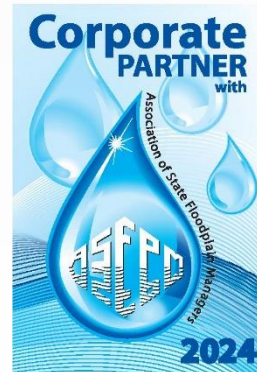


Decoding FEMA's FIRMs and FIS

Prepared for:
Florida Floodplain Managers Association Annual
Conference
April 24 2024



Background

NATIONAL FLOOD INSURANCE PROGRAM (NFIP)

In 1968, Congress created the National Flood Insurance Program (NFIP) to help provide a means for property owners to financially protect themselves. The NFIP offers flood insurance to homeowners, renters, and business owners if their community participates in the NFIP.

FLOOD INSURANCE RATE MAP (FIRM)

The official map of a community within the United States that displays Special Flood Hazard Areas (SFHA) and risk premium zones, as delineated by the Federal Emergency Management Agency (FEMA). The map depicts the SFHAs associated with the 100-year base flood and 500-year flood events. The FIRM is an important tool utilized for numerous purposes, including:

- Establishing flood insurance requirements and rates for properties;
- Utilized by design professions for the design and engineering for land development projects and structures located within SFHAs; and
- Utilized as a regulatory guide for the permitting of development and construction within SFHAs; and
- Utilized by Community Officials to administer floodplain management regulations and mitigate flood damage.



What do FIRMs Represent?

To determine a community's risk to flood hazards, FEMA performs an engineering study called a Flood Insurance Study (FIS). A FIS is a compilation and presentation of flood hazard areas along rivers, streams, coasts, and lakes within a community for the 100-year flood (1%-annual-chance) event.

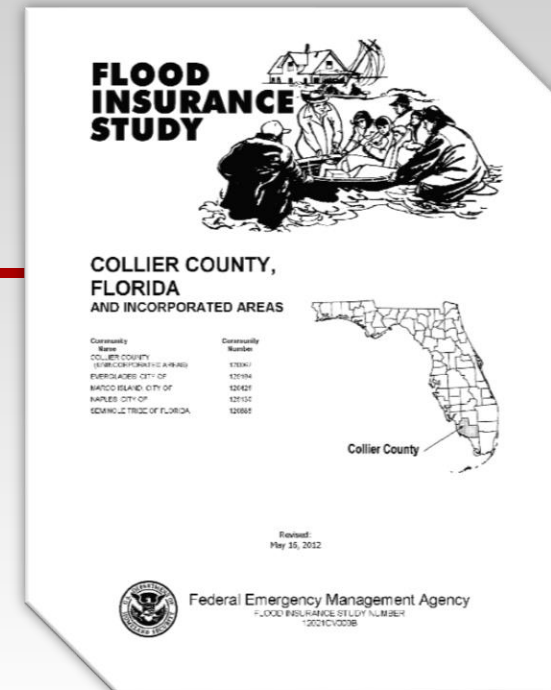
The FIS is based on:

- Historic information (such as river flow, storm tide, and rainfall data);
- Meteorological data;
- Topographic data;
- Hydrologic data;
- Hydraulic data;
- Open-space conditions;
- Flood-control works; and
- Development.

The FIS and FIRMs represent a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community. When a flood study is completed for the NFIP, the information and maps are assembled into an FIS. The FIS report contains detailed flood elevation data in flood profiles and data tables.

Effective FIRMs and FIS reports are available through **FEMA's Map Service Center:**
<https://msc.fema.gov/portal/home>

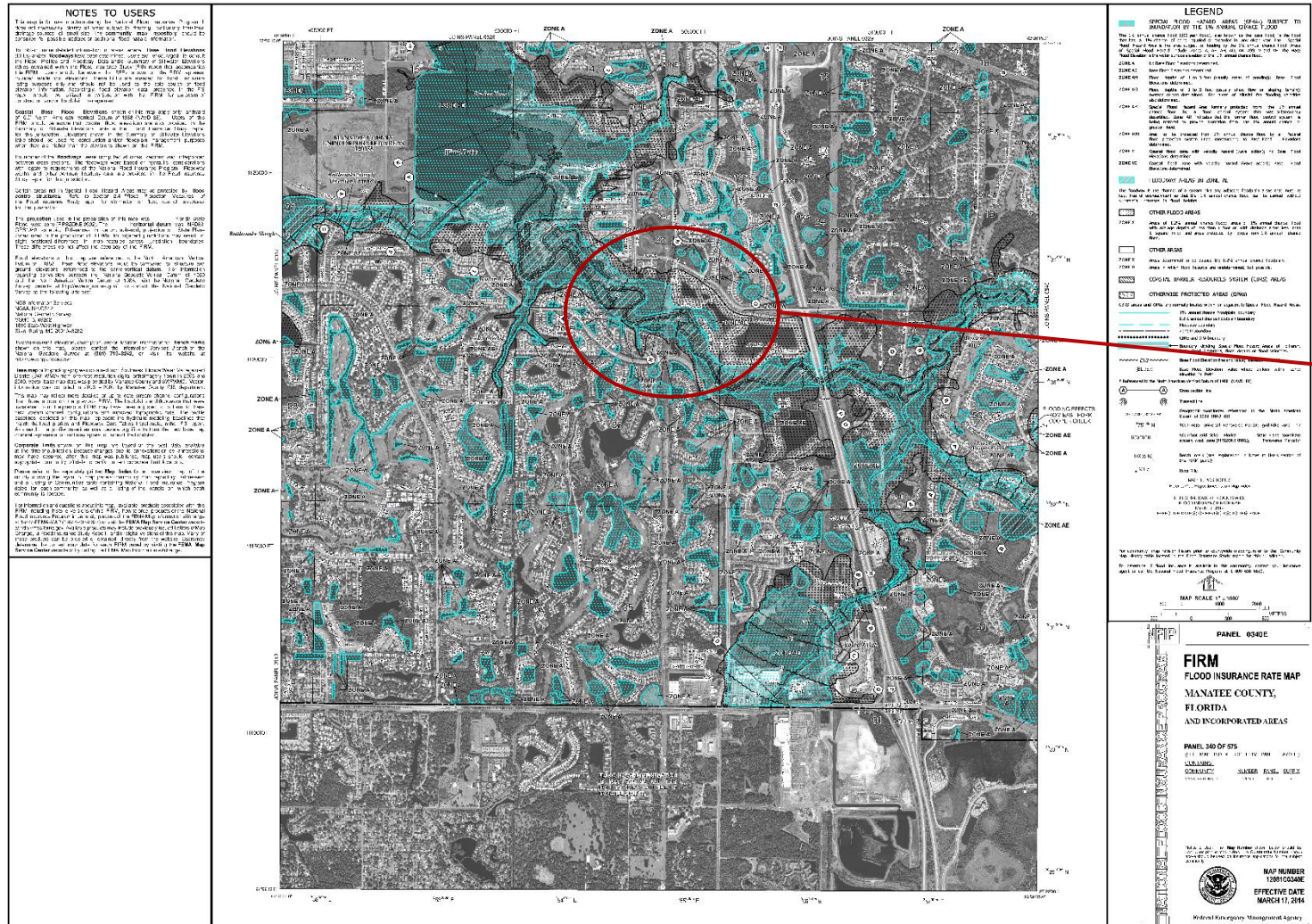
Now Digital FIRMs (DFIRMs) are Available!
FEMA's National Flood Hazard Layer:
<https://hazards-fema.maps.arcgis.com/>



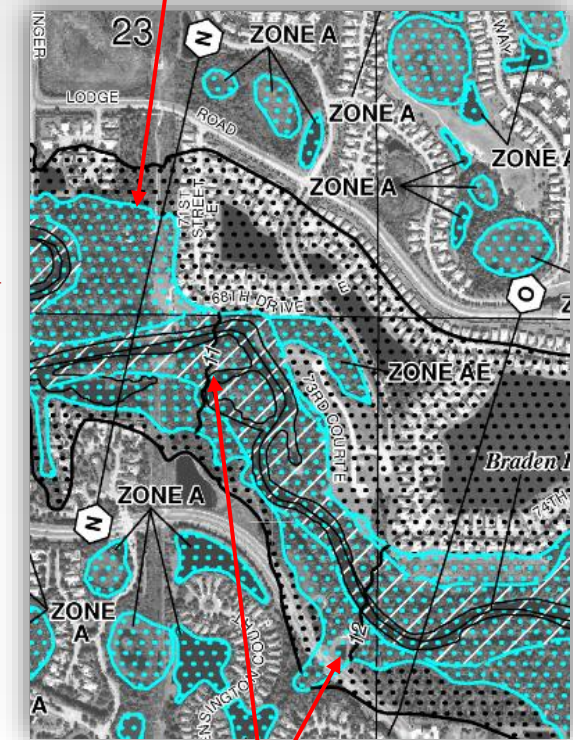


(EL XX) = Base Flood Elevation (BFE)

Example of a FEMA FIRM- Riverine

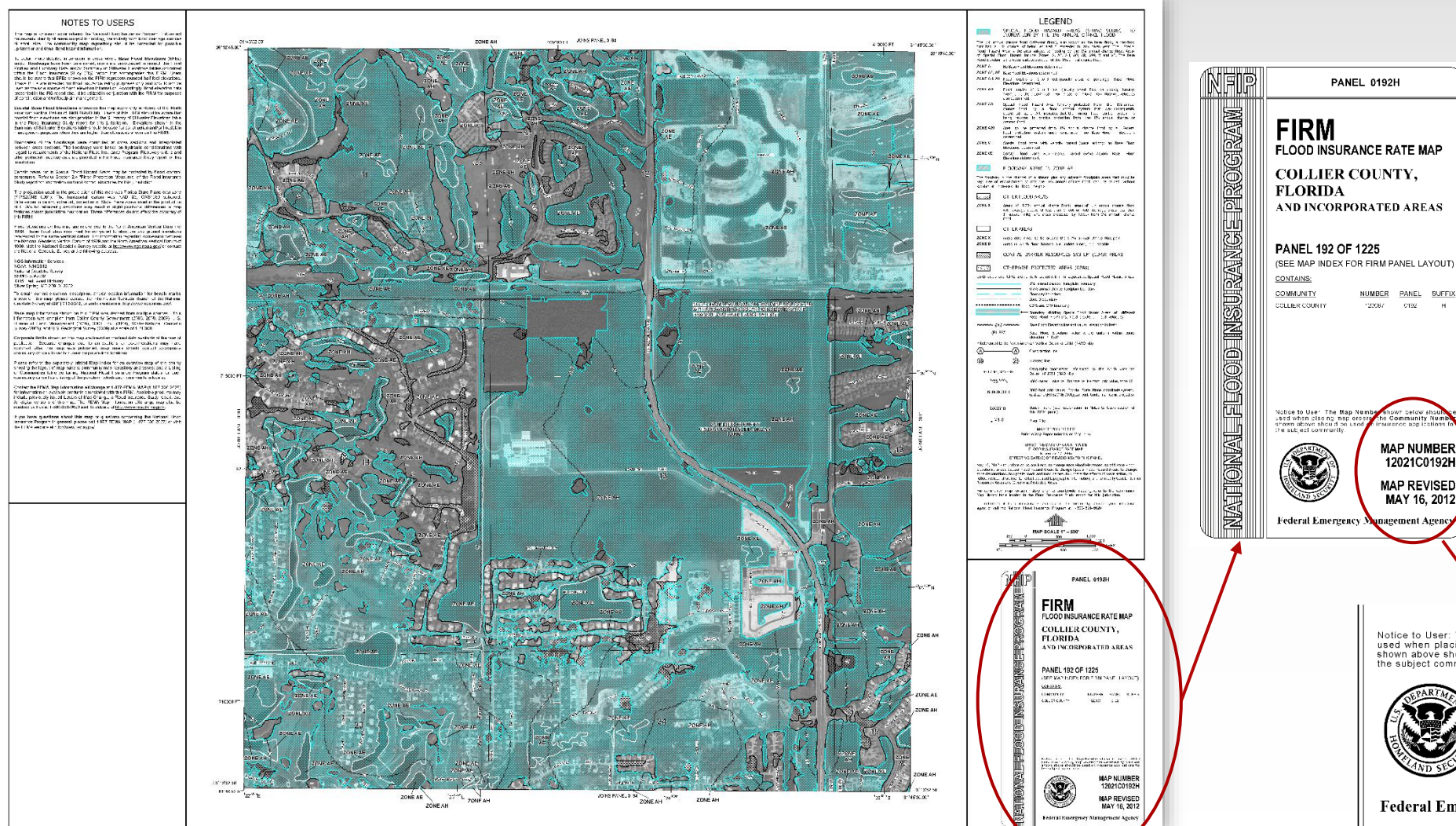


Cyan Lines Represent Change
in Flood Hazard Area



Base Flood Elevation (BFE) Contours

FIRM Panel Basics



The letter at the end of Panel # is the “Suffix, which represents the level of updates. This is update “H”, with the initial map being “A.” The “MAP REVISED” date represents the official effective date of revision to the full panel.

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
12021C0192H

MAP REVISED
MAY 16, 2012

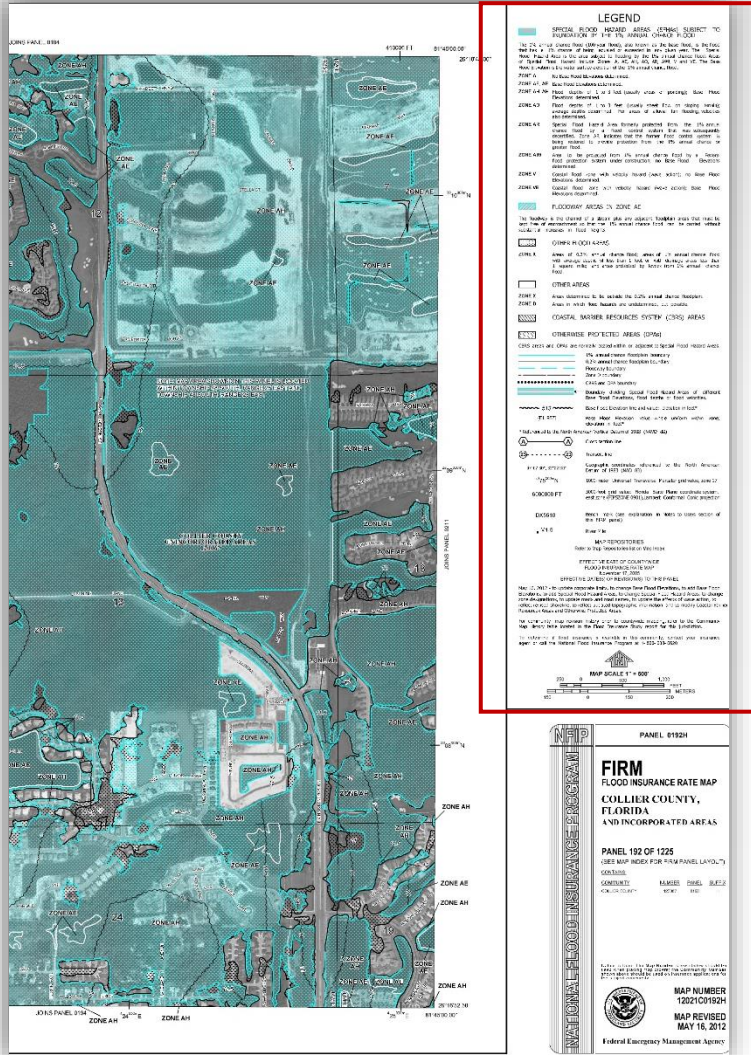


Federal Emergency Management Agency

J.R. EVANS
ENGINEERING

FIRM Panel Basics

Flood Hazard Area Definitions, Line Types, Vertical Datum, Coordinates



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE, AE** Base Flood Elevations determined.
- ZONE AH, AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

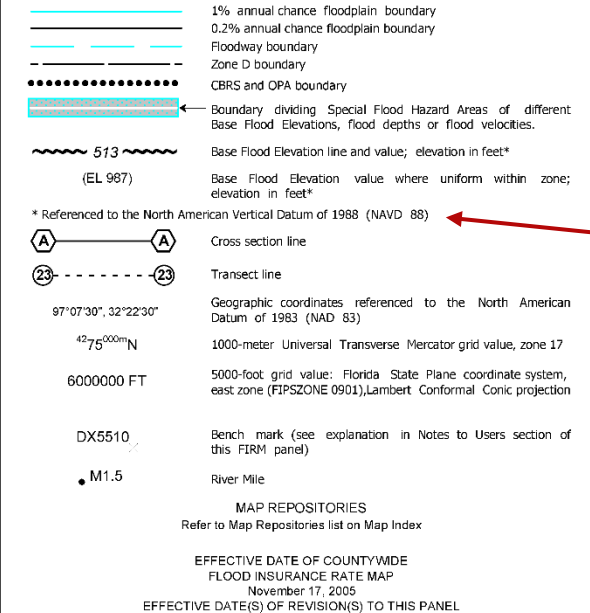
OTHER AREAS

- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

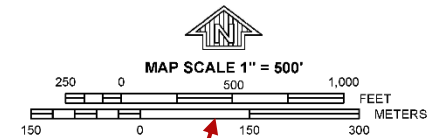


Vertical Datum is Important!

May 16, 2012 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update roads and road names, to update the effects of wave action, to reflect revised shoreline, to reflect updated topographic information, and to modify Coastal Barrier Resources Areas and Otherwise Protected Areas.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



Scale is Important!

What is the 100-Year Base Flood Event?

Special Flood Hazard Areas (SFHA) area subject to inundation by a flood that has a 1-percent or greater chance of being equaled or exceeded during any given year. This type of flood event is referred to as the 100-year flood or base flood event.

A 100-year flood is **not** a flood that occurs every 100 years!!

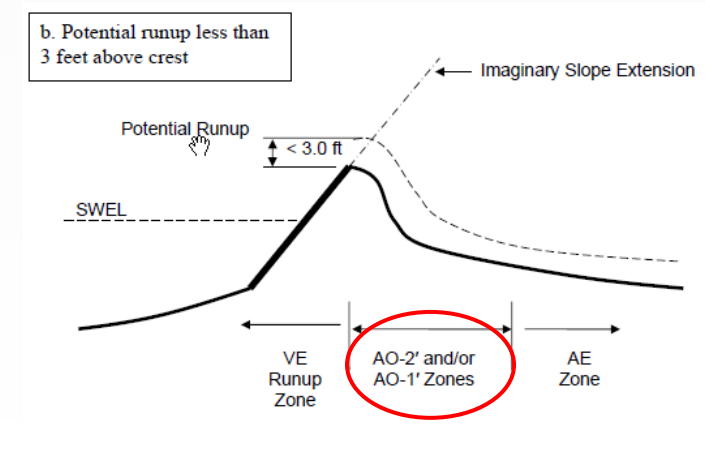
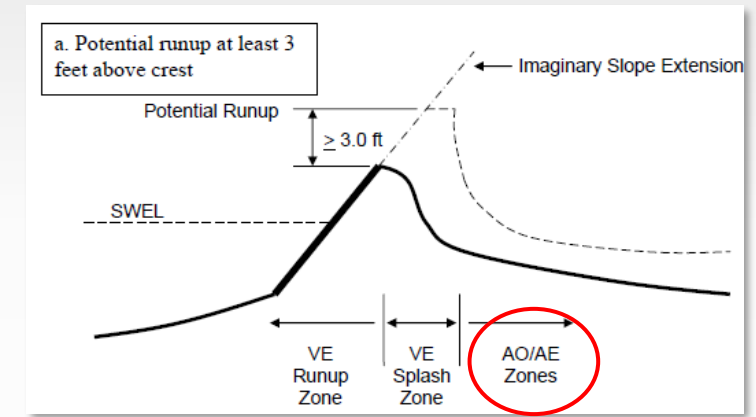
The 100-year flood has a 26% chance of occurring during a 30-year period! The 100-year flood is a regulatory standard used by Federal agencies and states to administer floodplain management programs and activities. The 100-year flood is used by the National Flood Insurance Program (NFIP) as the current basis for insurance requirements.

FEMA FLOOD ZONE DESCRIPTIONS

- VE or V Zone: **High Risk Zone with Additional Hazard**; Coastal Area; Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to this zone. The “E” in the Zone designation represents that a Base Flood Elevation (BFE) has been determined. Florida Building Code (FBC) and FEMA regulate specific design construction requirements for buildings located within this zone. In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to this zone.
- AE or (A1-30) Zone: **Moderate to High Risk Zone**; The base floodplain where base flood elevations are provided. The “E” in the Zone designation represents that a Base Flood Elevation (BFE) has been determined. In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to this zone.
- A Zone: **Moderate to High Risk Zone**; Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to this zone.

FEMA FLOOD ZONE DESCRIPTIONS

- AH Zone: **Moderate to High-Risk Zone**; Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one (1) and three (3) feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply to this zone.
- AO Zone: **Moderate to High-Risk Zone**; Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one (1) and three (3) feet. Flood depths derived from detailed hydraulic analyses. Zone AO are also designated in areas with high flood velocities. In coastal communities, Zone AO is mapped where flood waters overtop a structure/barrier and cause flooding on the landward side of the structure. Mandatory flood insurance purchase requirements and floodplain management standards apply to this zone.



FEMA FLOOD ZONE DESCRIPTIONS

- X Zone (Shaded): **Moderate Risk Zone**; Area of moderate flood hazard, usually the area between the limits of the 1-percent-annual-chance and 0.2-percent-annual-chance flood events. This zone is not considered a Special Flood Hazard Area (SHFA). In communities that participate in the NFIP, flood insurance is available to all property owners and renters in this zone. **Flood insurance purchase requirements do not apply to properties within this zone.**
- X Zone (Non-Shaded): **Low Risk Zone**; Defined as the area located above the limits of the 1-percent-annual-chance and 0.2-percent-annual-chance flood events. This zone is not considered a Special Flood Hazard Area (SHFA). **Flood insurance purchase requirements do not apply to properties within this zone and is available.**
- D Zone: **Undetermined Risk Zone**; Areas where there are possible by undetermined flood hazards, as no detailed analysis of flood hazards has been conducted. The designation of Zone D is also used when a community incorporates portions of another community's area where no map has been prepared. Flood insurance is available in Zone D; however it is not federally required by lenders for loans. The insurance rates are commensurate with the uncertainty of the flood risk, leading to typically higher rates than low-risk Zone X properties.



Distinctions of Flooding Sources

Riverine Flooding:

- ❖ Occurs with excessive rainfall over an extended period causing a river or watercourse to exceed its capacity (i.e. it rises over its banks).
- ❖ The level of river flooding depends on its size and the surrounding geography. A river on a flat and open area, may spill over occasionally and leave long-standing pools of flood water that won't drain away. This means that flooding in such an environment could build up over time without necessarily needing a single dramatic weather event.
- ❖ FEMA designates riverine flooding with the following SFHAs: Zone AE and Floodway



Distinctions of Flooding Sources

Coastal Flooding:

- ❖ Occurs when water reaches a level that begins to impact coastal infrastructure. Oceans are so vast (nearly 72% of the earth's surface) that the moon's gravitational pull moves the water, resulting in high and low tides.
- ❖ Coastal flooding from the ocean generally occurs in response to a combination of three processes which include:
 - Storm surge, tidal conditions and wind generated waves
- ❖ FEMA designates coastal flooding with the following SFHAs: Zone VE, AE, AO, X



Distinctions of Flooding Sources

Shallow Ponding Flooding:

- ❖ For the purposes of the NFIP, shallow flooding is defined as flooding with an average depth less than 3 feet, where no defined channel exists.
- ❖ Different types of shallow flooding commonly occur throughout the United States. Types of flows that result in shallow flooding include the following:
 - Unconfined flows over broad, relatively low relief areas, such as alluvial plains;
 - Intermittent flows in arid regions that have not developed a system of well-defined channels;
 - Overbank flows which are independent from the main channel;
 - Overland flow in urban areas; and
 - Flows collecting in depressions from ponding areas.
- ❖ FEMA designates shallow ponding flooding with the following SFHAs: Zone A, AH, AO, X (Shaded)

Flood Insurance Study (FIS)

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
SEMINOLE TRIBE OF FLORIDA	120685



Revised:
May 16, 2012



Federal Emergency Management Agency
FLOOD INSURANCE STUDY NUMBER
12021CV000B

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PUBLISHED SEPARATELY:

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Flood Insurance Rate Map

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FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 7



CHARLOTTE COUNTY, FLORIDA AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
CHARLOTTE COUNTY, UNINCORPORATED AREAS	120061
PUNTA GORDA, CITY OF	120062



FEMA

REVISED:

December 15, 2022

FLOOD INSURANCE STUDY NUMBER
12015CV001B

Version Number 2.6.3.5

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Flood Insurance Study (FIS)- Purpose & Study Area

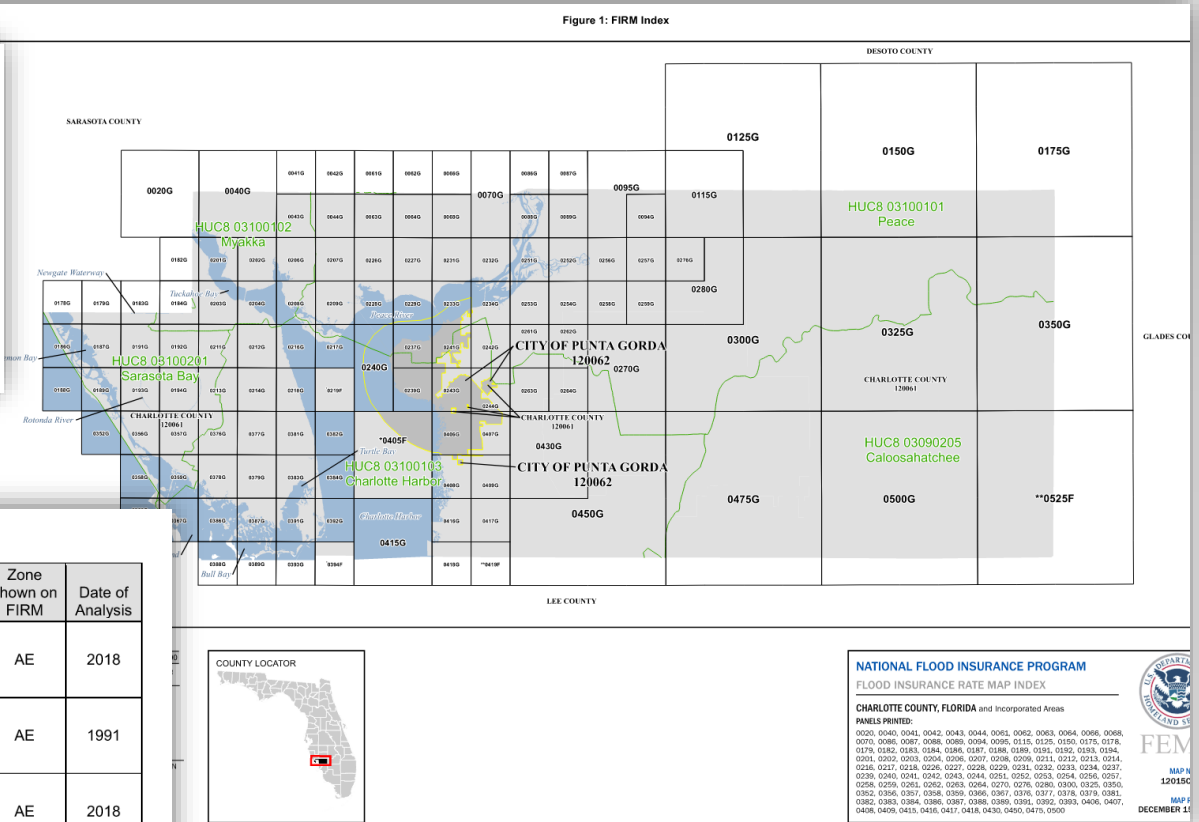
1.2 Purpose of this Flood Insurance Study Report

This Flood Insurance Study (FIS) Report revises and updates information on the existence and severity of flood hazards for the study area. The studies described in this report developed flood hazard data that will be used to establish actuarial flood insurance rates and to assist communities in efforts to implement sound floodplain management.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive than the minimum federal requirements. Contact your State NFIP Coordinator to ensure that any higher state standards are included in the community's regulations.

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Alligator Creek	Charlotte County, Unincorporated Areas; Punta Gorda, City of	At mouth	Approximately 700 feet upstream of confluence of South Prong Alligator Creek	03100103	6.9	--	Y	AE	2018
Alligator Creek	Charlotte County, Unincorporated Areas	Approximately 700 feet upstream of confluence of South Prong Alligator Creek	Approximately 200 feet upstream of Alfred Boulevard	03100103	1.2	--	Y	AE	1991
Auburn Waterway	Charlotte County, Unincorporated Areas	Confluence with Pellam Waterway	Approximately 80 feet upstream of U.S. Route 41/ Tamiami Trail	03100101	2.5	--	N	AE	2018
Auburn Waterway	Charlotte County, Unincorporated Areas	Approximately 80 feet upstream of U.S. Route 41/ Tamiami Trail	Hillsborough Boulevard	03100101	1.0	--	N	AE	2000
Broad Creek	Charlotte County, Unincorporated Areas	U.S. Route 17/ Duncan Road	Approximately 1 mile upstream of Airport Road	03100101	2.8	--	N	AE	2018
Broad Creek Tributary	Charlotte County, Unincorporated Areas	Driveway	Approximately 1,970 feet upstream of Driveway	03100101	0.4	--	N	AE	2018
		Approximately 1,970							



Flood Insurance Study (FIS)- Engineering Methods/Analysis

SECTION 5.0 – ENGINEERING METHODS

For the flooding sources 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 that are expected to be equaled or exceeded at least once on the average during any 10-, 25-, 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-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2-percent-annual-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 that equals or exceeds the 100-year flood (1-percent chance of annual exceedance) during the term of a 30-year mortgage is approximately 26 percent (about 3 in 10); 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 community at the time of

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Alligator Creek	At mouth	30.8	1,812	*	3,169	3,912	6,026
Alligator Creek	At I-75	28.5	1,718	*	3,004	3,708	5,704
Alligator Creek	Just upstream of confluence of South Prong Alligator Creek	10.0	729	*	1,035	1,417	2,017
Alligator Creek	At Jones Loop Road	6.6	404	*	643	761	1,062
Auburn Waterway	At Pellam Boulevard	2.63	990	*	1,410	1,670	2,090
Auburn Waterway	At Toledo Blade Boulevard	0.76	332	*	521	637	743
Auburn Waterway	At U.S. Route 41	0.35	282	*	396	519	662
Broad Creek	At State Route 17	5.2	896	*	1,118	1,206	1,356

completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

The engineering analyses described here incorporate the results of previously issued Letters of Map Change (LOMCs) listed in Table 26, "Incorporated Letters of Map Change", which include Letters of Map Revision (LOMRs). For more information about LOMRs, refer to Section 6.5, "FIRM Revisions."

5.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. A summary of the hydrologic methods applied to develop the discharges used in the hydraulic analyses for each stream is provided in Table 12. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 9. (Coastal stillwater elevations are discussed in Section 5.3 and shown in Table 16.) Stream gage information is provided in Table 11.

Table 12: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Alligator Creek	At mouth	Approximately 700 feet upstream of confluence of South Prong Alligator Creek	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Alligator Creek	Approximately 700 feet upstream of confluence of South Prong Alligator Creek	Approximately 200 feet upstream of Alfred Boulevard	Regional Regression Equations and log-Pearson Type III	HEC-2	1991	AE w/ Floodway	Discharges were adjusted for urbanization using established procedures (USGS 1984). Stream gage data obtained were used to develop log-Pearson Type III distributions giving additional estimates of the 10-, 50-, 100-, and 500-year discharges at those sites (USGS undated). These discharges were weighted with those calculated from the regional regression equations using established procedures (USGS 1982).
Auburn Waterway	Confluence with Pellam Waterway	Approximately 80 feet upstream of U.S. Route 41	*	Combined probability calculation	2018	AE	Combined probability analysis was calculated for each riverine cross section that intersected

Flood Insurance Study (FIS) - Coastal Analysis & Data

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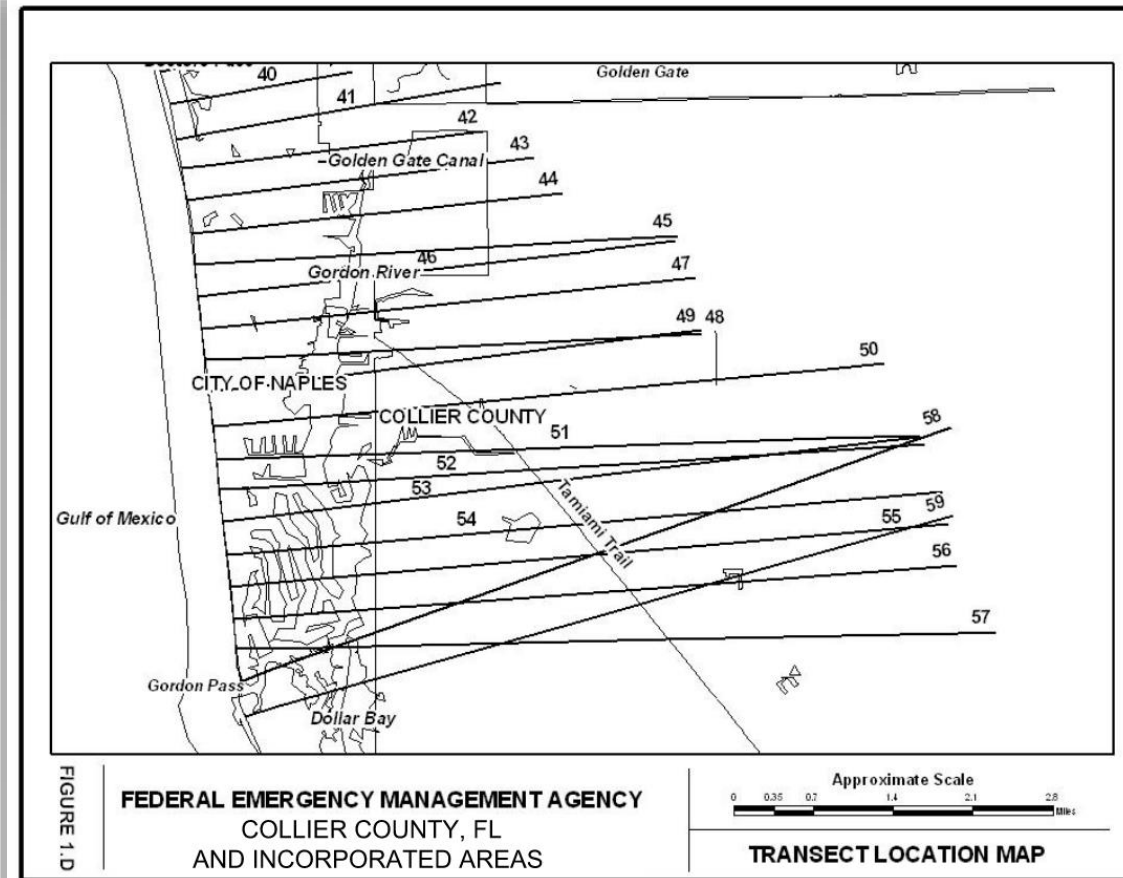
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PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map



Flood Insurance Study (FIS) - Coastal Analysis & Data

Table 14: Summary of Coastal Analyses

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
Charlotte Harbor	Sarasota/ Charlotte County boundary	Charlotte/ Lee County boundary	Overland Wave Propagation	WHAFIS	01/01/20
Charlotte Harbor	Sarasota/ Charlotte County boundary	Charlotte/ Lee County boundary	Statistical Analyses	JPM	01/01/20
Charlotte Harbor	Sarasota/ Charlotte County boundary	Charlotte/ Lee County boundary	Storm Surge	ADCIRC	01/01/20
Charlotte Harbor	Sarasota/ Charlotte County boundary	Charlotte/ Lee County boundary	Wave Generation	SWAN	01/01/20
Charlotte Harbor	Sarasota/ Charlotte County boundary	Charlotte/ Lee County boundary	Wave Runup	CHAMP/ RUNUP 2.0	01/01/20
Charlotte Harbor	Sarasota/ Charlotte County boundary	Charlotte/ Lee County boundary	Wave Setup	ADCIRC, SWAN	01/01/20
Gasparilla Sound	Sarasota/ Charlotte County boundary	Charlotte/ Lee County boundary	Overland Wave Propagation	WHAFIS	01/01/20
Gasparilla Sound	Sarasota/ Charlotte County boundary	Charlotte/ Lee County boundary	Statistical Analyses	JPM	01/01/20

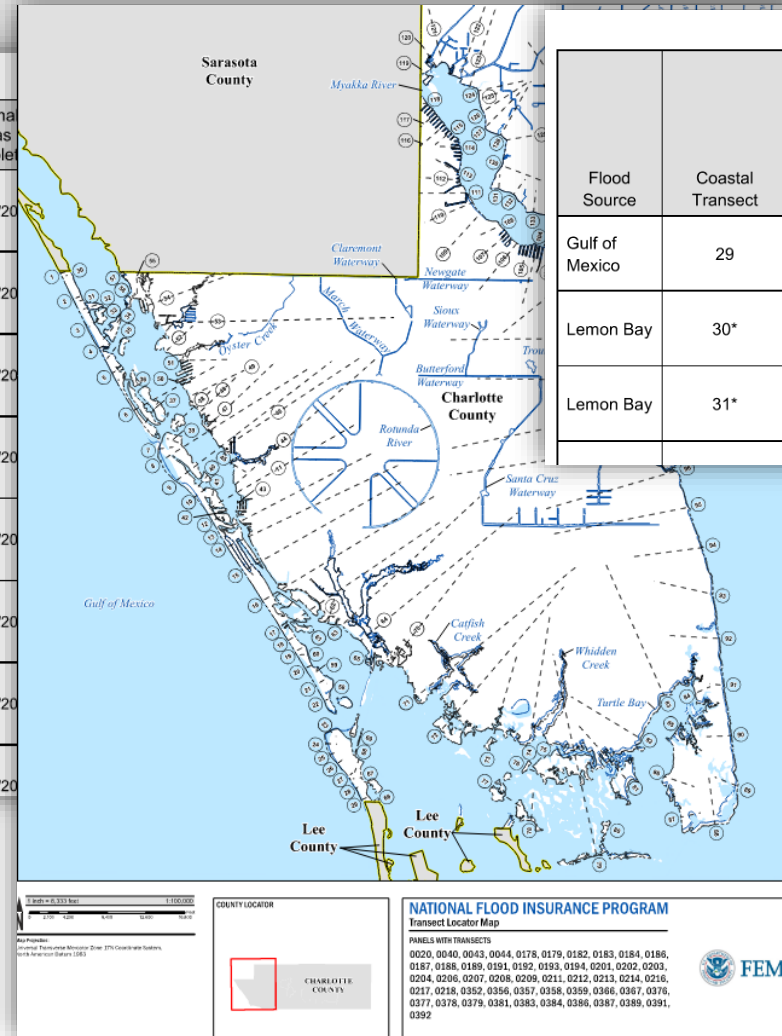


Table 16: Coastal Transect Parameters (continued)

Flood Source	Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				
		Significant Wave Height H_s (ft)	Peak Wave Period T_p (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Gulf of Mexico	29	11.8	11.6	3.7 3.3 - 3.7	5.4 4.8 - 5.4	6.9 5.9 - 6.9	8.3 7.0 - 8.3	11.5 9.4 - 11.5
Lemon Bay	30*	11.7	11.6	3.6 3.3 - 3.6	5.4 4.7 - 5.4	6.8 5.7 - 6.8	8.3 6.7 - 8.3	11.5 9.0 - 11.5
Lemon Bay	31*	2.9	2.8	3.4 3.4 - 3.6	5.2 5.2 - 5.2	6.5 6.5 - 6.7	7.9 7.9 - 8.1	11.5 11.4 - 11.5

- Coastal Transect Map
- Coastal Transect Initial Wave Conditions and Stillwater Elevations (SWELs)

Elements of the FIRM: Coastal Flood Hazard Areas

Name of Flooding Source

Coastal Transects: Dashed Lines and Numbers

White Lines Delineate SFHA zones



ZONE VE- Represents level of flood risk with storm surge and wave heights 3 feet or greater/ BFE indicated with "EL XX"

ZONE AE – Represents level of flood risk with storm surge and wave heights less than 3 feet/ BFE indicated with "EL XX."

Flood Insurance Study (FIS) - Coastal Data

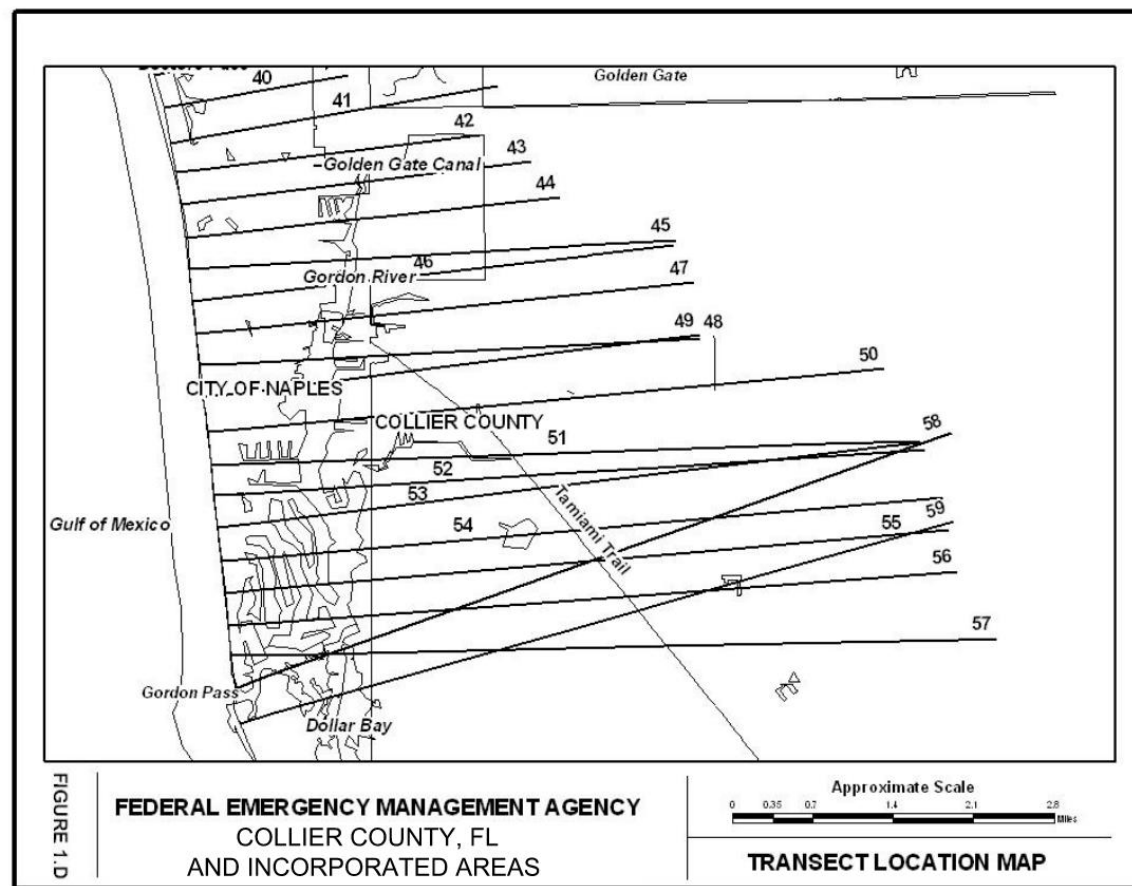


Table 2. Summary of Stillwater Elevations cont.

Transect Number	Flooding Source and Location	Starting Stillwater (without wave setup) Elevations (NAVD88)			
		10 percent- annual- chance	2 percent- annual- chance	1 percent- annual- chance	0.2 percent- annual- chance
48	In the vicinity of 32 10th Ave. South	3.80 ¹	7.25 ¹	8.40 ¹	10.43 ¹
49	Approximately 370' South of Naples Pier	3.87	7.28	8.41	10.41
50	In the vicinity of 1680 Gulfshore Blvd	3.80 ¹	7.24 ¹	8.37 ¹	10.37 ¹
51	In the vicinity of 2050 Gordon Drive	3.77 ¹	7.19 ¹	8.34 ¹	10.37 ¹
52	In the vicinity of 2490 Gordon Drive	3.72	7.15	8.30	10.33
53	In the vicinity of 2790 Gordon Drive	3.70 ¹	7.12 ¹	8.27 ¹	10.31 ¹
54	In the vicinity of 3170 Gordon Drive	3.67 ¹	7.09 ¹	8.24 ¹	10.28 ¹
55	In the vicinity of 3550 Gordon Drive	3.65	7.06	8.21	10.26
56	In the vicinity of 3944 Gordon Drive	3.53	6.97	8.12	10.19
57	In the vicinity of 4348 Gordon Drive	3.53	6.97	8.12	10.19
58	Approximately 250' north of north side of Gordon Pass	3.53	6.97	8.12	10.19
59	Approximately 925' south of south side of Gordon Pass	3.53 ¹	6.95 ¹	8.11 ¹	10.20 ¹
60	Approximately 14,000' north of the south tip of Keewaydin Island	3.46	6.71	7.91	10.06
61	Approximately 2700' south of the south tip of Keewaydin Island	3.67 ¹	6.59 ¹	7.66 ¹	9.60 ¹
62	Approximately 0 LA Peninsula Blvd	3.38 ¹	6.24 ¹	7.28 ¹	9.30 ¹
63	Transect starts approximately in the middle of Hiway Beach at the north end of Marco Island. Transect runs from north to south.	3.92 ¹	6.09 ¹	7.15 ¹	9.19 ¹
64	Marco Island - Transect crosses Collier Blvd approximately 450' north of intersection with San Marco Drive	3.66	6.65	7.80	9.88
65	Goodland- approximately 2,200' south of 751 Palm Point Drive. Transect runs south to north	4.76	7.83	8.94	11.22
66	Everglades City- Transect begins approximately 22,600' south west of middle of airport. Transect runs south to north	4.56	7.99	9.28	11.80
67	Everglades City- Transect begins approximately 1,000' south west of Chokoloskee. Transect runs south to north	4.56	7.99	9.28	11.80

¹ Stillwater have been interpolated, based on distance from PROBs evaluation points

Flood Insurance Study (FIS) - Coastal Data

Table 3. Transect Data cont.

Flooding Source	Stillwater Elevation (NAVD88)				Zone	BFE (NAVD88)
	10-percent-annual-chance	2-percent-annual-chance	1-percent-annual-chance	0.2-percent-annual-chance		
Gulf of Mexico						
Transect 54	3.67 ²	7.09 ²	9.64 ^{1,2}	10.28 ²	VE	12-16
					AE	9-12
	3.67 ²	7.09 ²	8.24 ^{2,3}	10.28 ²	AE	7-9
	3.01	5.79	6.89	8.98	VE	8
					AE	7-9
Transect 55	4.03	5.40	6.30	8.26	VE	8
					AE	7
	3.65	7.06	9.61 ¹	10.26	VE	12-16
					AE	9-12
	3.65	7.06	8.21 ³	10.26	AE	7-9
Transect 56	3.01	5.79	6.89	8.98	AE	7-8
	3.54	5.31	6.25	8.30	AE	7
	4.03	5.40	6.30	8.26	AE	7
	3.53	6.97	9.52 ¹	10.19	VE	12-16
					AE	9-11
Transect 57	3.53	6.97	8.12 ³	10.19	AE	7-9
					AE	6-8
	3.01	5.79	6.89	8.98	AE	6-8
	3.54	5.31	6.25	8.33	AE	6-8
	4.03	5.40	6.30	8.26	AE	6-8
	3.53	6.97	9.52 ¹	10.19	VE	12-16
					AE	8-11
	3.53	6.97	8.12 ³	10.19	VE	10
					AE	6-9
	3.88	5.55	6.36	8.36	AE	6
	3.39	5.08	5.85	7.74	AE	6-7
	5.86	6.26	6.78	8.12	AE	6-7
	7.35	7.43	7.69	8.49	AE	7

Table 2. Summary of Stillwater Elevations cont.

Transect Number	Flooding Source and Location	Starting Stillwater (without wave setup) Elevations (NAVD88)			
		10 percent-annual-chance	2 percent-annual-chance	1 percent-annual-chance	0.2 percent-annual-chance
48	In the vicinity of 32 10th Ave. South	3.80 ¹	7.25 ¹	8.40 ¹	10.43 ¹
49	Approximately 370' South of Naples Pier	3.87	7.28	8.41	10.41
50	In the vicinity of 1680 Gulfshore Blvd	3.80 ¹	7.24 ¹	8.37 ¹	10.37 ¹
51	In the vicinity of 2050 Gordon Drive	3.77 ¹	7.19 ¹	8.34 ¹	10.37 ¹
52	In the vicinity of 2490 Gordon Drive	3.72	7.15	8.30	10.33
53	In the vicinity of 2790 Gordon Drive	3.70 ¹	7.12 ¹	8.27 ¹	10.31 ¹
54	In the vicinity of 3170 Gordon Drive	3.67 ¹	7.09 ¹	8.24 ¹	10.28 ¹
55	In the vicinity of 3550 Gordon Drive	3.65	7.06	8.21	10.26
56	In the vicinity of 3944 Gordon Drive	3.53	6.97	8.12	10.19
57	In the vicinity of 4348 Gordon Drive	3.53	6.97	8.12	10.19
58	Approximately 250' north of north side of Gordon Pass	3.53	6.97	8.12	10.19
59	Approximately 925' south of south side of Gordon Pass	3.53 ¹	6.95 ¹	8.11 ¹	10.20 ¹
60	Approximately 14,000' north of the south tip of Keewaydin Island	3.46	6.71	7.91	10.06
61	Approximately 2700' south of the south tip of Keewaydin Island	3.67 ¹	6.59 ¹	7.66 ¹	9.60 ¹
62	Approximately 0 LA Peninsula Blvd	3.38 ¹	6.24 ¹	7.28 ¹	9.30 ¹
63	Transect starts approximately in the middle of Hiway Beach at the north end of Marco Island. Transect runs from north to south.	3.92 ¹	6.09 ¹	7.15 ¹	9.19 ¹
64	Marco Island - Transect crosses Collier Blvd approximately 450' north of intersection with San Marco Drive	3.66	6.65	7.80	9.88
65	Goodland- approximately 2,200' south of 751 Palm Point Drive. Transect runs south to north	4.76	7.83	8.94	11.22
66	Everglades City- Transect begins approximately 22,600' south west of middle of airport. Transect runs south to north	4.56	7.99	9.28	11.80
67	Everglades City- Transect begins approximately 1,000' south west of Chokoloskee. Transect runs south to north	4.56	7.99	9.28	11.80

¹ Stillwater have been interpolated, based on distance from PROBs evaluation points

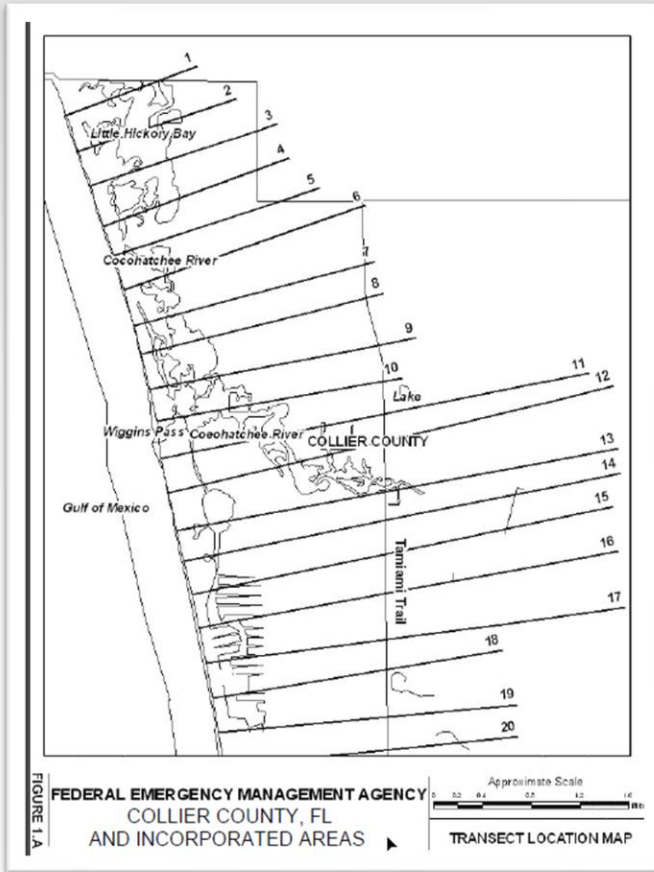
Coastal Transects: FIS Data Tables

Table 3. Transect Data

Flooding Source	Stillwater Elevation (NAVD88)				Zone	BFE (NAVD88)
	10-percent-annual-chance	2-percent-annual-chance	1-percent-annual-chance	0.2-percent-annual-chance		
Gulf of Mexico Transect 1	3.73 ²	8.06 ²	11.01 ^{1,2}	12.38 ²	VE	13-16
	3.73 ²	8.06 ²	9.61 ^{2,3}	12.38 ²	AE	10-12
	3.42	7.03	8.47	11.72	AE	9-10
					AE	9-10
Transect 2	3.74	8.06	11.00 ¹	12.32	VE	13-16
	3.74	8.06	9.60 ³	12.32	AE	10-12
	3.52 ²	7.07 ²	8.49 ²	11.68 ²	AE	9-10
					VE	11
Transect 3	3.76 ²	8.09 ²	11.02 ^{1,2}	12.33 ²	AE	9-10
					VE	13-16
	3.76 ²	8.09 ²	9.62 ^{2,3}	12.33 ²	AE	10-12
					VE	11
Transect 4					AE	10-11
	3.78	8.12	11.03 ¹	12.34	VE	13-16
	3.78	8.12	9.63 ³	12.34	AE	10-12
	3.62	7.10	8.51	11.63	AE	10
Transect 5					AE	10
	3.78 ²	8.07 ²	10.97 ^{1,2}	12.24 ²	VE	13-16
	3.78 ²	8.07 ²	9.57 ^{2,3}	12.24 ²	AE	10-12
					AE	10
Transect 6	3.78 ²	8.07 ²	10.97 ^{1,2}	12.24 ²	VE	13-16
	3.78 ²	8.07 ²	9.57 ^{2,3}	12.24 ²	AE	10-12
	3.54 ²	7.17 ²	8.59 ²	11.63 ²	VE	10
					AE	9-10
Transect 7	3.78	8.02	10.90 ¹	12.14	VE	13-16
	3.78	8.02	9.50 ³	12.14	AE	10-12
					AE	9-10
Transect 8	3.79 ²	7.98 ²	10.84 ^{1,2}	12.05 ²	VE	13-16
	3.79 ²	7.98 ²	9.44 ^{2,3}	12.05 ²	AE	10-12
					AE	9-10
Transect 9	3.79 ²	7.98 ²	10.84 ^{1,2}	12.05 ²	VE	12-16
	3.79 ²	7.98 ²	9.44 ^{2,3}	12.05 ²	AE	10-12
	3.61 ²	7.40 ²	8.78 ²	11.59 ²	AE	10
					AE	9-10

Represents mapped SFHAs on FIRM with corresponding BFE

Coastal Transects



Coastal Transect Location Map

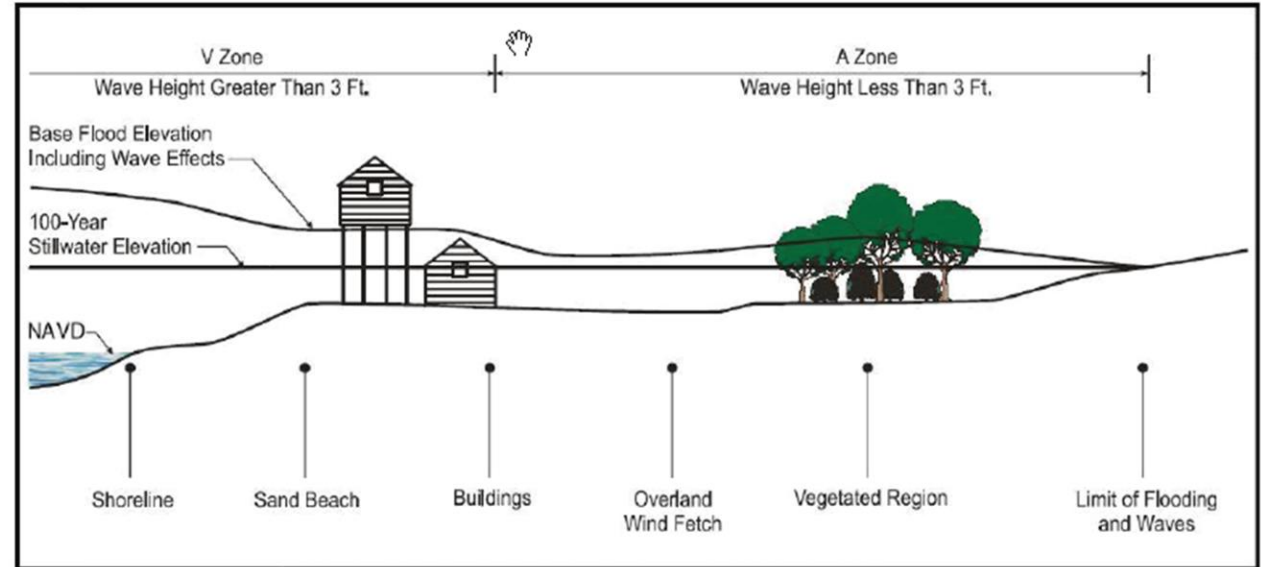


Figure 2. Transect Schematic

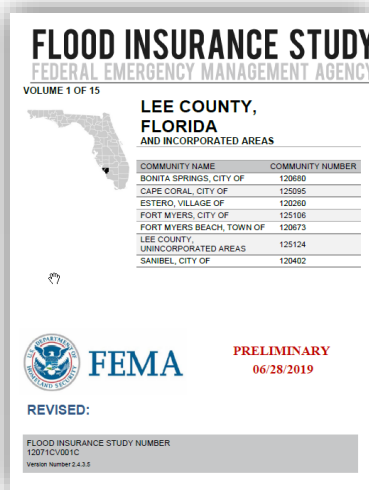
Typical Coastal Transect Schematic

Updates to Coastal Studies/FIRMs

FEMA has been working on a new coastal study for southwest Florida and includes the following Counties:

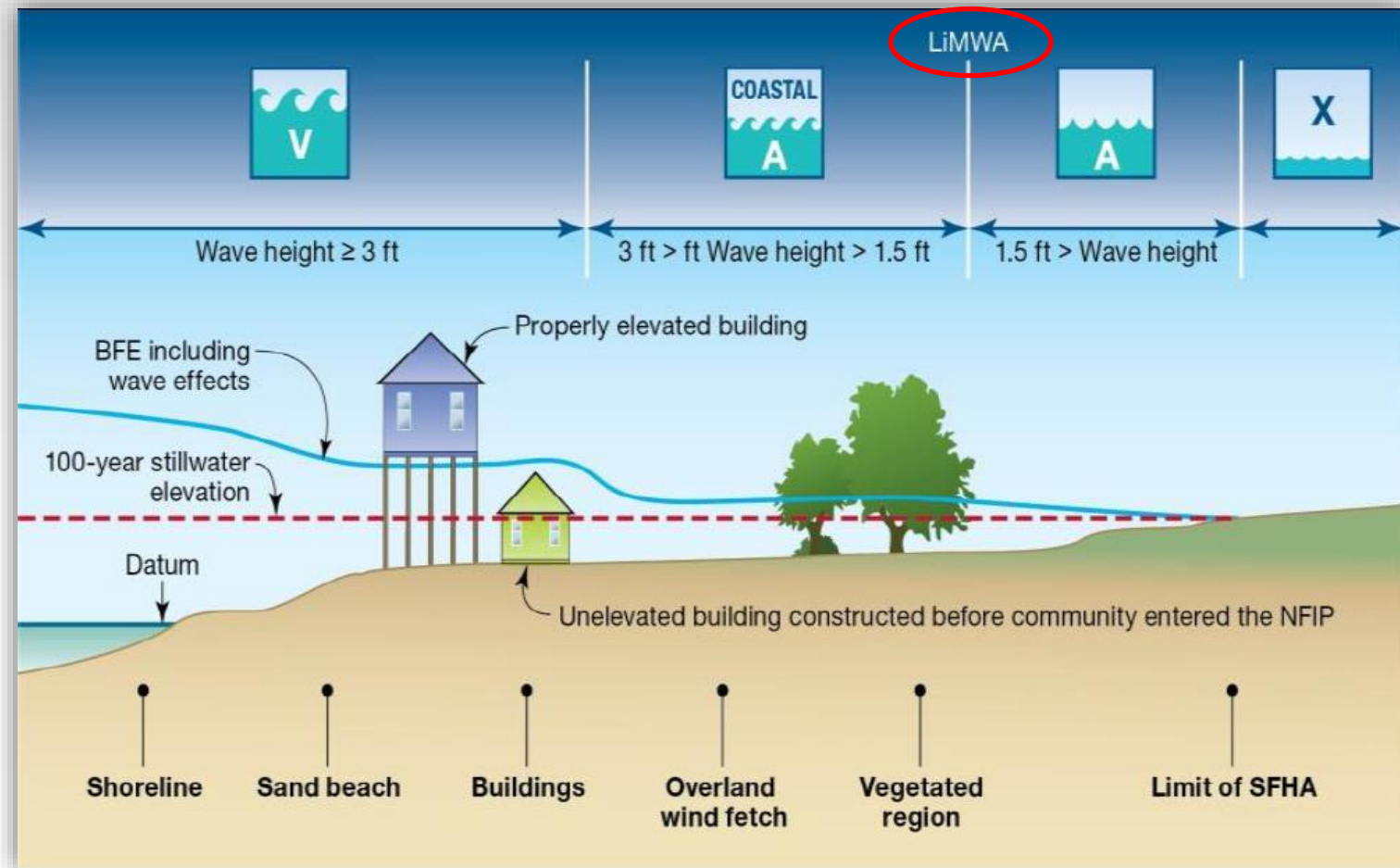
- Sarasota
- Charlotte
- Lee
- DeSoto
- Hendry
- Collier

Coastal study includes an update to the regional storm surge modeling, using more recent topographic and bathymetric data, storm data, tidal data, etc.



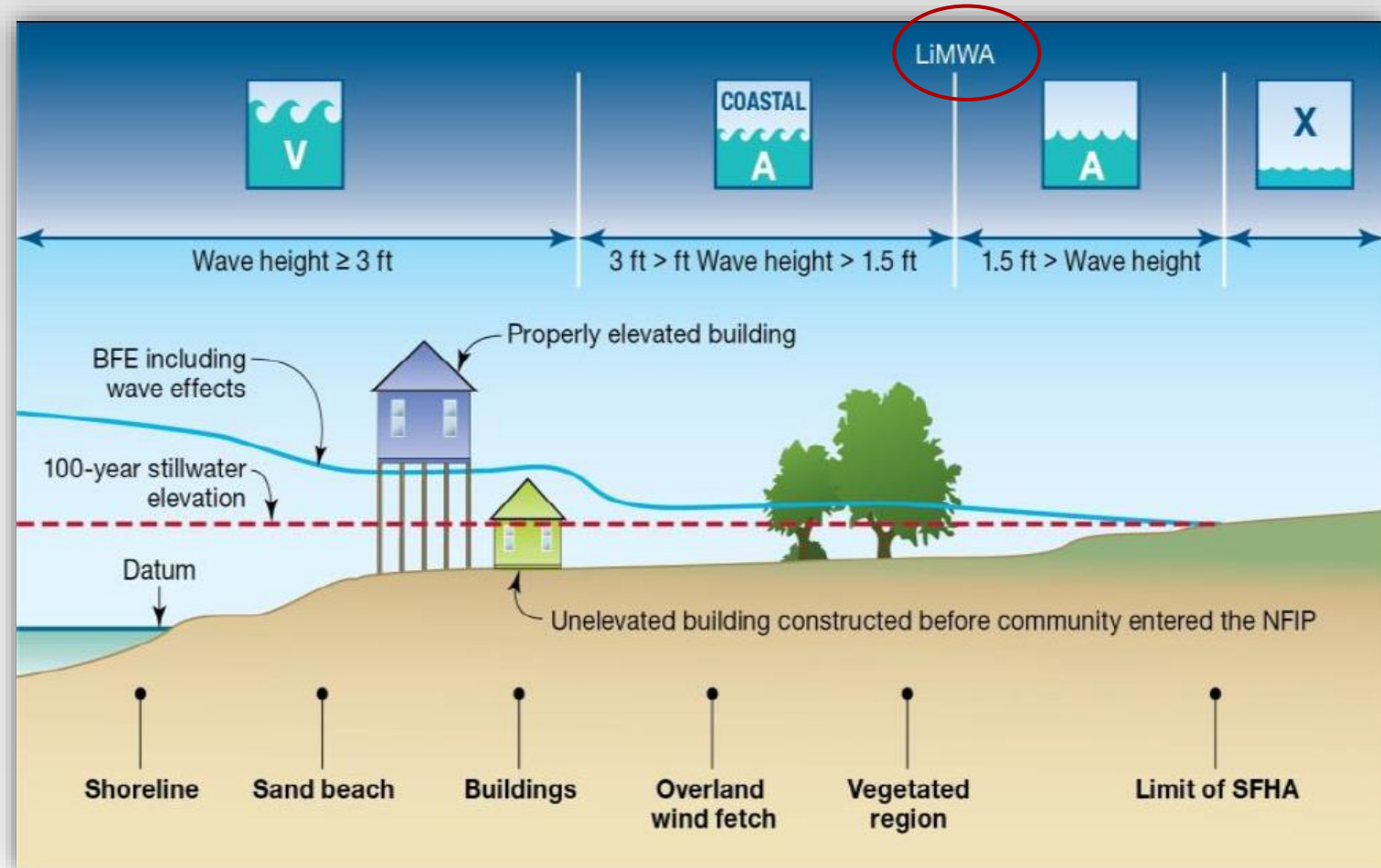
Elements of Coastal Flooding

- New FIRMs include the mapping of the LiMWA boundary. LiMWA stands for “*Limit of Moderate Wave Action*” and represents the area in which the coastal waves are between 1.5 feet and 3.0 feet in height above the 100-year Stillwater Elevation.
- LiMWA represents the limit of the “Coastal” Zone A.
- This new boundary will affect coastal construction requirements.



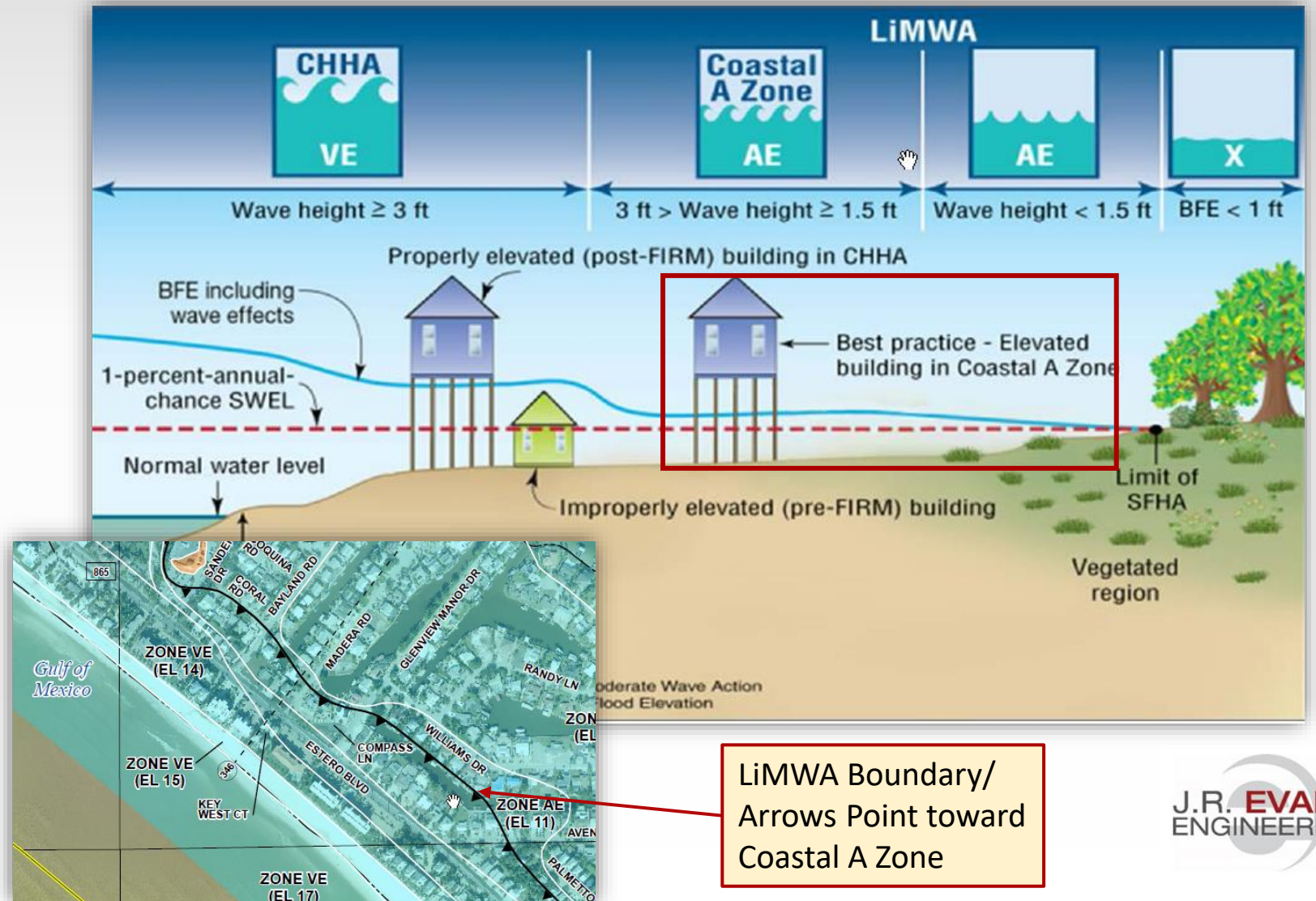
Elements of Coastal Flooding: Added Data to FIRMs

- Newly issued FIRMs may include the mapping of the LiMWA boundary. LiMWA stands for “*Limit of Moderate Wave Action*” and represents the area in which the coastal waves are between 1.5 feet and 3.0 feet in height above the 100-year Stillwater Elevation (SWEL).
- LiMWA represents the limit of the “Coastal” Zone A.
- This new boundary will affect coastal construction requirements.

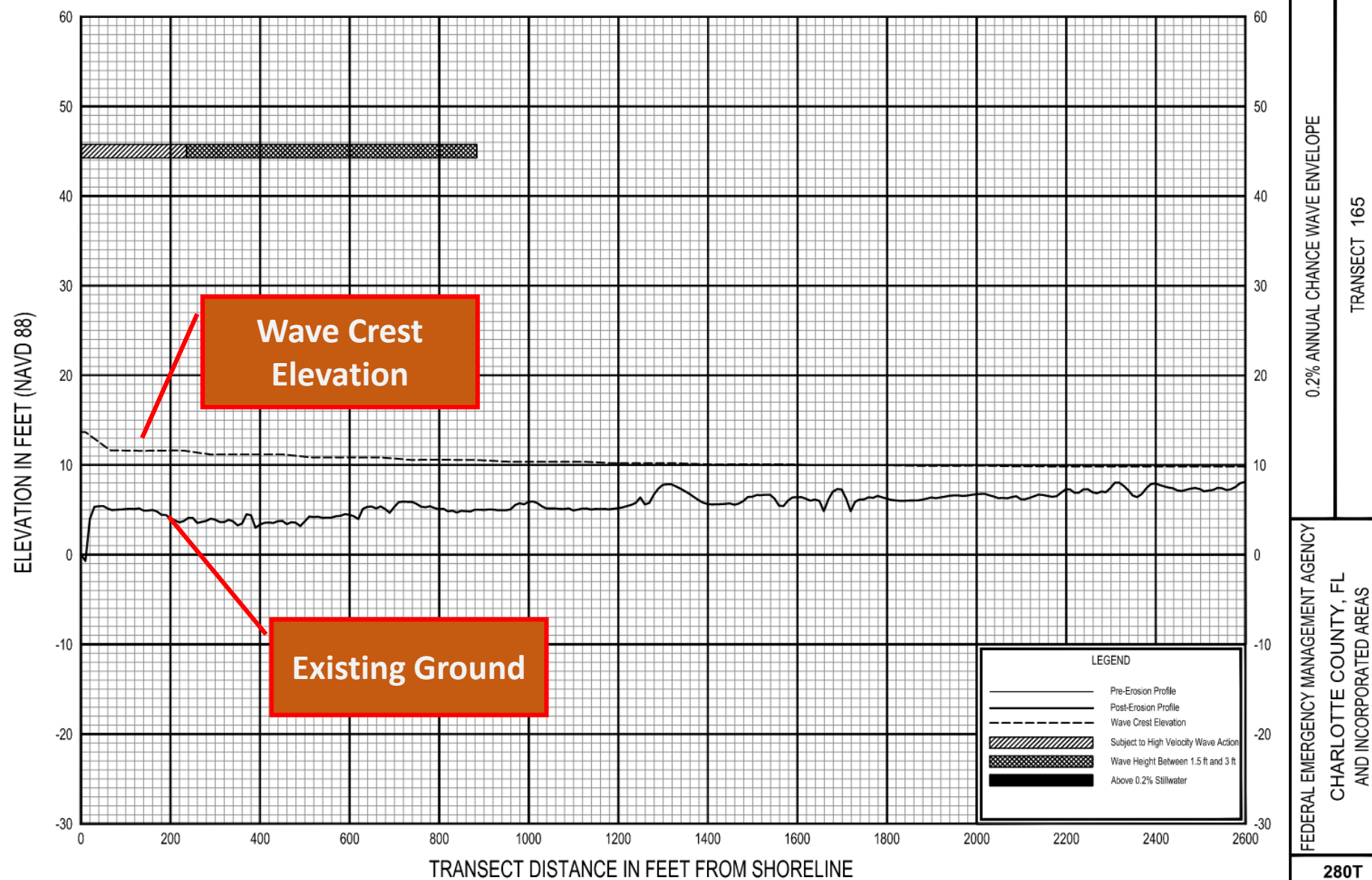


Elements of Coastal Flooding: Added Data to FIRMs

- New buildings located within the LiMWA boundary; generally, VE Zone construction requirements will be applicable per Florida Building Code (FBC). The requirements include (not limited to) the following:
 - Habitable Floor Elevated to above Base Flood Elevation (BFE).
 - Break-away Walls with Proper Venting for Enclosures
 - Limits on Enclosure Uses
- This also affects future substantial improvements to existing structures in which the improvements exceed 50% of structure value.
- No Federal Insurance regulatory requirement tied to LiMWA, at this time.

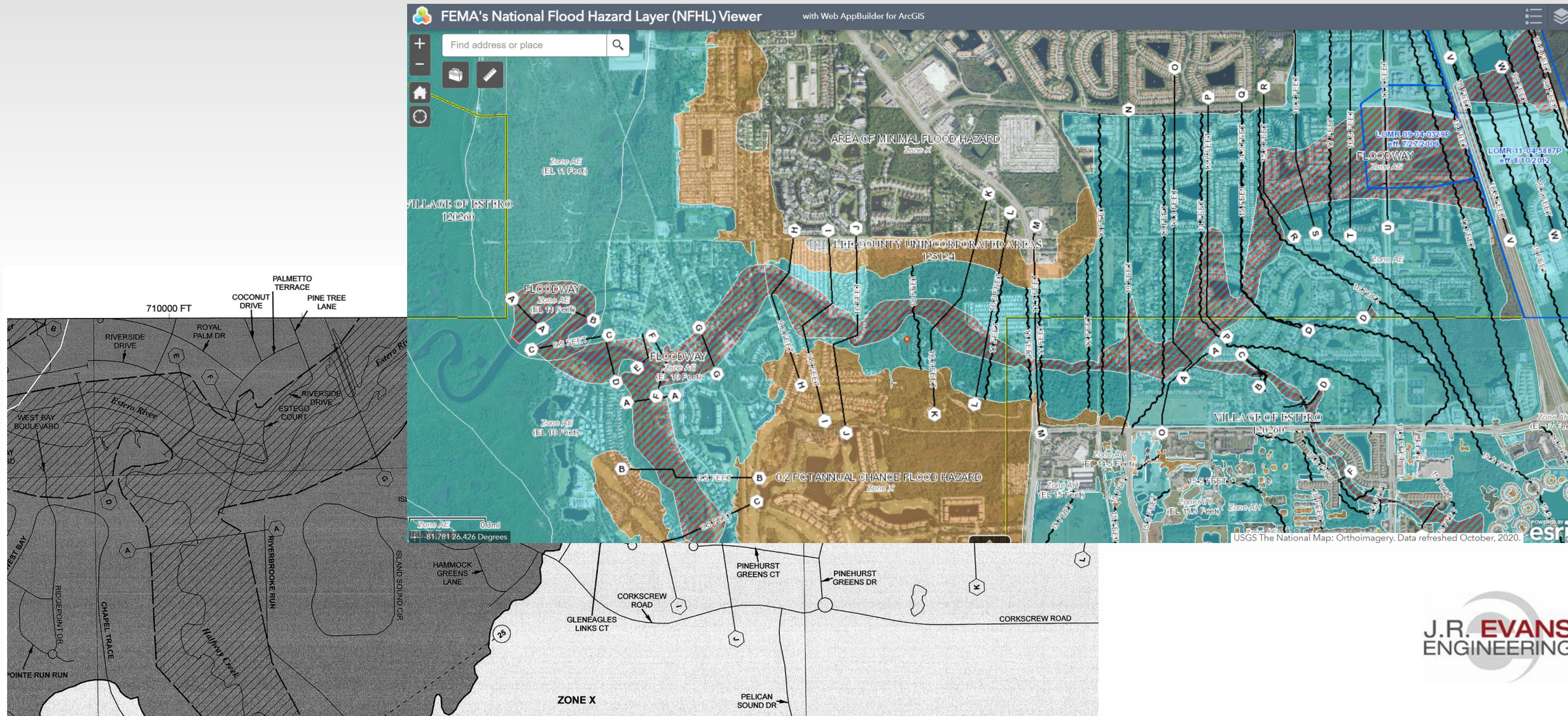


FIS Coastal Transect Profiles- More Data (without access to model)



- Coastal Transect Profiles:
- Ground Elevation with Eroded Profile
 - 1%-Annual-Chance Event Wave Crest Elevation = Coastal BFE
 - Areas of High-Hazard Conditions and Coastal A Zones (CAZ)

Flood Insurance Study (FIS) – Riverine Data



Flood Insurance Study (FIS) – Riverine Data

- Summary of Discharges
- Floodway Data
- River Profiles

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Table 8 – Summary of Discharges (continued)

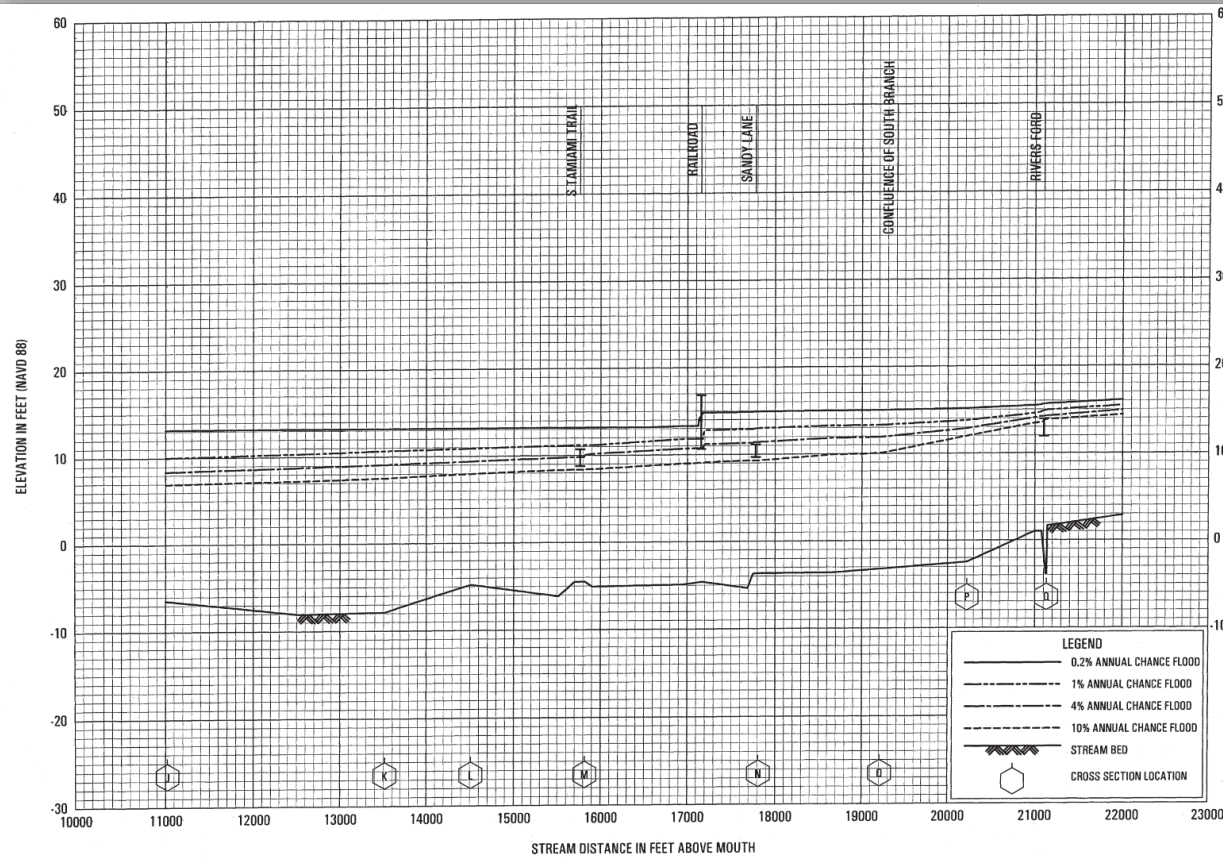
<u>Flooding Source and Location</u>	<u>Drainage Area (Square Miles)</u>	<u>PEAK DISCHARGES (cfs)</u>			
		<u>10-Percent- Annual-Chance</u>	<u>4-Percent-Annual- Chance</u>	<u>1-Percent- Annual-Chance</u>	<u>0.2-Percent- Annual-Chance</u>
ESTERO RIVER					
At mouth	61.54	3,152	4,435	6,185	8,419
At South Tamiami Trail	58.17	3,070	4,314	6,073	8,254
At I-75	41.19	2,351	3,258	4,698	6,395

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
ESTERO RIVER (Continued)								
I	9,911	997	4,569	1.3	9.8	9.8	10.1	0.3
J	11,024	475	3,981	1.5	10.0	10.0	10.3	0.3
K	13,511	565	3,847	1.6	10.6	10.6	11.0	0.4
L	14,511	540	2,675	2.3	10.9	10.9	11.3	0.4
M	15,817	200	1,641	3.7	11.1	11.1	12.0	0.9
N	17,811	1,390	5,574	0.9	13.0	13.0	14.0	1.0
O	19,207	786	5,926	0.9	13.3	13.3	14.2	0.9
P	20,221	2,071	3,358	1.5	13.8	13.8	14.6	0.8
Q	21,134	343	2,542	2.0	14.9	14.9	15.7	0.8
R	23,267	1,405	6,047	0.8	15.9	15.9	16.8	0.9
S	23,996	1,096	4,550	1.1	16.2	16.2	17.1	0.9
T	24,946	1,684	5,616	0.9	16.9	16.9	17.9	1.0
U	25,692	1,891	7,900	0.6	17.2	17.2	18.2	1.0
V	27,820	2,670	9,667	0.5	18.5	18.5	19.1	0.6

¹ Feet above mouth.

TABLE 11	FEDERAL EMERGENCY MANAGEMENT AGENCY LEE COUNTY, FL AND INCORPORATED AREAS	FLOODWAY DATA
		ESTERO RIVER

Flood Insurance Study (FIS) – Riverine Data



FLOOD PROFILES

ESTERO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEE COUNTY, FL
AND INCORPORATED AREAS

24P

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
ESTERO RIVER (Continued)								
I	9,911	997	4,569	1.3	9.8	9.8	10.1	0.3
J	11,024	475	3,981	1.5	10.0	10.0	10.3	0.3
K	13,511	565	3,847	1.6	10.6	10.6	11.0	0.4
L	14,511	540	2,675	2.3	10.9	10.9	11.3	0.4
M	15,817	200	1,641	3.7	11.1	11.1	12.0	0.9
N	17,811	1,390	5,574	0.9	13.0	13.0	14.0	1.0
O	19,207	786	5,926	0.9	13.3	13.3	14.2	0.9
P	20,221	2,071	3,358	1.5	13.8	13.8	14.6	0.8
Q	21,134	343	2,542	2.0	14.9	14.9	15.7	0.8
R	23,267	1,405	6,047	0.8	15.9	15.9	16.8	0.9
S	23,996	1,096	4,550	1.1	16.2	16.2	17.1	0.9
T	24,946	1,684	5,616	0.9	16.9	16.9	17.9	1.0
U	25,692	1,891	7,900	0.6	17.2	17.2	18.2	1.0
V	27,820	2,670	9,667	0.5	18.5	18.5	19.1	0.6

¹ Feet above mouth.

TABLE 11

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEE COUNTY, FL
AND INCORPORATED AREAS

FLOODWAY DATA

ESTERO RIVER

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FIS Data Tables for Riverine Studies

Floodway Data Tables (FDT):

For each watercourse that is detailed studied and contains a floodway, a table is provided in the FIS outlining the results of the study. The FIRM translates the study data and results into a mapping format. Provided is a sample FDT with highlights of specific elements:

Labeled Cross-sections:
Shown on FIRM

Distance (Feet) along
waterway from
mouth

Location where the coastal base flood elevation coincides with riverine base flood elevation

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BAYSHORE CREEK								
A	800	265	594	1.8	6.8 ²	0.8 ³	1.4	0.6
B	2,100	250	920	1.1	6.8 ²	3.4 ³	3.6	0.1
C	3,400	345	1,577	0.7	6.8 ²	3.7 ³	4.3	0.6
D	4,237	275	561	1.9	6.8 ²	4.0 ³	4.7	0.7
E	6,533	220	445	2.3	8.6	8.6	9.2	0.6
F	7,686	280	838	1.2	10.6	10.6	11.5	0.9
G	9,991	260	1,101	0.7	12.8	12.8	13.7	0.9
H	11,242	418	2,728	0.3	19.8	19.8	19.9	0.1
I	16,272	115	312	1.8	20.4	20.4	21.2	0.8
J	17,727	550	2,177	0.3	21.7	21.7	22.6	0.9
K	18,981	675	1,779	0.3	21.8	21.8	22.7	0.9
L	19,279	675	2,131	0.2	21.8	21.8	22.7	0.9
M	19,678	775	1,999	0.2	21.8	21.8	22.7	0.9
N	21,321	1,084	2,144	0.2	21.8	21.8	22.8	1.0

¹ Feet above mouth.

² Elevation computed without consideration of wave effects.

³ Elevation computed without consideration of backwater effects from Caloosahatchee River.

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEE COUNTY, FL
INCORPORATED AREAS

FLOODWAY DATA

BAYSHORE CREEK

Regulatory 100-Year Water Surface Elevation- Higher than “without Floodway” – considers coastal flooding effect. This is represented with a BFE Contour on the FIRM.

100-Year (Base Flood) Water Surface Elevation with Floodway Encroachment

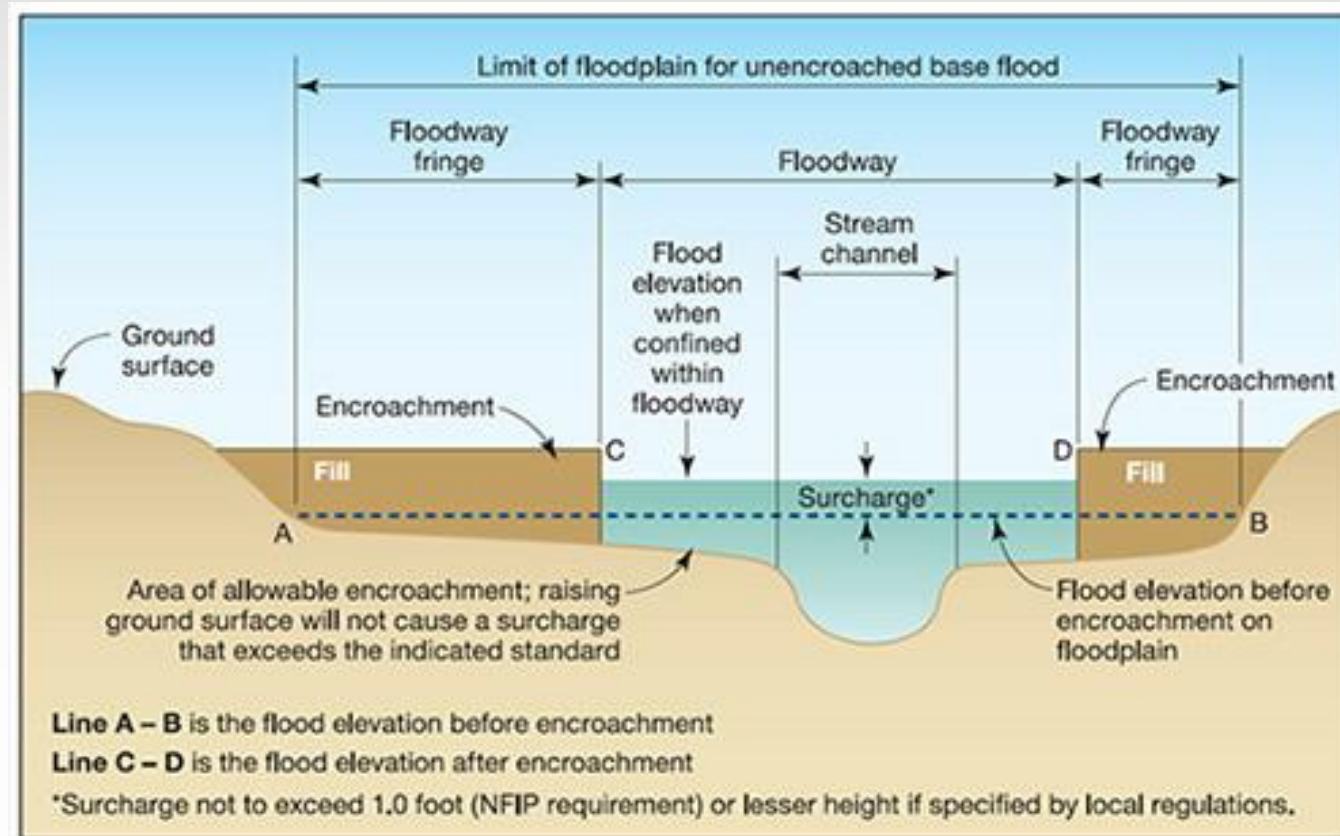
100-Year (Base Flood) Water Surface Elevation without Floodway Encroachment

What is a Regulatory Floodway?

FEMA Definition:

- A "**Regulatory Floodway**" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.
- The Floodway area is meant to represent the portion of the 1%-annual-chance-event (100-year) floodplain in which encroachment can occur without raising the water surface elevation by a certain amount, which is typically 1.0 ft.

What is a Regulatory Floodway?



Typical Riverine Floodplain Cross-section

Regulatory Floodway



NFIP Regulations and Requirements

44 CFR Section 60.3

- C(10) Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1–30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

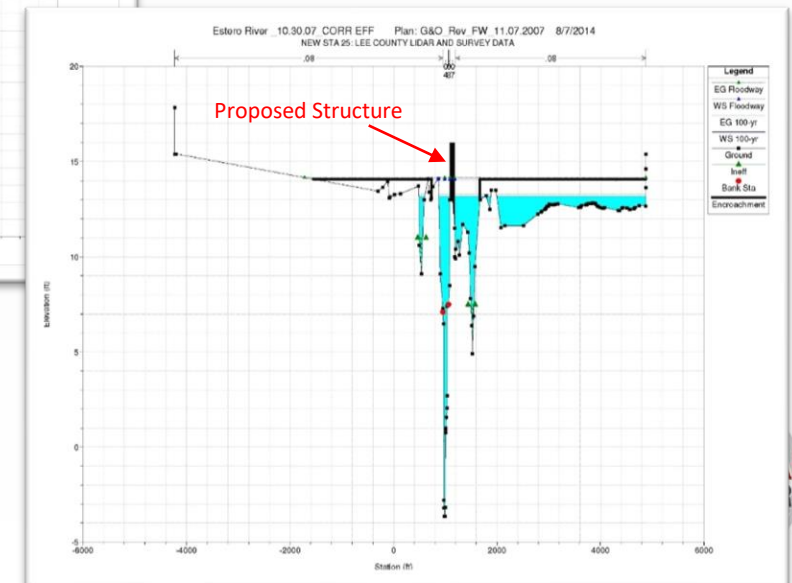
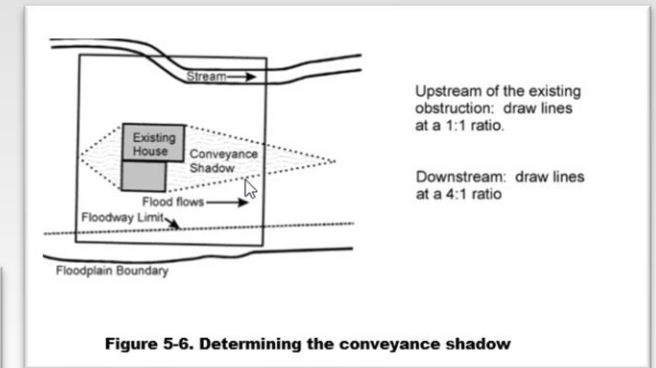
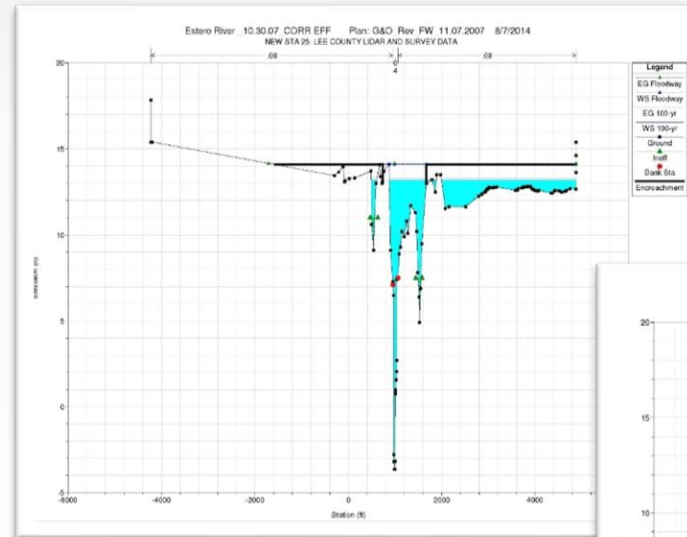
44 CFR Section 60.3

- d(3) Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge;

The analyses is referred to as a “No Rise/No Impact Certification.”

No Rise Certification Basics

- Every type of encroachment must be evaluated: Fence (even chain-link), new vertical structures (e.g. homes & sheds), fill placement, excavation, etc.
- The No Rise Certification must be certified by a licensed Professional Engineer, qualified to conduct the analysis.
- For small, minor encroachments (utility pole, open-type fence, etc.): The certification may be handled with evaluating flow *conveyance shadows* from adjacent upstream and downstream vertical structures or high ground.
- For encroachment evaluations that require a hydraulic analyses, the results must demonstrate no rise to the 0.00 ft degree between the effective base flood and floodway water elevations and proposed water elevations.



THANK YOU

ANY QUESTIONS

