

## 2.0 HAZARD IDENTIFICATION AND VULNERABILITY ANALYSIS

### 2.1 Hazards Studied

**2.1.1 Hazards:** Collier County is vulnerable to a wide array of hazards that threaten its communities, businesses, and environment. To determine the hazards that possess the greatest threat, a “Hazard and Risk Assessment” was initiated in 2004. This assessment was developed from historical data of events that occurred over the past 30 years. Although there are many more hazards that could affect Collier County, because of the detailed information required, the Local Mitigation Strategy Working Group (LMS) decided to initially focus on those hazards mandated by the State/Federal requirements in order to comply with the Disaster Mitigation Act of 2000 (DMA2K). Annex A contains the hazards addressed by this initial analysis. They are:

- [Tropical Cyclones](#) [Appendix 1](#)
- [Severe Storms](#) [Appendix 2](#)
- [Coastal & Riverine Erosion](#) [Appendix 3](#)
- [Tornadoes](#) [Appendix 4](#)
- [Flooding](#) [Appendix 5](#)
- [Wildfires](#) [Appendix 6](#)
- [Drought/Heat Wave](#) [Appendix 7](#)
- [Winter Storms/Freezes](#) [Appendix 8](#)
- [Sinkholes/Landslides](#) [Appendix 9](#)
- [Earthquakes](#) [Appendix 10](#)
- [Tsunamis](#) [Appendix 11](#)
- [Dam/Levee Failure](#) [Appendix 12](#)

The LMS may study the following hazards in detail at a later date when time, technology, money and other resources are available:

- Gas Pipeline Rupture
- Hazardous Material (HAZMAT) Transportation
- HAZMAT (Fixed Site)
- HAZMAT (Coastal Waters)
- Oil Pipeline Rupture
- Pandemic & Epidemic Illnesses (Influenza/SARS)
- Terrorism (Biological)
- Terrorism (Non-Biological)
- Utility Failure

Sources for the information to develop this assessment came from the following:

- National Weather Service Office (NWSO), Miami
- National Environmental Satellite, Data & Information Service, National Climate Data Center (NCDC)
- Federal Emergency Management Agency (FEMA)
- US Census Bureau
- Florida Division of Emergency Management (FDEM)
- South Florida Water Management District (SFWMD)

- Florida Division of Forestry (FDOF)
- National Oceanic & Atmospheric Administration (NOAA), Coastal Services Center
- HAZUS-MH software from FEMA for Estimating Potential Losses from Disasters
- The Arbiter of Storms (TAOS) modeling tool developed by University of Central Florida and Kinetic Analysis Corporation
- Southwest Florida Regional Planning Council
- Florida Department of Health (DOH)/Collier Health Department
- Southwest Florida Regional Hurricane Evacuation Study
- Collier County Administrative Services Division (CCASD)
- Collier County Public Library
- Collier County Public Utilities Division (CCPUD)
- Collier County Transportation Division (CCTD)
- Collier County Community Development & Environmental Services Division (CCCDES) (Land Development Code, Growth Management Plan, etc.)
- City of Naples
- City of Marco Island
- Everglades City
- Internet “topical” searches

**2.1.2 Methodology:** The LMS approach was to primarily use the HAZUS-MH model for analysis when the hazard was addressed because this program is “FEMA-Approved”. When the HAZUS-MH model did not address a particular hazard, the team then consulted the TAOS model (FDEM supported). Where local detailed hazard information from a credible source was available, the team used that information. Since the HAZUS-MH model has the credibility and support, it must be recognized that the limitation to it is that it uses the “Census 2000” data for its analytical backbone. Although the County has more current data, the team decided to use “Census 2000” data for consistency throughout the process until they were more comfortable with the process for Collier County Hazard Mitigation Plan update analyses in later years. For hazard information not addressed by HAZUS or TAOS, libraries, the Miami Weather Service Office and local experts were consulted. The State of Florida agencies were queried with limited success. The most helpful was the Forestry Division of the Department of Agriculture.

## **2.2 Physical Characteristics**

Collier County is located on the southwest coast of Florida. It is bordered on the north by Lee and Hendry counties, on the east by Miami-Dade and Broward counties, on the south by Monroe County and on the west by the Gulf of Mexico.

**2.2.1** It has 2,025 square miles of land area of which approximately 50 miles front on the Gulf of Mexico.

**2.2.2** The topography of the land is basically flat ranging from 2-5 feet along the coast to 35-40 in the northeast section of the county near Immokalee.

**2.2.3** **There are no major rivers within the county.** Most are south of US41 into the ten thousand islands. The Gordon River enters into Naples Bay and extends northward

to the vicinity of the Naples Airport. The Cocahatchee River in North Naples enters into the Gulf of Mexico via Wiggins Pass. The headwaters of each river are south and west of I-75. Water areas are comprised of man-made lakes, canals, and water retention areas with only a few natural lakes.

**2.2.4** The average elevation of the County is approximately 10-11 feet. However the average elevation of the highly developed areas of the urban area is 7-8 feet.

**2.2.5** Poor drainage conditions exist in the western and southern areas of the County where the water table is high. During periods of heavy rain over extended periods of time, most natural and man-made bodies of water may overflow resulting in flooding. If this were to occur, several highways in the County (US41, CR951, SR92, SR29, Golden Gate Parkway, Everglades Boulevard) could be inundated as well as roads in several residential areas.

## 2.3 Land Use Patterns

**2.3.1** There are twelve planning community areas within the unincorporated area of the County. The Naples urban area is bounded by the Gulf of Mexico to the west and south, CR846 to the north, and CR/SR951 to the east. The urban area consists of 7 of the 12 planning communities. Commercial areas are found along US41 from CR951 to the Lee County line, CR951 and Golden Gate Parkway in Golden Gate, Airport Road south of Golden Gate Parkway, North Collier Blvd. on Marco Island, and Main Street in Immokalee. The remainder of the urban area consists of single and multi-family residential areas. The Rural Estates Planning Community and the western portion of the Royal Fakapalm are primarily agricultural as are portions of the Corkscrew Planning Committee. Big Cypress is primarily undeveloped, protected wetlands. (see [Attachment 1](#) to Annex C)

**2.3.2** Intensity of development within the County urban area is low, ranging from 3-6 dwelling units per acre. The only exceptions to this are Park Shore, Pelican Bay, Vanderbilt, and Marco Island beachfront property where density is 12-16 units per acre. ([See Attachment 2 to Annex C for future land use patterns](#))

## 2.4 Demographics

Although for the study, US Census 2000 data sets were used for consistency, the following tables contain more up-to-date information for the public to consider in relation to the 2000 census information, for comparison. Again, the most current data will be used in later Hazard Mitigation Plan updates.

From US Census 2000							
Geographic area	Population	Housing units	Area in square miles			Density per square mile of land area	
			Total area	Water area	Land area	Population	Housing units
Collier County	251,377	144,536	2,304.93	279.59	2,025.34	124.1	71.4

For general reference purposes the following was gleaned from the University of Florida, April 2003		
<b>Estimates by Age Group</b>	<b>Number</b>	<b>Per Cent</b>
0-14	49,622	16.73
15-24	26,754	9.02
25-44	70,088	23.63
45-64	75,101	25.32
65+	75,043	25.31
<b>TOTAL POPULATION</b>	<b>296,608</b>	<b>100</b>
<b>DISTRIBUTION BY SEX</b>	<b>Number</b>	<b>Per Cent</b>
Male	148,601	50.1
Female	148,007	49.9
<b>RACE DISTRIBUTION</b>	<b>Number</b>	<b>Per Cent</b>
Hispanic (of any race)	58,135	19.6
American Indian	890	0.3
Other Non-Caucasian	18,686	6.3
Caucasian	218,897	73.8

<b>POPULATION DATA - ADDITIONAL INFORMATION (FROM THE 2004 CC CEMP)</b>	
Special Needs (registered with the County)	800 people
Migrant Population	16,500 people during planting and harvest seasons
Tourists (typically retired without school age children)	104,928 daily during November-April peak, of which 1,000 - 1,500 are transportation dependent; secondary maximum occurs in the summer months
Seasonal Workers (Nov. – Apr.)	Farming, Hotel/restaurant jobs and building trades
Non-English (Hispanic and Creole) Speaking Population	26,969 people, located primarily in Immokalee with smaller population in East Naples
Transient/Homeless (typically during winter months)	675
Hazard Vulnerable Areas	Flooding: South and west of US 41 Hazmat: Immokalee
Areas of Large Tourist Population	Coastal Areas: North Naples, City of Naples, Marco Island, Everglades City and the Port of the Islands area, Trailer and RV parks, condominiums, and golf course communities in North and East Naples.
Area of Concentrated Tourist Population	Beachfront areas from Vanderbilt Beach to Marco Island, with a sizeable German speaking population that visits throughout the year.
Inmate Population	Capacity=774, Average jailed population=1,000

### **ECONOMIC PROFILE**

\*PREPARED BY THE COLLIER COUNTY ECONOMIC DEVELOPMENT COUNCIL, 2003

<b>EMPLOYMENT BY MAJOR SECTOR</b>	<b>QUANTITY</b>	<b>PER CENT</b>
Trade Transportation & Utilities	21,493	20.0

Goods Production	17,168	16.0
Leisure & Hospitality	16,873	15.0
Professional & Business Services	12,459	11.0
Education & Health Services	12,044	11.0
Government	10,771	10.0
Natural Resources & Mining	7,026	6.0
Financial Activities	6,022	5.0
Other Services	4,679	4.0
Information	1,706	2.0
<b>TOTAL EMPLOYMENT</b>	<b>110,241</b>	<b>100.0%</b>
<b>UNEMPLOYMENT RATE</b>		<b>4.4%</b> (2002)
<b>PER CAPITA INCOME</b>	<b>\$41,269</b> (2001)	
<b>MEDIAN FAMILY INCOME (ESTIMATE)</b>	<b>\$61,400</b> (2003)	
<b>AVERAGE SINGLE FAMILY RESALE VALUES</b>	<b>\$341,089</b> (2002)	
<b>DWELLING UNITS ( INCL MH)</b>	<b>166,912</b> (2003)	
<b>MOBILE HOMES (EST)</b>	<b>12,199</b> (2003)	

## 2.5 Essential Facilities

**2.5.1 Essential Facilities** are essential to the health and welfare of the whole population and are especially important following hazard events. The potential consequences of losing them are so great, that they should be carefully inventoried. Be sure to consider not only their structural integrity and content value, but also the effects on the interruption of their functions because the vulnerability is based on the service they provide rather than simply their physical aspects. Essential facilities include hospitals and other medical facilities, police and fire stations, emergency operations centers and evacuation shelters, and schools. ([See Annex B](#))

**2.5.2 Hazardous Material Facilities** include facilities housing industrial/hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins.

**2.5.3** For the study region of Collier County, we considered the following essential facilities: hospitals, schools, fire stations, law enforcement facilities, emergency medical services stations and emergency operation facilities. General locations of the essential facilities are depicted on most of the hazard images. For Homeland Security reasons, as more essential facilities are added, specifics regarding the nature/purpose of some facilities may not go beyond its general purpose, or location.

## 2.6 Type Of Losses/Damages Anticipated

The losses will be express in dollars because this is a convenient reference tool to compare/contrast the community's vulnerability to the hazards studied. The numbers are

extremely “rough estimates” and should only be used for the purpose previously stated. The mathematical formulae used to quantify the degree of damages associated with a particular hazard are FEMA’s, unless otherwise stated. Details regarding the loss estimation techniques can be found in FEMA’s [“How-To Guide #2: Understanding Your Community's Risks; Identifying Hazards, And Determining Risks \(FEMA 386-2\)”](#).

**Building Data Requirements By Hazard**

Building Characteristics	Flood	Earthquake	Tsunami	Tornado	Coastal Storm	Landslide	Wildfire
Building Type / Type of Foundation	✓	✓	✓		✓		
Building Code Design Level / Date of Construction	✓	✓	✓	✓	✓		✓
Roof Material				✓	✓		✓
Roof Construction				✓	✓		✓
Vegetation							✓
Topography	✓				✓	✓	✓
Distance from the Hazard Zone	✓		✓		✓	✓	✓

## 2.7 Risk Summary

The figures below provide a summary of the communities affected by a particular hazard and the hazards’ the anticipated impacts.

Community Risk		Hazard Studied											
		Tropical Cyclone	Severe Storm	Coastal/Riverine Erosion	Tornadoes	Flooding	Wildfire	Drought/Heat Wave	Winter Storm/Freeze	Sinkhole	Earthquake	Tsunami	Dam/Levee Failure
EVERGLADES CITY	INCORPORATED	X	X	X	X	X		X	X				
CITY OF MARCO ISLAND	INCORPORATED	X	X	X	X	X		X	X				
CITY OF NAPLES	INCORPORATED	X	X	X	X	X		X	X				
GOLDEN GATE CITY	UNINCORPORATED	X	X		X	X	X	X	X				
GOLDEN GATE ESTATES	UNINCORPORATED	X	X		X	X	X	X	X				
IMMOKALEE	UNINCORPORATED	X	X		X	X		X	X				

**Risk Summary**

Risk Index/Characteristic		Hazard Studied											
		Tropical Cyclone	Severe Storm	Coastal/Riverine Erosion	Tornadoes	Flooding	Wildfire	Drought/Heat Wave	Winter Storm/Freeze	Sinkhole	Earthquake	Tsunami	Dam/Levee Failure
<b>FREQUENCY</b> (Probability)	Highly Likely		X	X	X	X	X	X	X				
	Likely	X											
	Possible												
	Unlikely									X	X	X	X
<b>MAGNITUDE</b> (Direct/Indirect - % of Developed Area)	Catastrophic (>50)							X					
	Critical (25-50%)	X										X	
	Limited (10-25%)					X	X						
	Negligible (<10%)		X	X	X				X	X	X		X
<b>WARNING TIME</b> (Speed of Onset)	Minimal (<6 hrs)		X		X		X						
	6 – 12 hours					X							
	12 – 24 hours												
	24 + hours	X		X				X	X	X	X	X	X
<b>SEVERITY</b> (Deaths & Injuries)	Catastrophic (Deaths)	X	X		X							X	
	Critical (Perm Injuries)												
	Limited (Min. Injuries)					X	X						
	Negligible (1 <sup>st</sup> Aid)			X				X	X	X	X		X
<b>Recovery Time</b> (Economic & Individual Impact)	> 6 Months	X									X	X	
	>1 ≤ 6 Months			X									
	1 wk ≤ 1 Mo.												
	≤ 1 Week		X		X	X	X	X	X	X			X