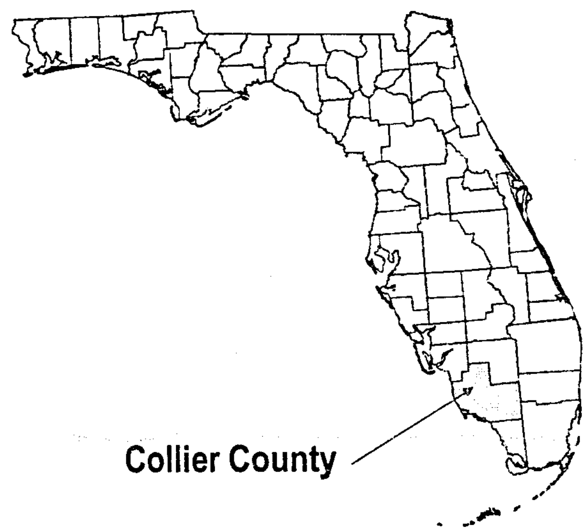
FLOOD INSURANCE STUDY

COLLIER COUNTY, FLORIDA
AND INCORPORATED AREAS



COMMUNITY NAME	COMMUNITY NUMBER
COLLIER COUNTY (UNINCORPORATED AREAS)	120067
EVERGLADES, CITY OF	125104
MARCO ISLAND, CITY OF	120426
NAPLES, CITY OF	125130

NOVEMBER 17, 2005

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
12021CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Countywide FIS Effective Date: November 17, 2005

Revised Countywide FIS Dates:

All flood elevations in this FIS report are referenced to the North American Vertical Datum of 1988 (NAVD 88). Flood elevations on the Flood Insurance Rate Map (FIRM) are referenced to both the NAVD 88 and the National Geodetic Vertical Datum of 1929 (NGVD 29). The NAVD 88 elevations are presented to the rounded whole-foot value, and should be used for NFIP purposes. These flood elevations must be compared to structure and ground elevations referenced in the same vertical datum. The NGVD 29 elevations are presented to the one-tenth of one foot value for informational purposes.

An average difference between NAVD 88 and NGVD 29 elevations has been computed to be 1.3 feet for Collier County, Florida. To convert elevations from NAVD 88 to NGVD 29, add 1.3 feet to the NAVD 88 value. For example, if a point is at mean sea level (0.00 ft.) with NAVD 88, it will be +1.3 ft. with NGVD 29.

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1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) investigates the existence and severity of flood hazards in, or revises and updates previous FISs/Flood Insurance Rate Maps (FIRMs), for the geographic area of Collier County, Florida, including: the City of Everglades, the City of Marco Island, the City of Naples, and the unincorporated areas of Collier County (hereinafter referred to collectively as Collier County).

This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This FIS has developed flood risk data for various areas of the county that will be used to establish actuarial flood insurance rates. This information will also be used by Collier County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some States or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

This FIS was prepared to include all jurisdictions within Collier County in a countywide FIS. The authority and acknowledgments for each jurisdiction included in this countywide FIS was compiled from their previously printed FIS reports. The Cities of Everglades and Naples, and the unincorporated areas of Collier County were combined into one FIS report dated June 3, 1986. For the June 3, 1986, FIS report, the coastal hydrologic and hydraulic analyses were obtained from the South Florida Water Management District (SFWMD) report entitled, The Determination of 100-Year Coastal Surge Flood Elevations for Coastal Collier County, Florida (South Florida Water Management District, 1984).

The authority and acknowledgments for the unincorporated areas of Collier County will also apply to the City of Marco Island, which was a part of the unincorporated areas until its incorporation on August 27, 1997.

For this countywide FIS, the hydrologic and hydraulic analyses for the Gulf of Mexico were prepared by Engineering Methods & Applications for FEMA, under Contract No. EMW-94-C-4392. This work was completed on November 30, 1996.

The digital base map information for the unincorporated areas of Collier County, the City of Everglades, and the City of Marco Island was derived from U.S. Geological Survey (USGS) 1:24,000 scale Digital Line Graphs. Digital base map information for the City of Naples was derived from Collier County parcel data dated 2003 and was provided by the City of Naples. Additional information may have been derived from other sources. These files were modified in and around the floodplains to match data compiled for the previous FISs of Collier County, Florida.

The coordinate system used for the production of the digital FIRMs is Universal Transverse Mercator referenced to the North American Datum of 1927 and the Clarke 1866 spheroid.

1.3 Coordination

The purpose of an initial Consultation Coordination Officer's (CCO) meeting is to discuss the scope of the FIS. A final CCO meeting is held to review the results of the study.

For this countywide FIS, an initial CCO meeting was held on August 4, 1993, and was attended by representatives of Collier County Engineering Services; Collier County Stormwater Management; Collier County Community Development; City of Naples Natural Resources; City of Naples Building Department; Big Cypress Basin; DeGrove Surveyors, Inc.; Engineering Methods & Applications, Inc.; Dewberry & Davis; and FEMA. Final CCO meetings were held on September 25, 2002, and February 13, 2004. Both meetings were attended by representatives of Collier County; the City of Naples; Tomasello Consulting Engineers, Inc.; Dewberry & Davis LLC; and FEMA.

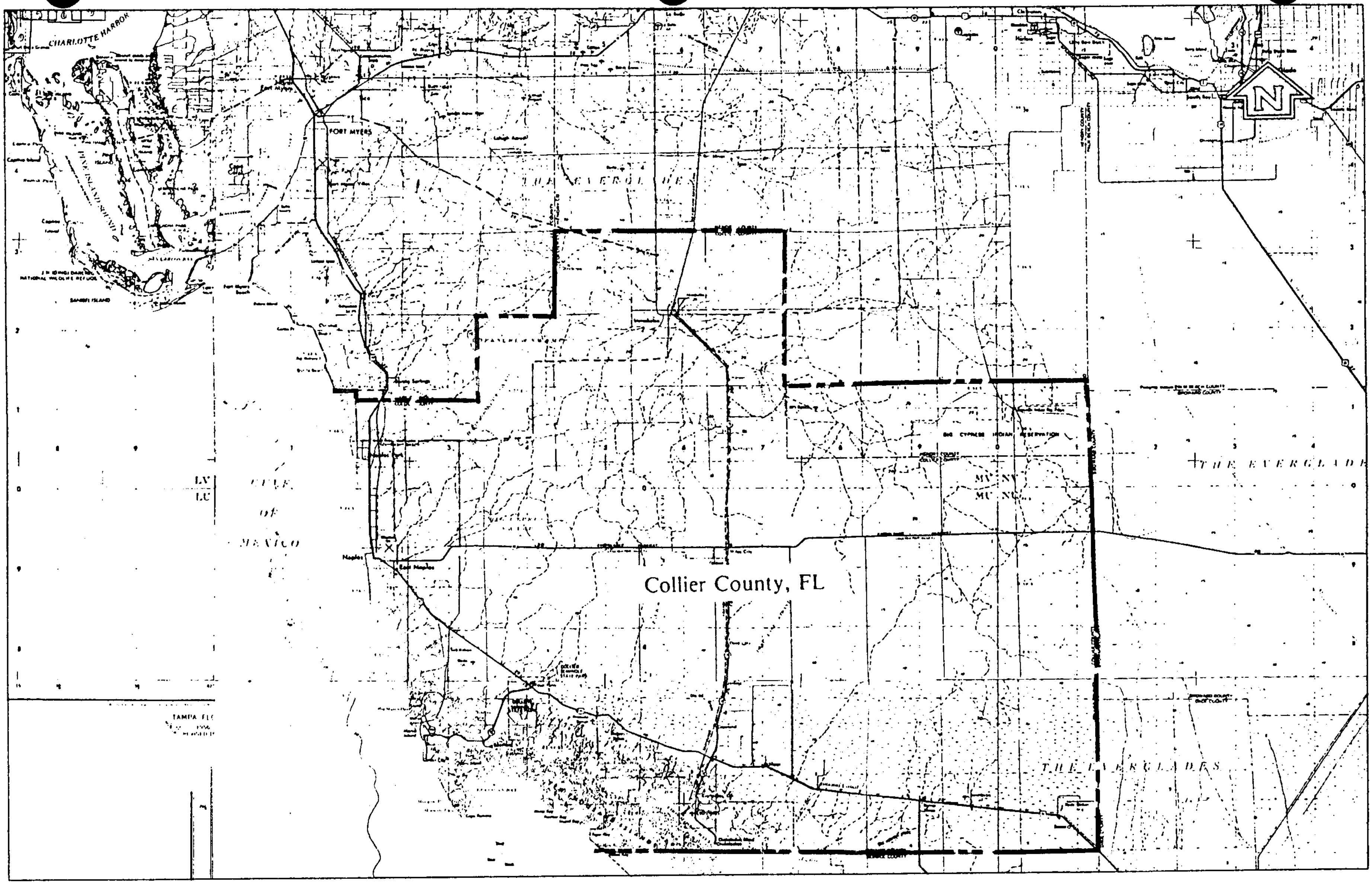
2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Collier County, Florida. The area of study is shown on the Vicinity Map (Figure 1).

For this countywide FIS, the entire coastline of the Gulf of Mexico was restudied by detailed methods.

Numerous non-coastal flooding sources in the county were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazard. The scope and methods of study were proposed to, and agreed upon by, FEMA and Collier County.



FEDERAL EMERGENCY MANAGEMENT AGENCY

COLLIER COUNTY, FL AND INCORPORATED AREAS

VICINITY MAP

FIGURE 1

2.2 Community Description

Collier County comprises approximately 2,100 square miles in the southwestern part of Florida. It is bounded by the Gulf of Mexico on the west and extends into the Everglades National Park to the east. Collier County is bordered on the north by Lee and Hendry Counties, on the east by Broward and Dade Counties, and on the south by Monroe County.

Collier County began developing extensively after the completion of the Tamiami Trail (U.S. Route 41) in 1928. Railroads were also completed leading into the Naples area at about the same time. Additional development was encouraged by the beginning of construction of the Golden Gate Canal in the early 1960s. The Faka Union Canal was begun in 1968. Controlled drainage provided by these canal systems permitted the development of the Golden Gate Estates, east of Naples and the Remuda Ranch area, southeast of Naples.

According to the 2000 census, the population of Collier County is 251,377. Naples, with a population of 20,976, is the largest city in the county. The City of Everglades has a population of 479. The City of Marco Island has a population of 14,879 (U.S. Department of Commerce, 2000).

Many residences are maintained as winter homes or retirement dwellings. The resort atmosphere of the region makes it attractive for tourists as well as a popular location for second homes. Tourism is the most important industry in Collier County, particularly near the Cities of Everglades and Naples. Other major types of industry are agriculture and cattle, an oil field at Sunniland, and limestone quarrying for road and building materials.

Key features of the county related to flooding are the extremely flat topography, the groundwater system, and drainage introduced by construction of canals. The general topography of Collier County is extremely flat, with land slopes on the order of 1 foot per mile to 0.5 foot per mile in the interior regions. There are no major natural streams such as those found in areas of steeper topography. Instead, flow occurs over wide, flat areas, in sloughs, and through manmade canal systems. Natural well-drained drainage channels are apparent only close to the coast. Groundwater in Collier County is associated with a shallow, unconfined aquifer. It is composed of sands and limestones and is a major source of fresh water for municipal, industrial, domestic, and irrigation purposes. It reaches a maximum thickness of approximately 130 feet near Naples and thins to the northeast, east, and southeast. Hydraulic properties of the aquifer have been examined in the western half of the county, particularly in the Naples area (FEMA, 1984).

One of the factors contributing to the development of the area is climate. Located in the subtropical climatic zone, Collier County has mild, dry winters and warm, rainy summers. The temperature, which is comfortably mild throughout the year, averages 75 degrees Fahrenheit annually. The rainy season, extending from May to October, coincides with the hurricane season. During these months, the study area receives nearly 80 percent of its annual 52-inch rainfall (FEMA, 1980).

The lack of steep slopes precludes rapid runoff; therefore, water accumulates in ponded areas and slowly infiltrates into the groundwater system or sluggishly drains over the land. The general drainage pattern is from the north to south and west (U.S. Geological Survey, 1972; U.S. Geological Survey, 1962). Much of the county is covered by ponded water during the rainy season.

Development has occurred in areas where measures such as drainage ditches, culverts, and elevated foundations are employed to minimize water damage. Development in these areas consists mainly of residential and commercial structures and can be found on the west coast of the county. Much of the inland area is undeveloped.

2.3 Principal Flood Problems

Flooding results from two major sources in Collier County. Coastal areas are subject to inundation from ocean surges, whereas inland areas become flooded when rainfall accumulates in low, flat areas. Rainfall occurs primarily due to thunderstorms in the summer months, with additional rainfall occurring with the passage of hurricanes. A transition region near the coast is vulnerable to both rainfall and ocean surge flooding.

Coastal lands typically lie below an elevation of 9 feet North American Vertical Datum of 1988 (NAVD 88) and are subject to flooding from hurricanes and tropical storms. Surges of over 12.7 feet NAVD 88 were reported just north of Collier County when the most severe historic storm hit in 1873. Floodwaters progressed as far as 10 miles inland in 1960.

Historical Storm Events

Labor Day Hurricane, August 31 - September 8, 1935

The Labor Day Hurricane was a severe tropical disturbance. Winds reached 65 miles per hour (mph) in the City of Everglades and 70 mph in Naples as the storm passed northward approximately 50 miles offshore.

October 13-21, 1944

The storm of October 1944 is among the most destructive recorded for the State of Florida, with damages estimated at $63 million. Flooding depths of up to 6 feet NAVD 88 were reported in the City of Everglades and in the low-lying areas of Naples. Severe beach erosion occurred along Naples Beach where approximately 4 miles of bulkhead were destroyed.

Hurricane Donna, August 29 - September 13, 1960

Hurricane Donna ranks as one of the great storms of the 20th Century. Its center traveled north, paralleling the Gulf Coast west of Collier County. At the City of Everglades, the tide ranged from a low of -2.1 feet NAVD 88 to a high exceeding 8 feet NAVD 88 some 5 hours later. Flooding extended from 6 to 10 miles inland.

U.S. Route 41 between the City of Everglades and Naples was covered with tidal debris. As the center moved northward, southwesterly winds generated high tides that flooded most of Goodland, Marco, and Naples. In Collier County, over 300 homes and trailers suffered major damage. High-water elevations were reported as listed:

Location	Elevation (feet NAVD 88)
Everglades	8.4
Goodland	10.4
Marco	8.9
Naples	10.3
Fort Myers Beach	9.1

Hurricane Isbell, October 8-15, 1964

Hurricane Isbell entered the west coast of Florida near the City of Everglades as it traveled from its origin in the western Caribbean. At the City of Everglades, the minimum pressure was 973.6 millibars, with winds reaching 80 knots.

Hurricane Dennis, August 17-21, 1981

On August 17, Dennis began as a tropical storm, striking the Gulf of Mexico coastline in southwest Florida with winds of more than 55 mph. Just after Dennis made landfall, it became stationary between Fort Myers and Lake Okeechobee, producing about 10 inches of rain in southeast Florida, with Homestead receiving almost 20 inches. After passing through central Florida and exiting by the Atlantic Coast, Dennis finally became a hurricane on August 20 just east of Cape Hatteras, North Carolina (Williams and Duedall, 1997).

Hurricane Bob, July 21-25, 1985

Hurricane Bob made landfall near Fort Myers as a tropical storm on July 23 with winds between 50 and 70 mph. It passed through central Florida and exited into the Atlantic Ocean near Dayton Beach on July 24, becoming a hurricane in the open ocean (Williams and Duedall, 1997).

Hurricane Floyd, October 9-13, 1987

Hurricane Floyd made landfall in the northern Keys of the Florida Bay near Key Largo. Along with numerous tornadoes in the southwest Florida coastal areas, the central pressure was measured at 29.32 inches of mercury (or 993 millibars) with winds of 75 mph (Williams and Duedall, 1997).

Hurricane Andrew, August 16-27, 1992

Hurricane Andrew was the costliest hurricane in the United States. On the morning of August 24, Andrew cut a path of destruction across south Florida from its Atlantic Ocean landfall location south of Miami through Homestead and the Everglades. Andrew finally exited into the Gulf of Mexico in southern Collier County near Marco Island before heading north in the Gulf of Mexico to make landfall again in Louisiana. Andrew became a hurricane at the time of exiting south of Marco Island and produced a storm tide elevation of 6 feet above mean low water recorded at Everglades City and 2 feet above mean sea level (NGVD 29) recorded at Fort Myers Beach. The peak gust recorded on August 24 at Collier County Emergency Operations Center was 87 mph. The damages incurred in Collier County due to Andrew were only 30 million dollars, not nearly as severe as the estimated damages of 20 to 25 billion dollars incurred in the major landfall area of Dade County, Florida. The Dade County damages were mostly due to the 145 mph sustained winds and partly due to the 17-foot peak storm surge in Biscayne Bay (U.S. Department of Commerce, 1993).

Hurricane Gordon, November 8-21, 1994

Gordon was a hurricane while out at sea in the Florida Straits between Key West and Cuba, but made landfall near Fort Myers on November 16 as a tropical storm with sustained winds of 45 mph and heavy rainfall. Naples airport recorded peak gusts of 29 mph, and the Naples Conservatory measured a total 2.43 inches of rainfall for Gordon (Williams and Duedall, 1997).

2.4 Flood Protection Measures

Flood protection measures include strict development regulations enforced by the communities, the Florida Department of Environmental Protection, and by the South Florida Water Management District.

Canals have been constructed to remove excess rainfall from inland regions. Water may be ponded for several months in areas that do not drain readily. The canals serve as a path for flow and have increased the fraction of rainfall that runs off the land. They also tend to shorten the time required for water to travel from interior regions to the ocean. The major canal systems include the Cocohatchee River Canal, Golden Gate Canal, Henderson Creek Canal, and the Faka Union Canal. The Barron River Canal parallels State Road 29 and drains from the north to south, ending near the City of Everglades. Some levees have been constructed to control the spread of water in sloughs draining swampy areas.

FEMA specifies that all levees must have a minimum of 3 foot freeboard against 100-year flooding to be considered a safe flood protection structure.

Levees exist in the study area that provide the county with some degree of protection against flooding. However, it has been ascertained that some of these levees may not protect the community from rare events such as the 100-year flood. The criteria used to evaluate protection against the 100-year flood are 1) adequate design, including freeboard, 2) structural stability, and 3) proper operation and maintenance. Levees that do not protect against the 100-year flood are not considered in the hydraulic analysis of the 100-year floodplain. The levees in Collier County do not meet the FEMA freeboard requirement.

3.0 ENGINEERING METHODS

For the flooding source studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this FIS. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the county at the time of completion of this FIS. Maps and flood elevations will be amended periodically to reflect future changes.

All elevations in this FIS report are referenced to the North American Vertical Datum of 1988 (NAVD 88). Flood elevations on the Flood Insurance Rate Map (FIRM) are referenced to both the NAVD 88 and the National Geodetic Vertical Datum of 1929 (NGVD 29). The NAVD 88 elevations are presented to the rounded whole-foot value, and should be used for NFIP purposes. These flood elevations must be compared to structure and ground elevations referenced in the same vertical datum. The NGVD 29 elevations are presented to the one-tenth of one foot value for informational purposes.

Elevation reference marks (ERMs) used in this study, and their descriptions, are shown on the FIRM. ERMs shown on the FIRM represent those used during the preparation of this and previous FISs. The elevations associated with each ERM were obtained and/or developed during FIS production to establish vertical control for determination of flood elevations and floodplain boundaries shown on the FIRM. Users should be aware that these ERM elevations may have changed since the publication of this FIS. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

3.1 Coastal Analyses

Pre-Countywide Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for each flooding source studied in detail affecting the community.

The determination of coastal inundation from the Gulf of Mexico caused by passage of storms (storm surge) was determined by the joint probability method (U.S. Department of Commerce, 1970). The storm populations were described by probability distributions of five parameters that influence surge heights. These were central pressure depression (which measures the intensity of the storm), radius to maximum winds, forward speed of the storm, shoreline crossing point, and crossing angle. These characteristics were described statistically based on an analysis of observed storms in the vicinity of Collier County. Primary sources of data for this were the National Hurricane Center HURDAT tape, which provided all of the storm parameter information (National Hurricane Center, 1983). A summary of the parameters used for the area is presented in Table 1, "Parameter Values for Surge Elevations."

For areas subject to flooding directly from the Gulf of Mexico, the FEMA coastal storm surge model for Collier County was developed by Tetra Tech, Inc., in 1981, to simulate the coastal surge generated by any chosen storm (that is, any combination of the five storm surge parameters defined previously). By performing such simulations for a large number of storms, each of known total probability, the frequency distribution of surge height can be established as a function of coastal location. These distributions incorporate the large-scale surge behavior, but do not include an analysis of the added effects associated with much finer scale wave phenomena, such as wave setup, wave height, or wave runup. As the final step in the calculations, the astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (Tetra Tech, Inc., 1981).

The stillwater elevations have been determined for the 100-year flood for the Gulf of Mexico and are summarized in Table 2, "Summary of Stillwater Elevations." Table 2 is based on stillwater elevations (without setup) associated with the storm surge model originally presented in the FIS report for Collier County, Florida, dated June 3, 1986 (FEMA, 1998). Due to the revised transect locations, some stillwater elevations have been interpolated or extrapolated from the previous FIS flood data.

TABLE 2 - SUMMARY OF STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	STARTING STILLWATER ELEVATION (feet NAVD 88)			
	10-YEAR	50-YEAR	100-YEAR	500-YEAR
GULF OF MEXICO				
Approximately 1,050 feet northwest of the intersection of Dominica Lane and Lee Beach Boulevard (Transect 1)	N/A	N/A	9.7	N/A
Approximately 550 feet west of the intersection of Felipe Lane and Lee Beach Boulevard (Transect 2)	N/A	N/A	9.7	N/A
Approximately 4,600 feet west of the intersection of Bay Forest Drive and Cedarwood Lane (Transect 3)	N/A	N/A	9.9	N/A
Approximately 4,850 feet west of the intersection of Lakehouse Drive and Vanderbilt Drive (Transect 4)	N/A	N/A	9.8	N/A

CENTRAL PRESSURE DEPRESSION (MILLIBARS)	HURRICANES							TROPICAL STORMS
	115	102	88	74	60	47	33	19
AVERAGE ASSIGNED PROBABILITIES*	0.006	0.007	0.007	0.04	0.23	0.15	0.23	0.33
STORM RADIUS TO MAXIMUM WINDS (NAUTICAL MILES)				13	27			
PROBABILITY				0.54	0.46			
FORWARD SPEED (KNOTS)		7.5			14.5			21.5
PROBABILITIES		0.54			0.39			0.07
DIRECTION OF STORM PATH (DEGREES FROM TRUE NORTH)	ENTERING 11		ENTERING 55		ALONGSHORE 328			EXITING 262
PROBABILITY — HURRICANES	0.16		0.21		0.35			0.28
PROBABILITY — TROPICAL STORMS	0.26		0.33		0.17			0.24
FREQUENCY OF STORM OCCURRENCE (STORM/NAUTICAL MILE/YEAR)					3.68 (10^{-3})			

*AVERAGE OF ENTERING, ALONGSHORE, AND EXITING PROBABILITIES

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLLIER COUNTY, FL AND INCORPORATED AREAS

PARAMETER VALUES FOR SURGE ELEVATIONS

TABLE 1

TABLE 2 - SUMMARY OF STILLWATER ELEVATIONS – continued

FLOODING SOURCE AND LOCATION	STARTING STILLWATER ELEVATION (feet NAVD 88)			
	10-YEAR	50-YEAR	100-YEAR	500-YEAR
GULF OF MEXICO (continued)				
Approximately 4,700 feet west of the intersection of Wiggins Pass Road and Vanderbilt Drive (Transect 5)	N/A	N/A	9.7	N/A
Approximately 5,450 feet northwest of the intersection of Bluebill Avenue and Vanderbilt Drive (Transect 6)	N/A	N/A	9.7	N/A
Approximately 1,550 feet northwest of the intersection of Bluebill Avenue and Gulf Shore Drive (Transect 7)	N/A	N/A	9.7	N/A
Approximately 3,850 feet northwest of the intersection of 95th Avenue North and Vanderbilt Drive (Transect 8)	N/A	N/A	9.7	N/A
Approximately 2,600 feet west of the intersection of Bay Colony Drive and Pelican Ridge Boulevard (Transect 9)	N/A	N/A	9.7	N/A
Approximately 6,550 feet west of the intersection of Ridge Drive and Route 41/45 (Transect 10)	N/A	N/A	9.7	N/A
Approximately 1,900 feet west of Glenlove Drive and Glenview Place (Transect 11)	N/A	N/A	9.7	N/A
Approximately 500 feet north of the City of Naples northern corporate limits (Transect 12)	N/A	N/A	9.7	N/A
Approximately 2,300 feet northwest of the intersection of Park Shore Drive and Gulf Shore Boulevard North (Transect 13)	N/A	N/A	8.7	N/A
Approximately 2,600 feet west of the intersection of Mermaid Bight and Crayton Road (Transect 14)	N/A	N/A	8.7	N/A

TABLE 2 - SUMMARY OF STILLWATER ELEVATIONS - continued

FLOODING SOURCE AND LOCATION	STARTING STILLWATER ELEVATION (feet NAVD 88) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
GULF OF MEXICO (continued)				
Approximately 800 feet northwest of the intersection of Gulf Shore Boulevard North and Harbour Drive (Transect 15)	N/A	N/A	8.7	N/A
Approximately 1,350 feet west of the intersection of Rudder Road and Hawsen Lane (Transect 16)	N/A	N/A	8.7	N/A
Approximately 400 feet west of the intersection of North Lake Drive and Gulf Shore Boulevard (Transect 17)	N/A	N/A	8.7	N/A
Approximately 500 feet west of the intersection of 11th Avenue South and Gulf Shore Boulevard South (Transect 18)	N/A	N/A	8.7	N/A
	N/A	N/A	7.9	N/A
Approximately 800 feet west of the intersection of 21st Avenue South and Gordon Drive (Transect 19)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
Approximately 550 feet southwest of the intersection of Champney Bay Court and Gordon Drive (Transect 20)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
Approximately 1,400 feet southwest of the intersection of Cutlass Lane and Gordon Drive (Transect 21)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
	N/A	N/A	5.7	N/A

TABLE 2 - SUMMARY OF STILLWATER ELEVATIONS - continued

FLOODING SOURCE AND LOCATION	STARTING STILLWATER ELEVATION (feet NAVD 88)			
	10-YEAR	50-YEAR	100-YEAR	500-YEAR
GULF OF MEXICO (continued)				
Approximately 3,650 feet southwest of the intersection of Cove Lane and Gordon Drive (Transect 22)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	5.7	N/A
Approximately 1,000 feet west of Bartell Bay (Transect 23)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
Approximately 5,300 feet southwest of Periwinkle Bay (Transect 24)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
Approximately 1,400 feet west of the northern tip of Halloway Island (Transect 25)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
	N/A	N/A	5.2	N/A
Approximately 5,000 feet northwest of the center of Halloway Island (Transect 26)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
	N/A	N/A	5.2	N/A
Approximately 4,000 feet west of the center of Halloway Island (Transect 27)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
	N/A	N/A	5.2	N/A

TABLE 2 - SUMMARY OF STILLWATER ELEVATIONS – continued

FLOODING SOURCE AND LOCATION	STARTING STILLWATER ELEVATION (feet NAVD 88)			
	10-YEAR	50-YEAR	100-YEAR	500-YEAR
GULF OF MEXICO (continued)				
Approximately 4,000 feet southwest of Johnson Bay (Transect 28)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
	N/A	N/A	5.7	N/A
Approximately 5,300 feet northwest of the intersection of Dolphin Avenue and Pelican Street (Transect 29)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
	N/A	N/A	5.7	N/A
Starts at Big Marco Pass (Transect 30)	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
Approximately 1,100 feet southwest of the intersection of Blackmore Court and Spinnaker Drive (Transect 31)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
	N/A	N/A	5.2	N/A
Approximately 700 feet southwest of the intersection of Collier Boulevard and San Marco Road (Transect 32)	N/A	N/A	8.7	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
	N/A	N/A	5.2	N/A
Approximately 1,300 feet west of the intersection of Winterberry Drive and South Collier Boulevard (Transect 33)	N/A	N/A	8.7	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A

TABLE 2 - SUMMARY OF STILLWATER ELEVATIONS – continued

FLOODING SOURCE AND LOCATION	STARTING STILLWATER ELEVATION (feet NAVD 88)			
	10-YEAR	50-YEAR	100-YEAR	500-YEAR
GULF OF MEXICO (continued)				
Approximately 5,500 feet northwest of Grassy Bay (Transect 34)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
Approximately 3,500 feet southwest of Grassy Bay (Transect 35)	N/A	N/A	8.7	N/A
Starts at Neal Key (Transect 36)	N/A	N/A	9.7	N/A
	N/A	N/A	9.2	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	5.7	N/A
	N/A	N/A	5.2	N/A
Starts at Round Key (Transect 37)	N/A	N/A	9.2	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
	N/A	N/A	5.2	N/A
	N/A	N/A	4.7	N/A
Starts at Sandfly Pass (Transect 38)	N/A	N/A	8.7	N/A
	N/A	N/A	8.2	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
	N/A	N/A	4.7	N/A
Starts at Chokoloskee Pass (Transect 39)	N/A	N/A	8.7	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
	N/A	N/A	4.7	N/A
Starts at Chokoloskee Island (Transect 40)	N/A	N/A	8.7	N/A
	N/A	N/A	7.2	N/A
	N/A	N/A	6.2	N/A
	N/A	N/A	4.7	N/A

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding source studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along the shoreline.

Users of the FIRM should be aware that coastal flood elevations are provided in the Summary of Stillwater Elevations table in this report. If the elevation on the FIRM is higher than the elevation shown in this table, a wave height, wave runup, and/or wave setup component likely exists, in which case, the higher elevation should be used for construction and/or floodplain management purposes.

The FEMA storm surge model was utilized to simulate the hydrodynamic behavior of the surge generated by the various synthetic storms. This model utilizes a grid pattern approximating the geographical features of the study area and the adjoining areas. Surges were computed utilizing grids of 5 nautical miles by 4.5 nautical miles, and 1 nautical mile by 1 nautical mile, depending on the resolution required.

Underwater depths and land heights for the model grid systems were obtained from USGS quadrangles (U.S. Geological Survey, 1958, et cetera); Collier County Coastal Construction Control Line Maps (Florida Department of Natural Resources, 1979); National Oceanic and Atmospheric Administration navigational charts (U.S. Department of Commerce, 1981); City of Naples Storm Sewer Plans (W. R. Wilson and Associates, 1962); Topographic Maps of Western Collier County (Collier County Board of County Commissioners, 1964); and Florida Department of Transportation Collier County General Highway Map (Florida Department of Transportation, 1978). In addition, various topographic maps, construction plans, and beach profiles were used for land heights in portions of northwestern Collier County (Post, Buckley, Schuh and Jernigan, Inc., April 1981, Topographic Survey – Golf Course; Post, Buckley, Schuh and Jernigan, Inc., 1983; Post, Buckley, Schuh and Jernigan, Inc., 1982; Post, Buckley, Schuh and Jernigan, Inc., April 1981, Construction Plans – Bay Villas; Post, Buckley, Schuh and Jernigan, Inc., 1979; Post, Buckley, Schuh and Jernigan, Inc., February 1981; Florida Department of Natural Resources, 1973; Wilson, Miller, Barton, Soll and Peek, 1974; Gee & Jenson Engineers, Architects, Planners, Inc., 1980).

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a report prepared by the National Academy of Sciences (NAS) (National Academy of Sciences, 1977). This method is based on the following major concepts. First, depth-limited waves in shallow water reach maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest is 70 percent of the total wave height above the stillwater level. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstructions, such as sand dunes, dikes and seawalls, buildings and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures described in the NAS report cited above. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

Countywide Analyses

For this revision, new analyses of wave setup, wave heights, storm induced erosion, and primary frontal dune criteria were performed using the existing stillwater elevations for the Gulf of Mexico.

The usual setup calculation is based upon wave behavior over a simple slope. Setup develops slowly as waves accumulate by wave mass transport. Also, as the propagation distance increases, setup is lost by lateral flows. A reasonable addition to the stillwater level was made to reflect the additional hazard due to setup.

To account for these facts, three different setup allowances were used for Collier County. In areas from the Collier/Lee County boundary into the northern portion of Naples a setup value of 1.4 feet was added without reduction based on the previous study where coastal surge was extended inland without reduction. In areas from the southern portion of Naples to Cape Romano, the setup was dropped from the open coast value of 1.4 feet to zero, approximately linearly, based on the previous study where surge penetrates farther inland and drops substantially as one moves inland. For the region east of Cape Romano within Gullivan Bay and the Ten Thousand Islands, no setup has been added, owing to the broad expanse of very shallow water and the importance of two-dimensionality in the propagation of waves from deepwater into this region.

In many areas along the Collier County shoreline, existing dunes were found to be insufficient in size to sustain wave attack. Frontal dunes with reservoirs exceeding 540 square feet are considered to experience dune retreat, while those with reservoirs of less than 540 square feet are considered to experience dune removal. Therefore, using standard erosion analysis procedures as outlined in the Guidelines and Specifications for Wave Elevation Determination and V Zone Mapping (FEMA, March 1995), the protection afforded by the dunes with less than 540 square feet of reservoir was removed from the coastal analysis, resulting in a low beach profile slope. The complete inundation of the barrier island during the 100-year coastal flood does not allow for the development of wave runup. As a result, wave runup was not considered in the coastal base flood elevations.

Wave heights were computed along transects (cross-section lines) that were located along the coastal areas in accordance with the Guidelines and Specifications for Wave Elevation Determination and V Zone Mapping (FEMA, March 1995). The transects were oriented perpendicular to the average shoreline on which wave propagation is determined, and were located with consideration given to the physical and cultural characteristics of the land so that they would closely represent conditions of their locality. Transects were spaced close together in areas of complex topography and dense development. In areas having more uniform characteristics, they were spaced at larger intervals. It was also necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects. Calculations along the transects were continued inland until the waves were substantially dissipated, or until flooding from another source with an equal water-surface elevation could be reached. The transects used in this study are shown in Figure 2, "Transect Location Map," and were chosen based on topography, vegetation, and cultural development. Figure 3 is a profile for a typical transect illustrating the effects of energy dissipation and regeneration of a wave as it moves inland.

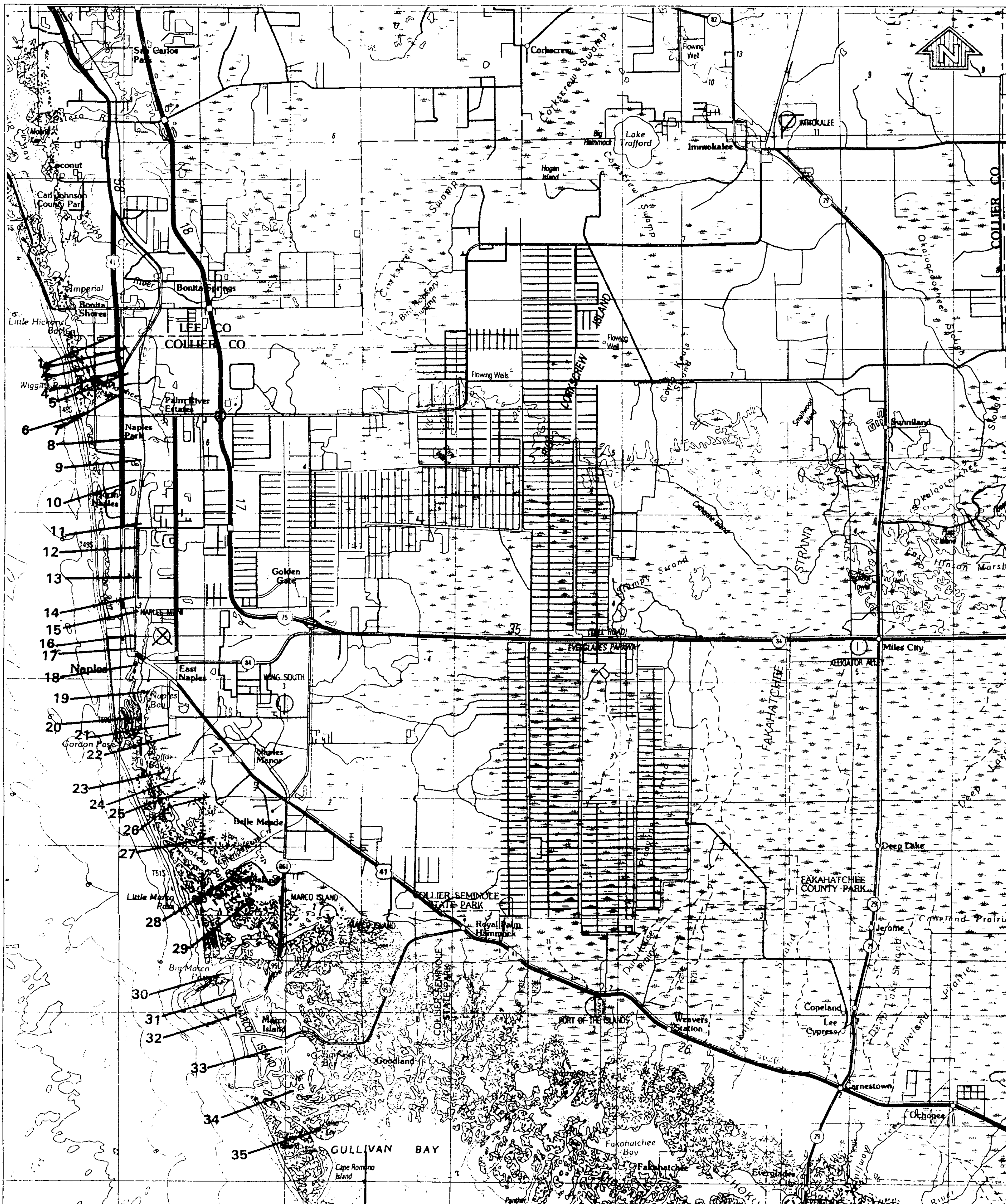


FIGURE 2

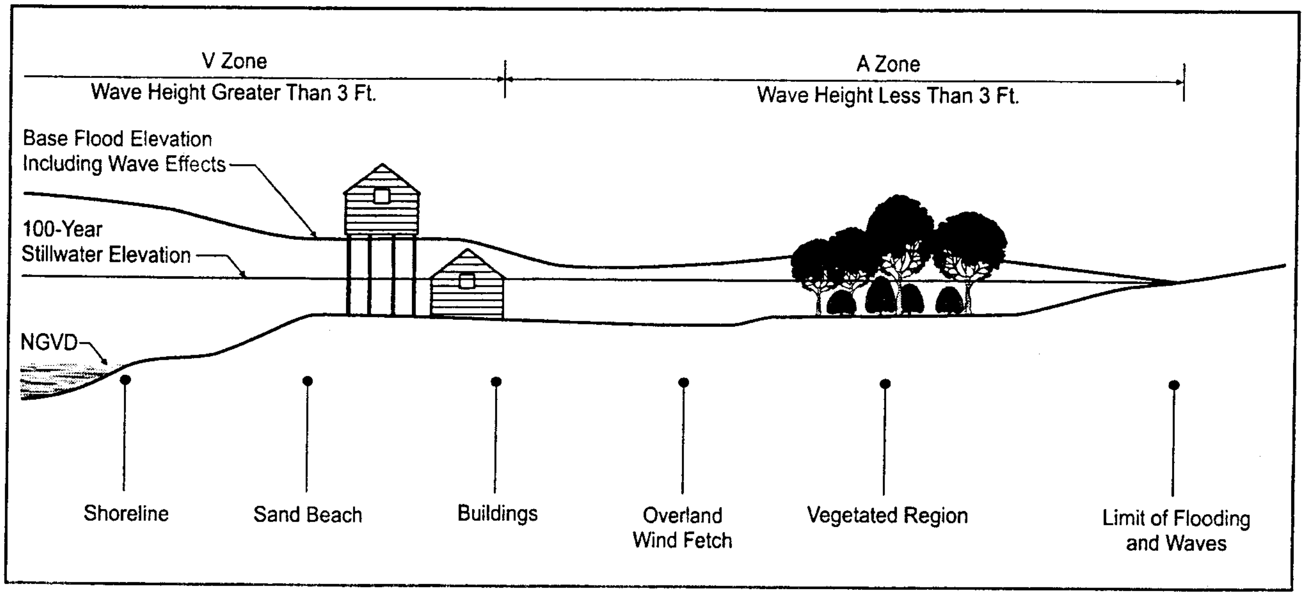
FEDERAL EMERGENCY MANAGEMENT AGENCY

COLLIER COUNTY, FL
AND INCORPORATED AREAS

APPROXIMATE SCALE

4 0 4 8 12 MILES

TRANSECT LOCATION MAP



TRANSECT SCHEMATIC Figure 3

Each transect was taken perpendicular to the shoreline and extended inland to a point where wave action ceased. Along each transect, wave heights and crest elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The stillwater elevations for the 100-year flood (plus wave setup) were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole foot increments along the transects. The location of the 3-foot breaking wave for determining the terminus of the V-Zone (coastal high hazard area) was computed at each transect.

As of 1989, FEMA also defines a "coastal high hazard area" as an area of special flood hazards extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action (i.e., wave heights greater than or equal to 3 feet) from storms or seismic sources. The "primary frontal dune" is defined as a continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms such as hurricanes. The inland limit of the primary frontal dune occurs at the point where there is a distinct change from relatively steep to relatively mild slope. Where appropriate, the V-Zone was revised to include the primary frontal dune.

Table 3 "Transect Descriptions," describes the location of each transect. In addition, Table 3 provides the 100-year stillwater, added wave setup, and maximum 100-year wave crest elevations for each transect.

TABLE 3 - TRANSECT DESCRIPTIONS

TRANSECT	LOCATION	STARTING ELEVATION (feet NAVD 88) 100-YEAR STILLWATER	MAXIMUM 100-YEAR WAVE CREST[1]
1	Approximately 1,050 feet northwest of the intersection of Dominica Lane and Lee Beach Boulevard	11.1[2]	17.7
2	Approximately 550 feet west of the intersection of Felipe Lane and Lee Beach Boulevard	11.1[2]	17.7
3	Approximately 4,600 feet west of the intersection of Bay Forest Drive and Cedarwood Lane	11.3[2]	18.0
4	Approximately 4,850 feet west of the intersection of Lakehouse Drive and Vanderbilt Drive	11.2[2]	17.8
5	Approximately 4,700 feet west of the intersection of Wiggins Pass Road and Vanderbilt Drive	11.1[2]	17.7
6	Approximately 5,450 feet northwest of the intersection of Bluebill Avenue and Vanderbilt Drive	11.1[2]	17.7
7	Approximately 1,550 feet northwest of the intersection of Bluebill Avenue and Gulf Shore Drive	11.1[2]	17.7
8	Approximately 3,850 feet west of the intersection of 95th Avenue North and Vanderbilt Drive	11.1[2]	17.7
9	Approximately 2,600 feet west of the intersection of Bay Colony Drive and Pelican Ridge Boulevard	11.1[2]	17.7

[1]Because of map scale limitations, the maximum wave elevation may not be shown on the FIRM
[2]Wave setup of 1.4 feet applied without inland reduction

TABLE 3 - TRANSECT DESCRIPTIONS - continued

TRANSECT	LOCATION	STARTING ELEVATION (feet NAVD 88) 100-YEAR STILLWATER	MAXIMUM 100-YEAR WAVE CREST[1]
10	Approximately 6,550 feet west of the intersection of Ridge Drive and Route 41/45	11.1[2]	17.7
11	Approximately 1,900 feet west of Glenlove Drive and Glenview Place	11.1[2]	17.7
12	Approximately 500 feet north of the City of Naples northern corporate limits	11.1[2]	17.7
13	Approximately 2,300 feet northwest of the intersection of Park Shore Drive and Gulf Shore Boulevard North	10.1[2]	16.2
14	Approximately 2,600 feet west of the intersection of Mermaid Bight and Crayton Road	10.1[2]	16.2
15	Approximately 800 feet northwest of the intersection of Gulf Shore Boulevard North and Harbour Drive	10.1[2]	16.2
16	Approximately 1,350 feet west of the intersection of Rudder Road and Hawsen Lane	10.1[2]	16.2
17	Approximately 400 feet west of the intersection of North Lake Drive and Gulf Shore Boulevard	10.1[2]	16.2
18	Approximately 500 feet west of the intersection of 11th Avenue South and Gulf Shore Boulevard South	10.1[3]	16.2

[1]Because of map scale limitations, the maximum wave elevation may not be shown on the FIRM
[2]Wave setup of 1.4 feet applied without inland reduction
[3]Wave setup of 1.4 feet applied with inland reduction

TABLE 3 - TRANSECT DESCRIPTIONS - continued

TRANSECT	LOCATION	STARTING ELEVATION (feet NAVD 88) 100-YEAR STILLWATER	MAXIMUM 100-YEAR WAVE CREST[1]
19	Approximately 800 feet west of the intersection of 21st Avenue South and Gordon Drive	10.1[2]	16.2
20	Approximately 550 feet southwest of the intersection of Champney Bay Court and Gordon Drive	10.1[2]	16.2
21	Approximately 1,400 feet southwest of the intersection of Cutlass Lane and Gordon Drive	10.1[2]	16.2
22	Approximately 3,650 feet southwest of the intersection of Cove Lane and Gordon Drive	10.1[2]	16.2
23	Approximately 1,000 feet west of Bartell Bay	10.1[2]	16.2
24	Approximately 5,300 feet southwest of Periwinkle Bay	10.1[2]	16.2
25	Approximately 1,400 feet west of the northern tip of Halloway Island	10.1[2]	16.2
26	Approximately 5,000 feet northwest of the center of Halloway Island	10.1[2]	16.2
27	Approximately 4,000 feet west of the center of Halloway Island	10.1[2]	16.2
28	Approximately 4,000 feet southwest of Johnson Bay	10.1[2]	16.2

[1]Because of map scale limitations, the maximum wave elevation may not be shown on the FIRM
[2]Wave setup of 1.4 feet applied with inland reduction

TABLE 3 - TRANSECT DESCRIPTIONS - continued

TRANSECT	LOCATION	STARTING ELEVATION (feet NAVD 88) 100-YEAR STILLWATER	MAXIMUM 100-YEAR WAVE CREST[1]
29	Approximately 5,300 feet northwest of the intersection of Dolphin Avenue and Pelican Street	10.1[2]	16.2
30	Starts at Big Marco Pass	9.2[3]	14.8
31	Approximately 1,100 feet southwest of the intersection of Blackmore Court and Spinnaker Drive	10.1[2]	16.2
32	Approximately 700 feet southwest of the intersection of Collier Boulevard and San Marco Road	10.1[2]	16.2
33	Approximately 1,300 feet west of the intersection of Winterberry Drive and South Collier Boulevard	10.1[2]	16.2
34	Approximately 5,500 feet northwest of Grassy Bay	10.1[2]	16.2
35	Approximately 3,500 feet southwest of Grassy Bay	10.1[2]	16.2
36	Starts at Neal Key	9.7	15.6
37	Starts at Round Key	9.2	14.8
38	Starts at Sandfly Pass	8.7	14.0
39	Starts at Chokoloskee Pass	8.7	14.0
40	Starts at Chokoloskee Island	8.7	14.0

[1]Because of map scale limitations, the maximum wave elevation may not be shown on the FIRM
[2]Wave setup of 1.4 feet applied with inland reduction
[3]Wave setup of 1.0 foot applied as inland reduction (from open coast)

Based on the eroded profiles and the effective FIS stillwater elevations (adjusted to include wave setup), the wave envelope was computed for each transect. The wave envelope represents the maximum vertical landward limit of wave activity and includes the wave crest and wave setup elevations. The computer program "Wave Height Analysis for Flood Insurance Studies," or WHAFIS 3.0, provided the maximum expected wave crest elevation along each transect. This methodology accounted for fetch length, submerged bathymetry, and type and extent of land cover along each transect. Density, type, and physical dimensions of rigid and flexible vegetation, buildings, and other structures were considered based on field inspection.

Table 4, "Transect Data," includes the flooding source, 10-, 50-, 100-, and 500-year stillwater elevations, flood hazard zone designations, and base flood elevations.

TABLE 4 - TRANSECT DATA

FLOODING SOURCE	STILLWATER ELEVATION (feet NAVD 88) 10-YEAR	50-YEAR	100-YEAR	500-YEAR	ZONE	BASE FLOOD ELEVATION[1] (feet NAVD 88)
GULF OF MEXICO						
Transect 1	N/A	N/A	11.1[2]	N/A	VE	14-18
Transect 2	N/A	N/A	11.1[2]	N/A	VE AE	13-18 11-13
Transect 3	N/A	N/A	11.3[2]	N/A	VE AE	13-18 11-13
Transect 4	N/A	N/A	11.2[2]	N/A	VE AE	13-18 11-13
Transect 5	N/A	N/A	11.1[2]	N/A	VE AE	14-18 11-13
Transect 6	N/A	N/A	11.1[2]	N/A	VE AE	13-18 11-13
Transect 7	N/A	N/A	11.1[2]	N/A	VE AE	13-18 12-13

[1]Because of map scale limitations, base flood elevations shown on the FIRM represent average elevations for the zones depicted.
[2]Wave setup of 1.4 feet applied without inland reduction

TABLE 4 - TRANSECT DATA – continued

FLOODING SOURCE	STILLWATER ELEVATION (feet NAVD 88) 10-YEAR	50-YEAR	100-YEAR	500-YEAR	ZONE	BASE FLOOD ELEVATION[1] (feet NAVD 88)
GULF OF MEXICO (continued)						
Transect 8	N/A	N/A	11.1[2]	N/A	VE	14-18
					AE	11-13
Transect 9-12	N/A	N/A	11.1[2]	N/A	VE	13-18
					AE	11-13
Transects 13-17	N/A	N/A	10.1[2]	N/A	VE	12-16
					AE	10-12
Transect 18	NA	N/A	10.1[3]	N/A	VE	12-16
					AE	10-12
			8.9[4]		AE	9-10
Transect 19	N/A	N/A	10.1[3]	N/A	VE	12-16
					AE	10-12
			9.2[4]		AE	9-11
			7.7[5]		AE	8-10
			6.2		AE	6-7
Transect 20	N/A	N/A	10.1[3]	N/A	VE	12-16
					AE	10-12
			9.2[4]		AE	9-10
			7.7[5]		AE	8-10
			6.2		AE	6-7
Transect 21	N/A	N/A	10.1[3]	N/A	VE	12-16
					AE	10-12
			9.2[4]		VE	11-12
					AE	9-11
			7.7[5]		AE	8-9
			6.2		AE	6-7
			5.7		AE	6

[1]Because of map scale limitations, base flood elevations shown on the FIRM represent average elevations for the zones depicted.
[2]Wave setup of 1.4 feet applied without inland reduction
[3]Wave setup of 1.4 feet applied with inland reduction
[4]Wave setup of 1.0 foot applied as inland reduction (from open coast)
[5]Wave setup of 0.5 foot applied as inland reduction (from open coast)

TABLE 4 - TRANSECT DATA – continued

FLOODING SOURCE	STILLWATER ELEVATION (feet NAVD 88) 10-YEAR	50-YEAR	100-YEAR	500-YEAR	ZONE	BASE FLOOD ELEVATION[1] (feet NAVD 88)
GULF OF MEXICO (continued)						
Transect 22	N/A	N/A	10.1[2]	N/A	VE	12-16
					AE	10-12
			9.2[3]		VE	11
					AE	9-11
			7.7[4]		VE	9
					AE	8-10
			5.7		AE	6-7
Transect 23	N/A	N/A	10.1[2]	N/A	VE	12-16
					AE	10-12
			9.2[3]		AE	9-11
			7.7[4]		VE	9
					AE	8-9
			6.2		AE	6-8
Transect 24	N/A	N/A	10.1[2]	N/A	VE	12-16
					AE	10-12
			9.2[3]		AE	9-10
					AE	8-9
			7.7[4]		VE	9
			6.2		AE	6-8
Transect 25	N/A	N/A	10.1[2]	N/A	VE	12-16
					AE	10-12
			9.2[3]		AE	9-11
			7.7[4]		AE	8-9
			6.2		VE	8
					AE	6-8
			5.2		AE	5-6

[1]Because of map scale limitations, base flood elevations shown on the FIRM represent average elevations for the zones depicted.
[2]Wave setup of 1.4 feet applied with inland reduction
[3]Wave setup of 1.0 foot applied as inland reduction (from open coast)
[4]Wave setup of 0.5 foot applied as inland reduction (from open coast)

TABLE 4 - TRANSECT DATA - continued

FLOODING SOURCE	STILLWATER ELEVATION (feet NAVD 88) 10-YEAR	50-YEAR	100-YEAR	500-YEAR	ZONE	BASE FLOOD ELEVATION[1] (feet NAVD 88)
GULF OF MEXICO (continued)						
Transect 26	N/A	N/A	10.1[2]	N/A	VE	12-16
					AE	10-12
			9.2[3]		AE	9-11
			7.7[4]		AE	8-9
			6.2		VE	8
					AE	6-8
			5.2		AE	5-6
Transect 27	N/A	N/A	10.1[2]	N/A	VE	12-16
					AE	10-12
			9.2[3]		VE	11-12
					AE	9-11
			7.7[4]		VE	10-12
					AE	8-9
					VE	9
			6.2		AE	6-8
			5.2		AE	5-6
Transect 28	N/A	N/A	10.1[2]	N/A	VE	13-16
			9.2[3]		VE	12-13
			7.7[4]		VE	10-12
					AE	8-10
			6.2		AE	6-8
			5.7		AE	6
Transect 29	N/A	N/A	10.1[2]	N/A	VE	12-16
					AE	10-12
			9.2[3]		AE	10-11
			7.7[4]		VE	10-11
					AE	8-10
			6.2		AE	6-8
			5.7		AE	6

[1]Because of map scale limitations, base flood elevations shown on the FIRM represent average elevations for the zones depicted.
[2]Wave setup of 1.4 feet applied with inland reduction
[3]Wave setup of 1.0 foot applied as inland reduction (from open coast)
[4]Wave setup of 0.5 foot applied as inland reduction (from open coast)

TABLE 4 - TRANSECT DATA – continued

FLOODING SOURCE	STILLWATER ELEVATION (feet NAVD 88) 10-YEAR	50-YEAR	100-YEAR	500-YEAR	ZONE	BASE FLOOD ELEVATION[1] (feet NAVD 88)
GULF OF MEXICO (continued)						
Transect 30	N/A	N/A	9.2[3]	N/A	VE	11-15
					AE	9-11
			7.7[4]		VE	10
					AE	8-10
			6.2		VE	8-9
					AE	6-8
Transect 31	N/A	N/A	10.1[2]	N/A	VE	12-16
					AE	10-12
			9.2[3]		AE	9-10
			7.7[4]		AE	8-10
			6.2		VE	8-9
					AE	6-8
			5.2		VE	7-8
					AE	5-7
Transect 32	N/A	N/A	10.1[2]	N/A	VE	12-16
					AE	10-12
			7.7[4]		AE	8-9
			6.2		VE	8-9
					AE	6-8
			5.2		AE	5
Transect 33	N/A	N/A	10.1[2]	N/A	VE	12-16
					AE	10-12
			7.7[4]		VE	10-11
					AE	8-10
			6.2		VE	8-9
					AE	6-8
Transect 34	N/A	N/A	10.1[2]	N/A	VE	12-16
					AE	10-12
			9.2[3]		VE	11-12
					AE	9-10
			7.7[4]		VE	10-11
					AE	8-10
					VE	9
			6.2		AE	6-8

[1]Because of map scale limitations, base flood elevations shown on the FIRM represent average elevations for the zones depicted.
[2]Wave setup of 1.4 feet applied with inland reduction
[3]Wave setup of 1.0 foot applied as inland reduction (from open coast)
[4]Wave setup of 0.5 foot applied as inland reduction (from open coast)

TABLE 4 - TRANSECT DATA – continued

FLOODING SOURCE	STILLWATER ELEVATION (feet NAVD 88) 10-YEAR	50-YEAR	100-YEAR	500-YEAR	ZONE	BASE FLOOD ELEVATION[1] (feet NAVD 88)
GULF OF MEXICO (continued)						
Transect 35	N/A	N/A	10.1^{2}	N/A	VE	12-16
					AE	10-12
			9.2^{3}		VE	11-12
					AE	9-11
Transect 36	N/A	N/A	9.7	N/A	VE	12-16
					AE	10-12
			9.2		VE	11-12
					AE	9-11
			8.2		VE	10-11
					AE	8-10
			7.2		VE	9-11
					AE	7-9
			5.7		AE	6-8
			5.2		AE	5
Transect 37	N/A	N/A	9.2	N/A	VE	11-15
					AE	9-11
			8.2		VE	10-11
			7.2		VE	9-11
					AE	7-9
			6.2		AE	7-8
			5.2		AE	5-6
			4.7		AE	5
Transect 38	N/A	N/A	8.7	N/A	VE	11-14
					AE	9-11
			8.2		VE	10-12
					AE	8-10
			7.2		AE	7-9
			6.2		AE	6-7
			4.7		AE	5
Transect 39	N/A	N/A	8.7	N/A	VE	11-14
					AE	9-11
			7.2		VE	9-11
					AE	7-9
			6.2		AE	6-7
			4.7		AE	5

[1]Because of map scale limitations, base flood elevations shown on the FIRM represent average elevations for the zones depicted.
[2]Wave setup of 1.4 feet applied with inland reduction
[3]Wave setup of 0.5 foot applied as inland reduction (from open coast)

TABLE 4 - TRANSECT DATA – continued

FLOODING SOURCE	STILLWATER ELEVATION (feet NAVD 88) 10-YEAR	50-YEAR	100-YEAR	500-YEAR	ZONE	BASE FLOOD ELEVATION[1] (feet NAVD 88)
GULF OF MEXICO (continued)						
Transect 40	N/A	N/A	8.7	N/A	VE	11-14
					AE	9-11
			7.2		VE	9-10
					AE	7-9
			6.2		AE	6-7
			4.7		AE	5-6

[1]Because of map scale limitations, base flood elevations shown on the FIRM represent average elevations for the zones depicted

After analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in interpolation, including topographic and land cover data for the wave transects obtained from surveys performed by Wilson Miller on July 18-24, 1994 (Wilson Miller, 1994), State of Florida Coastal Construction Control Line beach profile data and 2-foot contour topographic maps (Florida Department of Environmental Protection, 1979 and 1988), 1-foot contour topographic maps from the South Florida Water Management District (South Florida Water Management District, 1983, et cetera), aerial photography by the Florida Department of Transportation (Florida Department of Transportation, 1993-94), and USGS topographic maps (U.S. Geological Survey, 1958, et cetera). Supplementary information regarding soil and vegetation types was obtained from the Soil Conservation Service's soils survey (U.S. Department of Agriculture, 1990). Changes to topography caused by erosion were accounted for using FEMA's erosion procedures (FEMA, March 1995). These procedures consider dune retreat or removal based upon the dune cross-section size and the storm surge elevation.

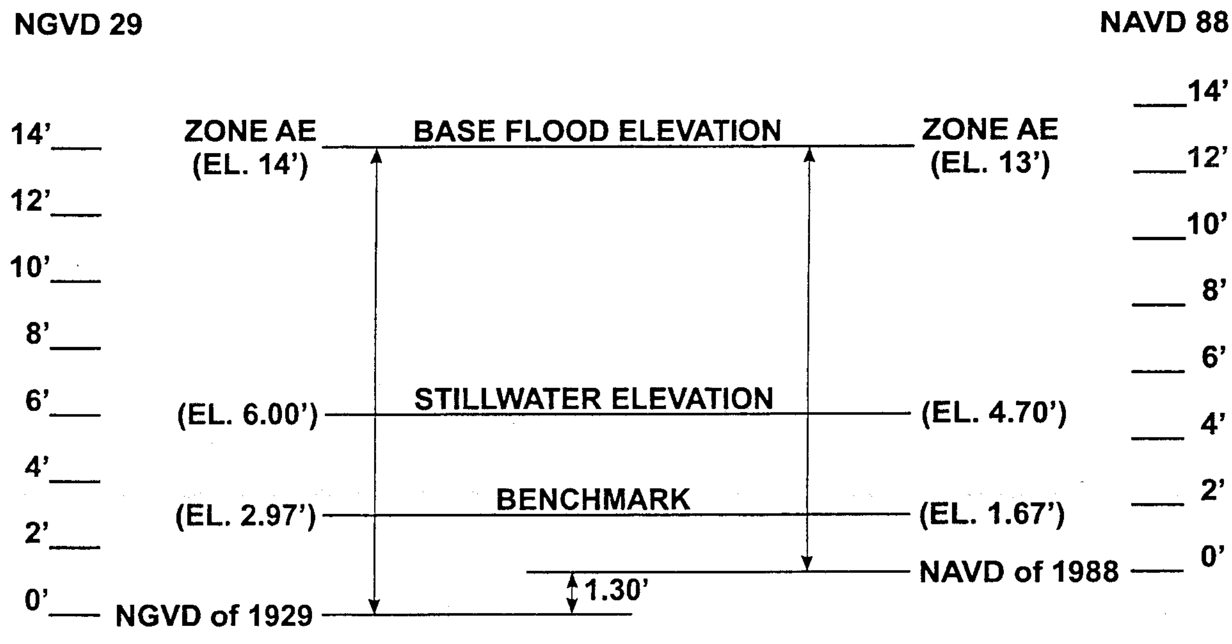
3.2 Riverine Approximate Zone A Analyses

Large areas of the county in the June 3, 1986, FIS, were designated as Zone D flood zones, which are areas for which flood hazards are undetermined, but possible. For this revision, several of these areas were redelineated as approximate Zone A and Zone X areas using standard FEMA methodologies and USGS Floodprone Quadrangle Maps, and include inland portions of the county not affected by coastal flooding.

3.3 Vertical Datum Conversion

All FISs and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FISs and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD 29). With the finalization of the North American Vertical Datum of 1988 (NAVD 88), many FIS reports and FIRMs are being prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown in this FIS report are referenced to NAVD 88. Flood elevations on the FIRM are referenced to both NAVD 88 and NGVD 29. The NAVD 88 base flood elevations on the FIRM are presented to the whole-foot rounded values, and should be used for NFIP purposes. These flood elevations must be compared to structure and ground elevations referenced in the same vertical datum. The NGVD 29 elevations are presented on the FIRM to the one-tenth of one foot increment for informational purposes. Figure 4, "Collier County Vertical Datum Conversion," illustrates the differences in BFEs due to the datum conversion. It is important to note that adjacent communities may be referenced to NGVD 29. This may result in differences in base flood elevations across the corporate limits between the communities.



The difference between NGVD 1929 and NAVD 1988 is 1.30'
NAVD 88 = NGVD 29 - 1.30'

This schematic illustrates the differences in BFEs due to datum conversion only

Figure 4 – COLLIER COUNTY VERTICAL DATUM CONVERSION

Prior versions of the FIS report and FIRM were referenced to NGVD 29. When a datum conversion is effected for an FIS report and FIRM, the Flood Profiles, base flood elevations (BFEs) and ERMs reflect the new datum values. To compare structure and ground elevations to 1% annual chance (100-year) flood elevations shown in the FIS and on the FIRM, the subject structure and ground elevations must be referenced to the new vertical datum values.

For more information on NAVD 88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA-20/June 1992, or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS provides 100-year floodplain data, which may include a combination of the following: 10-, 50-, 100-, and 500-year flood elevations; delineations of the 100-year and 500-year floodplains; and 100-year floodway. This information is presented on the FIRM and in many components of the FIS, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the county. For the flooding source studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each transect.

For this countywide FIS, the boundaries were interpolated between wave transects, using aerial maps at scales of 1:2,400 and 1:1,200 with contour intervals of 1 and 2 feet, respectively (Florida Department of Environmental Protection, 1979 and 1988; South Florida Water Management District, 1983, et cetera) and topographic maps at a scale of 1:24,000 with a contour interval of 5 feet (U.S. Geological Survey, 1958, et cetera).

For the flooding sources studied by approximate methods, the 100-year floodplain boundaries were delineated using topographic maps (U.S. Geological Survey, 1958, et cetera).

The 100- and 500-year floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones VE, A, and AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The countywide FIRM presents flooding information for the entire geographic area of Collier County. Previously, separate FIRMs were prepared for each identified flood-prone incorporated community within the county. Historical data relating to the maps prepared for each floodprone community up to and including this countywide FIS, are presented in Table 5, "Community Map History."

7.0 OTHER STUDIES

FISs have been prepared for the unincorporated areas of Lee County (FEMA, 2003), and Hendry County (FEMA, 1982), Broward County and Incorporated Areas (FEMA, 1997), Monroe County and Incorporated Areas (FEMA, 2002), and Dade County and Incorporated Areas (FEMA, 1995).

This study is referenced to the new vertical datum NAVD 88 and therefore does not match FISs of adjacent counties that are referenced to NGVD 29. Furthermore, the consideration of wave setup and erosion in this study produces a difference in actual base flood elevations at the county boundaries.

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Collier County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS reports and FIRMs for all of the incorporated and unincorporated jurisdictions within Collier County.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA, Federal Insurance and Mitigation Division, Koger Center - Rutgers Building, 3003 Chamblee Tucker Road, Atlanta, Georgia 30341.

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Federal Emergency Management Agency. (July 20, 1998, Flood Insurance Rate Map; June 3, 1986, Flood Insurance Study report). Flood Insurance Study, Collier County, Florida (Unincorporated Areas). Washington, D.C.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Collier County (Unincorporated Areas)	September 14, 1979	None	September 14, 1979	October 1, 1983 December 18, 1984 June 3, 1986 August 3, 1992 February 16, 1995 July 20, 1998 November 17, 2005
Everglades, City of	July 17, 1970	None	October 6, 1972	July 1, 1974 May 23, 1975 November 28, 1975 June 3, 1986 November 17, 2005
Marco Island, City of	September 14, 1979[1]	None[1]	September 14, 1979[1]	October 1, 1983[1] December 18, 1984[1] June 3, 1986[1] August 3, 1992[1] February 16, 1995[1] July 20, 1998[1] November 17, 2005
Naples, City of	May 5, 1970	August 7, 1970	July 2, 1971	July 1, 1974 February 13, 1976 July 16, 1980 June 3, 1986 November 4, 1992 November 17, 2005

[1]This community did not have its own FIRM prior to this countywide FIS. The land area for this community was previously shown on the FIRM for the unincorporated areas of Collier County, but was not identified as a separate NFIP community. Therefore, the dates for this community were taken from the FIRM for Collier County.

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLLIER COUNTY, FL AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

TABLE 5

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