effect on reducing future loss from this situation. To include the following: (a) Develop written site clearance procedures and provide to construction trades for use prior to an emergency. (b) Impose fines if construction sites are not cleared before a storm event. (c) Improve enforcement, especially pre-storm. (d) Sites should be cleared no later than watch period (36 hours).	Director of Emergency Management	Hurricane, Flooding, Tornado	1, 2, 3, 4, 5, 6, 7			18 mos	None	City	100		**4/30/2010**	Leave AM

Monroe County LMS Mitigation Initiatives : PRIORITIZED

Project #	Project Owner / Sponsor	Project Title/ ID	Project Location (County or city?)	Brief Description of Project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	Project Cost (in Char. Form)	Benefits (in Char. Form)	Est time to complete (IF FUNDED)	Expected F/S Grant Fund	Likely Source of Match	Rank (by SubC)	Date submitted	Last date confirmed to remain on list	Notes
47	Key West Housing Authority	Senior Citizen Plaza Shutters	Key West	1999-	ck w Rick Casey re grant submittal	Hurricane/Tropical Storm	1, 4, 5, 6			6 mos	HMGP	City	200			
56	Multijurisdictional	Strategy and implementation program to address under/unemployment and work force problems related to disasters.		1999-Local Mitigation Strategy Working Group members from the Florida Keys Employment and Training Council (FKETC). Now (WORKFORCE #) expressed the need to develop mitigation initiatives dealing with economic and employment issues. Continued employment for people with low and moderate incomes promotes productivity and self-sufficiency. Gainful employment can help emotional recovery. The purpose of this project is to identify and implement ways to reduce the effects of disasters on the work force and economy of the Florida Keys	bring to D Barsell attn or is it within PA criteria	All Hazards	1, 6			2 yrs	None	City	175		**4/30/2010**	Per DCA, this is part of post-disaster Public Assistance program / Ongoing for the WG.
81	Multijurisdictional	Production of a Mitigation Program Technical Assistance and Resource Manual.		1999-During the Working Group's activities and discussions it was determined that their was a need for an assistance manual to identify mitigation assistance programs and provide direction on how to apply for funds and grants such as the federal Hazard Mitigation Grant Program. This manual would be especially useful to small agencies and private non-profits that are invited to apply for state and federal grants, but may not have the technical knowledge to complete the application process. The manual would also include a listing and description of various government and/or private programs that could apply to mitigation efforts.	advent of website access, applicant briefings, etc. may be unnecessary further development of HMGP EM website to enhance informational outreach.	Hurricane, Flooding, Tornado, Wildfire, Drought, Coastal Erosion	1, 2, 3, 4, 5, 6, 7			12 mos	None	LMS			**4/30/2010**	DCA and FEMA materials may be sufficient

Monroe County LMS Mitigation Initiatives : PRIORITIZED

Project #	Project Owner / Sponsor	Project Title/ ID	Project Location (County or city?)	Brief Description of Project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	Project Cost (in Char. Form)	Benefits (in Char. Form)	Est time to complete (IF FUNDED)	Expected F/S Grant Fund	Likely Source of Match	Rank (by SubC)	Date submitted	Last date confirmed to remain on list	Notes
83	Multijurisdictional	**Severe Weather**		1999-Pursuant to guidance from the National Weather Service, development of projects related to a tornado mitigation strategy including: (1) Use of warning devices such as NOAA weather radios equipped with warning systems; (2) Use of route alert to warn particularly susceptible areas such as mobile home and RV parks; (3) Installation of tone alert warning systems in schools linked to the National Weather Service or Emergency Management; (4) Identification and/or construction of safe rooms or areas in residences and vulnerable locations, such as mobile home and trailer facilities; (5)Public education about tornado safety and warning systems.	address next LMSWG meeting	Hurricane, tornado	1, 2, 3, 4, 5, 6, 7			12 mos	None	LMS			**4/30/2010**	Discuss - Ongoing: Review possiblity of Reverse 911 (Emergency communications) other than NOAA WR, Hazardous Weather Awareness Week. * Weather radios provided by MC EM FY 08 - 09 * Preparing solicitaion for bid of City employee mass notification system * Reseaching cooperative system with MC SO.
3	Marathon	City Hall	Marathon	2006-Design, development of architectural and engineering plans and construction of a wind resistant facility for use as a City Hall.	Lisa Watson (305) 481-6725	Hurricane/Tropical Storm	1, 2, 4, 5, 6	$4,790,500		1-2 yrs	HMGP	City	400			
88	Marathon	Coco Plum Beach Enhacements	Marathon	2005-This project will include three main components: Stabilization and Enhacement of beach dunes with native plantings, installation of educational signage, and installation of a boardwalk to the large salt pond	Lisa Watson	Hurricane/Tropical Storm, Coastal Erosion	2, 6	$100,000		1-2 yrs	DEP	City				
89	Marathon	Fire-Rescue EOC equipment	Marathon	2005-To assist with the purchasing of computers and EOC related equipment	Lisa Watson	All Hazards	1	$45,000		6 mos	None	City				

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90	Churches	Retrofiting County Designated Disaster Recovery Staging Sites.		2006-Retrofiting two existing Monroe County(San Pedro, and St. Peters) designated recovery centers and hurricane recovery sites (fixed feeding stations) with new freezers and underground electrical cords and receptacles extending from existing generators to accommodate emergency service vehicles assisting with disaster recovery efforts.	Keith Douglas	hurricane/tropical storm	1, 4, 6	$65,700		9 mos	HMGP	Owner				
87	Electric Power Utilities: Florida Keys Electric Cooperative (FKEC) and City Electric System	Hurricane retrofits		1999-Key West City Electric System wishes to identify the need for the following shutter projects: Fire Protection Pump Building; Diesel Fuel Pump Station; CT #2 Generator Building; Medina Building; Garcia Steam Plant Shutter Project; Vehicle Maintenance Building; MSD Generator Building; Rebate Building; Stock Island Power Plant Substation; CT #3 Generator Building; Control CAB Building; and Warehouse B.	ck w Keys Energy	hurricane/tropical storm	1, 4, 6			9 mos	HMGP	Owner				
86	Florida Keys Aquaduct Authority	Extension of FKAA water lines to affected areas on Big Pine Key		1999-Big Pine Key was an area that sustained severe damage in Hurricane Georges. Part of this damage was contamination of residential potable water wells. The project to extend FKAA service to these areas will provide a permanent solution to mitigate the problem/	ck w Higley @ FKAA	hurricane/tropical storm	1, 2			9 mos	None	Owner				Ongoing
57	Florida Keys Children Shelter	Roof replacement		2005- Replace existing roof and tie downs.	1539 Kathy Tuell 852-4246	hurricane/tropical storm	1, 4, 6	$160,000		6mos to 1 yr	HMGP	Owner	170			
15	Florida Keys Electric Coop	Replace existing aluminum warehouse with concrete structure Tavernier Operations Facility		Replacement of FKEC's main warehouse to mitigate and to build above code. The existing warehouse was built with aluminum and the new facility is going to be build of concrete to withstand Category 5 Hurricane force winds.	Ray Rash or Kim Jones 305-852-2431 305-747-0291	hurricane/tropical storm	1, 4, 6	$9,673,252		1yr to 2	HMGP	Owner	330	7-Sep-06		submit under Wilma / Under construction

Monroe County LMS Mitigation Initiatives : PRIORITIZED

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54	Hospice of the Florida Keys	Protection and upgrade of Hospice of the Florida Keys Office		Structural upgrade and protection of office for hospice and home health care provider for Monroe County Citizens.	Liz Kern 305-294-8812	hurricane/tropical storm	1, 4, 6	$180,000		6 mos to 1yr	HMGP	Owner	180	7-Sep-06		submit under Wilma
37	Monroe Association of Retarded Citizens, Inc.	Structural Retrofit MARC Residence Windsor LN		2005-Monroe Association of Retarded Citizens, Inc. request funds to wind retrofit roof	1539 / Diana Flenard	hurricane/tropical storm	1, 4, 6	$35,000		6 mos to 1 yr	HMGP	Owner	260			pending
7	Nature Conservancy	Wildfire Non-Structural		2006-Identification and removal of dead flammable vegetation near homes and other buildings; involves mechanical and manual removal as well as prescribed fire	Alison Higgins	Wildfire	1, 5	$200,000		1-2 yrs	HMGP	Owner	365			
4	Nature Conservancy	Hurricane Prone Tree Program - Matching Funds		2006-Non-native trees often grow taller than the safer "hurricane height" of our natives. For example Australian pines caused the most damage to houses, powerlines, & roadblocks for Hurricane Georges.	Allison Higgins	hurricane/tropical storm	2, 5, 6	$244,000		6 mos to 1yr	None	Owner	390	13-Apr-06		
84	Private/Non-Profit Agencies	Improve hurricane-resistance of various buildings and facilities		1999-• Shutter the Monroe County Association for Retarded Citizens (MARC) Workshop and Windsor Home facility. • Retrofit the American Red Cross Building in Tavernier. • Shutter Florida Low-Income Housing Monroe County Atlantic Pines Apartments. • Marathon Economic Development Council floodproofing and roof retrofit projects for Marathon Marina.Monroe County Seacamp Project for facility roof upgrade and shutter project. • Historic Florida Keys Foundation Key West Old City Hall roof/louver retrofit project and Old Key West Armory roof retrofit and shutter project. • Fifth Street Baptist Church and Sunbeam School shutter project. • Florida Keys Outreach Coalition Shutter Project.	address next LMSWG meeting	hurricane/tropical storm	1, 4, 5, 6			18 mos	HMGP	Owner				Needs discussion

Monroe County LMS Mitigation Initiatives : PRIORITIZED

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53	Rural Health Network	Medically equipped mobile van		2005-Rural Health Network of Monroe County Fl., Inc.	1539 find out Keith Douglas repl	All Hazards	1	$165,000		6mos or <	HMGP	Owner	185			

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
89	Monroe Co School Board	Marathon High School Gym Retrofit		2006-Retrofit Gym to withstand category 5 hurricane and make EHPA compliant	Nancy Romain ck w MCSB rep			500,000.00								COMPLETED
55	Monroe Co	Monroe County Mass Immigration Study and Plan		1999-The potential instability of political affairs in Cuba and the close proximity of the Florida Keys to the Caribbean demonstrates the need for Monroe County to study the impact of a mass immigration incident on the County and develop a plan to prepare for the special requirements of such an occurrence. The study and plan could utilize information in current mass immigration policies and plans developed by the City of Key West and Dade County.				Integrated into Comprehensive Emergency Management Plan 5/18/06					215			COMPLETED
59	Monroe Co	Courthouse Annex Office Building Retrofit, Key West (houses offices of County Attorney and other essential agencies)		1999-Install panels for first floor entry.				5/18/06					160			REMOVED
60	Monroe Co	Elevation of mobile homes to base flood elevation.		1999-Many mobile homes were damaged as a result of Hurricane Georges and Tropical Storm Mitch. The project would elevate and strengthen mobile homes in the (Big Pine) section of the Keys. This will not only make these structures better able to withstand future storm damage but will allow them to remain in the affordable housing stock in Monroe County.				5/18/06					155			REMOVED
65	Monroe Co	Retrofit Gato Building County Office Facility, Key West.		1999-Install hurricane resistant windows and storm shutters or panels for entry doors. Upgrade roofing system to an I-180. Provide emergency power system.				5/18/06								COMPLETED

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
30	Monroe Co	Review and study the issue of the hazardous potential of fuel storage tanks for Monroe County. Development and adoption of an ordinance requiring secure anchoring of propane tanks.		1999-The presence of various types of fuel storage tanks in the Florida Keys presents a potential hazard during severe weather and can contribute to transportation accidents. A study will be conducted to research the issue and determine how to make these facilities safer. In addition, propane tanks both residential and commercial created problems after Hurricane Georges. The likelihood of these containers coming loose during severe weather and becoming dangerous flying and floating debris is very high. The Florida Department of Environmental Protection cites “wild drum” hunts as a large part of their post-disaster activities. This problem could be remedied with strict codes and enforcement to ensure that the tanks are adequately tied-down to reduce the threat of their dislodging in a weather emergency.	ck w Lisa Gordon dept. Env. Protect. And MCFR								275			REMOVED. Confirmed State database compiles statistics showing registration of all petroleum storage tanks 550 gal AGL and 110_ BGL
1	Monroe Co	Old Mariner's Hospital Shutters						Unknown								
40	Monroe Co	Plantation Key Recycling Yard Shutters														REMOVED
50	Monroe County Public Works	Elevate Gate Five Operators MCDC-Stock Island (2), Key Vaca Jail, Plantation Key Jail, MCSO Hanger Marathon		2006-Due to inundation vulnerability of traffic and sallyport gate operators at certain secured facilities, it is proposed to elevate these operators above base flood elevation. This will be accomplished through the installation of a concrete support foundation & relocating all associated equipment. Full replacement can range from $8-10K each.	Bob Stone			15,000.00					190		13-Apr-06	COMPLETED. Per Bob Stone, on 12.23.09, this project was completed, the quarterly reports submitted, and closed out in Sept., 2009

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
49	Monroe County Public Works	Overhead Rolling Doors at MCDC-Stock Island.		2006-Retrofit and placement of overhead rolling doors at facility located at 5501 College Road in order to meet 155 mph windload criterion.	Bob Stone			22,000.00					190		7-Sep-06	COMPLETED. Per Bob Stone, on 12.23.09, this project was completed, the quarterly reports submitted, and closed out in Sept., 2009
58	Monroe County Public Works	Elevate Fire Sprinkler Pumps MCDC-Stock Island and Key Vaca Jail - Marathon		2006-Due to inundation vulnerability and to preserve life, health, and safety in jail facilities, it is proposed to elevate the fire suppresion pumps above base flood elevation. This can be accomplished through the installation of a new elevated concrete pump room and relocating / extending all associated equipment.	Bob Stone			40,000.00					170		13-Apr-06	REMOVED. Per Bob Stone, on 12.23.09, this project was denied by State DEM and FEMA.

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
20	Multijurisdictional	County-wide Comprehensive Landscape Mitigation Initiative		1999-Despite the fact that debris removal and loss of landscaping are critical effects from wind events such as hurricanes, little attention has been given to the mitigation aspects of landscaping. Through the LMS process, particularly the public forum held in Key West and the landscape presentation provided by Deborah Shaw, Biologist for the Florida Keys Electric Coop., the Working Group recognized the importance of addressing this issue in a comprehensive manner. As such, the Group developed a landscape mitigation initiative to be included in the Mitigation Strategy. It was noted that this was a particularly suitable project because the problems of loss of vegetation and debris removal were identified as significant mitigation issues. The Group defined the many hazards and mitigation issues that the project would address. These include: Storm Related Hazards (Debris Removal/Loss of Access, Canal and Waterway Clearance, Power Outages); Environmental Hazards (Loss of habitat, Loss of beneficial vegetation, especially native species, Mangrove protection); Drought Effects	5/18/06										305	REMOVED

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
21	Multijurisdictional	Research the FEMA Project Impact Program and determine eligibility of Monroe County and/or its municipalities to participate in this mitigation program. The project could also include implementation of the process required for local government and county acceptance in the Project Impact program.		1999-The federally sponsored Project Impact Program provides funds for participating governments to promote the concept of hazard mitigation by fostering public/private partnerships, providing information and outreach, and related programs. Through the Local Mitigation Strategy Working Group process members are much more aware of the benefits of mitigation and the things they can do in their communities to reduce the cycle damage and loss. Communities could optimize their plans by participating in the Project Impact Program and receiving funding support.	5/18/06										300	REMOVED (federal program terminated)

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
27	Multijurisdictional	Research and develop a Uniform Sign Code for the Keys that incorporates mitigation measures.		1999-Mitigation issues regarding sign damage should be considered. A common problem is the extensive damage to signs that occurs during wind events. A cooperative effort to address the problem would save duplication of effort and contribute overall to hazard mitigation. Islamorada has recently conducted sign surveys and studies. Their findings may be useful in the development of a uniform sign code for the entire Keys. There are certain types of signs that generally fair better during storms than others do. This was true even for Hurricane Andrew. Signs contribute greatly to dangerous flying debris that causes damage. Proper types of signs and good engineering can contribute much to reduction of property damage and replacement costs. A good sign program that considers the effects of hazards is a useful mitigation tool.									290			REMOVE. Determined to be DOT / municipality domain. Fl. Bldng. Code applies to any signs on Pvt. Properties.
56	Monroe County	#4 Beach Drive, MM 15, Bay Point, 33040 (Finigan)		Demolish residence & elevate. Proj. to include all design & assoc. Eng. Costs.				Demo:$15K / Replacement: $175K/Engineering:$15K. Est. Total =$205K						7-Dec-07	7-Dec-07	REMOVE (online record indicates replaced with modular home early 2010)
55	Monroe Co	Elevate property at 5 Barcelona Dr Big Coppitt (Nowoclien)	Monroe Co	2006-To build new home above flodd plain on stilts.	Wayne Nowocien/MC			$181,000		1-2 yrs			175			REMOVE (online records indicate MFH demolished 2006)

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
10	Monroe Co	Retrofit Monroe County Fire Stations.	Monroe Co	1999-Implement the following improvements at locations shown below: Big Pine Key Volunteer Fire/Rescue: Provide shutters for windows. Relocate electrical main to panel in safe location. Conch Key Fire Station: Install shutters in the EMS Addition. Marathon Volunteer Fire Station: Install shutters. Tavernier Volunteer Fire Station: Install shutters.	Chief Callahan	Hurricane / Tropical Storm, Tornado	1,2,4,5						355		10.29.10	CONFIRMED: All stations have protective wind resistant coverings.
4	Monroe Co	Evaluate the need for generators at sewage treatment plants, both public and private, and at fuel distribution plants.	Monroe Co	1999-Conduct a countywide study to determine the emergency power needs of important facilities such as sewage treatment plant, pumping facilities, fuel distribution lines, etc. This is an important need and was discussed on several occasions by the LMS Working Group. The project should be coordinated with the incorporated municipalities who, through the LMS process, have also expressed a need for this type of study.		Hurricane / Tropical Storm, Tornado	1,2,4,5,6						350		Reviewed 06.29.10	NO REPRESENTATION - Suggest Removal from prioritized list.
7	Monroe Co	Establish and maintain regular communication with local TV and radio stations.	Monroe Co	1999-Ensure full cooperation from radio stations for use of the FCC-mandated Emergency Alert System (EAS). Work with local TV and radio stations to ensure dissemination of accurate emergency information. Ensure that the local communications industry uses the EAS during times of emergency and/or pre-empts regular programming to provide critical information for the County's welfare and safety.	Laura White, MCSO Emerg. Communications	Hurricane / Tropical Storm, Tornado	1,2,4,5,6						315			COMPLETED Suggest Removal from prioritized list.

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
9	Monroe Co	Monroe County Structural Evaluation of Facilities of Special Concern	Monroe Co	1999-Engineering evaluation to identify viability to retrofit and recommend improvements to mitigate storm damage. Includes: Lower Keys Health Systems; De Poo Hospital; Fishermen's Hospital; Nursing Homes, including Bayshore Manor	need Hosp rep at LMSWG meetig	Hurricane / Tropical Storm, Tornado	1,2,4,5,6						205		Reviewed 06.29.10	Old Mariner's Hospital shutters (eliminated from list). INACTIVE INITIATIVE - Suggest Removal from prioritized list - No Representation.
10	Monroe Co	Repair/Replacement of Storm Damaged Housing to Bring into County Code Compliance (specific locations to be determined).	Monroe Co	1999-A considerable amount of the County's housing stock was damaged during Hurricane George. The project would repair or replace existing housing units to meet current county codes. This makes these structures better able to withstand future storm damage and thereby reduce the risk of potential loss. The proposal also contributes to the maintenance and availability of affordable housing in Monroe County.	addressed thru FEMA trailers and grant applications	Hurricane / Tropical Storm, Tornado	1,2,4,5,6						190		Reviewed 06.29.10	Current FMA's (Garcia & Finnigan) in progress. COMPLETED - Suggest Removal from prioritized list
11	Monroe Co	Retrofit Key West International Airport Terminal	Monroe Co	1999- Install storm shutters for glass doors and windows. Provide a new emergency power system for the terminal.	P Horton 3518 / Larry Chalmers	Hurricane / Tropical Storm, Tornado	1,2,4,5,6								Reviewed 06.29.10	COMPLETED - Suggest Removal from prioritized list.
12	Monroe Co	Retrofit Old Courthouse, Key West (Historic Property)	Monroe Co	1999-Install storm shutters (screens) , interior mounted to conform to historic guidelines and retain appearance of historic exterior. Install panels for entry doors consistent with historic guidelines.	John King	Hurricane / Tropical Storm, Tornado	1,2,4,5,6								Reviewed 06.29.10	COMPLETED - Suggest Removal from prioritized list.
13	Monroe Co	East Martello Foundation Repair	Monroe Co		Ck w Hist. Rvw. Bd. / new mgr. (Diane Silva). John King	Hurricane / Tropical Storm, Tornado	5,6,7						285		Reviewed 06.29.10	NO REPRESENTATION - Suggest Removal from prioritized list.
14	Monroe Co	Communication Improvement Program	Monroe Co	1999-	Laura White, MCSO Emerg. Communications	Hurricane / Tropical Storm, Tornado	1,2,4,5,6						260		Reviewed 06.29.10	COMPLETED - Suggest Removal from prioritized list.

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
15	Monroe Co	East Martello Window Replacement	Monroe Co		Hist. Pres. Society - Geo. Born	Hurricane / Tropical Storm, Tornado	5,6,7						240		Reviewed 06.29.10	NO REPRESENTATION - Suggest Removal from prioritized list.
16	Monroe Co	East Martello Storm Water Retention	Monroe Co	1999-	ck w eng,hist board	Hurricane / Tropical Storm, Tornado	5,6,7						210		Reviewed 06.29.10	NO REPRESENTATION - Suggest Removal from prioritized list.
17	Monroe Co School Board	Hurricane retrofit/shutters	Monroe Co	1999-Sugarloaf School; Plantation Key Elementary School; Switlick Elementary School; Gerald Adams Elementary School; Sigsbee Elementary School; Reynolds School; Poinciana Elementary School; Key Largo Elementary School; Key West High School; Big Pine Key Elementary School; Glynn Archer Elementary School; Harris School; Horace O'Bryant School; Marathon High School; Sands School.	Sunny Booker	Hurricane / Tropical Storm, Tornado	1,2,4,5,6								Reviewed 06.29.10	Discuss - Ongoing - Suggest EHPA retrofit completed (KWHS, Poinciana, MHS, CSHS, KL). NO REPRESENTATION - Suggest Removal from prioritized list.
18	Monroe County	Marathon Airport Window Protection	Monroe Co	Retrofit windows at the Airport Terminal with impact resistant glass and accordion shutters.	Reggie Paros 305-289-6002 / 6060	Hurricane / Tropical Storm, Tornado	1,2,4,5,6	$59,912		6 mos or less			320	7-Sep-06	Reviewed 06.29.10	submit under Wilma / Approved Agreement Received. COMPLETED - Remove from PRIORITIZED list.
19	Monroe County Public Works	Riprap Revetment Stabilization for protection of three locations; Tidal basin & Wilkenson Pt., H. Harris Pk, Kl., MM68 Landfill, Long Key.	Monroe Co	2006-Riprap boulders protecting the three locations noted have been damaged by storms/hurricanes. The riprap has been repaired by the County; however, in order to mitigate recurrent storm damage, it is necessary to pump cement slurry mix into the riprap voids. Future riprap damage is likely without cementuous stabilization.	**Joe Medallion**	Hurricane / Tropical Storm, Tornado	1,2,4,5,6	$75,500		6 mos to 1yr			335	13-Apr-06	Reviewed 06.29.10	COMPLETED - Remove from Prioritized List.
20	Monroe County Public Works	Overhead Rolling Doors at Marathon Garage	Monroe Co	2006-Retrofit and placement of overhead rolling doors at three County facilities in order to meet 155 mph windload criterion.	Bob Stone	Hurricane / Tropical Storm, Tornado	1,2,4,5,6	$24,840		6 mos or <			150	13-Apr-06	Reviewed 06.29.10	COMPLETED - Remove from Prioritized List.

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
22	Multijurisdictional	Strategy and implementation program to address under/unemployment and work force problems related to disasters.		1999-Local Mitigation Strategy Working Group members from the Florida Keys Employment and Training Council (FKETC). Now (WORKFORCE #) expressed the need to develop mitigation initiatives dealing with economic and employment issues. Continued employment for people with low and moderate incomes promotes productivity and self-sufficiency. Gainful employment can help emotional recovery. The purpose of this project is to identify and implement ways to reduce the effects of disasters on the work force and economy of the Florida Keys	bring to D Barsell attn or is it within PA criteria	Hurricane / Tropical Storm, Tornado	1,6						175		Reviewed 06.29.10	Per DCA, this is part of post-disaster Public Assistance program. COMPLETED: Suggest removal from Prioritized list.
24	Multijurisdictional	Impact study on the effect of the Uniform State Construction Code on Monroe County and its incorporated areas.		1999-The project would involve studying the impacts of the Uniform State Construction Code on local codes, regulatory authority, and building practices in the Florida Keys.	ck w D Koppel	Hurricane / Tropical Storm, Tornado	All Goals Addressed								Reviewed 06.29.10	Latest Florida Building Code does address concern / Review through 2010. NO REPRESENTATION, CONSIDER COMPLETED - Suggest Removal from prioritized list.

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

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25	Multijurisdictional	**Severe Weather**		1999-Pursuant to guidance from the National Weather Service, development of projects related to a tornado mitigation strategy including: (1) Use of warning devices such as NOAA weather radios equipped with warning systems; (2) Use of route alert to warn particularly susceptible areas such as mobile home and RV parks; (3) Installation of tone alert warning systems in schools linked to the National Weather Service or Emergency Management; (4) Identification and/or construction of safe rooms or areas in residences and vulnerable locations, such as mobile home and trailer facilities; (5)Public education about tornado safety and warning systems.	address next LMSWG meeting	Hurricane / Tropical Storm, Tornado	1,2,4,5,6								Reviewed 06.29.10	Discuss - Ongoing: Review possiblity of Reverse 911 (Emergency communications) other than NOAA WR, Hazardous Weather Awareness Week. COMPLETED: Suggest removal from Prioritized list.
52	Monroe County	Purchase and install hurricane shutter on passenger terminal Florida Keys Marathon Airport	Marathon	Remove failing storm shutters from external windows of the Marathon Airport Terminal and replace with impact resistant glass on one set of four windows on street side, ground level, and accordian shutters on two Door / window combinations on street side, ground level.	Reggie Paros, Director, Marathon Airport	Hurricane / Tropical Storm - Tornado	1,2,4,5,6	$52,500						11-Sep-06		Completed
48	Monroe County Public Works	Retrofit of overhead rolling doors at various County facilities.	Monroe Co	Retrofit overhead rolling doors at the following facilities: Monroe County Detention Center, Key West Fleet Maintenance Garage, Marathon Fleet maintenance garage.	Monroe County Public Works	Hurricane / Tropical Storm - Tornado	1,2,4,5	$250,000						16-Mar-06	06.29.10	Completed
6	Monroe County School Board	Marathon High School Gym Retrofit	Marathon	2006-Retrofit Gym to withstand category 5 hurricane and make EHPA compliant	Fred Sims, MCSD, Total Progrem Manager	Hurricane / Tropical Storm - Tornado	1,2,4,5	$500,000								Completed

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

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69	Islamorada	Design, develop architectural plans, engineering and construction of Islamorada Village of Islands Fire Station/Emergency Operations Center.		1999-The project will provide for sustainable critical facilities. It will assure quality control in planning, operations, and preparing for disasters within Islamorada Village of Islands.	Ed Koconis, 305-664-6420	Hurricane	1, 4, 5	$1,200,000.00								COMPLETED
1	Islamorada	Administration Center and Public Safety Headquarters	Islamorada	Islamorada completed the construction of a new Administration Center and Public Safety Headquarters in December 2009. The new facility replaces the previous Village Hall which was flooded during Hurricane Wilma and subsequently demolished.	Myles Milander, 305-664-6451	Hurricane, Floods	1,4,5,6	$4,530,000					435	7-Sep-06		COMPLETED
6	Islamorada	Sea Oats beach Engineering Design Study	Islamorada	Provide the Village of Islamorada with engineering design drawings and construction permit for a dune restoration project at Sea Oats Beach. The beach and sunes were seriously eroded from the 2005 hurricanes.	Ed Koconis, 305-664-6420	Hurricane	1, 2, 3, 7	$50,000					380	7-Sep-06		COMPLETED
34	Islamorada	Stormwater Drainage Improvement Tollgate Shores	Islamorada	Installation of stormwater drainage for Tollgate Shores Subdivision consisting of 24 individual homes on the gulf side of Lower Matecumbe Key. This area is prone to severe flooding, especially from storm surge.	John Sutter, 305-853-1686	Hurricane, Flooding	1, 5	$213,406					270	7-Sep-06		COMPLETED

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COMPLETED - REMOVED

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51	Islamorada	Computer Weather Equipment to assist in the emergency planning and warning process.		The project provides for the acquisition of computerized equipment to provide access for weather-related products such as hurricane tracking. The equipment will assist the Village with early, site-specific information for intelligence and planning and early warning of severe weather. Weather related equipment is especially critical to provide for warning and notification of tornadoes, a problem that was experienced in the Islamorada area.	William Wagner, 305-664-6490	Hurricane	1						270			COMPLETED
25	Key Colony Beach	Install hurricane resistant or have emergency back-up cellular phone transmitters, includes purchase of satellite phone.		1999-The project would include a study to identify the proper and necessary equipment for purchase to ensure reliable cellular telephone service during emergencies				5/18/2006					295			REMOVED
33	Key Colony Beach	Purchase of buildable property and/or repetitively flooded properties; and conversion to city-owned property		1999-The project would provide for public acquisition of potentially buildable land to stop its development. When acquired the City would maintain the sites as permanent open space. This is an excellent mitigation project since its purpose is to reduce the amount of development in the City and preserve the affected sites as open space in perpetuity. The acquisition includes the Siddiqui Property.				5/18/2006					265			REMOVED

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
71	Key Colony Beach	Retrofit traffic lights and signage to resist hurricane wind forces.		1999-The project would determine what measures could be taken to reduce damage to traffic controls and signs that occurs during severe weather. The damage and loss of traffic signals and signs is common in hurricanes, regardless of the storm's strength. There is a need to investigate ways that this could be prevented. The sign aspect of the project could be coordinated with the proposed multi-jurisdictional, joint sign project described later in this listing.				5/18/06								COMPLETED
73	Key Colony Beach	Hurricane retrofit City Hall/Post Office Complex		1999-				5/18/06								COMPLETED

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

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7	Key West	Storm Water Mitigation Project including installation of injection wells and trench / trench drains.		1999-Storm water injection wells and trench-draining systems are part of the City's storm water improvement plan. This work is vital to prevent storm related environmental and health problems. The project is composed of the following components. It may be phased for component projects submitted separately for grant programs. City of Key West Storm Water Projects include: • Kamien Subdivision Drainage Project – Estimated Cost: $1,240,800.00 (completed) • Searstown Stormwater Drainage Project – Estimated Cost: $422,700.00 (completed) • Reynolds Street Outfall Project – Estimated Cost: $590,000.00 (completed) • DA Sewer Replacement Project – Estimated Cost: $8,645,600.00 (completed) • G Sewer Replacement – Estimated Cost: $3,761,050.00 (completed) • White Street/Laird Street/Sirugo Ave. Drainage Project – Estimated Cost: $198,900.00 (completed)	City General Services, City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7	07.22.08								completed projects completed moved from prioritized list per JOC instructuion. There are 6 more projects pending
22	Key West	Tree Removal Program		1999-The tree removal program would work in conjunction with the Key West Tree Commission and City Electric System. The program would function year-round to reduce the dangers of falling debris. It will help mitigate post-storm debris problems and power outages causes by trees falling on power lines.	5/18/06	Hurricane	1, 2, 3, 4, 5, 6, 7						295		295	Eliminated-City KW ongoing program

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COMPLETED - REMOVED

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23	Key West	Upgrade and retrofit the Southernmost Waste to Energy Facility (including roof).		1999-The project would strengthen one of the City's primary utilities, the Waste to Energy Facility, by reducing vulnerability to the effects of storms and power outages. The cost-benefit potential of this project is very favorable.												COMPLETED REMOVE
46	Key West	Establish a universal frequency for emergency communications to be used by all City agencies. Coordinate the effort with Monroe County to ensure consistent planning and operations.		1999-The project would include investigation of appropriate means of providing a universal frequency, including pros and cons of various systems. Close coordination with Monroe County and other municipalities to ensure consistency during emergency and avoid duplication of effort and incompatible systems.		Hurricane, Flooding, Tornado	1, 2, 3, 4, 5, 6, 7									COMPLETED
66	Key West	City of Key West Records Management Backup		1999-In the event of a disaster or serious emergency valuable City records and data could be lost. It is necessary to develop a program to determine the best ways to ensure that records are not lost. Such as project would include evaluating status of existing data, determining whether to convert hard copy data to computer format, protection of computer files, and remote data back up. The project could include a plan to secure paper files, computer data and equipment, and establishing a remote location for data beck-up, storage and retrieval in the event of a disaster.	City Clerk	Hurricane, Flooding,	1, 2, 3, 4, 5, 6, 7	5/18/06								COMPLETED

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
8	Key West	Storm Water Mitigation Project including installation of injection wells and trench / trench drains.		1999-Storm water injection wells and trench-draining systems are part of the City's storm water improvement plan. This work is vital to prevent storm related environmental and health problems. The project is composed of the following components. It may be phased for component projects submitted separately for grant programs. City of Key West Storm Water Projects include: • Front Street Outfall Drainage Improvements Project – Estimated Cost: $285,800.00 (Deleted) • United/Thompson Street Drainage Improvements Project – Estimated Cost: $209,000.00 (Completed)	Projects completed per Annalise on 5/18/06 were removed and transferred to completed list as instructed by JOC.	Hurricane, Flooding,	1, 2, 3, 4, 5, 6, 7						360			COMPLETED. Of the 220 proposed stormwater injection wells, 17 have been completed. Flagler Ave tide valves: 9 valves have been identified as part of $800,000 project * A FY 09 - 10 federal stumilus grant has permitted construction of approximately 290 storm water gravity wells.
24	Key West	East Front Street Drainage/ Flood control		2005-Application under HMGP submitted 5/11/05	1539 Annalise Mannix	Hurricane, Flooding,	1, 2, 3, 4, 5, 6, 7	2,407,011.00					290			REMOVED
35	Key West	Develop a "mutual-aid" program with local grocery stores. Include the following factors: Determine emergency needs such as back-up power, staging areas, storage, and distribution. Recommend use of support agreements with markets in other locations.		1999-The program would address logistical and economic problems that occurred during Hurricane Georges. It deals with critical issues like emergency supplies and feeding and maintaining commercial operations during an emergency. such as a hurricane. When implemented, the program will have a significant effect of reducing these problems in the future.	ck w AML could fall under "PA"	Hurricane, Flooding,	1, 2, 3, 4, 5, 6, 7						265			REMOVED. Previously, per DCA, conducted through the IAP - Now have gen. capabilities (Publix & W. Dixie) where no POD's will be co-located.
51	Key West	Elevation of residence at 308 Catherine St. KW (Romaquera)		2006-To elevate residence above flood base elevation	Dave Parker	Hurricane, Flooding,	1, 5, 6	48,000.00					190		13-Apr-06	REMOVED. Rejected /denied (low B/C)

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
5	Layton	Retrofit Layton City Hall to be flood-proof, wind resistant, and properly equipped to ensure continuity of government operations and for use as a alternative Emergency Operations Center and hurricane refuge of last resort.		1999-The project would include an engineering study to determine what improvements to make for flood-proofing and wind resistance. A determination would be made of items needed to prepare the building for use as a hurricane shelter.				Completed					385			COMPLETED
9	Layton	Construct a culvert across US 1 to reduce rising water from storm surge.		1999-The project would include a feasibility study and installation of the appropriate size and type of culvert.				5/18/2006					360			REMOVED
19	Layton	City of Layton Records Management Backup		1999-In the event of a disaster or serious emergency valuable City records and data could be lost. It is necessary to develop a program to determine the best ways to ensure that records are not lost. Such as project would include evaluating status of existing data, determining whether to convert hard copy data to computer format, protection of computer files, and remote data back up. The project could include a plan to secure paper files, computer data and equipment, and establishing a remote location for data beck-up, storage and retrieval in the event of a disaster.				5/18/2006					315			completed
26	Layton	Establish emergency communications system including purchase of satellite phone to assure availability of communications during an emergency.		1999-The City will purchase a satellite phone to ensure there is a reliable means of communications in the event of a disaster.				5/18/2006					295			REMOVED

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

Project #	Project Owner / Sponsor	Project Title/ID	Project Location	Brief description of project	Point of Contact	Hazards Address (all that apply)	Mitigation Goals (all that apply)	COST (if completed, otherwise leave blank)	BLANK	BLANK	BLANK	Fund Source	Rank (if ranked)	Date Submitted	Date moved to C-R-U list	NOTES (Completed, Unconfirmed, Removed)
35	Layton (or KCB?)	Purchase of repetitive loss buildings and properties in Layton and conversion to City owned permanent open space.		1999-The project would provide for public acquisition of buildings and properties that are subject to persistent damage and return of the sites to open space owned and maintained by the City. This is an excellent mitigation project since its purpose is to remove structures likely to experience future damage and loss and convert them to public open space. This removes development and replaces it with permanent open space.				5/18/2006					265			COMPLETED
38	Layton	Purchase Emergency Generators						5/18/2006					245			COMPLETED
49	Layton	Identification and installation of storm resistant signs.		1999-The project would determine what measures could be taken to reduce damage to signs that occurs from severe weather. The damage and loss of signs is common in hurricanes, regardless of the storm's strength. There is a need to investigate ways that this could be prevented. The project could be coordinated with the proposed multi-jurisdictional, joint sign project described later in this listing.				5/18/2006					275			COMPLETED
50	Layton	Storm friendly landscaping.		1999-The project would include a study to determine types of landscaping that are resistant to storm effects and encourage planting of such materials in the City. The project could be coordinated with the Multi-jurisdictional comprehensive landscape mitigation initiative				5/18/2006					275			COMPLETED
1	Marathon	Fire-Rescue and EOC		2006-Design, development of architectural and engineering plans and construction of a wind resistant facility for use as a Fire / EOC.	3/1/08			Completed					450			COMPLETED

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

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67	Marathon	Replacement of home with new modular home (Hillman)		2006-On october 24th 2005 home was flooded by Hurricane Wilma. The damage was greater than 50% of the home value and they need to bring up to code. Replacement requires that is brought up to above flood elevation. The new home will resist up to 175 mph wind strenght and its windows will be Miami-Dade Code rated.	Rose Ann Hightower			213,000.00					120		28-Apr-06	
1	Marathon	107th to 109th Street Stormwater Improvement Project	Marathon	2005-Installation of drainage and retention structures to minimize the impacts from rainfall/flood events with a 25-year frequency.										Aug-05	07.22.08	COMPLETED
2	Marathon	West 105th to 116th Street Stormwater Improvement Project	Marathon	2005-Installation of drainage and retention structures to minimize the water quality impacts from rainfall/flood events with a 25-year frequency.										Aug-05		COMPLETED
3	Marathon	City Recovery Plan	Marathon	2005-Technical creation of City Recovery Plan				$45,000								DELETE
41	Baptist Health South Florida dba Mariners Hospital, Tavernier	Mariners Hospital Flood Barriers		2006-To install engineered flood barriers at the first floor door and window openings to provide protection against Category 2, 3, and 4 surges which could reach to +13 feet MSL or above per Surge Data provided by the State of Fl. DCA, DEM.	John Sohn Manuel Reyes-Otalara, R.A. 305-853-1615 305-661-5990			1,200,000.00					225		7-Sep-06	COMPLETED.. Not supported by LMSWG. This project has been completed no indication that HMGP funding was provided funding.
80	Florida Keys Aquaduct Authority	Reactivating the reverse osmosis/desalinization facilities located in Stock Island and Marathon.		1999-The project will rehabilitate the FKAA facilities and are funded by the Authority. These are exciting mitigation efforts, especially considering the potential disaster-related water problems in the Keys.				5/18/06								COMPLETED
90	Habitat for Humanity of Key West and the Lower Florida Keys, Inc.	Lower Keys Disaster Facility		2005-Habitat for Humanity of Key West and the Lower Florida Keys, Inc.	1539 application needs to be re-written and re-submitted to LMSWG			1,000,000.00					none		Needs to be re-structure for Wilma submittal	REMOVED (denied)

MONROE COUNTY LMS WORKGROUP
COMPLETED - REMOVED

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48	Sapodilla Holdings LLC	The Villas at Coconut Cay		Reconstruct and redevelopment of 50 year old Keys resort that has been rendered unusable by floods.	Jim Ryne 305-289-7672			8,000,000.00					195		7-Sep-06	REMOVED (denied - lowe B:C)
45	St. Justin Martyr Catholic Church	Accordion Shutter System		2005-To protect designated Shelter during disaster and emergencies.				10,555.00					200		2006 May	REMOVED (do not intend to submit)
43	Key Largo Baptist Church	Hardening of facility		Harden and upgrade existing facility to ARC standards to serve as an emergency response point. Improvements to include communication infrastructure.	Steve Vetter/Jerry Gaddis 305-394-1818, and Gaddis 305-766-1354			50,000.00					220		7-Sep-06	REMOVE. Not an ADA compliant facility - renders them ineligible / suggests talking to Contractor re. 20% const. fees must be allocated to ADA complinace
61	Seacamp	Seacamp building elevation		2006-To elevate and business office safe from flooding and improve to withstand wind damage.	D. Gallagher	hurricane/tropical storm	1, 5	$90,000		6mos or <			160			Denied
8	Florida Keys Children Shelter	Roof replacement	Plantation Key	2005-Florida Keys Children Shelter request funds to replace existing roof and tie downs.	Kurt Rochenback	Hurricane/Tropical Storm, Tornado	1,2,4,5	$160,000							06.29.10	Completed w/ funding from Ocean Reef Community & State of Florida not-for-profit Windstorm funding.
7	Habitat for Humanity of Key West & Lower Florida Keys, Inc.	Retrofit of Local Government Supported Disaster Recovery Center. MM 30.5 US Route 1, BPK, FL. 33043		Rehabilitation and retrofit of 13,500 sq. ft. office / warehouse public building under long term lease to HfH to act as Disaster Recovery Center for the Florida Lower Keys.		Hurricane/Tropical Storm, Tornado, preservation of economy	1,2,4,5,6	$600,000							06.29.10	Rejected by SOF Mitigation Bureau
45	Habitat for Humanity of Key West & Lower Florida Keys, Inc.	Affrodable Housing Project in Big Coppitt Key		Construction of 15 affordable housing units.		Hurricane/Tropical Storm, Tornado, preservation of economy	1,2,4,5,6	$1,875,000							06.29.10	Substantially completed w/ remaining two units to be completed mid-July.
46	Habitat for Humanity of Key West & Lower Florida Keys, Inc.	Residential Shutter Program in Partnership with DCA and FEMA.		Additional funding for open HMGP contract for the purchase & installation of storm panels for single family homes. Popular, cost effective and successful non-profit / government partnership program.		Hurricane/Tropical Storm, Tornado, preservation of economy	1,2,4,5,6	$2,000,000							06.29.10	Completed in 2007 - audtited by DCA

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9	Monroe Association of Retarded Citizens, Inc	Wind retrofit Roof		2005-Monroe Association of Retarded Citizens, Inc. request funds to wind retrofit roof		Hurricane/Tropical Storm, Tornado, preservation of economy	1,2,4,5	$35,000							06.29.10	Funding pvded. thru Volunteer Florida Foundation Grant of $25,000.00 of $37,950.00 total cost.
41	Key West, Housing Authority of	Rehabilitation and Retrofit of Senior Citizens Plaza.	Key West	Rehabilitation & retrofit shutters Miami Dade County approved wind resistance of 199 low income elderly housing complex. This project has been identified in Monroe County's Local Mitigation Strategy.	Manual Castillo, Director, KWHA	Hurricane, Torndao	1, 4, 5, 6	$800,000								Completed FY 09 -10
13	Key West	Shutter Madeline Bean Building	Key West	Shutter City Hall Annex with Dade County approved system	City General Services, City Engineer	Hurricane, Torndao	1, 2, 4, 5, 6,	$40,000								Building to be demolished FY 10 - 11 - REMOVE
14	Key West	Southwall Replacement	Key West	Reconstruct Seawall two to four feet higher to stop rolling waves over the sidewalk and State Road A1A	City General Services, City Engineer	Hurricane, Flooding, Coastal, Erosion	1, 3, 4, 5, 6, 7	$1,000,000								FDOT project from 3900 block to 2500 block, completed FY 08 - 09
4	Key West	Bathymetry of Lower Keys	Key West	2006-Conduct Lidar Bathymetry of the Lower Keys	City General Services, City Engineer	Hurricane, Flooding, Coastal, Erosion	1, 2, 3, 4, 5, 6, 7	$150,000								Completed FY 08 - 09
	Key Colony Beach	Stormwater Phase VII	Key Colony Beach	6 (six) 120-foot Injection Wells	Ck w Ed Borysiewicz	Flooding	3, 5, 7	$300,000						17-May-10	May-10	Project Currently Unde
	Key Colony Beach	City Hall Complex Generator	Key Colony Beach	100% Back-up Power	Ck w Ed Borysiewicz	Hurricane	1, 2, 4, 5	$45,000						17-May-10	May-10	Completed in 2007
59	Monroe County	28 Tarpon Avenue, Key Largo, Fl 33037 (Castillo)	Key Largo	Demolition and Replacement of residence	Diane Bair, FEMA Flood Plain Manger	Hurricane / Flooding / Tropical Storm - Tornado	1,2,4,5	272,520.54						19-Dec-07		submitted in person to D. Bair / Completed
57	Monroe County	35 Jolly Roger Dr., K.L., FL 33037 (Cartwright)	Key Largo	Elevation and second floor conversion of 1958 SFR	Diane Bair, FEMA Flood Plain Manger	Hurricane / Flooding / Tropical Storm - Tornado	1,2,4,5	$160,000.00						7-Dec-07	7-Dec-07	Status Unknown - No Response UNCONFIRMED
51	Monroe County	Elevation of residence 21 Ventana Lane, Big Coppitt Key (Keeler-Descoteaux)	Monroe Co	To elevate private residence to above base level flood .	Diane Bair, FEMA Flood Plain Manger	Hurricane / Flooding / Tropical Storm - Tornado	1,2,4,5	$40,000						16-Mar-06		No Response UNCONFIRMED

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82	Multijurisdictional	Impact study on the effect of the Uniform State Construction Code on Monroe County and its incorporated areas.		1999-The project would involve studying the impacts of the Uniform State Construction Code on local codes, regulatory authority, and building practices in the Florida Keys.	ck w D Koppel / City Building Official, John Woodson	Hurricane, Flooding, Tornado, Wildfire, Drought, Coastal Erosion	1, 2, 3, 4, 5, 6, 7								**4/30/2010**	Latest Florida Building Code does address concern / Review through 2010 * FBC addresses local codes, FEMA audit
51	Key West	Joaquin Romaquera	Key West	Elevate 308 Catherine St.	AML requested leave	hurricane, flooding	1, 5, 6								**4/30/2010**	FEMA denied - owner wishes to pursue
42	Key West	White St. Pier (WSP) Rip Rap Installation	Key West	2006-To install Rip Rap along the West Side of the White St. Pier to minimize errosion and undermining of the structure.	City General Services Dep City Engineer	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7	$350,000		6 mos <			220	2-May-06		AML to go out to bid shortly * Completed FY 09 - 10
8	Key West	Storm Water Mitigation Project including installation of injection wells and trench / trench drains.	Key West	1999-Storm water injection wells and trench-draining systems are part of the City's storm water improvement plan. This work is vital to prevent storm related environmental and health problems. The project is composed of the following components. It may be phased for component projects submitted separately for grant programs. City of Key West Storm Water Projects include: • Grinnell Street Drainage Improvement Project – Estimated Cost: $323,850.00 • Duval Street Outfall Drainage Improvements – Estimated Cost: $135,700.00 • Flagler Avenue Outfall Drainage Improvement Project – Estimated Cost: $323,850.00 • Mallory Square Outfall/Whitehead Street Drainage Project – Estimated Cost: $230,500.00	Projects completed per Annalise on 5/18/06 were removed and transferred to completed list as instructed by JOC. Front St. and United-Thompson St. Drain. Proj. transferred to C-R list 12.29.09	Hurricane, Flooding	1, 2, 3, 4, 5, 6, 7						360		4/30/2010	Of the 220 proposed stormwater injection wells, 17 have been completed. Flagler Ave tide valves: 9 valves have been identified as part of $800,000 project