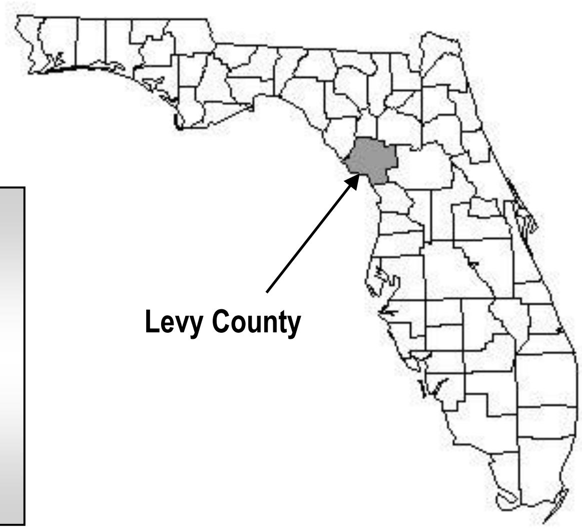
LEVY COUNTY, FLORIDA
AND INCORPORATED AREAS



COMMUNITY NAME	COMMUNITY NUMBER
BRONSON, TOWN OF	120582
CEDAR KEY, CITY OF	120373
CHIEFLAND, CITY OF	120392
INGLIS, TOWN OF	120586
LEVY COUNTY (UNINCORPORATED AREAS)	120145
OTTER CREEK, TOWN OF	120592
WILLISTON, CITY OF	120393
YANKEETOWN, TOWN OF	120147

Revised February 3, 2017

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
12075CV000B

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 2, 2012

Revised FIS Effective Date: February 3, 2017 – To update Special Flood Hazard Areas and to reflect updated topographic information.

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FLOOD INSURANCE STUDY
LEVY COUNTY, FLORIDA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) report 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 Levy County, Florida, including the Towns of Bronson, Inglis, Otter Creek, Yankeetown; Cities of Cedar Key, Chiefland, Williston and the unincorporated areas of Levy County (hereinafter referred to collectively as Levy County).

Please note that the Town of Fanning Springs is located in Levy and Gilchrist Counties. The Town of Fanning Springs is not included in this FIS report. See separately published Gilchrist County FIS report and FIRM for flood hazard information.

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 Levy County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and will also be used 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 Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

This FIS was prepared to include the unincorporated areas of Levy County and the incorporated communities within Levy County into a countywide format. Information on the authority and acknowledgments for the November 2, 2012 countywide FIS, as compiled from their previously printed FIS reports, is shown below. There are no previous FISs or FIRMs for the City of Chiefland and the City of Williston, therefore, the previous authority and acknowledgement information for these communities is not included in this FIS. These communities may not appear in the Community Map History table (Section 6.0).

City of Cedar Key

The hydrologic and hydraulic analyses for this study were performed by Gee & Jenson Engineers-Architects-Planners, Inc., for the Federal Emergency Management Agency (FEMA), under contract No. H-4779. This study was completed in February 1981.

Town of Inglis

The hydrologic and hydraulic analyses for this study were performed by Gee & Jenson Engineers-Architects-Planners, Inc., for FEMA, under contract No. H4779. This study was completed in March 1981.

Levy County (Unincorporated Areas)

The hydrologic and hydraulic analyses for this study were performed by Gee & Jenson Engineers-Architects-Planners, Inc., for FEMA, under contract No. H4779. This study was completed in March 1981.

Town of Yankeetown

The hydrologic and hydraulic analyses for this study were performed by Gee & Jenson Engineers-Architects-Planners, Inc., for FEMA, under contract No. H4779. This study was completed in March 1981.

Hydrologic data for the Withlacoochee River was taken from a Flood Hazard Information Report prepared by the U.S. Army Corps of Engineers (USACE) for the Southwest Florida Water Management District (SWFWMD).

For the November 2, 2012 countywide FIS, revised hydrologic and hydraulic analyses were prepared for FEMA by URS Corporation under contract with the Suwannee River Water Management District (SRWMD) and SWFWMD, FEMA Cooperating Technical Partners (CTPs).

The digital base map files for the November 2, 2012 countywide revision were derived from Florida Department of Transportation Digital Orthoimagery, produced at a resolution of 1-foot from photography dated March 2006. The coordinate system used for the production of the digital FIRM is State Plane in the Florida HARN West projection zone, referenced to the North American Datum of 1983.

Physical Map Revision, Effective February 3, 2017

As part of the FEMA Risk MAP Project for the Lower Suwannee Watershed (HUC 03110205), AMEC Environment & Infrastructure, Inc. (AMEC) and North Florida Professional Services (NFPS), under contract with SRWMD, revised this Countywide FIS and DFIRM for Levy County. More specifically, AMEC and NFPS revised the Zone AE Special Flood Hazard Areas (SFHAs) on panels 0005, 0010, 0015, 0110, 0120, 0130, and 0140.

The digital base map files consisted of 2010 1-foot resolution aerial photography from the Florida Department of Transportation.

The coordinate system used for the production of the digital FIRM was Florida State Plane HARN North zone, referenced to the North American Datum of 1983.

1.3 Coordination

Consultation Coordination Officer's (CCO) meetings may be held for each jurisdiction in this countywide FIS. An initial CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to explain the nature and purpose of a FIS, and to identify the streams to be studied by detailed methods. A final CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to review the results of the study.

Areas requiring detailed study for the previous FIS were identified at a meeting attended by representatives of FEMA, Gee & Jenson Engineers-Architects-Planners, Inc., the study contractor, and Levy County on May 4, 1978. The legal announcement of the flood insurance study and its purpose was placed in the Chiefland Citizen, the Gainesville Sun, and Dunnellon Press in January 1979.

November 2, 2012 Countywide Revision

An initial CCO meeting was held on November 14, 2007. A final CCO meeting was held on February 10, 2010. These meetings were attended by representatives of the study contractors, SRWMD, SWFWMD, Levy County, City of Cedar Key, Town of Inglis, Town of Yankeetown and FEMA.

Physical Map Revision, Effective February 3, 2017

For this PMR, a Risk MAP Discovery Meeting was held on September 8, 2011. A combined Flood Risk Review and Risk MAP Resilience Meeting was held on November 20, 2013. A final CCO meeting was held on April 30, 2015, and was attended by representatives from Levy County, SRWMD, SRWMD's engineering contractor, and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Levy County, Florida.

The Gulf of Mexico, the Suwannee River, and the Withlacoochee River were delineated as detailed study areas, as well as those flooding sources listed in Table 1.

TABLE 1 – FLOODING SOURCES STUDIED BY DETAILED METHODS

Stream	Limits of New or Revised Detailed Study
Bronson North Ditch	From SR-32/ Ishie Avenue/ NE 90th Street, upstream 1.6 miles to a point just downstream of SR-24.
Bronson South Ditch	From NE 61st Place/ Limerock Road, upstream 2.1 miles to a point just downstream of SR-24.
Long Pond	Located near Chiefland, on the west side of US Highway 19 - From CR-345 upstream 5.1 miles to a point just downstream of CR-347/ NW 60th St.

The study analysis included coastal flooding due to hurricane-induced storm surge. Both the open coast surge and its inland propagation were studied; in addition, the added effects of wave heights were also considered.

The Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction. The scope and methods of the study were proposed to and agreed upon by FEMA, SRWMD, SWFWMD and Levy County.

2.2 Community Description

Levy County, located on the Gulf Coast of northern Florida, is bounded on the north by Dixie, Gilchrist and Alachua Counties, on the east by Marion County and on the south by Citrus County. It lies approximately 15 miles southwest of Gainesville and encompasses about 1,080 square miles.

The major north-south arteries are U.S. Highways 98 and 19, and U.S. Highway ALT 27 (State Road 339). East-west access is via State Roads 24 and 121. Rail service to Levy County is supplied by The Seaboard Coastline Railroad with the major yard located in Chiefland. Public air service is provided by the George T. Lewis Airport and the Williston Municipal Airport.

The Levy County economy is mostly dependent upon forestry, farming, and commercial fishing. Residential and commercial development is presently centered about the communities of Cedar Key, Chiefland, Bronson, Williston and Yankeetown. Tourism and retirement interests are increasing, creating a potential for development in floodplain areas for water sports and recreation.

The topography of the county is generally low in the coastal region, lying below the 10-foot North American Vertical Datum (NAVD) contour. Elevations in the western portions of the county near the Town of Bronson rise to approximately 100 feet NAVD.

The Suwannee River, which flows in a southerly direction, forms the western boundary of the county. The river originates in the interior of Georgia and extends approximately 220 miles to the Gulf of Mexico. Its drainage area encompasses about 10,000 square miles.

The Waccasassa River, lying in the central portion of the county extends approximately 30 miles from the northeastern portion of the county to the Gulf of Mexico.

The Withlacoochee River forms the southern boundary of Levy County and has a drainage area that encompasses approximately 2,000 square miles near the Gulf of Mexico. The river is approximately 160 miles in length and extends from its headwaters beginning in the Green Swamp in Pasco, Sumter, Polk and Lake Counties to the Gulf of Mexico near Yankeetown at the Citrus County-Levy County boundary. A prominent feature within the Withlacoochee River basin is the Florida Cross State Canal System. The western terminus of this system includes a major canal, lock, dam and an associated reservoir. Inglis Dam, located a short distance upstream of the Gulf on the Withlacoochee River, forms Lake Rousseau which provides water to operate the lock located within the barge cabal.

The City of Cedar Key is located on the gulf coast in western Levy County. The City is located approximately 57 miles southwest of Gainesville. Cedar Key was established in the mid-1800's and lumbering of the forested areas of cedar and cypress in the region was the major industry until the forest was depleted. Current economic activities consist mainly of commercial and recreational fishing and tourism. Development consists of single family residential and marine oriented commercial establishments.

The City of Cedar Key, as the name implies includes a series of small keys projecting into the Gulf of Mexico, interconnected with short bridges and with only one link to the mainland over SR 24. The topography is characterized by small hills ranging in elevation from sea level to about 30 feet NAVD. Several small keys lie about 1 to 3 miles offshore, forming a semicircle around the city.

The Town of Inglis is located near the gulf coast in southern Levy County. Tourism and retirement interests are increasingly creating a potential for development in floodplain areas near the water due to sports and recreation. The Withlacoochee River forms the southern boundary of the town.

The Town of Yankeetown is located on the gulf coast in southern Levy County adjacent to the Withlacoochee River. A significant amount of the Town consists of wetlands and coastal marshes. The developed portion of Yankeetown generally lies between State Road 40 and the Withlacoochee River. State Route 40 is the primary access to Yankeetown and runs in an east west direction. It connects Yankeetown to U.S. Route 19, a major north-south arterial, providing access to the adjacent coastal counties.

The land surface in Yankeetown range from low lying, marshy coastal lands extending approximately 2 miles inland from the coast to higher lands in the southwest portion of the town. Surface water runoff drains from the flatwood areas north of the town southward and southwestward toward the Withlacoochee River and then westward towards the Gulf of Mexico.

The 2010 population for Levy County was reported to be 40,801 (U.S. Census Bureau, 2012). Census estimates for the incorporated areas are as follows.

Community	2009 Population Estimate
City of Cedar Key	954
Town of Inglis	1,618
Town of Yankeetown	680
Town of Bronson	1,049
Town of Otter Creek	127
City of Williston	2,875
City of Chiefland	2,185

The climate in Levy County is subtropical with mean annual temperatures in the upper 60s, and average winter temperatures varying between 50 and 60 degrees Fahrenheit (°F). Temperatures in the summer months average about 80° F, being moderated by sea breezes and frequent thunderstorms. Rainfall averages about 60 inches annually with the majority of accumulation in May through September. Winds are generally southerly in summer months and northerly in winter months (USDOC, 1978).

2.3 Principal Flood Problems

General flooding in Levy County results from periods of intense rainfall causing ponding and sheet-runoff in the low, poorly-drained areas. The floodplains of the Suwannee, Withlacoochee, and Waccasassa River are also subject to flooding during high river stages. Coastal areas are subject to flooding and wave action associated with hurricanes and tropical storms.

The northwestern portion of the county lies within the flood plain of the Suwannee River and has been subject to several historical floods. Notable flooding in this area was recorded in 1948, 1973 and 1984 at the US Geographic Survey (USGS) gage at Wilcox, Florida.

The southern portion of the county lies within the floodplain of the Withlacoochee River which has also been subject to historical flooding. In recent years, floods causing significant damage along the Withlacoochee River were reported to have occurred in 1934, 1950 and 1960. USGS gage records at Croom, Florida indicated that the 1934 and 1950 storms had a magnitude that would occur on the average once in 75 and 60 years, respectively (75- and 60-year recurrence intervals). A more recent flood occurred in 1974. High water marks surveyed and referenced by the SWFWMD determined this to be approximately a 2-year flood (SWFWMD, April 1975).

Records of past coastal flooding in this area have been limited, primarily because of the undeveloped nature of the shoreline areas. However, several hurricanes have affected Levy County in the past. Among the more historic was the September 22 – October 11 hurricane of 1896. This storm made landfall between Cedar Key and St. Marks, Florida. At Cedar Key, 28 lives were lost as most of the town was destroyed by high tides, waves, and fires. Over 100 fishing and shrimping boats were lost during this storm (USACE, 1961).

Minor flooding was caused by hurricane Alma in 1966, approximately a 5-year recurrence at Cedar Key (a storm that would occur every 5 years on the average) and Hurricane Agnes in 1972, approximately a 5-year recurrence at Cedar Key. On September 5, 1950, Hurricane Easy made landfall near Cedar Key with winds of 120 mph and rainfall totals of 24.5 in Cedar Key in 3 days and 38.70 in Yankeetown in 24 hours, which became the largest 24 hour rainfall total on record to date for the United States. Hurricane Elena brushed Cedar Key 50 miles to the west on August 31 and September 1, 1985 with wind gusts of over 100 mph. The resulting storm surge was 9.2 feet (Gainesville News, 2016).

2.4 Flood Protection Measures

The southern portion of Levy County including the Towns of Inglis and Yankeetown are afforded protection against flooding from the Withlacoochee River by the Florida Cross State Canal System, which includes Inglis Lock and Dam and

Lake Rousseau. This system also helps reduce flood stages in this portion of the county. The remainder of the county has no measures designed and constructed specifically for that purpose.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50, 100-, and 500-year period (recurrence intervals); have been selected as having special significance for flood plain management and for flood insurance premium 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 one year are considered. For example, the risk of having a flood which equals or exceeds the 1-percent annual chance flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (four in 10), and for any 90-year period, the risk increases to about 60 percent (six in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Precountywide Revisions

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the county.

The hydrologic data for the Withlacoochee River was taken from “Flood Hazard Information, Withlacoochee River, Nobleton to Gulf of Mexico, Florida” dated August 1976 (USACE, August 1976). This report indicates that the discharge through the portion of the Withlacoochee River downstream of Lake Rousseau is 1540 cubic feet per second (cfs). The USACE report on the Cross Florida Barge Canal states, “Under present conditions the maximum capacity of the bypass facilities, with the highest operating stage at Inglis Dam held to 27.5 feet to avoid flood damages in Dunnellon is about 1,540 cfs. The bypass facilities were placed into operation in December 1969. The discharge since that time has varied from a maximum of 1,740 cfs to a minimum of 58 cfs.”

“One of the major effects of the project in this area has been the reduction of potential flood damages along the Lower Withlacoochee River by elimination of freshwater flooding. The maximum flood of record (1960) with a maximum discharge of about 9,500 cfs caused floodwater elevations of about 11.0 feet in Inglis and 6.0 feet in Yankeetown. With the additional discharge capacity of the project canal, it is estimated that such a flood could be discharged with a maximum flood elevation at Yankeetown slightly higher than 3 feet NAVD. Flood crests of that elevation could be passed without significant damage."

The report presented flood profiles for the mean annual, 10-, 25-, 50-, and 100-year floods, and the Standard Project Flood. The 500-year flood profile was determined by plotting the various frequency floods on probability paper at various locations on the river and extrapolating the 500-year flood elevation.

The flows of the required frequencies for the Suwannee River were based on statistical analyses of discharge records covering the 37-year period taken from the Wilcox, Florida gage (No. 02323500) on the Suwannee River. The statistical analysis is the standard Log-Pearson Type III method as recommended by the Water Resources Council (USWRC, June 1977). The flows at the mouth of the Suwannee River were considered the same as those at the gage in Wilcox. The small increase in drainage area is offset by the travel length in that reach.

The summary of drainage area-peak discharge relationships for each stream studied in detail is shown in Table 2 – "Summary of Discharges".

TABLE 2 – SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (CFS) 10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
BRONSON NORTH DITCH					
At SR-32/ Ishie Ave./ NE 90th St.	1.38	70	153	216	342
At U.S. Highway 27-A	0.35	18	38	54	86
BRONSON SOUTH DITCH					
At NE 61st Place/ Limerock Road	2.46	120	148	215	369
At NE 67th Place	1.30	146	148	148	191
At Picnic Street	0.36	35	37	37	48
LONG POND					
At County Road 345	44.47	NA	NA	442	728
At County Road 347/ NW 60th St.	1.31	NA	NA	67	100
SUWANNEE RIVER					
At mouth	9,940	41,465	62,910	72,905	98,310
At Wilcox	9,640	41,465	62,910	72,905	98,310

Coastal storm frequencies (number of occurrences per year) were determined using the Joint Probability Method as developed by Vance Myers (USDOC, April 1970). The Joint Probability Method enables one to create a number of simulated storms based on an analysis of historical records. Characteristics analyzed include the frequency at which storms enter the study area, and the probabilities associated with the size and intensity of a given storm.

A statistical analysis was performed to derive the probability distributions (range of parameter values versus their associated probabilities) for the principal parameters which describe a hurricane or tropical storm; these are the central barometric pressure (measures intensity of a storm), the radius to maximum winds (measures the lateral extent of a storm), the forward speed, and the direction of travel.

An analysis was also performed to determine the frequency with which hurricanes and tropical storms penetrate the west Florida coast or pass offshore if parallel to the coast.

Publications utilized in the above analysis included “Tropical Cyclone Data Deck” (USDOC, May 1973), “Tropical Cyclones of the North Atlantic” (USDOC, June

1978), "Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and the East Coasts of the United States (USDOC, May 1975) and "Meteorological Criteria for Standard Project Hurricane and Probable Maximum Hurricane Windfields, Gulf and East Coasts of the United States" (USDOC, September 1979), all by the National Oceanic and Atmospheric Administration. The National Hurricane Research Project Reports Nos. 5 and 33 (USDOC, March 1957 and November 1959) were also utilized in the analysis.

By combination of all parameters each with its associated probability, a large number of simulated storms can be numerically modeled, each with its own unique probability (Joint Probability). The probability of each resulting storm surge is then combined with the storm recurrence rate (frequency at which storms strike the coast) and the corresponding frequency (events of this surge height per year) for each storm surge determined. This procedure permits the simulation of many years of record, from which reliable estimates of flood recurrence intervals can be made. As a final step in the calculations, the astronomic tide of the study area was combined with the computed storm surge to yield recurrence intervals of total water level. Where the potential for generation of storm waves greater than 1-foot existed, an analysis of wave heights was also performed and the computed wave heights were combined with the total water level to yield BFEs. Reduction in still water level as the storm surge moved inland was also calculated taking into account topography and vegetation characteristics.

The values representing the parameters and their assigned probabilities are shown in Table 3 – "Parameter Values for Surge Elevation Computations."

<u>November 2, 2012 Countywide Revision</u>

For this countywide FIS, three areas were analyzed in detail. The three study areas are described below.

The Bronson North Ditch Study Reach consists of a single stream reach, which is located near Bronson, Florida. The limits of the detailed study extends from the structure at SR-32/ Ishie Avenue/ NE 90th Street, upstream 1.6 miles to a point located just downstream of SR-24. The total contributing drainage area at the outfall for the reach located at NE 90th Street is approximately 1.38 square miles. The basin consists of a uniform distribution of land uses including rural, agricultural and low density urbanized areas (Bronson).

The Bronson South Ditch Study Reach consists of a single stream reach, which is located near Bronson, Florida. The limits of the detailed study extends from the structure at NE 61st Place/ Limerock Road, upstream 2.1 miles to a point located just downstream of SR-24. The total contributing drainage area at the outfall for the reach located at NE 61st Place is approximately 2.46 square miles. The basin consists of a uniform distribution of land uses including rural, agricultural and low

CENTRAL PRESSURE DEPRESSION (In Hg.)	29.47	29.20	28.94	28.67	28.41	28.14	27.88	27.61
PROBABILITY:								
Entering	31%	31%	12%	7%	7%	5%	2%	5%
Exiting	26%	32%	7%	7%	11%	7%	4%	0%
Parallel	32%	26%	7%	12%	11%	10%	4%	4%
STORM RADIUS (Nautical Miles)	15		22.5		30.0			
PROBABILITY:	37%		43%		20%			
FORWARD SPEED (Knots)	6.0		11.5		17.0			
PROBABILITY:								
Entering	24%		36%		40%			
Exiting	55%		32%		13%			
Parallel	41%		40%		19%			
CROSSING ANGLE[1] (Degrees)	260	300		340	20	60		
PROBABILITY:	6%	24%		24%	23%	23%		
FREQUENCY OF OCCURRENCE	Landfalling/Existing – 0.0035 storms/nautical mile/year Alongshore = 0.0011 storms/nautical mile/year							

[1] = Clockwise from North

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEVY COUNTY, FL AND INCORPORATED AREAS

PARAMETER VALUES FOR SURGE ELEVATION COMPUTATIONS

density urbanized areas (Bronson). The basin can be characterized as having deep well drained sandy soils east of US-27A with a higher percentage of wetlands and depressional storage associated with the South Ditch system located west of US-27A.

The Long Pond Study Reach consists of a single stream reach, which is located near Chiefland, Florida on the west side of U.S. Highway 19. The limits of the detailed study extends from CR-345 upstream 5.1 miles to a point located just upstream of CR-347 (NW 60th Street). The total contributing drainage area at the outfall for the reach located at CR-345 is approximately 44.47 square miles. The basin consists primarily of rural and agricultural land uses with a minor amount of low density urbanized areas (Chiefland). The basin can be characterized as having deep well drained sandy soils east of Us-19 with a higher percentage of wetlands and depressional storage associated with Long Pond located west of US-19. The overall average channel slope is approximately 2.47 feet per mile.

Streamflows for the Bronson North Ditch were estimated using USGS Regional Regression Equations for a series of flood frequencies. The methodologies and equations used in that analysis are presented in detail in USGS, Water Resources Investigations 82-4012, Technique for Estimating Magnitude and Frequency of Floods on Natural-Flow Streams in Florida, 1982. The National Streamflow Statistics Program (NSS), Version 4, was used to compute streamflow estimates for this analysis.

Streamflow hydrographs used for unsteady-flow modeling of the Bronson South Ditch and Long Pond Study Areas were computed using standard rainfall-runoff methodologies in accordance with the NRCS National Engineering Handbook (NEH), Part 630, Hydrology. The AdICPR computer model was used to develop these runoff hydrographs for a series of flood frequencies in accordance with FEMA requirements.

Input data required to conduct the regional regression and rainfall-runoff analyses were developed using GIS methods. Drainage basin and subbasin boundary maps for each of the study areas were prepared using available topographic data, which includes standard USGS elevation models for the Bronson and Chiefland areas as well as and supplemental LiDAR data in the vicinity of Long Pond.. Input data required for the regression equation estimates, including Drainage Area, Channel Slope and Lake Area, were all determined using GIS based topography and land use data. Input data required for the rainfall-runoff analysis, including Drainage Area, Time of Concentration and Curve Number were all determined using GIS based topography, soils and land use data.

To verify the reasonableness of estimated results for the regressions and runoff model analyses, a flood frequency analysis was conducted using streamflow gage data. This regional flood frequency analysis was conducted to estimate streamflows at 17 USGS gages within a 9 county area adjacent to Levy County on streams with characteristics similar to those of the study reaches. The methodologies used in this analysis are documented in Bulletin #17B, Guidelines for Determining Flood Flow Frequency, March 1982. The USGS computer program PEAKFQ – Annual Flood Frequency Analysis Using Bulletin 17B Guidelines, Version 4.1, February 25, 2002 was used to estimate streamflows and associated flood frequencies.

Elevations for floods of the selected recurrence intervals of Long Pond are shown below.

FLOODING SOURCE AND LOCATION	ELEVATION (FEET NAVD 88)			
	10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
LONG POND				
CR-345 to CR-341	NA	NA	26.6	27.8
CR-341 to NW 55th Ave	NA	NA	26.8	27.8
NW 55th Ave to CR-347	NA	NA	28.3	28.6

Physical Map Revision, Effective February 3, 2017

For this revision, no new hydrologic and/or hydraulic analyses were performed.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods for the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. For construction and/or floodplain management purposes, users are encouraged to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Precountywide Revisions

Water-surface elevations of floods of the selected recurrence intervals for the Withlacoochee River were determined from analysis of stream gages which have sufficiently long periods of record (USACE, August 1976).

Cross sections for the water elevation analysis of the Suwannee River were obtained by aerial surveying methods from photography flown in 1979 for upland areas and by field measurement for areas below the water-surface. Bridges were field checked to confirm elevation data and structural geometry.

Channel roughness factors (the "n" factor for Manning's Formula) used in the hydraulic computations, were chosen based on aerial photography and field observations of the streams and floodplain areas.

This measure of roughness for the main channel of the Suwannee River ranges from 0.033 to 0.039 with floodplain roughness values ranging from 0.05 to 0.15 for all floods.

The acceptability of the above hydraulic factors, cross-sections, and hydraulic structure data was checked using these computations and comparing the results to known historic storms and the resulting flood elevations.

Water-surface elevations of floods of the selected recurrence intervals were initially computed through use of the Corps of Engineers "HEC-2" step backwater computer program (USACE, November 1976). In 2006, the HEC-2 computer files for the Suwannee River were converted to HEC-RAS files by the SRWMD for the Dixie and Gilchrist County, Florida FIS. Flood profiles were drawn showing water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations at the mouth of the Suwannee River used in these calculations were determined from the slope-area method.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Located on the Gulf of Mexico, the coastline areas of Levy County are primarily subject to coastal storm surge flooding from hurricanes and tropical storms. Detailed hydraulic analyses of the shoreline characteristics were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. The U.S. Department of Housing and Urban Development's standard coastal storm surge model (USDHUD, May 1978 revised March 1979 and February 1979 revised April 1979) was utilized to determine these flood levels. This model is a numerical hydrodynamic computer model which calculates the coastal storm surges previously described in Section 3.1. Before applying the numerical model to the study area, several recent hurricanes which have affected the west coast of Florida were simulated for verification purposes. Surge elevations computed by the numerical model were compared to recorded tide gage heights at St. Marks and Cedar Key, Florida. The results are shown below.

Location	Storm	Computed by Numerical Model Plus Predicted Tide	Observed
St. Marks	Hurricane Alma 1966	4.6	4.2[(a)]
	Hurricane Agnes 1972	7.0	7.1[(a)]
Cedar Key	Hurricane Alma 1966	5.8	5.3[(b)]
	Hurricane Agnes 1972	5.5	5.6[(b)]

(a) = Data from tide gage station, U.S. Army Corps of Engineers.
(b) = Data from tide gage station, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Survey.
All elevations referenced in feet above NAVD.

The numerical model for this region consisted of five nautical mile square grids extending 200 nautical miles in the north-south direction, and 200 nautical miles in the east-west direction. Water depths for the offshore regions were taken from selected National Ocean Survey hydrographic surveys with various dates and scales and National Ocean Survey bathymetric maps at a scale of 1 to 250,000 with bathymetric contour intervals at 2 and 10 meters depending on depth (USDOC). Additional topographic sources were utilized in conjunction with the storm surge model (USDOI).

Because of the increased development in southern Levy County, a finer numerical model was applied to determine surge reductions inland from the coast.

The inland model consisted of one nautical mile square grids extending 35 nautical miles in the north-south direction, centered near the mouth of the Withlacoochee River and 20 nautical miles in the east-west direction, centered near the mouth of the Crystal River.

Water depths for the fine grid model were obtained from National Ocean Survey hydrographic surveys with various dates and scales (USDOC). Land elevations for the model were obtained from USGS 7.5 minute series topographic quadrangles.

Roughness values (the “n” factor for Manning’s formula) used in the fine grid computations were chosen based on aerial photography (1979) and field inspection (1980 and 1981). Typical values ranged from 0.06 for the tidal marsh areas to 0.40 for densely wooded uplands. The assigned values for typical vegetation types were obtained from standard roughness coefficient tables, such as those given in Chow 1959 (Ven Te Chow, 1959), and from an unpublished U.S. Army Corps of Engineers report on the evaluation of Manning’s “n” in vegetated areas.

The computed stillwater flood elevations for Levy County are tabulated in the Coastal Flood Insurance Zone Data Table. These elevations reflect the combination of storm parameters, bathymetric and other features to produce the storm surge elevation with a recurrence interval of 100 years at specific locations along the coast. The variation of the stillwater elevations along the coast is mainly attributed to the offshore bathymetry and the orientation of the shoreline. Other features such as constrictive bays, passes, and shoals have localized effects on the surge elevations.

November 2, 2012 Countywide Revision

For this countywide FIS, the areas presented below were studied in detail to estimate flood elevations for the selected recurrence intervals.

The Bronson North Ditch Study Reach is located near the Town of Bronson, LevyCounty, Florida northeast of County Road 24 and south of Station Pond. The limits of the detailed study extend from State Highway 32/ Ishie Avenue/ NE 90th Street, upstream 1.6 miles to a point located just downstream of SR-24. The total contributing drainage area for the reach located above State Highway 32 is approximately 1.38 square miles with a channel slope for the main channel averaging about 3 feet per mile within the detailed study area. The main channel has mostly a sandy bottom with vegetated banks, some minor local obstructions and moderate meander. The overbank areas are generally heavily vegetated with trees causing a high degree of roughness. The land use is characterized as being predominately forested with a few areas identified as commercial. The soil type for the main channel and floodplain is mainly Placid and Smyrna fine sand.

The Bronson North Ditch Study Reach includes conveyance of the ditch through culvert structures located at State Highway 32 and State Road 27-A. The structure located at State Highway 32 consists of two parallel concrete box culverts with dimensions of 6.15-feet span by 3.9 feet rise and approximately 35 feet in length. The structure located at State Road 27-A is a concrete box culvert with dimensions of 8.1-feet span by 3 feet rise and approximately 181 feet in length.

The Bronson South Ditch Study Reach is located near the Town of Bronson, Levy County, Florida southwest of County Road 24 and north of Chunky Pond. The limits of the detailed study extend from the structure at NE 61st Place/ Limerock Road, upstream 2.1 miles to a point located just downstream of SR-24. The total contributing drainage area for the reach located above NE 61st Place is approximately 2.46 square miles with a channel slope for the main channel averaging about 4 feet per mile within the detailed study area. The main channel has mostly a sandy bottom with vegetated banks, some minor local obstructions and moderate meander. The overbank areas are generally heavily vegetated with trees causing a high degree of roughness. The land use is characterized as being predominately forested with a few areas identified as recreation and single family residential. The soil type for the main channel and floodplain is mainly Placid and Smyrna fine sand.

The Bronson South Ditch Study Reach includes conveyance of the ditch through culvert structures located at NE 61st Place/Limerock Road, Picnic Street, and Main Street as well as one bridge structure located at NE 67th Place. The structure located at NE 61st Place consists of consists a 4-foot diameter concrete pipe culvert approximately 49 feet in length. The structure located at Picnic Street consists of consists of a two parallel 3.5-foot diameter concrete pipe culverts approximately 77 feet in length. The structure located at Main Street consists of a 2-foot diameter corrugated metal pipe culvert approximately 48 feet in length. The wooden bridge structure located at NE 67th Place has one 1-foot diameter circular wooden pier, a deck width of 10 feet, a deck thickness of 1.3 feet, and no existing bridge guard rail.

The Bronson South Ditch study reach drains to an extensive depressional area identified on the USGS Quadrangle map as Chunky Pond. Water elevations in Chunky Pond are controlled by a structure located just upstream of Ercil Smith Road. This system was operated in the past for water management purposes. This system is presently inoperable and the control gates are fixed in an open condition. The effects of stages in Chunky Pond were included as part of the Bronson South Ditch studies.

The Long Pond study reach is located near the City of Chiefland, Levy County, Florida west of U.S. Highway 19/ U.S. Highway 98. The Limits of the detailed study extend from County Road 345 to approximately 5.1 miles upstream to County Road 347 NW 60th St. The total contributing drainage area for the reach located above County Road 345 is approximately 44.47 square miles with a channel slope for the main channel averaging about 5 feet per mile at the downstream and about 8 feet per mile at the upstream within the detailed study area. The main channel has mostly a soil bottom with vegetated banks, some minor local obstructions and moderate meander. The overbank areas are generally heavily vegetated with trees causing a high degree of roughness. The land use is characterized as being predominately forested with a few areas identified as small single family residential. The soil type for the main channel and floodplain is mainly Placid and Popah soils.

The Long Pond Study Reach includes conveyance of the stream through four culvert structures located at the following: County Road 345, County Road 341, NW 55th Avenue and County Road 347/ NW 60th Avenue. The structure located at County Road 345 consists of two parallel concrete box culverts with dimensions of 10.5 feet span by 5 feet rise and approximately 46 feet in length. The structure located at County Road 341 consists of two parallel concrete box culverts with dimensions of 10 feet span by 8 feet rise and approximately 33 feet in length. The structure located at NW 55th Avenue consists of two parallel 3.5- foot diameter concrete pipe culverts with a concrete headwall and approximately 37 feet in length. The structure located at County Road 347 consists of one 3.5- foot diameter concrete pipe culvert with a concrete headwall and approximately 53 feet in length.

HEC-RAS models were developed for the Bronson North Ditch, Bronson South Ditch and Long Pond Study Reaches to simulate flood elevations. Each model included details of natural channel geometry and considered all structures which potentially impact flood levels such as bridges and culverts. Channel cross-sections were obtained primarily from field surveys with supplemented cross-sections being developed from USGS Levy County topographic data. Bridge and culvert structures were surveyed to obtain elevation data and structural geometry. Bridge and culvert structure surveys included the top of road profile and upstream regular cross section. All field survey was established with horizontal control in Florida North Zone (903) State Plane coordinates, and vertical control in NAVD. Subsequent to the Bronson North Ditch and Bronson South Ditch model development, additional LiDAR grids were provided by SWFWMD (5/2011) with a cell size of 5-foot and were used to delineate the model results. The Bronson North Ditch and Bronson South Ditch HEC-RAS models were not revised to include the SWFWMD LiDAR data.

Channel and floodplain roughness coefficients (Manning's "n") were estimated based upon the methodology documented in USGS Water Supply Paper 2339. A combination of field observation, surveyor photographs, and aerial photography (USGS DOQQ) was used to estimate the parameters used in the methodology. All of the areas studied as part of this revision have channels composed of sandy material and generally have bare bottoms. The channels have a relatively high roughness factor due to overhanging vegetation that persists year round. Similarly, the overbank areas are quite rough due to surface irregularities and heavy vegetation. Roughness values for the main channels ranged from 0.031 to 0.13, and overbank values ranged from 0.090 to 0.150 for the streams studied in detail in this revised analysis.

The HEC-RAS models developed for the Long Pond and Bronson South Ditch Study Reaches were run in unsteady-flow mode to account for significant floodplain storage in each system and the variation in tailwater stages with time that could influence upstream water levels in the respective study reach. For Long Pond, tailwater stages were computed based on normal depth in the receiving system. For Bronson South Ditch, the tailwater elevations within Chunky Pond (receiving system) were simulated using a dynamic stormwater model (AdICPR) and this relationship was represented in the HEC-RAS model as a stage hydrograph. The HEC-RAS model developed for the Bronson North Ditch Study Reaches was run in steady-flow mode and the starting water-surface elevations was determined using normal depth methods for the receiving system.

Floodways were determined for the streams in this study using methods 4 and 5 in HEC-RAS initially, then method 1 to refine the floodway and fix the encroachment stations. All surcharge values are between 0.0 and 1.0, and the floodway contains the channel and is within the 1-percent annual chance floodplain at all cross sections.

Physical Map Revision, Effective February 3, 2017

For this revision, no new hydrologic and/or hydraulic analyses were performed.

Qualifying bench marks within a given jurisdiction are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS). First or Second Order Vertical bench marks that have a vertical stability classification of A, B, or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.

Bench marks cataloged by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)

Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutments)

Stability C: Monuments which may be affected by surface ground movements (e.g., concrete mounted below frost line)

Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post)

In addition to NSRS bench marks, the FIRM may also show vertical control monument established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for benchmarks, please contact the Information Services Branch of the NGS at (301) 713-3242 or visit their website at www.ngs.noaa.gov.

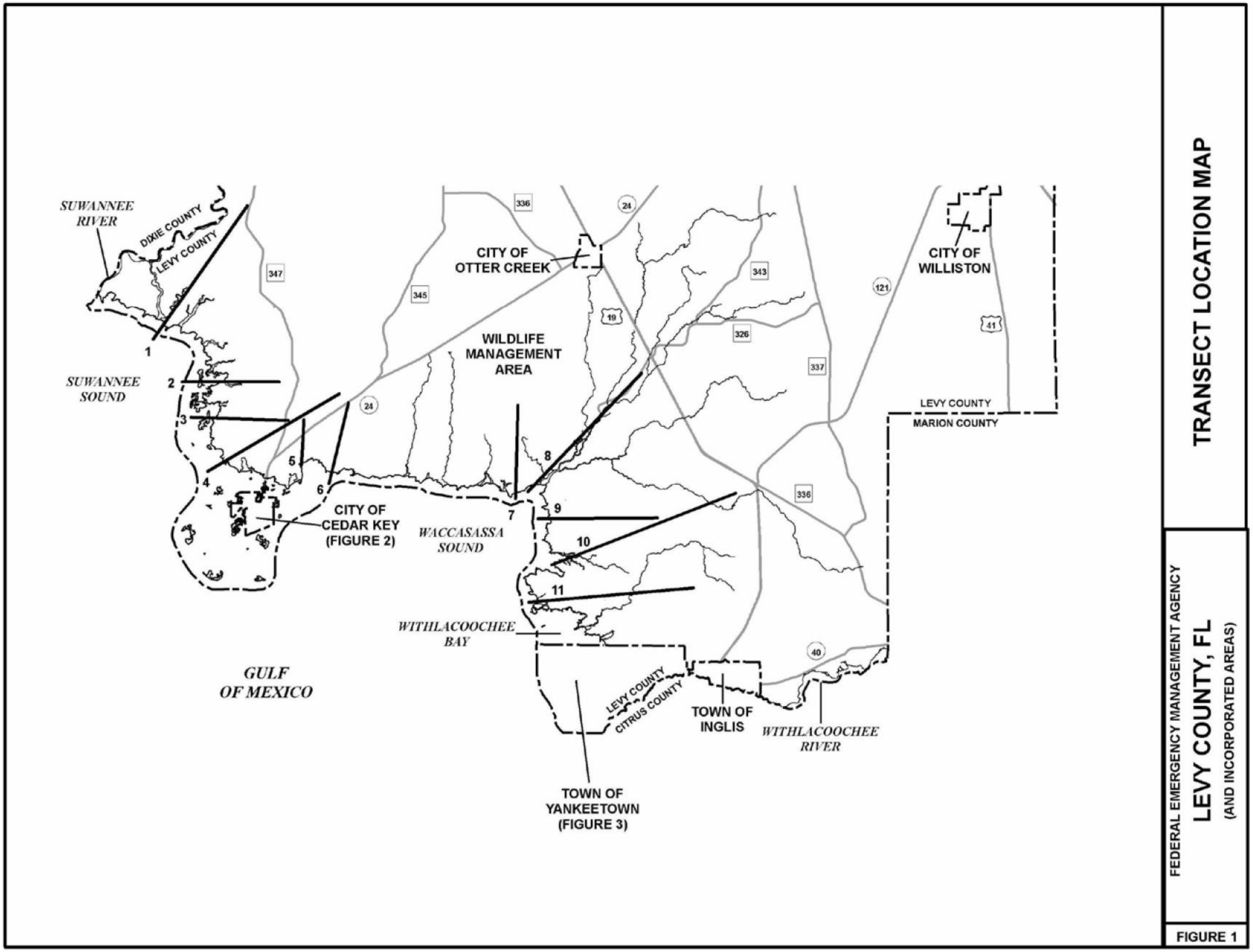
Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community.

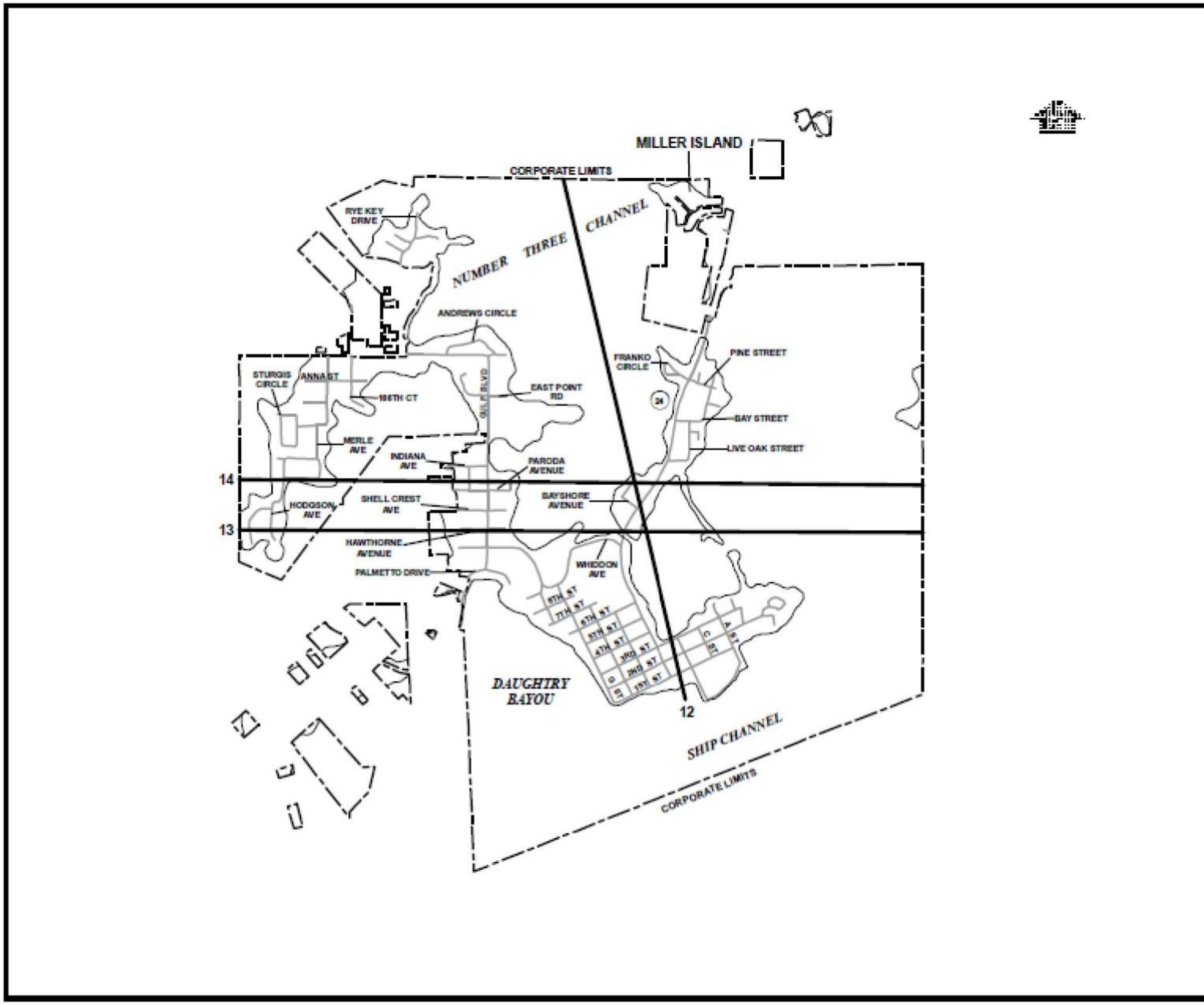
3.3 Wave Height Analysis

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in the National Academy of Sciences report (NAS, 1977). This method is based on the following major concepts. First, depth-limited waves in shallow water reach a maximum breaking height that is equal to 0.78 times the still water depth. The wave crest elevation is 70 percent of the total wave height plus the still water elevation. The second major concept is that wave height may be diminished 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 prescribed in the National Academy of Sciences. 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.

Wave heights were computed along transects (cross section lines) that were located along the coastal areas, as illustrated in Figures 1, 2 and 3 "Transect Location Map" in accordance with the Users Manual for Wave Height Analysis (FEMA, 1977). The transects were located with consideration given to the physical and cultural characteristics of the land so that they would closely represent conditions in 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.

The transects were continued inland until the wave was dissipated or until flooding from another source with equal or greater elevation was reached. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation and physical features. The still water elevations for the 1-percent annual chance flood 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. Areas with a wave component 3 feet or greater were designated as velocity zones. Other areas subject to wave action were designated as A Zones with BFEs adjusted to include wave crest elevations. A listing of the transect locations, starting still water surge elevations and initial wave crest elevations is provided in Table 4 – "Transect Locations, Stillwater Starting Elevations and Maximum Wave Crest Elevations."


SUWANNEE RIVER
DIXIE COUNTY
LEVY COUNTY
SUWANNEE SOUND
CITY OF OTTER CREEK
WILDLIFE MANAGEMENT AREA
CITY OF WILLISTON
LEVY COUNTY
MARION COUNTY
CITY OF CEDAR KEY (FIGURE 2)
WACCASASSA SOUND
WITHLACOOCHEE BAY
GULF OF MEXICO
LEVY COUNTY
CITRUS COUNTY
TOWN OF INGLIS
WITHLACOOCHEE RIVER
TOWN OF YANKEETOWN (FIGURE 3)
1
2
3
4
5
6
7
8
9
10
11
336
24
347
345
343
19
326
121
41
337
336
40
TRANSECT LOCATION MAP
FEDERAL EMERGENCY MANAGEMENT AGENCY
LEVY COUNTY, FL
(AND INCORPORATED AREAS)
FIGURE 1



CITY OF CEDAR KEY, FL
TRANSECT LOCATION MAP

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEVY COUNTY, FL
(AND INCORPORATED AREAS)

FIGURE 2

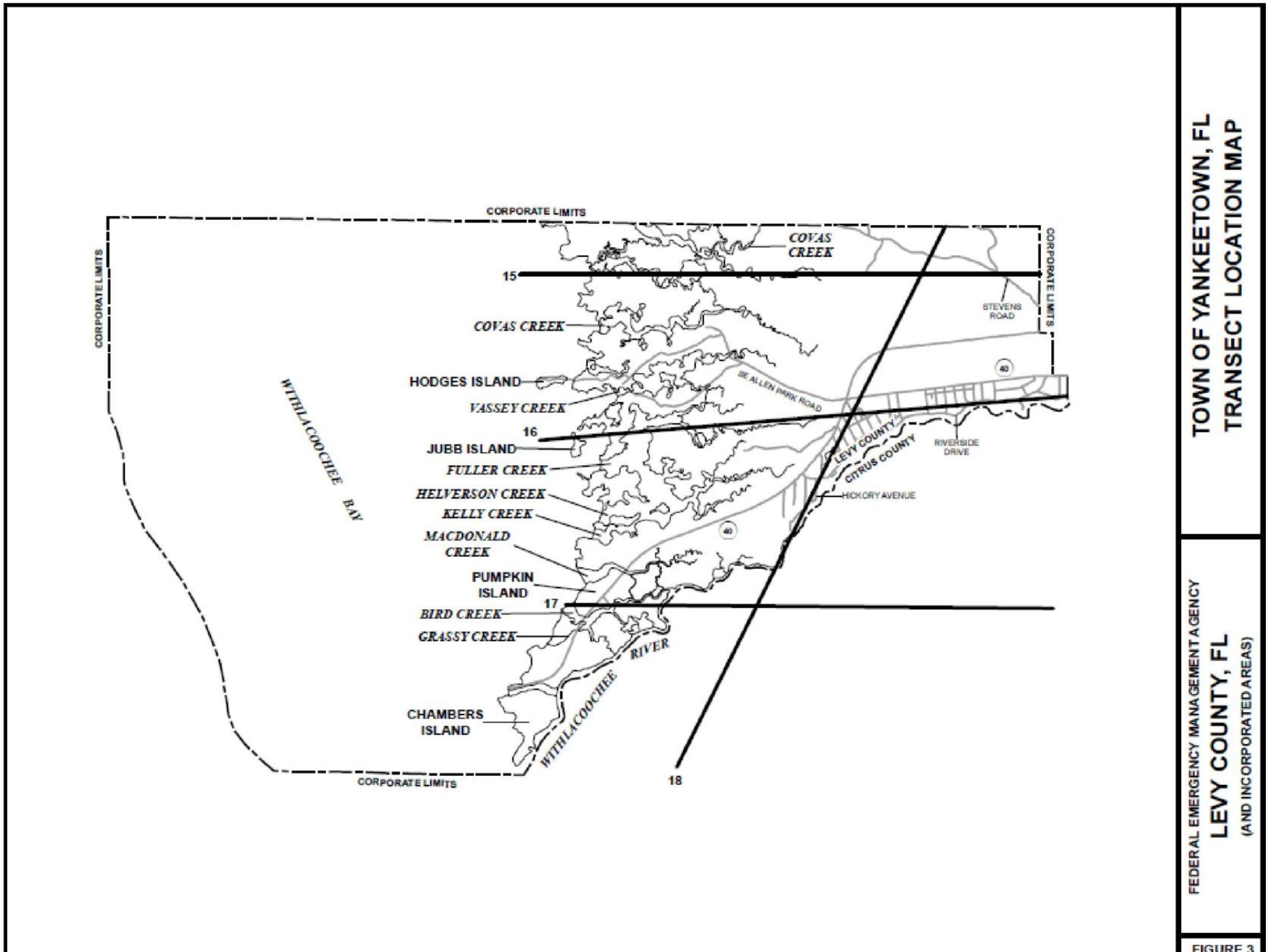

CORPORATE LIMITS
COVAS CREEK
15
STEVENS ROAD
COVAS CREEK
40
HODGES ISLAND
SE ALLEN PARK ROAD
VASSEY CREEK
WITHLACOOCHEE BAY
16
JUBB ISLAND
LEVY COUNTY
CITRUS COUNTY
RIVERSIDE DRIVE
FULLER CREEK
HELVERSON CREEK
HICKORY AVENUE
KELLY CREEK
MACDONALD CREEK
PUMPKIN ISLAND
17
BIRD CREEK
GRASSY CREEK
WITHLACOOCHEE RIVER
CHAMBERS ISLAND
CORPORATE LIMITS
18
TOWN OF YANKEETOWN, FL
TRANSECT LOCATION MAP
FEDERAL EMERGENCY MANAGEMENT AGENCY
LEVY COUNTY, FL
(AND INCORPORATED AREAS)

FIGURE 3

TABLE 4 – TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS AND MAXIMUM WAVE CREST ELEVATIONS

TRANSECT	LOCATION	ELEVATIONS ABOVE NAVD 88 (Ft) STILLWATER	WAVE CREST
Levy County (Unincorporated Areas)			
1	Levy County – at Weeks Fisher Creek, heading northeast, Gulf of Mexico	12.1	19.1
2	Levy County – at Deer Island, heading east, Gulf of Mexico	12.3	19
3	Levy County – at Hog Island, heading east, Gulf of Mexico	12.3	19
4	Levy County – approximately 1/3 of a mile south of Richards Island, heading northeast, Gulf of Mexico	12.3	19.5
5	Levy County – approximately 1/3 of a mile east of Live Oak Key, heading north, Gulf of Mexico	12.7	20.1
6	Levy County – At Hall Creek, heading north-northeast, Gulf of Mexico	12.8	20.2
7	Levy County – approximately 1/2 of a mile west of Depew Creek, heading north, Gulf of Mexico	13.1	20.7
8	Levy County – approximately 1/3 of a mile north of the Waccasassa River, heading northeast, Gulf of Mexico	13.2	20.8
9	Levy County – at Divedapper Creek, heading east, Gulf of Mexico	13.2	20.8

TABLE 4 – TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS AND MAXIMUM WAVE CREST ELEVATIONS (Continued)

TRANSECT	LOCATION	ELEVATIONS ABOVE NAVD 88 (Ft) STILLWATER	WAVE CREST
Levy County (Unincorporated Areas)			
10	Levy County – at Turtle Creek Bay, heading east-northeast, Gulf of Mexico	13.1	20.7
11	Levy County – at 13.8 Eleven Prong, heading east, Gulf of Mexico	13.0	20.5
City of Cedar Key			
12	Oriented NNW crossing 2nd Street approximately 200 feet west of the intersection with C Street	11.9	18.8
13	Oriented due east and crossing Gulf Boulevard approximately 150 feet south of Hawthorne Avenue	11.9	18.8
14	Oriented due east and crossing Gulf Boulevard approximately 150 feet south of Paroda Avenue	11.9	18.8
Town of Yankeetown			
15	Approximately 3/4 of a milenorth of Hodges Island, heading west	12.9	20.4
16	At Jubb Island heading east	12.8	20.2
17	At Pumpkin Island heading east	12.8	20.2
18	Beginning at the mouth of John’s Creek (Citrus County) and heading northeast into Yankeetown	12.7	20.1

Figure 4 is a profile for a hypothetical transect showing the effects of energy dissipation on a wave as it moves inland. This figure shows the wave elevation being diminished by obstructions, such as buildings, vegetation and rising ground elevations and being increased by open, unobstructed wind fetches. Actual wave conditions in Levy County may not necessarily include all the situations illustrated in Figure 4 – "Transect Schematic".

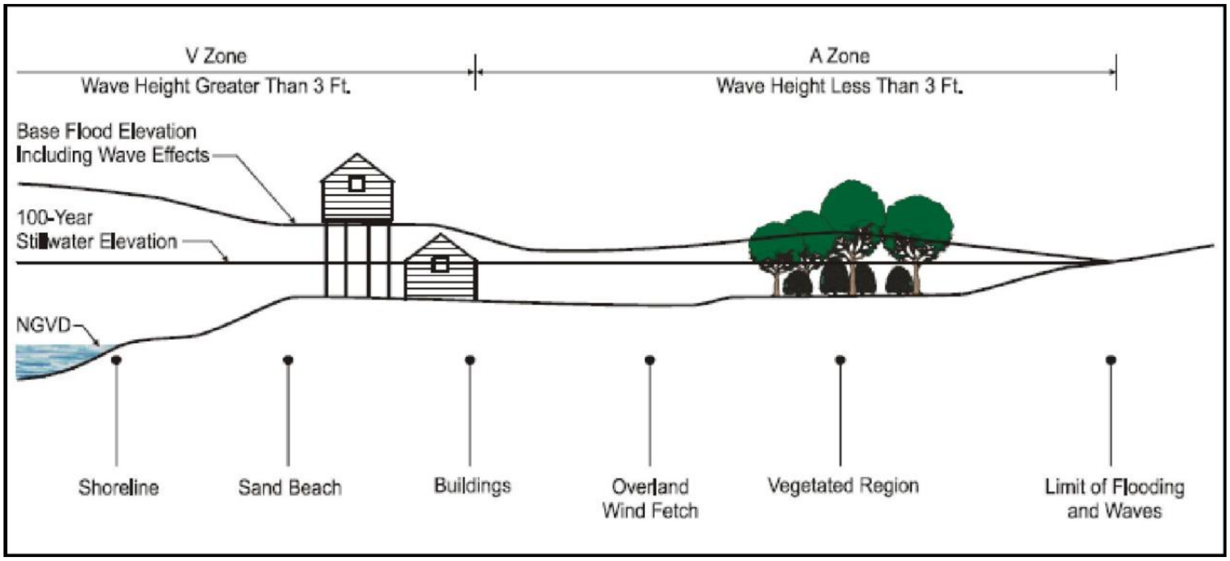


Figure 4 – Transect Schematic

Table 5 – "Transect Data," lists the flood hazard zone and BFEs for each transect, along with the 1-percent annual chance starting stillwater elevation for the Gulf of Mexico.

TABLE 5 – TRANSECT DATA

TRANSECTS	STILLWATER ELEVATION (feet NAVD 88) 10-Percent	2-Percent	1-Percent	0.2-Percent	Zone	BASE FLOOD ELEVATION (feet NAVD 88)[1]
Levy County						
1	7.1	10.3	12.1	14.6	VE	19.2 – 14.2
	4.3	8.0	9.3	11.8	AE	13.2 – 9.2
2	7.3	11.0	12.3	14.8	VE	19.2 – 14.2
	6.7	10.4	11.7	14.2	AE	13.2 – 12.2
3	7.3	11.0	12.3	14.8	VE	19.2 – 14.2
	6.7	10.4	11.7	14.2	AE	13.2 – 12.2
4	7.4	11.0	12.3	14.7	VE	19.2 – 14.2
	5.8	9.4	10.7	13.1	AE	13.2 – 11.2
	4.8	8.4	9.7	12.1	AE	10.2

[1] Due to map scale limitations, BFEs shown on the Flood Insurance Rate Map may represent average elevations for the zone depicted.

TABLE 5 – TRANSECT DATA
(Continued)

TRANSECTS	STILLWATER ELEVATION (feet NAVD 88) 10-Percent	2-Percent	1-Percent	0.2-Percent	Zone	BASE FLOOD ELEVATION (feet NAVD 88)[1]
Levy County						
5	7.8	11.4	12.7	15.1	VE	20.2 – 15.2
	7.5	11.1	12.4	14.8	VE	14.2
	6.9	10.7	12.0	14.4	AE	13.2 – 12.2
	6.2	9.8	11.1	13.5	AE	11.2
6	7.9	11.5	12.8	15.2	VE	20.2 – 15.2
	6.3	9.9	11.2	13.6	VE	14.2 – 13.2
	6.0	9.6	10.9	13.3	AE	12.2 – 11.2
	5.0	8.6	9.9	12.3	AE	10.2
7	8.1	11.7	13.1	15.6	VE	21.2 – 15.2
	6.0	9.6	11.0	13.5	VE	14.2 – 13.2
	5.6	9.2	10.6	13.1	AE	12.2 – 10.2
	4.1	7.7	9.1	11.6	AE	9.2
8	8.2	11.8	13.2	15.7	VE	21.2 – 15.2
	5.3	8.9	10.3	12.8	VE	14.2 – 13.2
	5.1	8.7	10.1	12.6	AE	12.2 – 10.2
	4.5	8.1	9.5	12.0	AE	9.2
9	8.2	11.8	13.2	15.7	VE	21.2 – 15.2
	5.3	8.9	10.3	12.8	VE	14.2 – 13.2
	4.9	8.5	9.9	12.5	AE	12.2 – 10.2
	3.2	6.8	8.2	10.7	AE	9.2 – 8.2
10	8.1	11.7	13.1	15.6	VE	21.2 – 15.2
	5.9	9.5	10.9	13.4	VE	14.2
	4.7	8.3	9.7	12.2	AE	13.2 – 8.2
11	9.0	11.9	13.0	15.2	VE	20.2 – 15.2
	7.7	10.6	11.7	13.9	VE	14.2
	7.2	10.1	11.2	13.4	AE	13.2 – 11.2
	5.3	8.2	9.3	11.5	AE	10.2 – 9.2
City of Cedar Key						
12 –14	7.0	10.6	11.9	14.3	VE	14.2 – 19.2

[1] Due to map scale limitations, BFEs shown on the Flood Insurance Rate Map may represent average elevations for the zone depicted.

TABLE 5 – TRANSECT DATA
(Continued)

TRANSECTS	STILLWATER ELEVATION (feet NAVD88) 10-Percent	2-Percent	1-Percent	0.2-Percent	Zone	BASE FLOOD ELEVATION (feet NAVD 88)[1]
Town of Inglis						
*	2	[2]	12.2	[2]	AE	12.2
*	[2]		9.2	[2]	AE	9.2
Town of Yankeetown						
15	8.9	11.8	12.9	15.1	VE	20.2 – 15.2
	8.2	11.0	12.0	14.1	VE	14.2
	7.8	10.4	11.4	13.4	AE	13.2 – 11.2
	7.0	9.3	10.2	12.0	AE	10.2
16	8.8	11.7	12.8	15.0	VE	20.2 – 15.2
	8.4	11.1	12.2	14.3	VE	14.2
	8.3	11.1	12.1	14.2	AE	13.2 – 12.2
	6.6	8.9	9.7	11.4	AE	11.2 – 10.2
17	8.8	11.7	12.8	15.0	VE	20.2 – 19.2
18	8.7	11.6	12.7	14.9	VE	16.2 – 15.2
	8.4	11.1	12.2	14.3	VE	14.2

[1] Due to map scale limitations, BFEs shown on the Flood Insurance Rate Map may represent average elevations for the one depicted.
[2] Not available.
* Outside corporate limits.

Ground elevations for wave calculations were taken from USGS 7.5 minute quadrangles with a contour interval of five feet, and in some cases from aerial transects with a scale of 1-inch 800 feet flown in 1979 with spot elevations (USDOI and AASCF).

Coefficients for inland wave height reduction (transmission coefficients) were determined from aerial photography (1979) and by field inspection (1981). Fetch factors for wave build-up in unobstructed wind fetches were determined from the above sources and from standard tables and figures.

Wave elevations between transects were interpolated using the cited sources. Factors affecting wave elevations between transects were identified and considered in relation to their effect upon wave elevations. The results showed that wave action was not appreciably reduced over the tidal marsh areas boarding the Gulf of Mexico. However, a significant decrease in height did occur in the wooded swamp areas.

Computed wave elevations are based upon existing topography, vegetation, and current development patterns and will require recomputation if significant changes occur in any of the above factors.

3.4 Vertical Datum

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 and on the FIRM are referenced to NAVD 88. Structure and ground elevations in the community must, therefore, be referenced to NAVD 88. It is important to note that adjacent communities may be referenced to NGVD 29. This may result in differences in BFEs across the corporate limits between the communities.

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 and BFEs reflect the new datum values. To compare structure and ground elevations to 1-percent annual chance flood elevations shown in the FIS and on the FIRM, the subject structure and ground elevations must be referenced to the new datum values.

As noted above, the elevations shown in the FIS report and on the FIRM for Levy County, Florida and Incorporated Areas, are referenced to NAVD 88. Ground, structure, and flood elevations may be compared and/or referenced to NGVD 29 by applying a standard conversion factor. The conversion factor from NGVD 29 to NAVD 88 is -0.76 feet. The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 will appear as 102 on the FIRM and 102.6 will appear as 103. Therefore, users that wish to convert the elevations in this FIS to NGVD 29 should apply the stated conversion factor(s) to elevations shown on the Flood Profiles and supporting data tables in the FIS report, which are shown at a minimum to the nearest 0.1-foot.

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 Spatial Reference System Division, National Geodetic Survey, NOAA, Silver Spring Metro Center, 1315 East-West Highway, Silver Spring, 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. Therefore, each FIS provides 1-percent annual chance flood elevations and delineations of the 1- and 0.2-percent-annual-chance floodplain boundaries and 1-percent annual chance floodway to assist communities in developing floodplain management measures. 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 Flood Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section and whole-foot BFEs. Between cross sections and whole-foot BFEs, the boundaries for Gulf of Mexico, Suwannee River, and some portion of Withlacoochee River were interpolated using a cell size of 5-foot LIDAR data. The Bronson North Ditch, and Bronson South Ditch were delineated with LiDAR grids provided by SWFWMD (5/2011) with a cell size of 5-foot. The Long Pond, and the Withlacoochee River boundaries were interpolated using a 10m resolution Seamless DEM.

For the February 3, 2017 PMR, the floodplain boundaries were re-delineated, using effective base flood elevations, on Light Detection and Ranging (LiDAR) derived topography.

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent annual chance floodplain boundaries are close together, only the 1-percent annual chance 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.

Areas studied by approximate methods within the SRWMD jurisdiction were updated using a data layer known as ‘wetcomp’ provided by the Suwannee River Water Management District. ‘Wetcomp’ combines National Wetlands Inventory (NWI) data, land use and cover, as well as hydrography features. In areas within the SWFWMD jurisdiction, the 2007 Land Use Land Cover data layer was downloaded from SWFWMD to identify wetland flood features.

4.2 Floodways

The floodways is the channel of a stream, plus any adjacent floodplain areas that must be kept free of encroachment in order that the 1-percent annual chance flood may be carried without substantial increases in flood heights.

There was no floodway computed for the Withlacoochee River or the Long Pond area due to the extremely flat terrain of the area.

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent annual chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1-percent chance annual flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this FIS report and on the FIRM were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 6 – Floodway Data. The computed floodways are shown on the FIRM. In cases where the floodway and the 1-percent annual chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

The area between the floodway and the 1-percent annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent annual chance flood by more that 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 5- “Floodway Schematic.”

Portions of the floodway for the Suwannee River extend beyond the county boundary.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BRONSON NORTH DITCH								
A	95[1]	55	176	0.6	55.3	55.3	56.2	0.9
B	2,260[1]	685	3,410	0.1	55.3	55.3	56.2	0.9
C	6,462[1]	44	48	1.1	55.9	55.9	56.4	0.5
D	8,533[1]	225	204	0.6	58.7	58.7	59.3	0.6
BRONSON SOUTH DITCH								
A	50[2]	328	520	0.7	58.6	58.6	58.9	0.3
B	5,186[2]	98	332	0.6	60.1	60.1	60.8	0.7
C	9,375[2]	1,063	4,304	0.1	60.2	60.2	60.9	0.7
D	10,595[2]	625	1,566	0.1	60.2	60.2	60.9	0.7
E	11,164[2]	430	2,544	0.1	60.2	60.2	60.9	0.7
SUWANNEE RIVER								
A	15.40[3]	7,091/380[4]	63,554	1.1	9.5	9.5	10.2	0.7
B	17.65[3]	7,807/2,234[4]	68,689	1.0	10.5	10.5	11.3	0.8
C	21.49[3]	4,847/975[4]	47,699	1.4	12.4	12.4	13.2	0.8
D	26.54[3]	3,531/3,105[4]	45,494	1.5	15.1	15.1	15.9	0.8
E	28.07[3]	4,688/281[4]	60,145	1.1	15.7	15.7	16.6	0.9

[1] Feet above State Highway 32/Ishie Avenue/NE 90th Street
[2] Feet above NE 61st Place / Lime Rock Road
[3] Miles above mouth
[4] Total Width / Width within County

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEVY COUNTY, FL
AND INCORPORATED AREAS

FLOODWAY DATA

BRONSON NORTH DITCH – BRONSON SOUTH DITCH – SUWANNEE RIVER

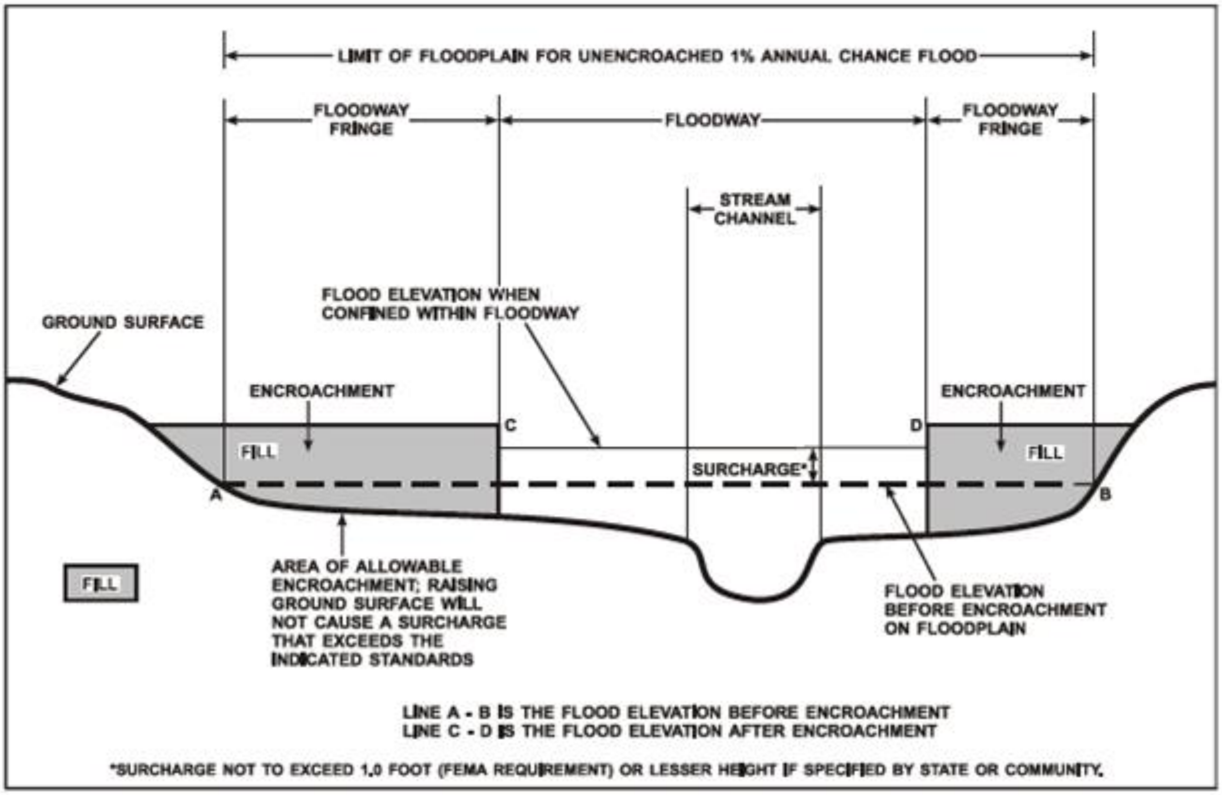


Figure 5 - Floodway Schematic

5.0 INSURANCE APPLICATION

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

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent annual chance floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent annual chance floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot BFEs 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 1-percent annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs 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 1-percent annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot 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 1-percent annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No BFEs or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 1-percent annual chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no BFEs are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 1-percent annual chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot BFEs 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 0.2-percent annual chance floodplain, areas within the 0.2-percent annual chance floodplain, and to areas of 1-percent annual chance flooding where average depths are less than 1-foot, areas of 1-percent annual chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent annual chance flood by levees. No BFEs 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 1-percent annual chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs 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 1-and 0.2-percent annual chance floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The current FIRM presents flooding information for the entire geographic area of Levy County. Prior to countywide mapping, separate Flood Hazard Boundary Maps (FHBMs) and/or FIRMs were prepared for each identified flood-prone incorporated community and the unincorporated areas of the county. Historical data relating to the pre-countywide FIRMs prepared for each community are presented in Table 7 – "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Bronson, Town of	October 13, 1978	None	February 1, 1987	N/A
Cedar Key, City of	July 22, 1977	N/A	March 1, 1984	June 2, 1992 June 30, 1999
Chiefland, City of[1]	N/A	N/A	N/A	N/A
Inglis, Town of	December 29, 1978	None	March 1, 1984	N/A
Levy County (Unincorporated Areas)	January 24, 1975	December 16, 1977 October 1, 1983	March 1, 1984	June 2, 1992
Otter Creek, Town of	August 17, 1979	None	September 1, 2005	N/A
Williston, City of[1]	N/A	N/A	N/A	N/A
Yankeetown, Town of	August 20, 1971	None	August 20, 1971	July 1, 1974 February 27, 1976 March 1, 1984

[1] This community does not have map history prior to the first countywide mapping

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEVY COUNTY, FL AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

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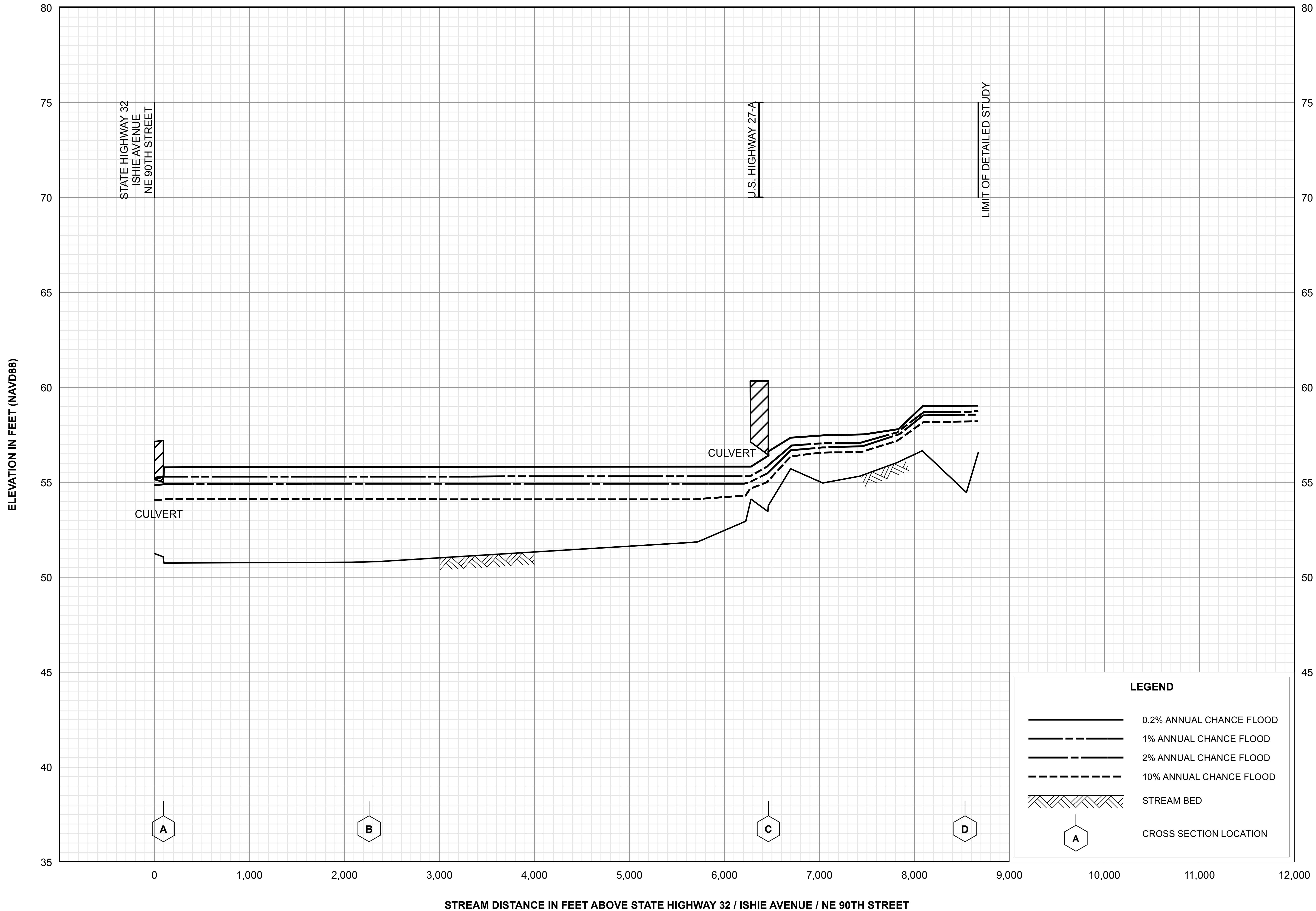


FEDERAL EMERGENCY MANAGEMENT AGENCY

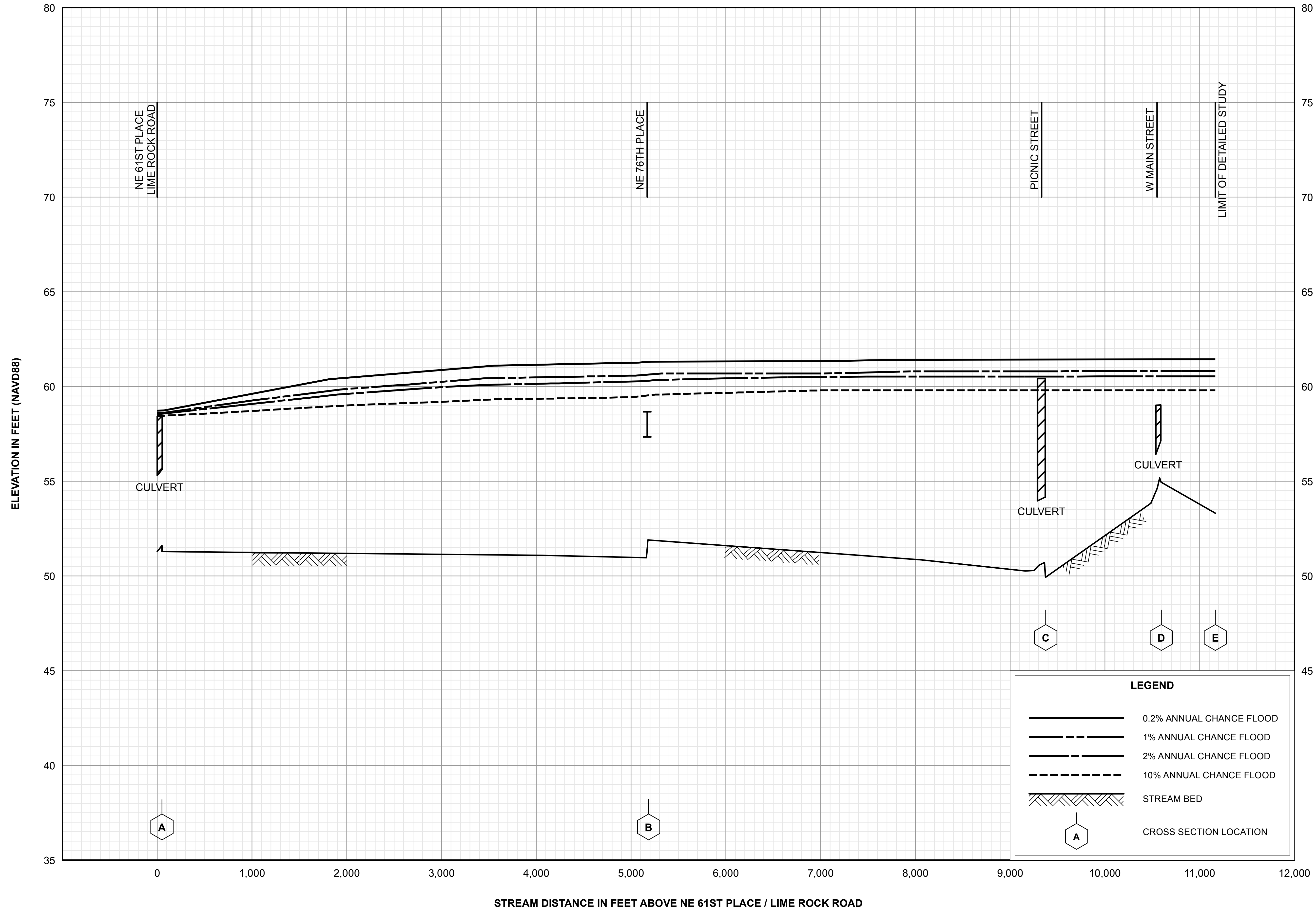
LEVY COUNTY, FL

AND INCORPORATED AREAS

FLOOD PROFILES

BRONSON NORTH DITCH

01P



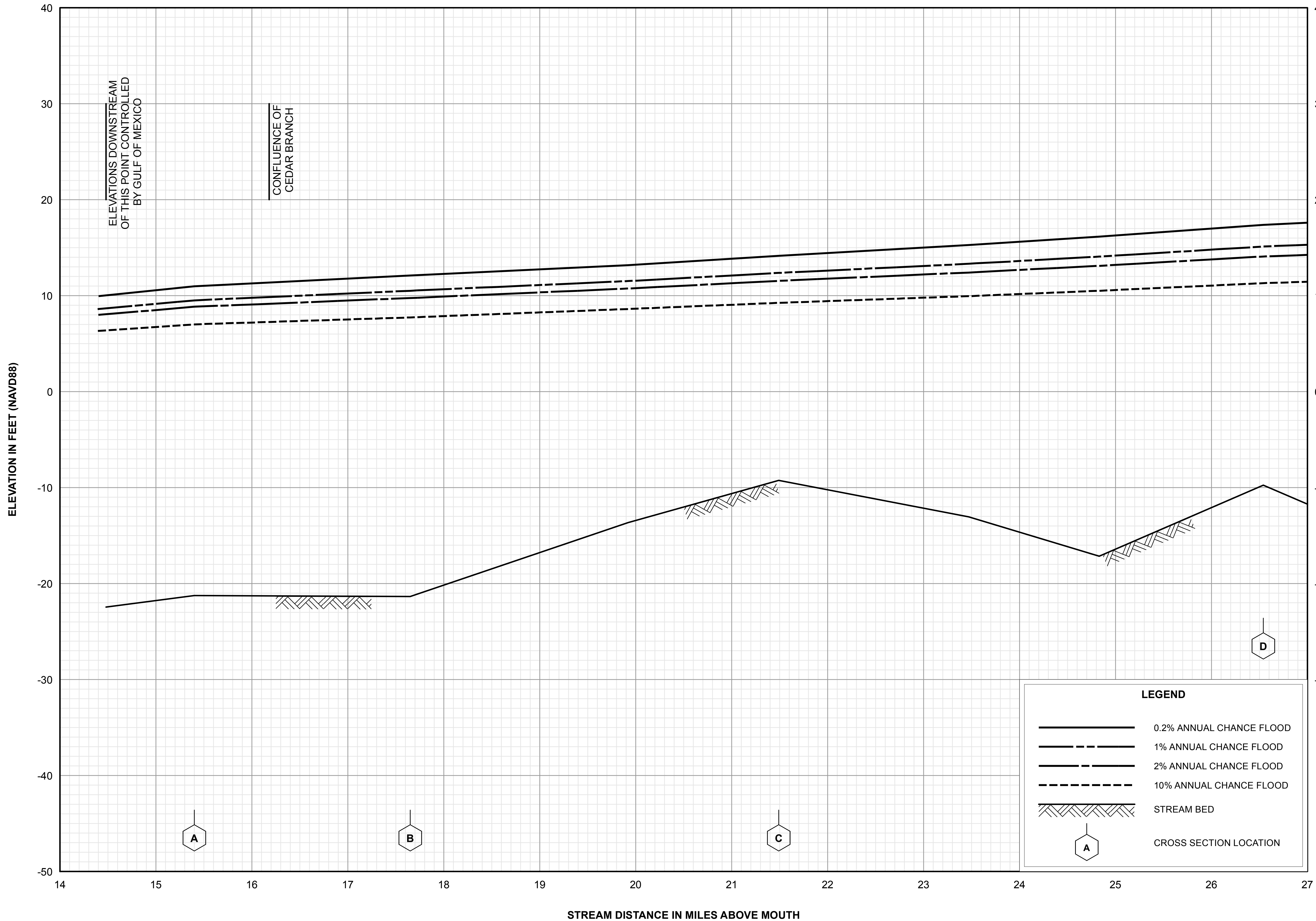
FLOOD PROFILES

BRONSON SOUTH DITCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEVY COUNTY, FL
AND INCORPORATED AREAS

02P



FLOOD PROFILES

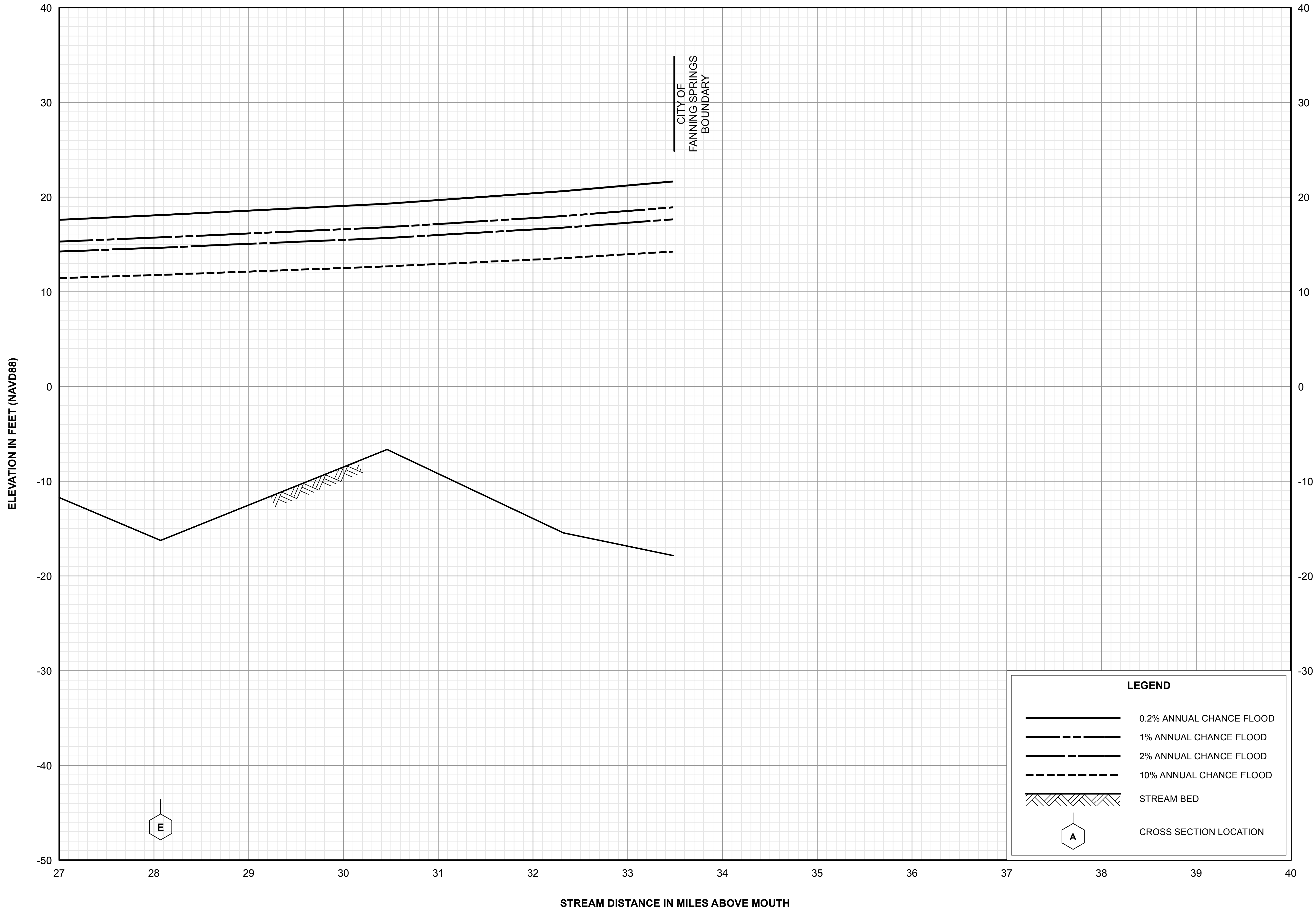
SUWANNEE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEVY COUNTY, FL

AND INCORPORATED AREAS

03P



FLOOD PROFILES

SUWANNEE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEVY COUNTY, FL
AND INCORPORATED AREAS

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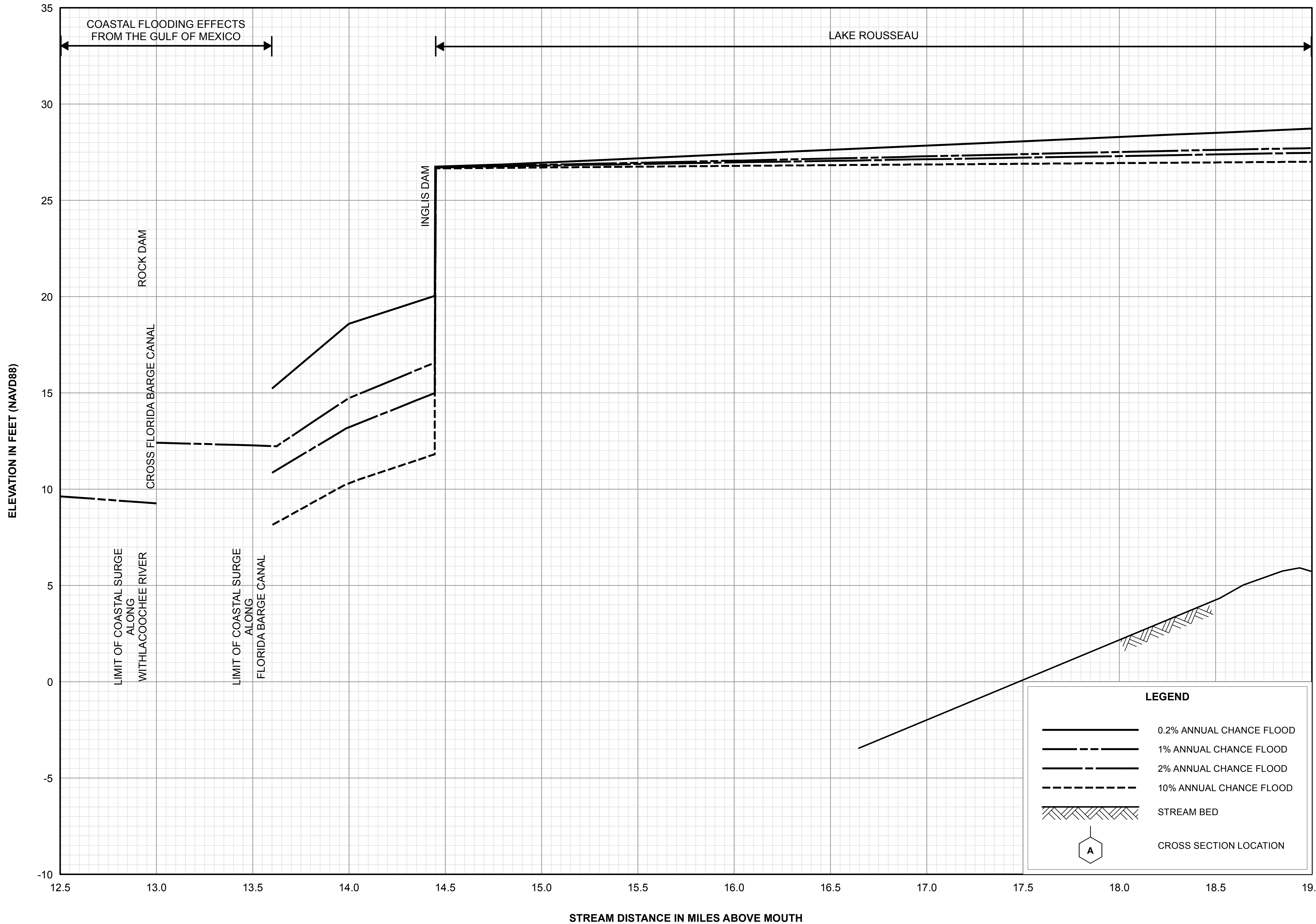


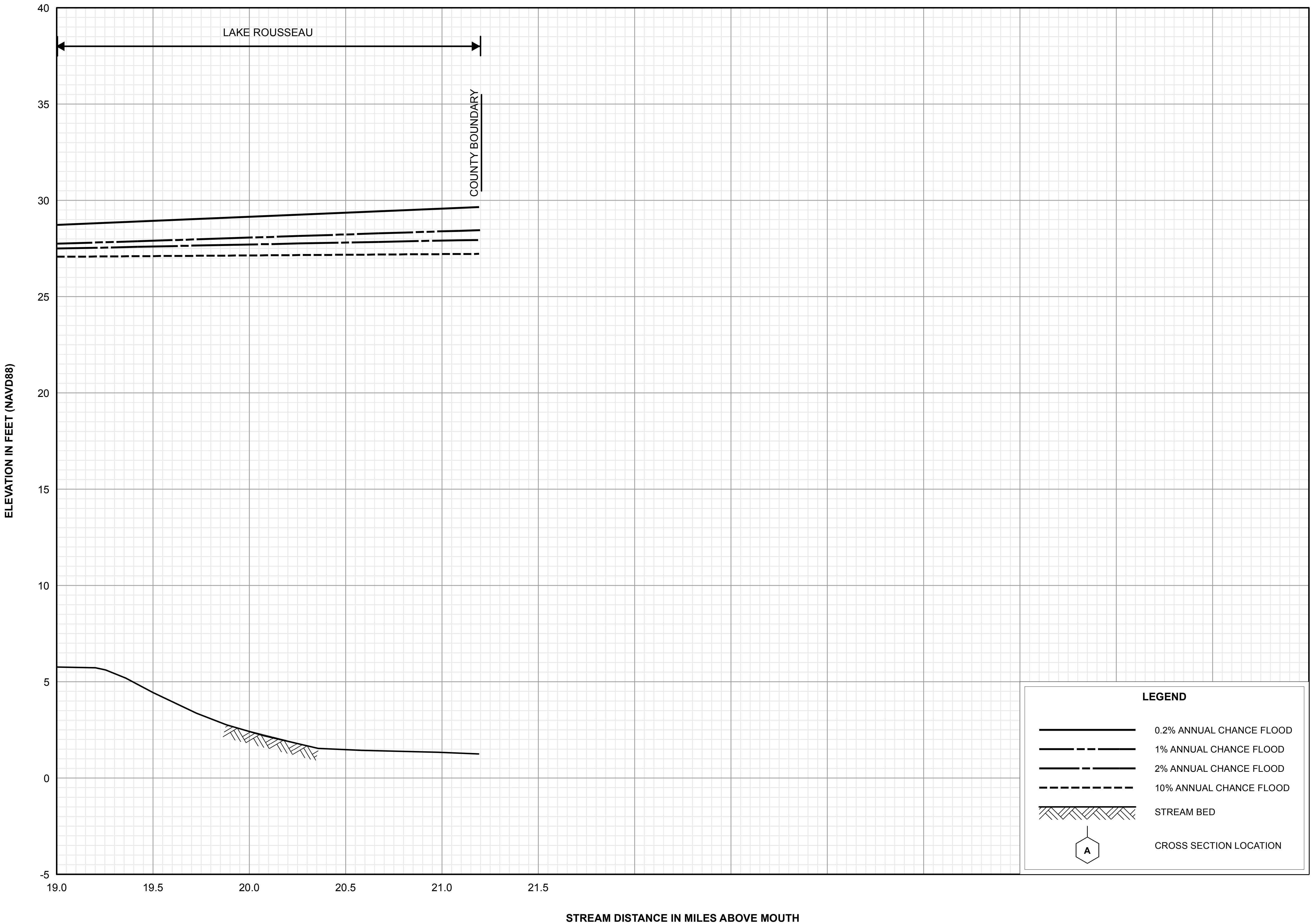
FLOOD PROFILES

WITHLACOOCHEE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEVY COUNTY, FL

AND INCORPORATED AREAS



FLOOD PROFILES

WITHLACOOCHEE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEVY COUNTY, FL

AND INCORPORATED AREAS

06P