TAYLOR ENGINEERING, INC.

FEMA Coastal Hazard Mapping and Beyond

What FEMA is doing to increase flood communication

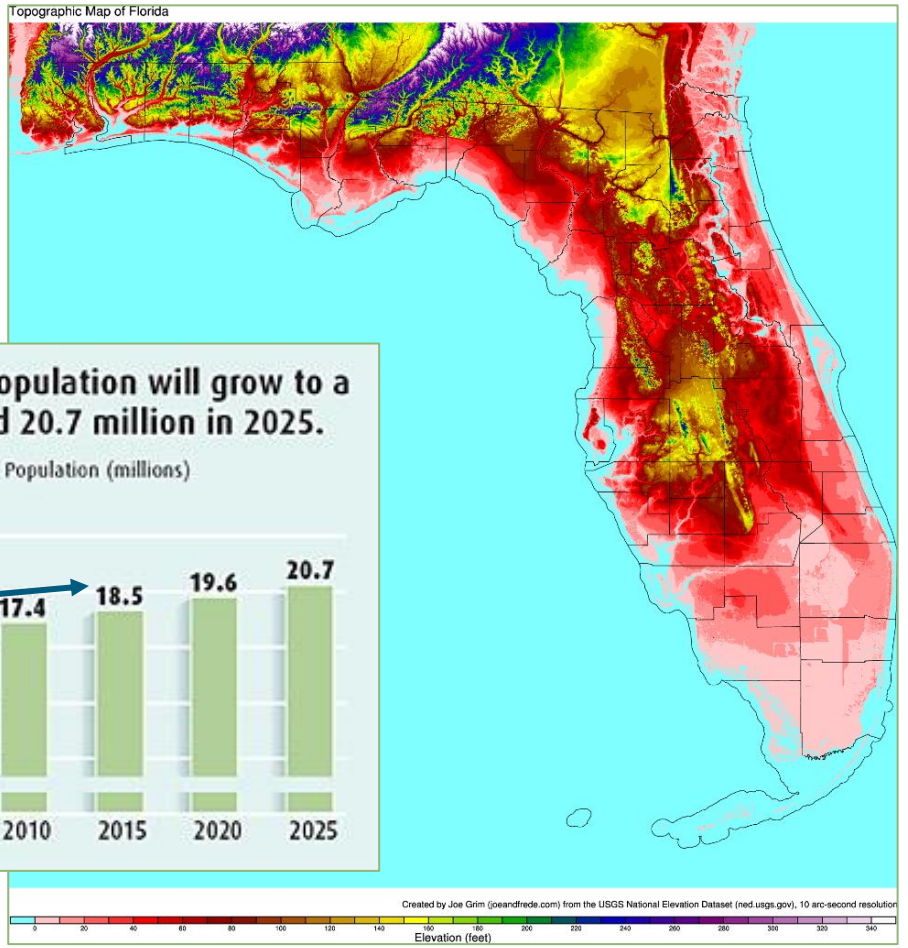
Presented by: Michael DelCharco

February 2017

FEMA Coastal Hazard Mapping and Beyond

Miami-Dade is an example of the exploding population

Where we live…
and will continue to live



We beat this –
actual **20M in 2015**

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FEMA Coastal Hazard Mapping and Beyond

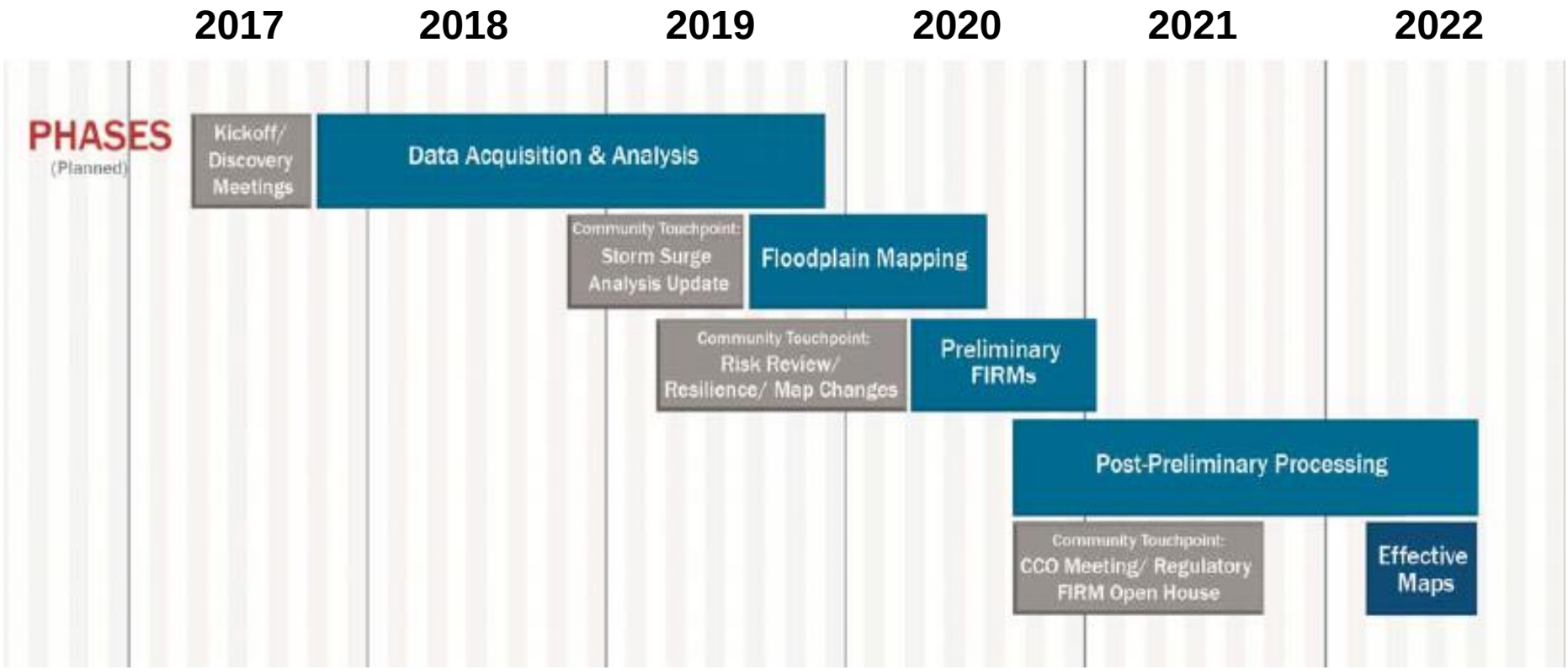
- National Flood Insurance Program - 1968
  - Result of flooding along Mississippi
  - Unknown risks

- FEMA's focus on NFIP
  - Provide flood insurance
  - Improve floodplain management
  - Develop maps of flood hazards

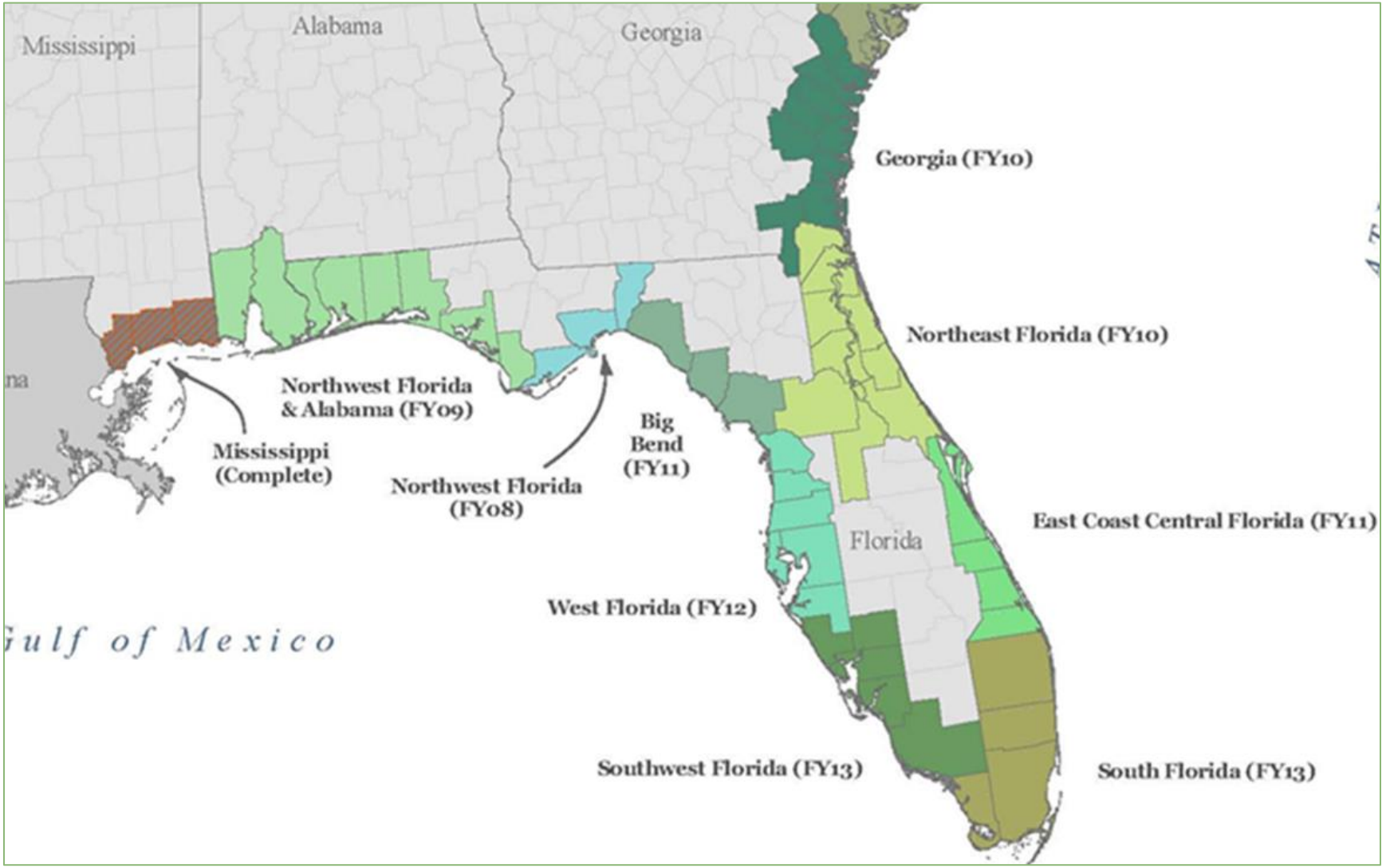
FEMA Coastal Hazard Mapping and Beyond

- Risk MAP Objective (Coastal)
  - To provide updated flood hazard data for 100% of the populated U.S. coast

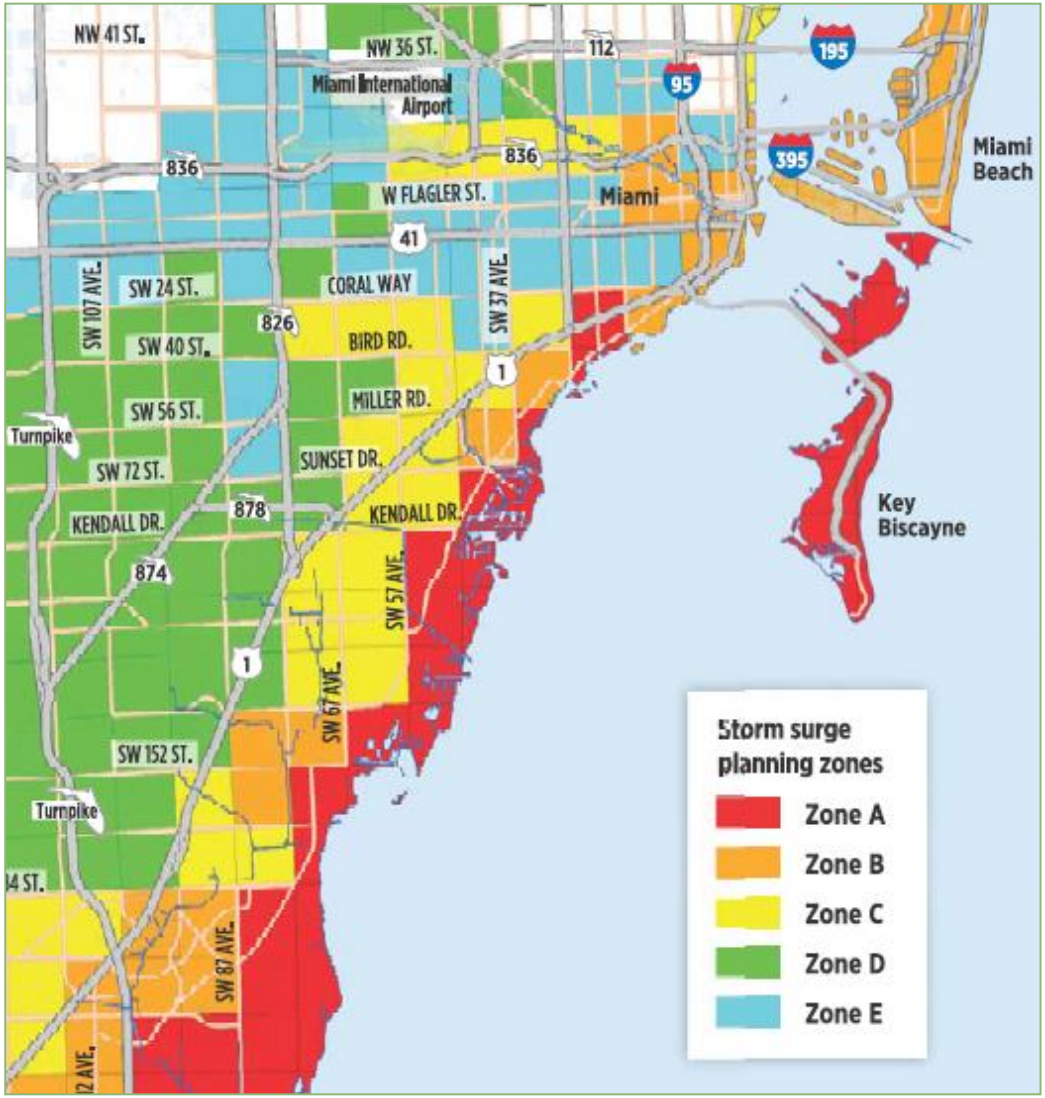
FEMA Coastal Hazard Mapping and Beyond



FEMA Coastal Hazard Mapping and Beyond



FEMA Coastal Hazard Mapping and Beyond



The new FEMA Coastal Study is NOT a Hurricane Evacuation Study and is not meant to replace your current Hurricane Evacuation Study.

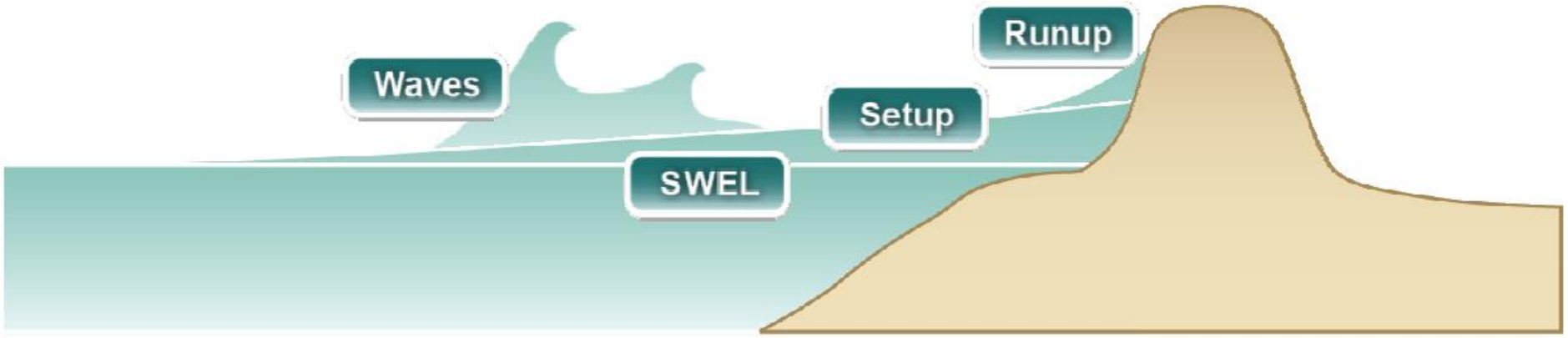
FEMA Coastal Hazard Mapping and Beyond

- Discovery
- Data Acquisition
- Coastal Engineering Analyses
- Floodplain Mapping
- Produce Preliminary Flood Insurance Rate Maps
- Post-Preliminary Processing

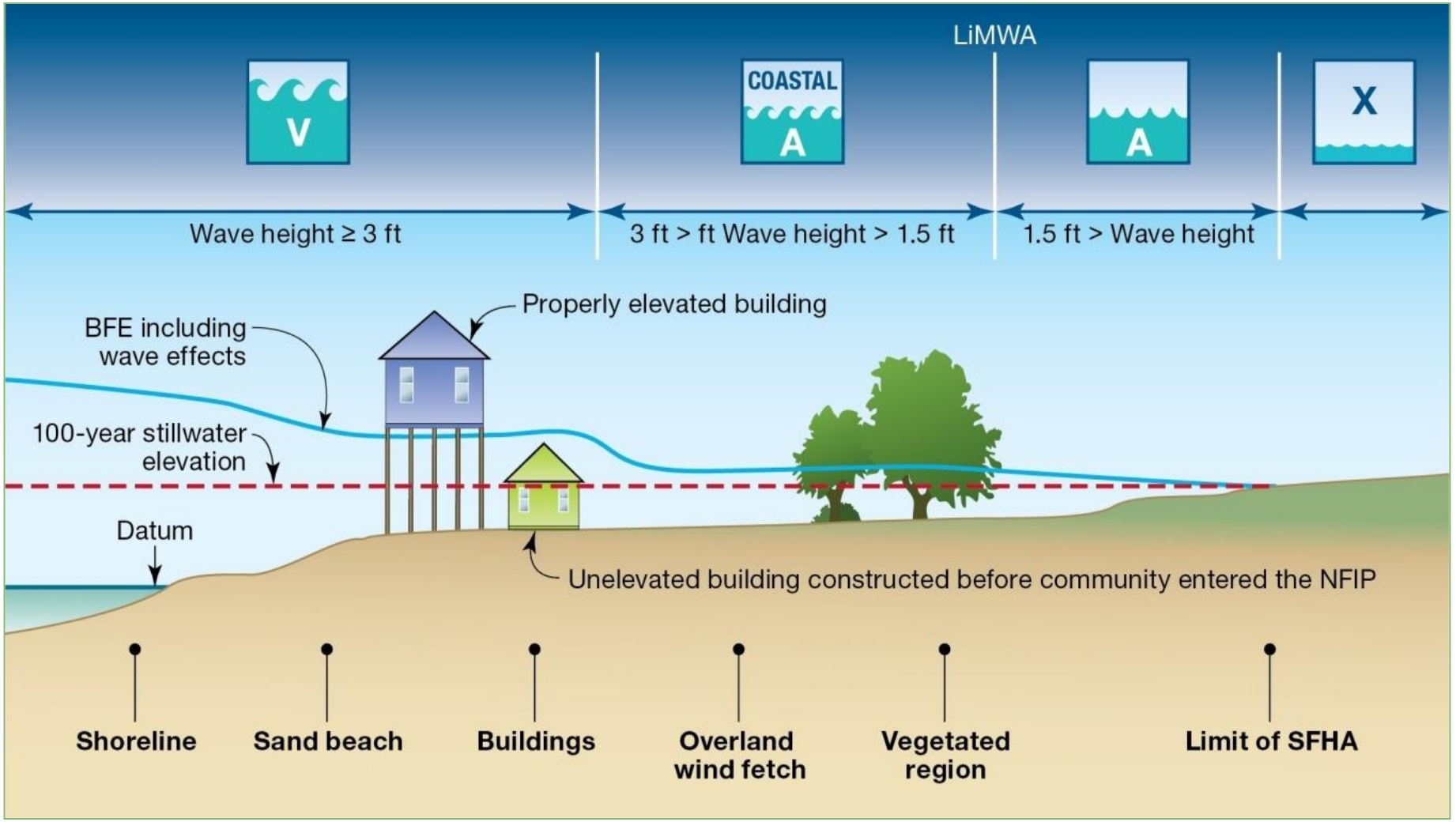
FEMA Coastal Hazard Mapping and Beyond

Base Flood Elevation (BFE) on FIRM includes 4 components:

1. Storm surge stillwater elevation (SWEL)
2. Amount of wave setup
3. Wave height above storm surge (SWEL) elevation
4. Wave runup above storm surge elevation (where present)



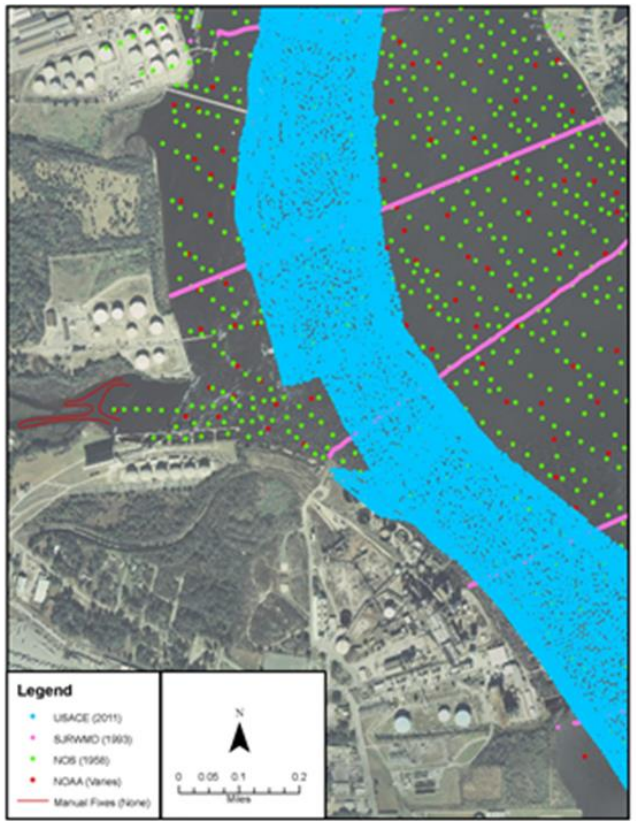
FEMA Coastal Hazard Mapping and Beyond



FEMA Coastal Hazard Mapping and Beyond

- Numerical Modeling – combined Advanced Circulation (ADCIRC) and Simulating Waves Near Shore (SWAN)
  - Digital Elevation Model (DEM)
  - Site reconnaissance
  - Mesh development
  - Land cover data analysis
  - Validation
  - JPM-OS storm suite selection
  - Run hundreds of synthetic storms
  - Calculate the statistical 1% annual chance event

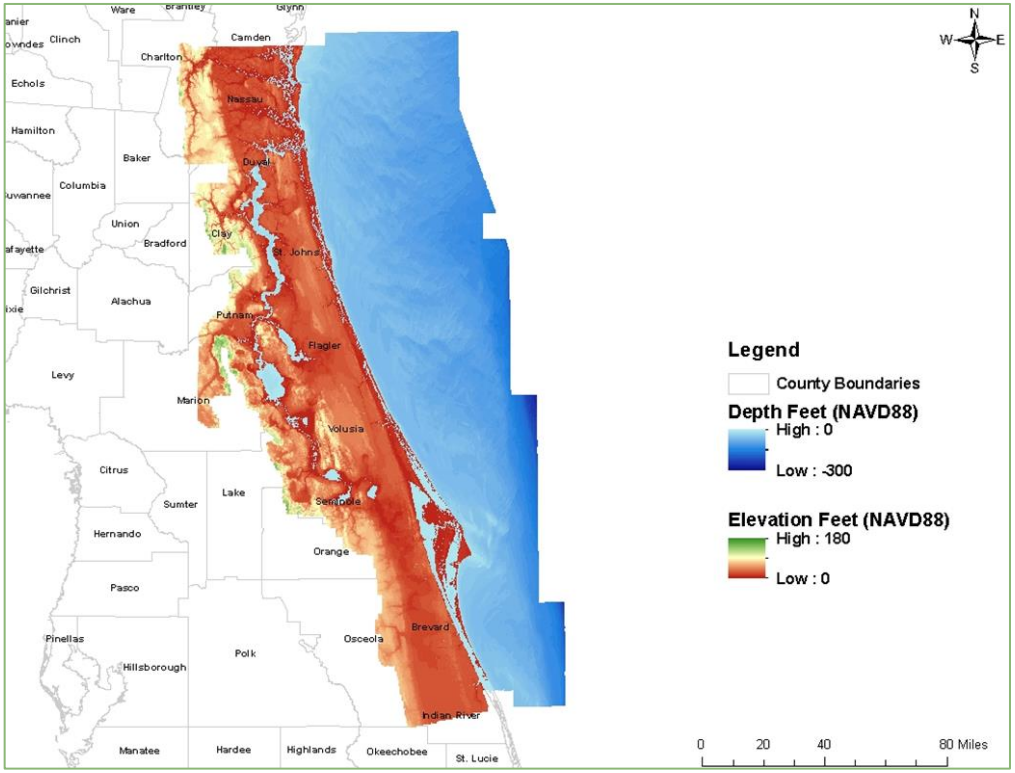
FEMA Coastal Hazard Mapping and Beyond



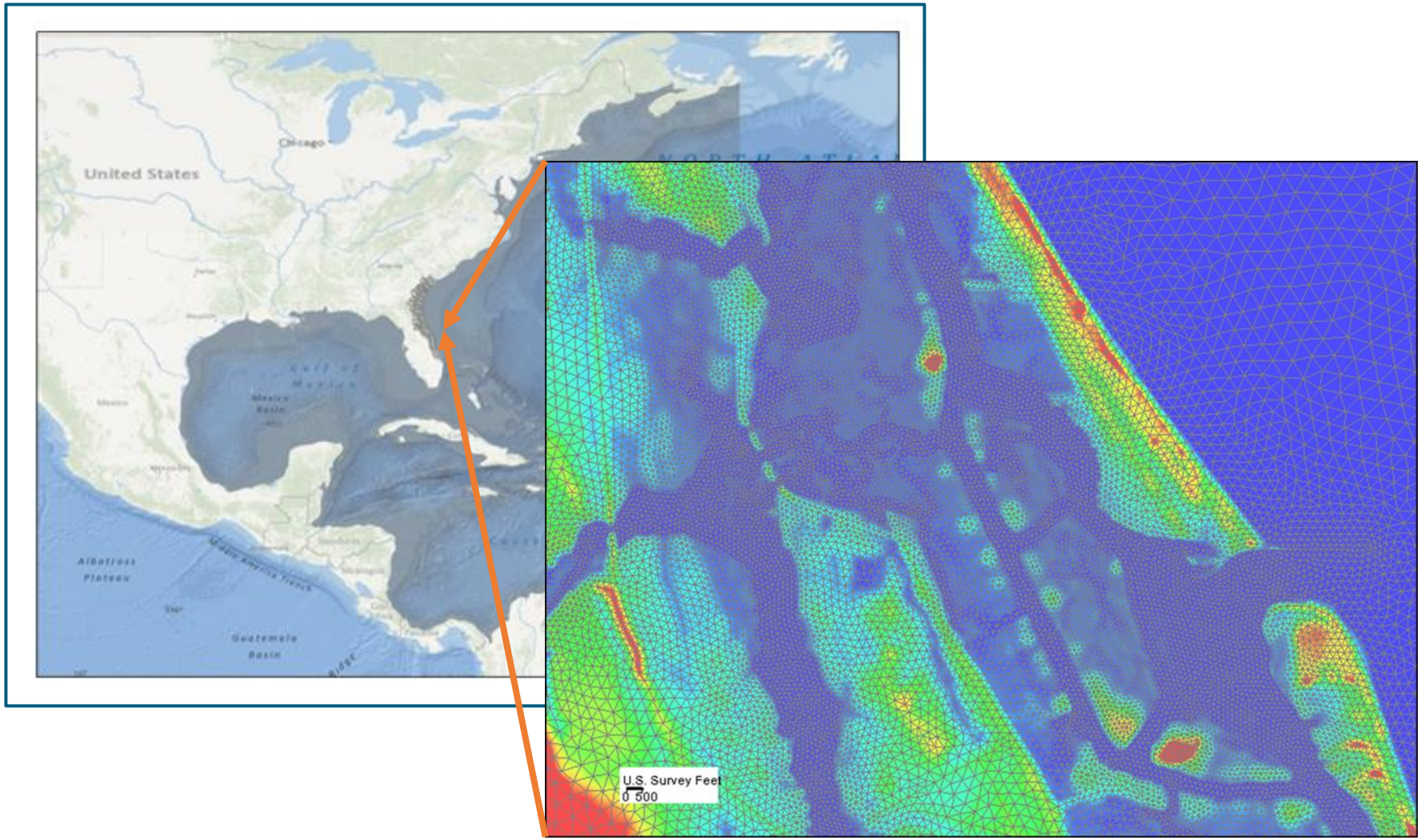
Legend

- USACE (2011)
- SJRWMD (1993)
- NOS (1958)
- NOAA (Varies)

Same area, different data sources, survey dates, and data extents



FEMA Coastal Hazard Mapping and Beyond



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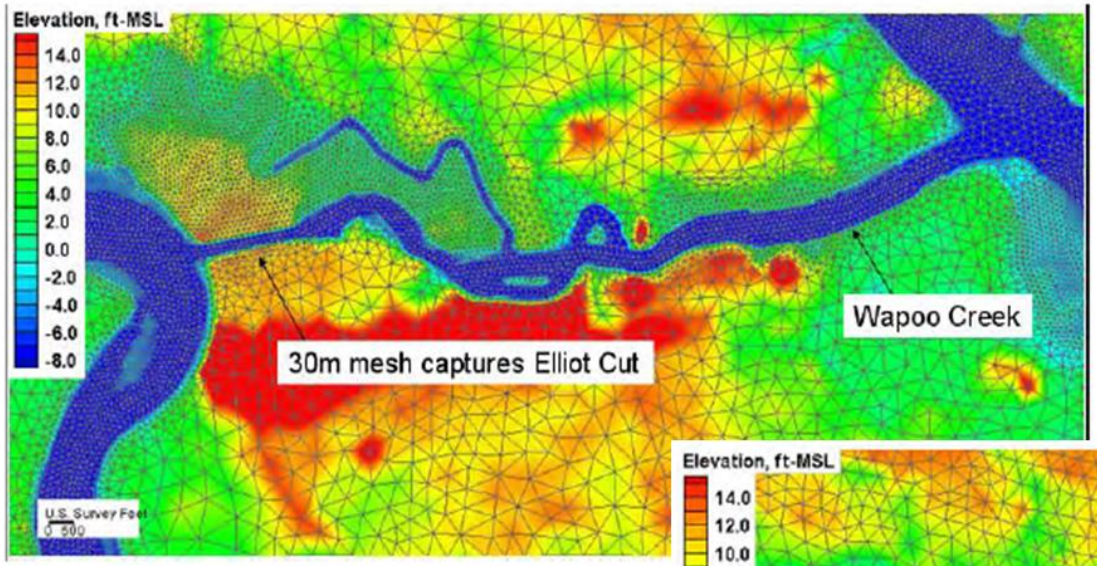

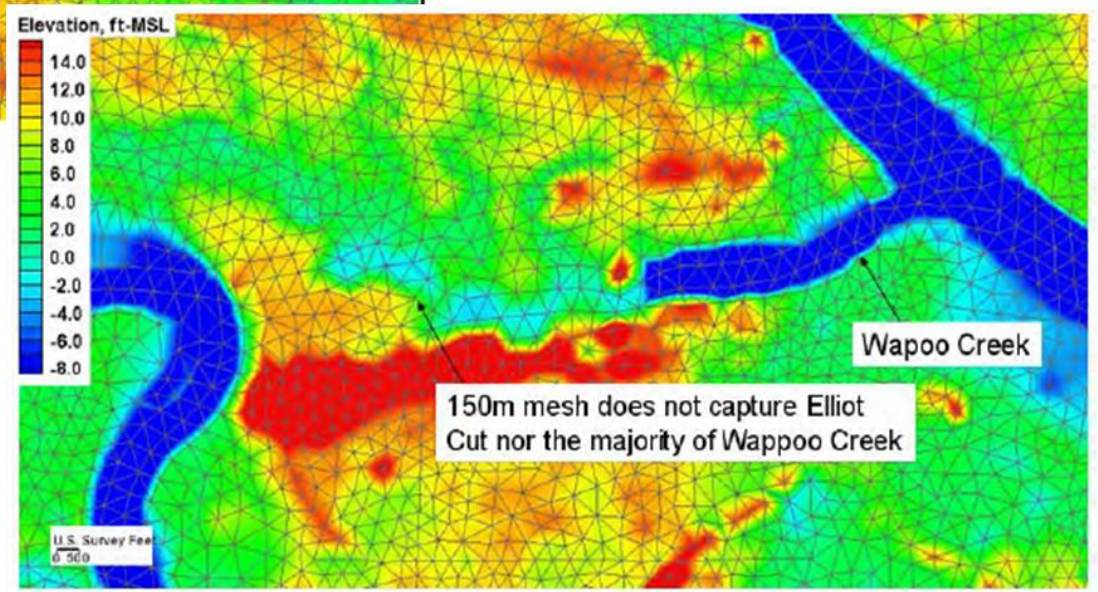

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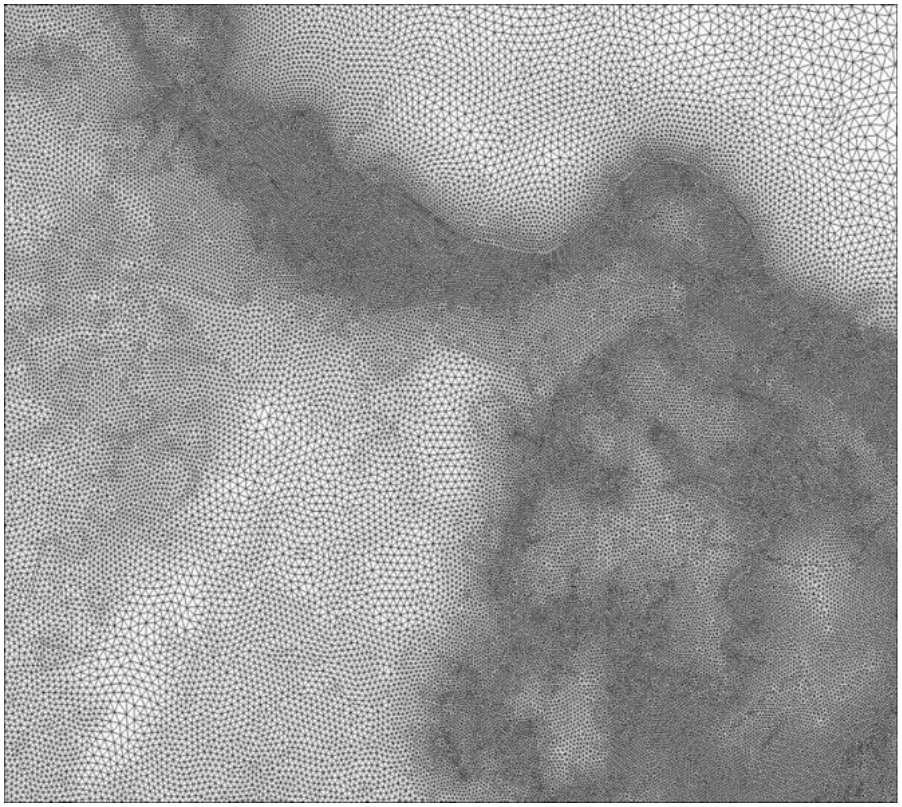

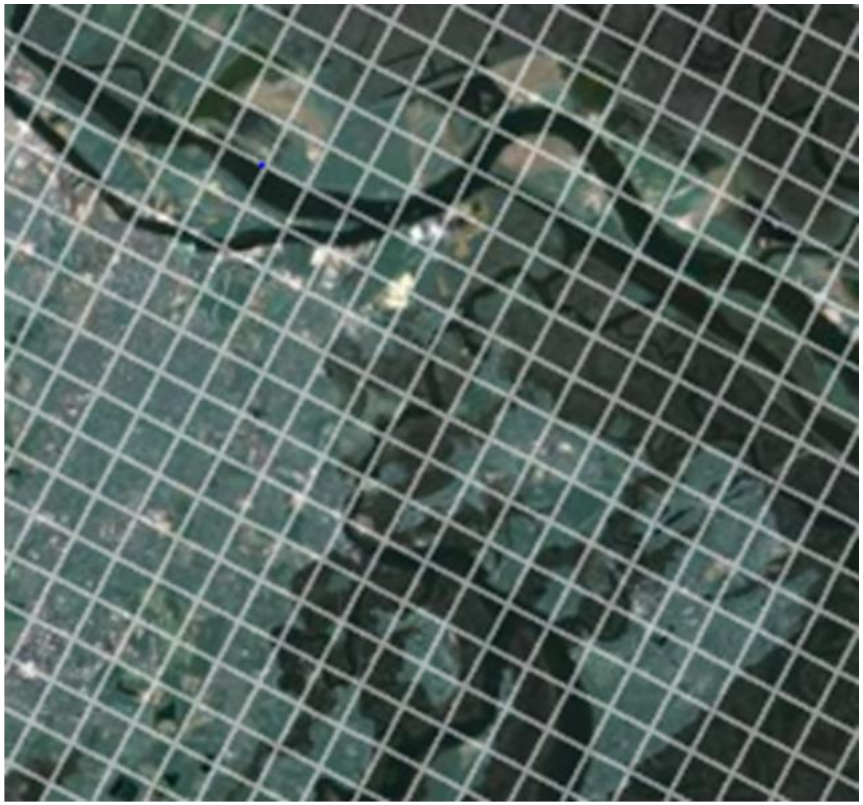

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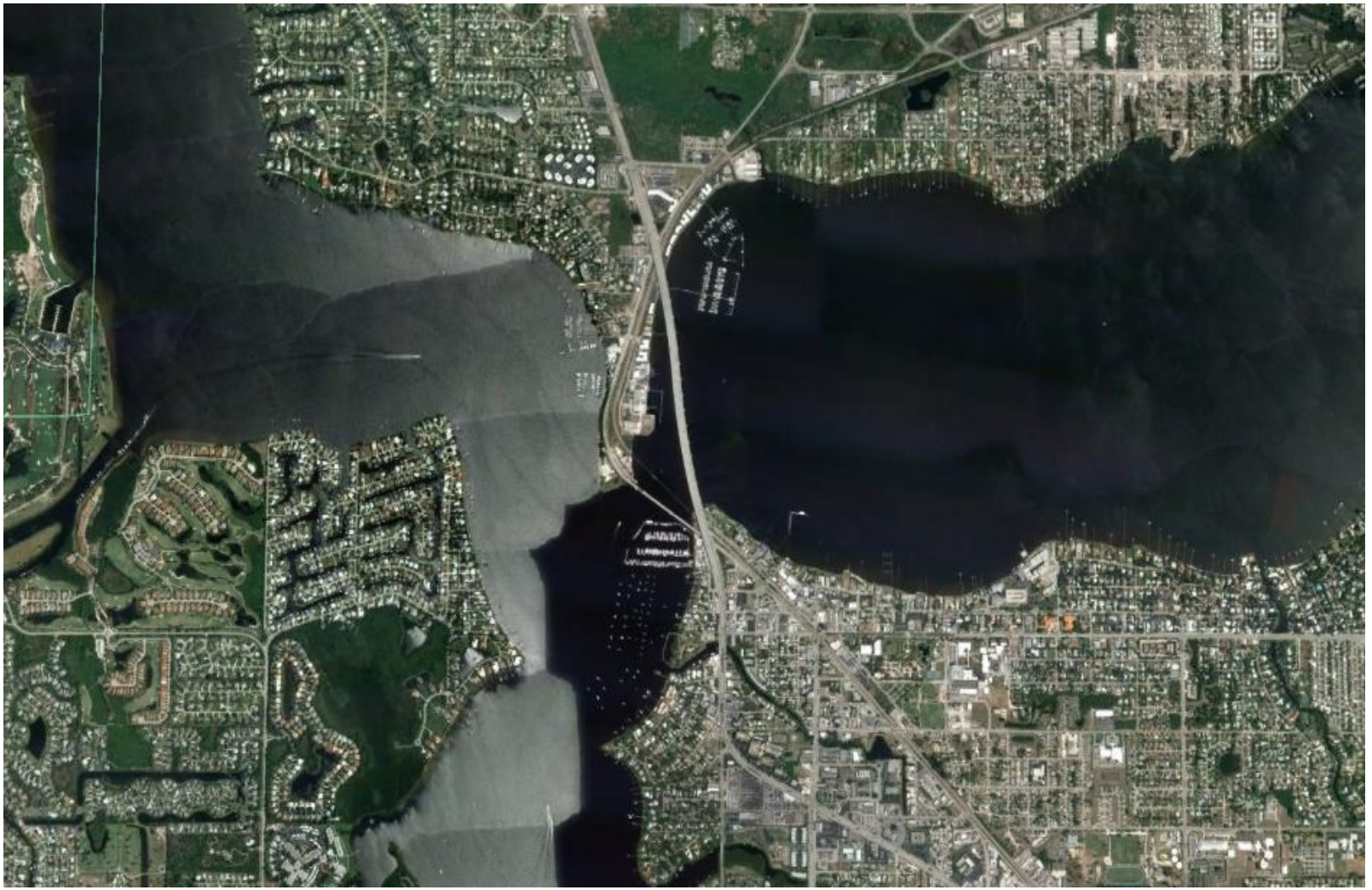

SWAN+ADCIRC Mesh – Martin County; Stuart

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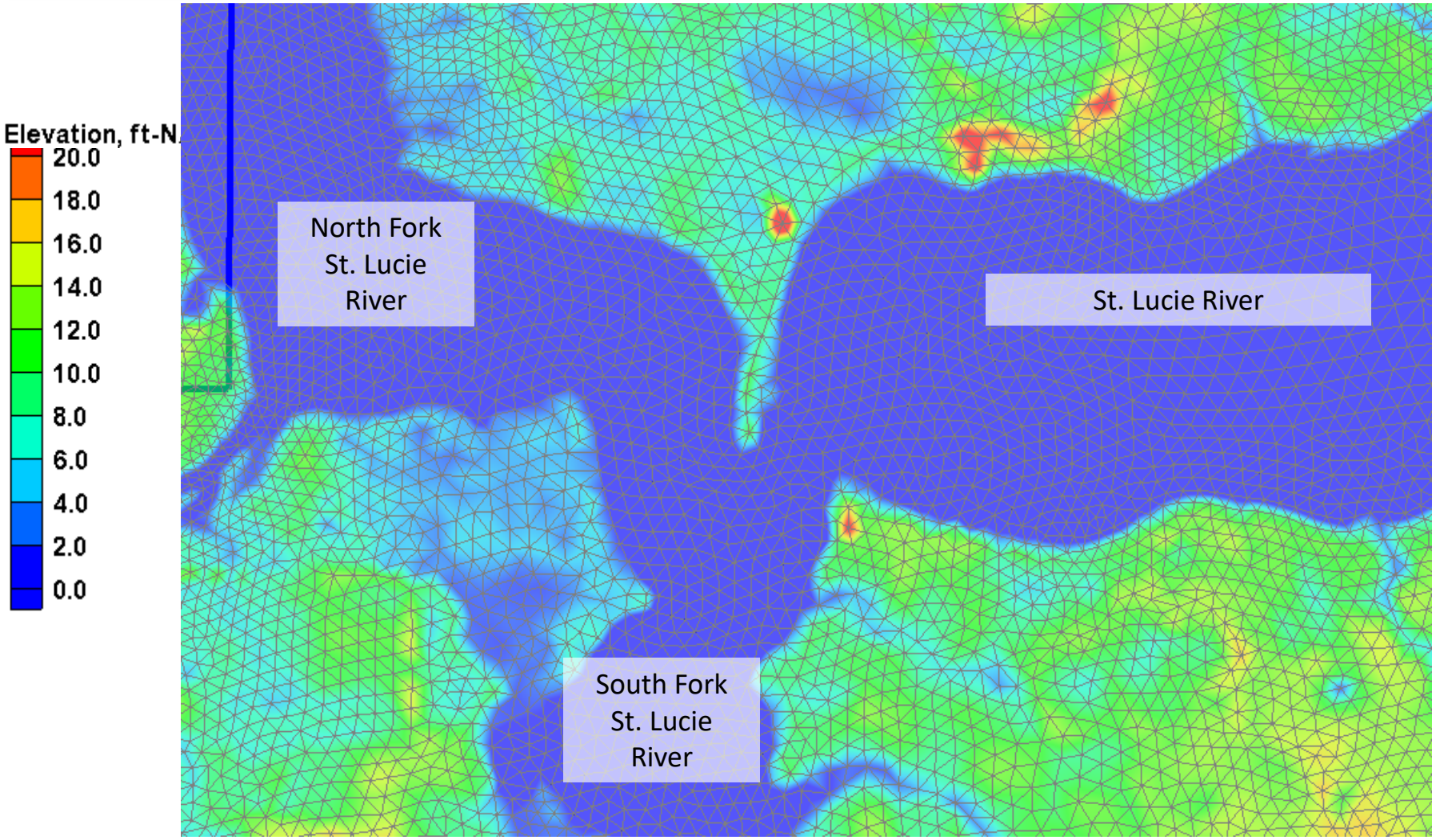

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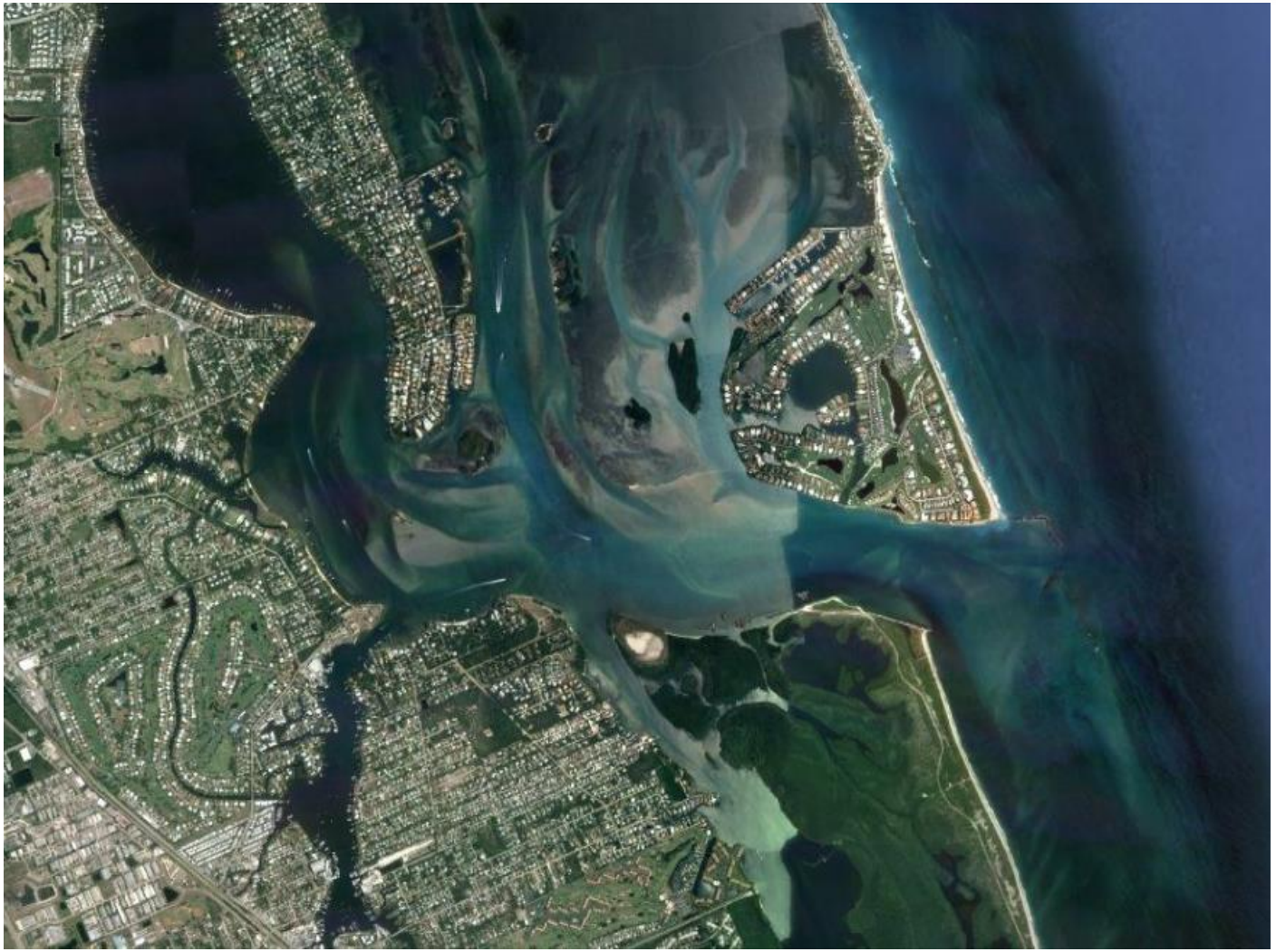
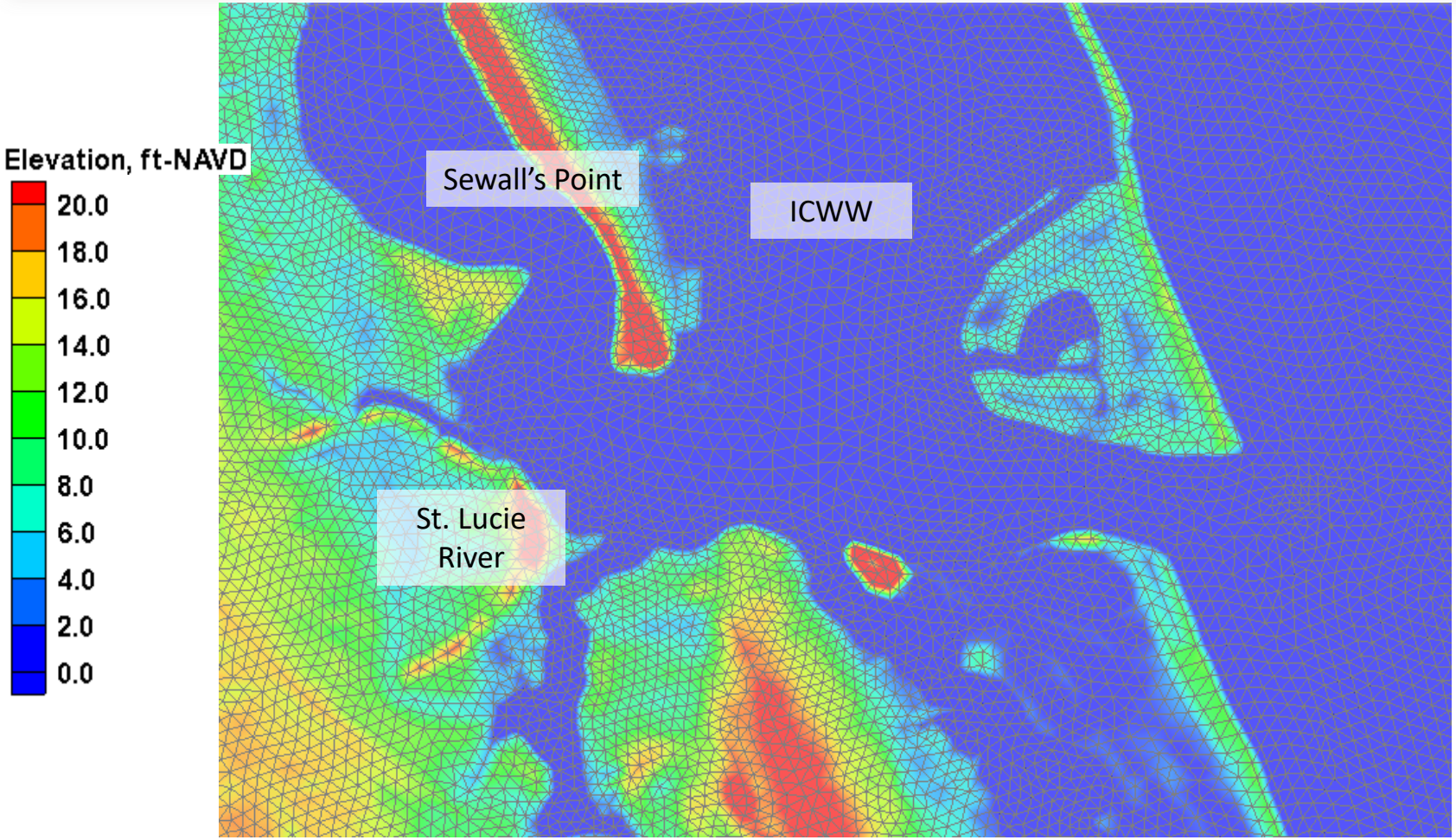


SWAN+ADCIRC Mesh – Martin County; St Lucie Inlet

FEMA Coastal Hazard Mapping and Beyond

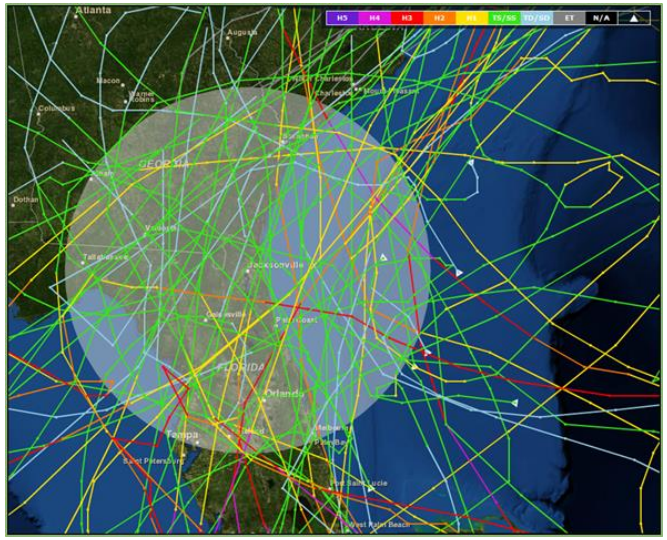


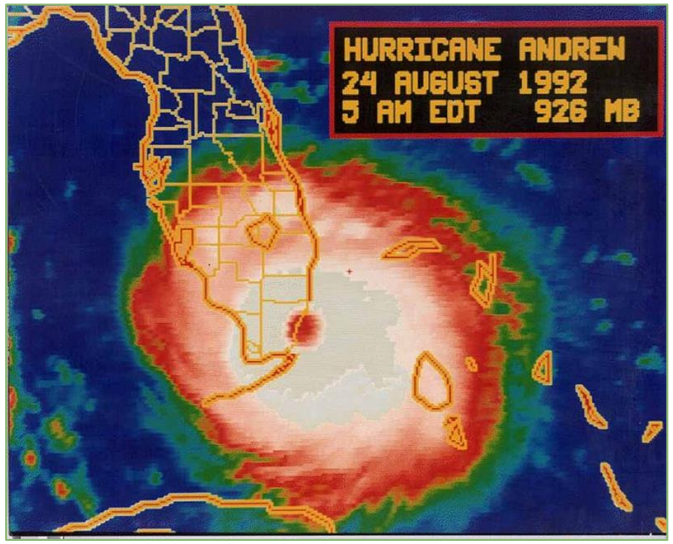
SWAN+ADCIRC Mesh – Martin County; St Lucie Inlet

FEMA Coastal Hazard Mapping and Beyond

Storm Climatology

- Review historical storms
- Pick 5 storms to validate the hurricane/surge model
  - Demonstrated model capability to reproduce water levels and waves in project area
  - Comparisons to available data showed reasonable agreement for water levels and waves





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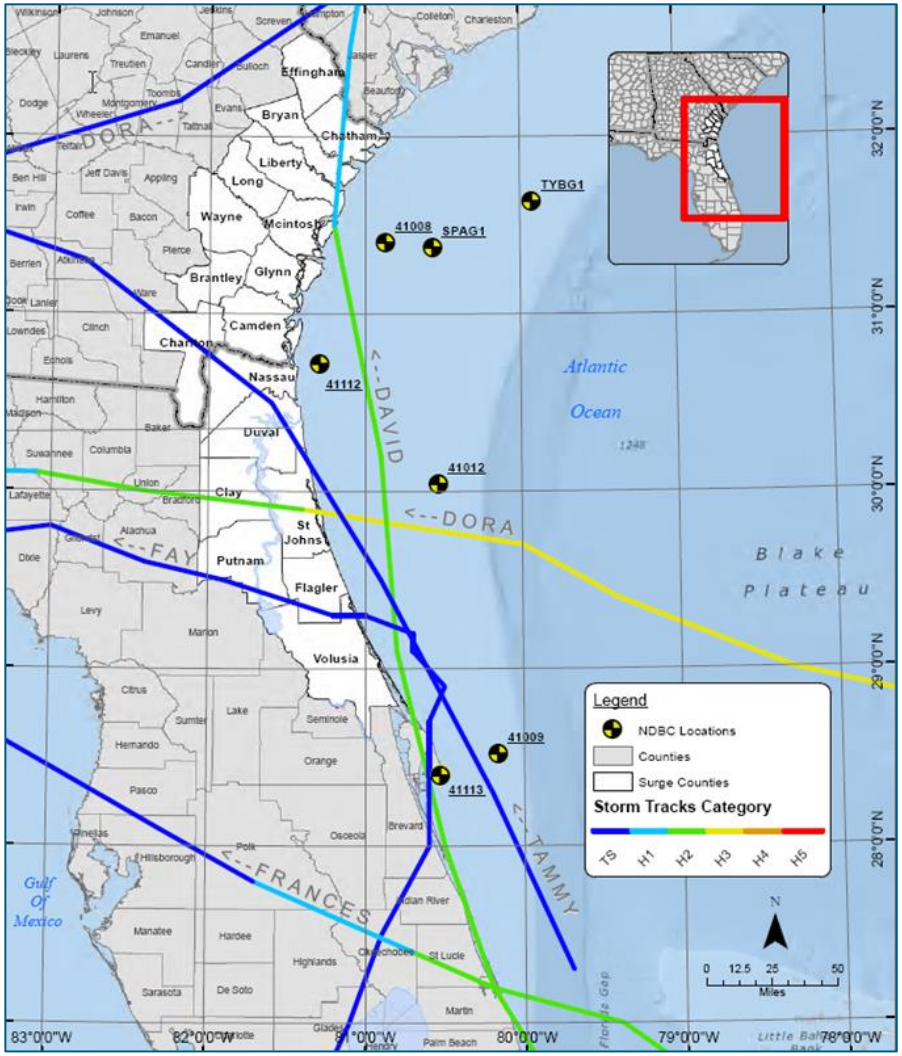

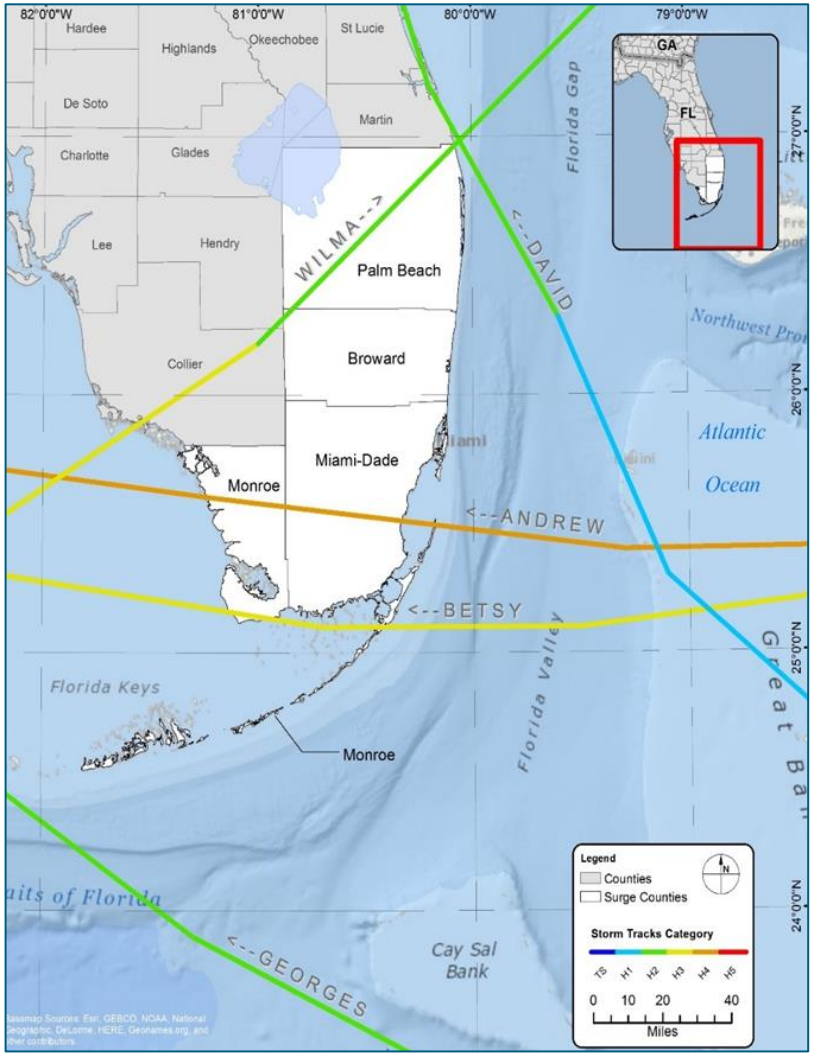

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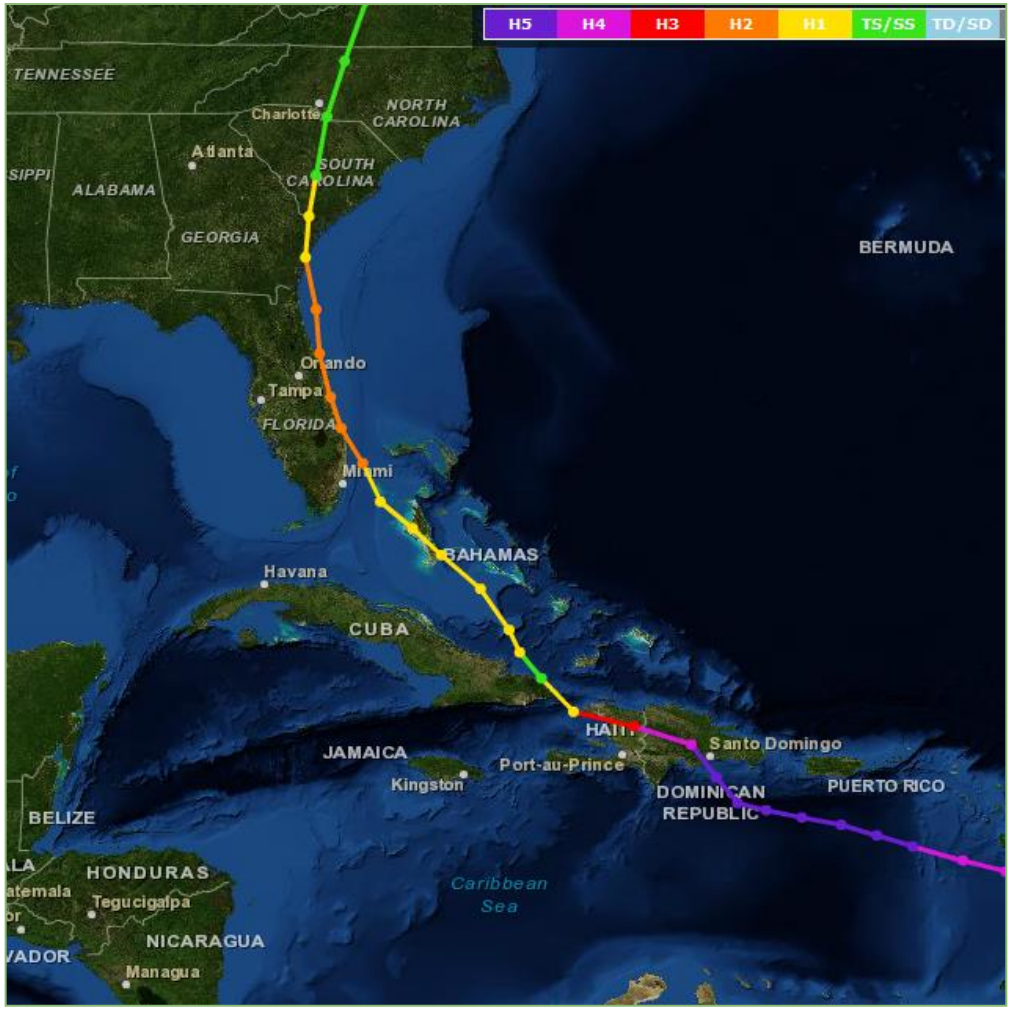

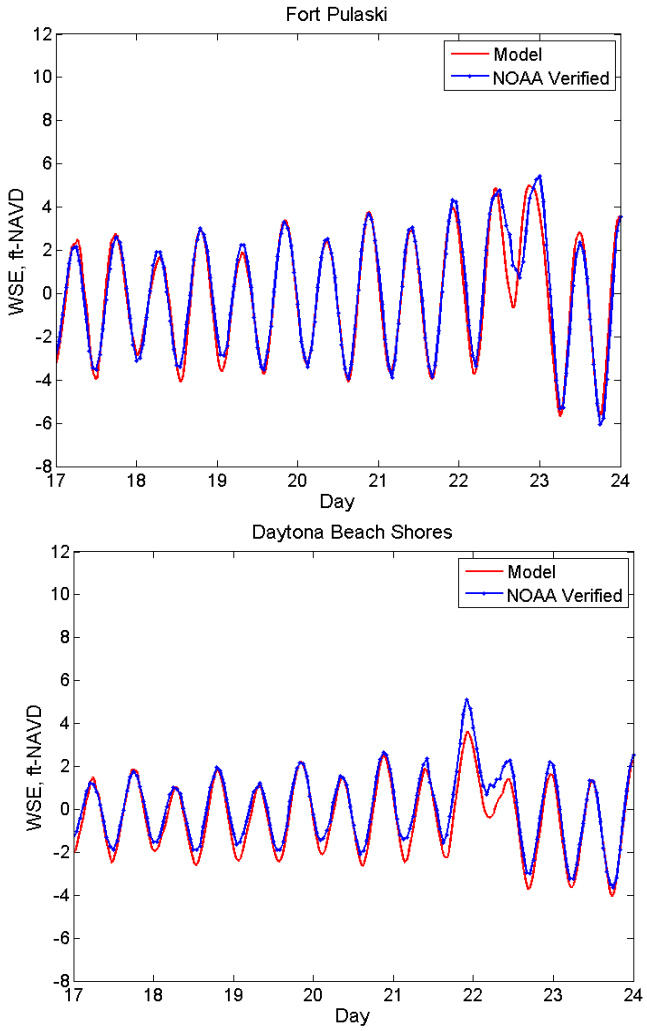

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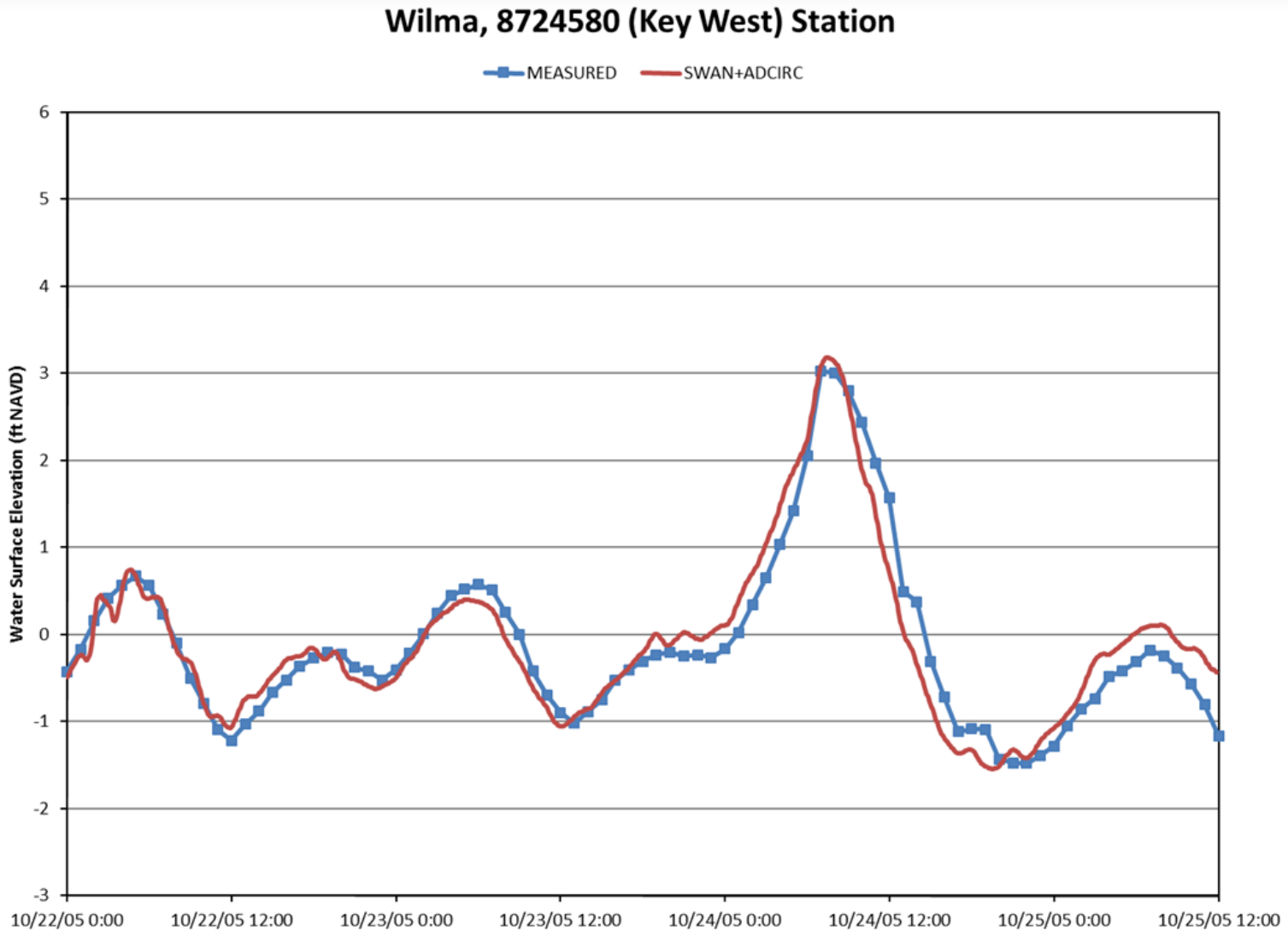


FEMA Coastal Hazard Mapping and Beyond

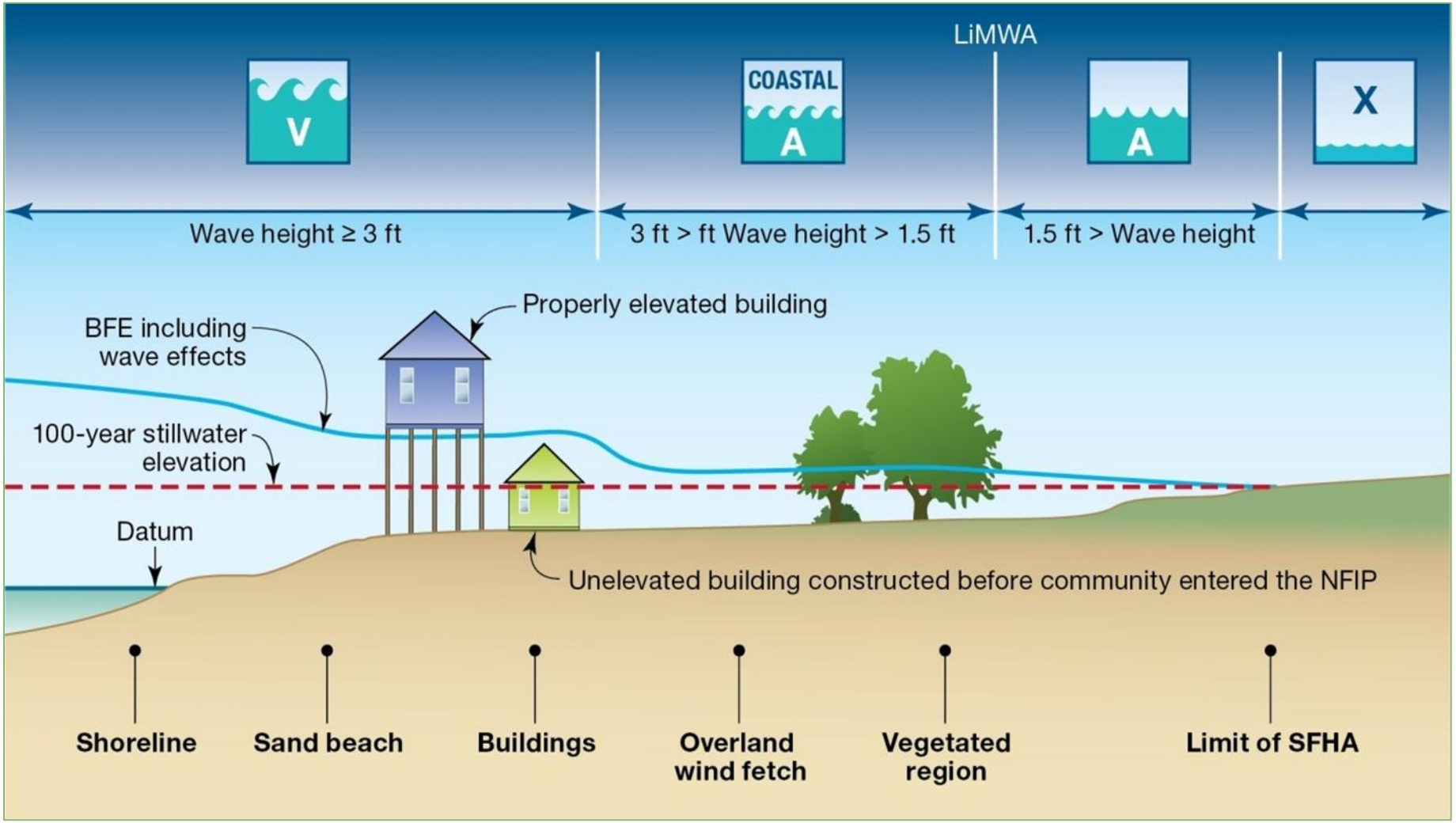
Storm Climatology

- Generate hundreds of hypothetical storms using 5 parameters
  1. Central pressure
  2. Radius to maximum winds
  3. Forward speed
  4. Storm heading
  5. Holland's B (shape parameter)

- Ensure covers whole range of possible storms for study area based on historic data for the area
- Run storms on super computer
- Calculate the 1% annual chance event

FEMA Coastal Hazard Mapping and Beyond

Understanding Your Risk – 1% Annual Chance Event



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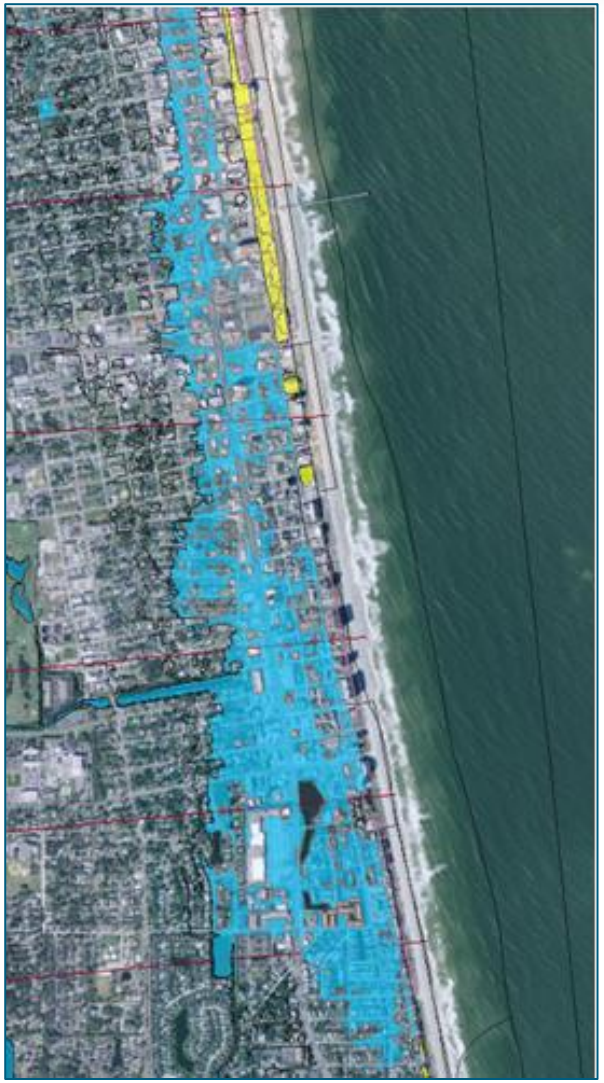

Hurricane Dora 1964

The effects of Hurricane Dora's storm surge lingered in the easternmost streets in the Beaches community

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Understanding Your Risk – 1% Annual Chance Event

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Understanding Your Risk – 1% Annual Chance Event

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New Flood Insurance Study Format

Table 17: Coastal Transect Parameters

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
Atlantic Ocean	1	10.44	9.59	6.7 5.3 - 6.8	7.2 5.7 - 7.3	8.9 7.0 - 9.0	10.2 8.9 - 10.4	13.2 12.5 - 13.3
Atlantic Ocean	2	10.69	9.70	6.7 4.7 - 6.7	7.2 5.0 - 7.2	8.9 6.0 - 8.1	10.2 8.7 - 10.2	13.2 12.2 - 13.3
Atlantic Ocean	3	18.14	12.50	6.6 4.7 - 6.8	7.1 5.0 - 7.3	8.8 6.2 - 9.0	10.1 8.7 - 10.4	13.3 12.4 - 13.5
Atlantic Ocean	4	18.23	12.45	6.7 5.5 - 6.8	7.2 5.9 - 7.5	8.9 7.3 - 9.2	10.2 9.0 - 10.6	13.2 12.2 - 13.7
Atlantic Ocean	5	18.36	12.22	6.7 5.7 - 6.9	7.2 6.1 - 7.4	8.9 7.6 - 9.2	10.2 9.0 - 10.8	13.2 12.1 - 13.8
Atlantic Ocean	6	18.21	11.70	6.6 5.7 - 6.7	7.1 6.1 - 7.3	8.7 7.6 - 9.0	10.1 9.0 - 10.5	13.1 12.0 - 13.5
Atlantic Ocean	7	18.10	11.56	6.6 5.9 - 6.7	7.0 6.3 - 7.2	8.7 7.5 - 8.9	9.9 8.9 - 10.3	13.1 11.8 - 13.5
Atlantic Ocean	8	17.14	12.63	6.6 5.9 - 6.6	7.1 6.1 - 7.11	8.6 7.6 - 8.8	10.0 8.9 - 10.0	12.9 11.8 - 13.0
Atlantic	9	16.95	12.62	6.4	6.9	8.4	9.7	12.6

Figure 8: 1% Annual Chance Total Stillwater Elevations for Coastal Areas

FEMA Coastal Hazard Mapping and Beyond

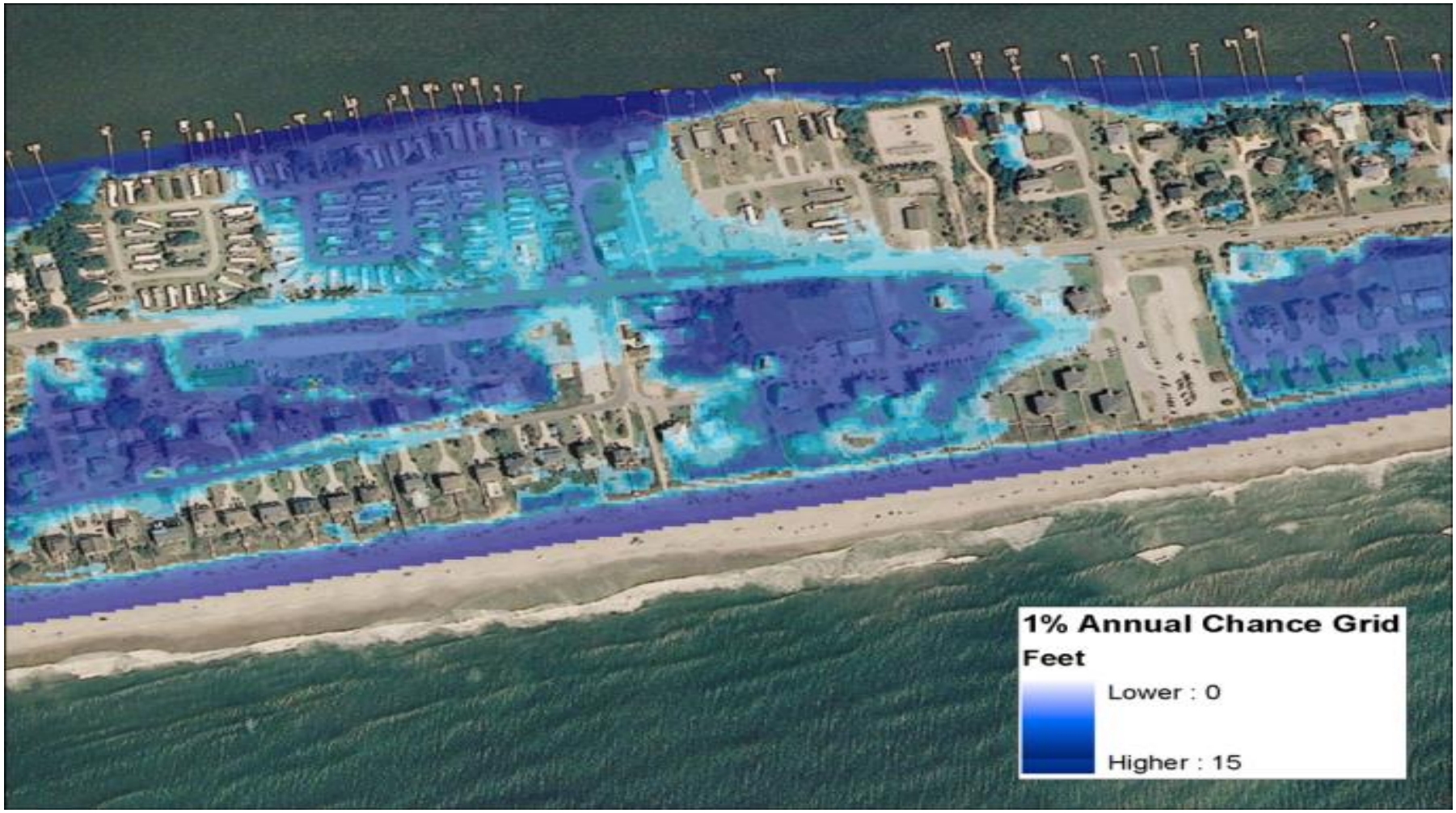
Understanding Your Risk – 1% Annual Chance Event

- We have all this data…
- Brainstorming!
- Non-Regulatory Products

FEMA Coastal Hazard Mapping and Beyond

- Makes it easy for communities and homeowners to identify impacts of new FIRM
- Assists in prioritizing mitigation actions
- Helps identify reasons for changes

FEMA Coastal Hazard Mapping and Beyond



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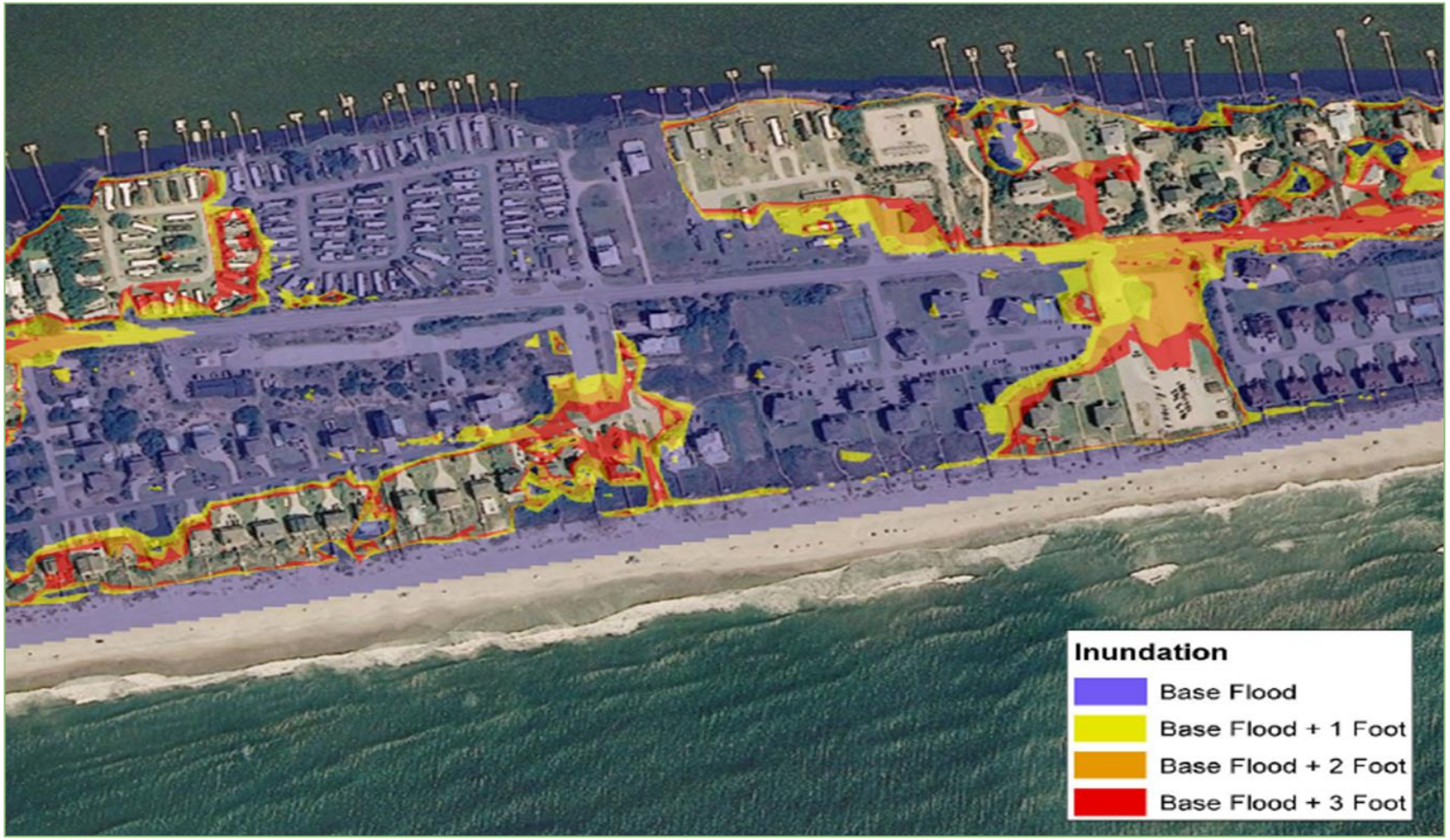

FEMA Coastal Hazard Mapping and Beyond

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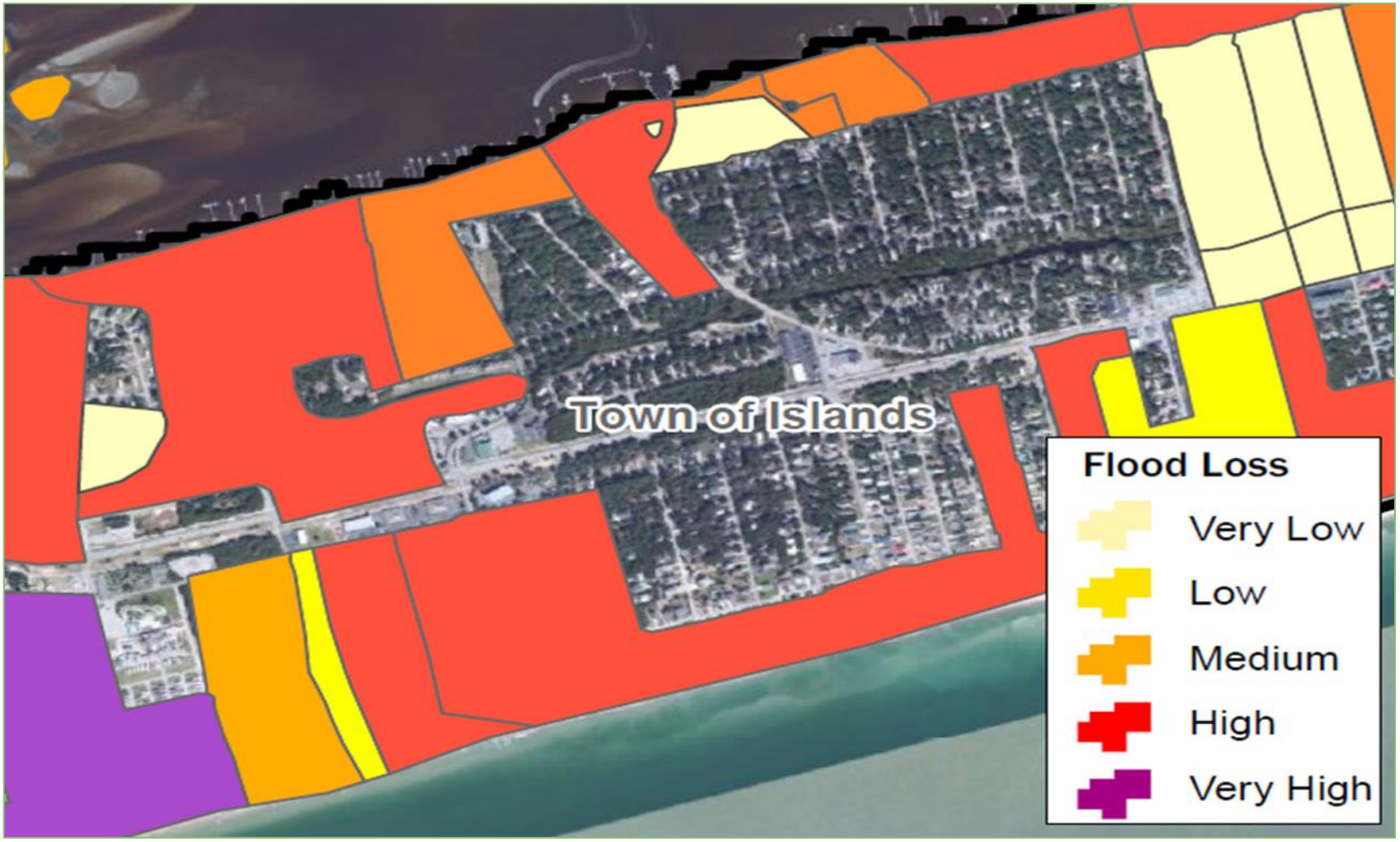

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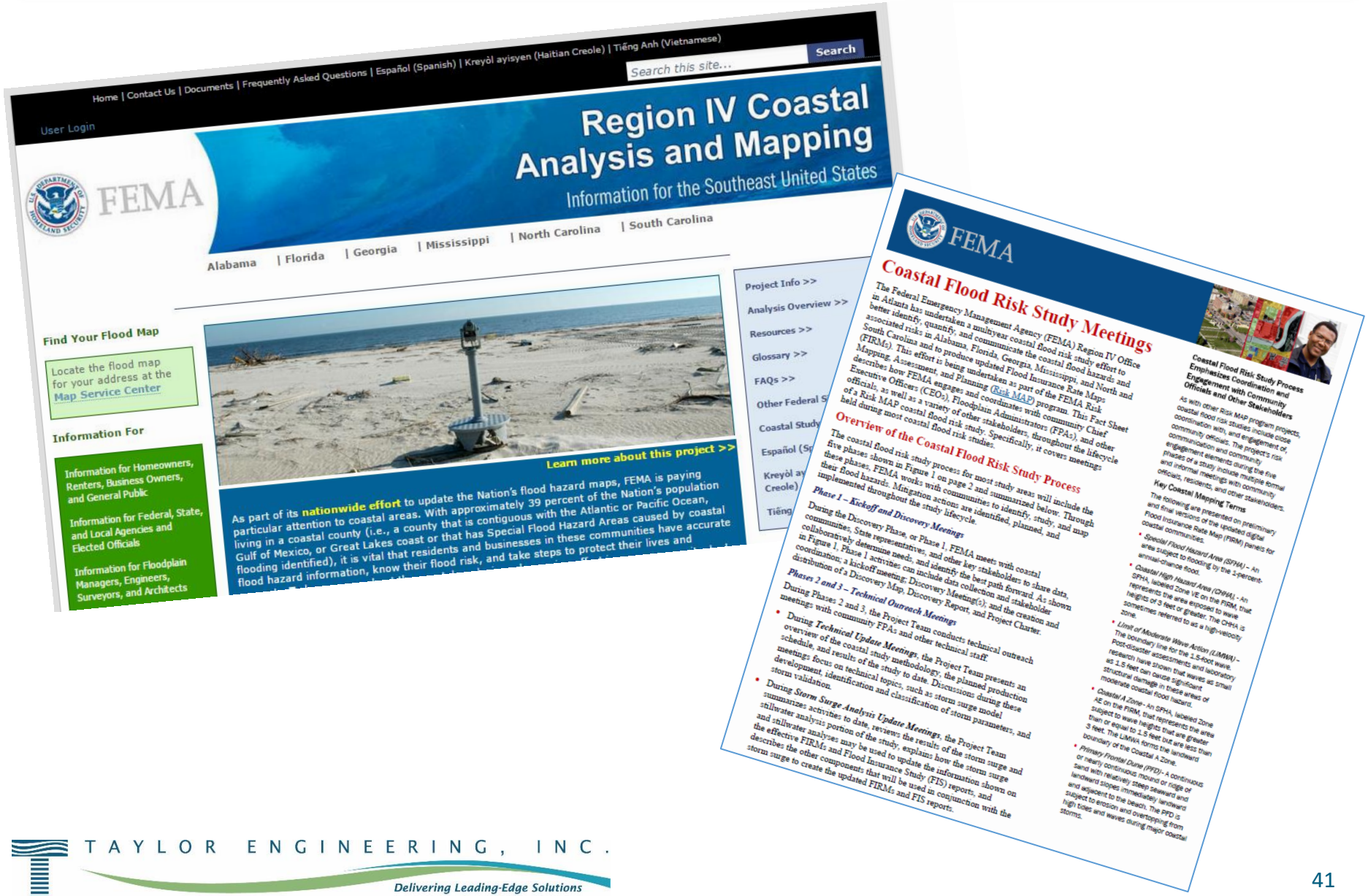

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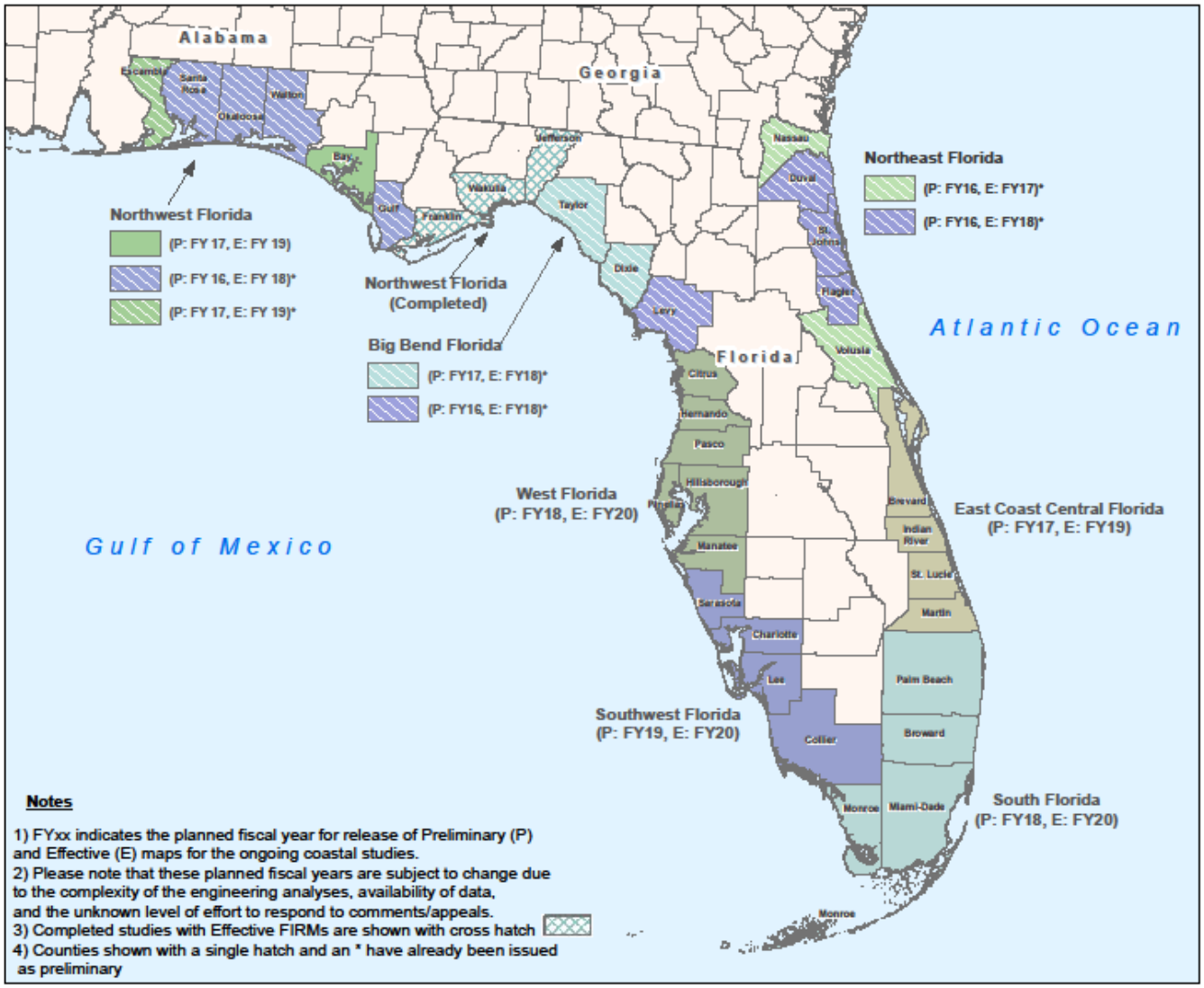

Florida: FEMA Coastal Study Status (as of 1/30/2017)

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We don't know all the flood hazards…