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Memorandum

Reference # 13134.201.M2.Rev0 (PBC Task Order #1778-1)

Status: Correspondence

December 4, 2020

Attention: **Mr. Jeremy McBryan, PE, CFM (Palm Beach County)**

CC: Onur Kurum (Baird)

From: Gordon Thomson (Baird)

RE: Review & Evaluation of FEMA's Coastal Flood Risk Study FEMA and Stakeholder Coordination (Deliverable 3.1)

The National Flood Insurance Program (NFIP) is a federal program that provides flood insurance to property owners within participating communities. Palm Beach County (County) and a number of its communities participate in the program. The Federal Emergency Management Agency (FEMA) is responsible for administering the NFIP and, as such, periodically updates information on the flood hazards. The updated information is incorporated into FEMA's Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRM) for a given study area.

FEMA is in the process of updating the FIS for the South Florida study area with the Coastal Flood Risk Study (SFL study), which revaluated the coastal flood hazard originating from the Atlantic Ocean. Palm Beach County, along with Broward, Miami-Dade, and Monroe Counties, is located within the SFL study area. FEMA's SFL study leveraged numerical modeling and engineering analyses in an attempt to better define the coastal flood risks associated with storm surge. Baird was tasked with performing a technical review and evaluation of FEMA's model setups, inputs, outputs, and other provided data to identify specific elements to improve the accuracy, consistency, reliability, and repeatability of the study with respect to Palm Beach County.

Summary of FEMA and Stakeholder Coordination Activities

Baird's review and evaluation of FEMA's Coastal Flood Risk Study included coordination with FEMA, its contractors (the Compass/AECOM Team), local government elected officials, and staff and other stakeholders. The coordination included the following activities, which are documented in further detail below.

- February 4, 2020 – FEMA Consultation Coordination Officer (CCO) Meeting and Open House
- July 23, 2020 – Palm Beach County Water Resources Task Force Meeting
- September 22, 2020 – Palm Beach County Board of County Commissioners Workshop Meeting
- November 17, 2020 – FEMA and Palm Beach County Technical Discussion
- Other Coordination

FEMA Consultation Coordination Office (CCO) Meeting and Open House (February 4, 2020)

FEMA held public meetings throughout the geographic region included in the SFL study area. Baird attended FEMA's Consultation Coordination Officer (CCO) Meeting and Open House on February 4, 2020 in West Palm Beach, Florida. These meetings provided the opportunity for FEMA to inform the public and local governments of the study objectives, analysis, methodologies, findings, and schedule. See Attachment 1 for FEMA's CCO Meeting presentation.

Palm Beach County Water Resources Task Force Meeting (July 23, 2020)

Baird presented at a virtual webmeeting of the Palm Beach County Water Resources Task Force held on July 23, 2020. Baird provided the Task Force members and public attendees an overview of the purpose and framework of FEMA's studies, FEMA's recently completed coastal analysis for South Florida, and the scope, preliminary findings, and next steps of Baird's technical review and evaluation. See Attachment 2 for Baird's presentation to the Task Force.

Palm Beach County Board of County Commissioner Workshop Meeting (September 22, 2020)

Baird and County staff presented at the Palm Beach County Board of County Commissioners (BCC) Workshop Meeting held on September 22, 2020. The BCC and public attendees were briefed on FEMA's coastal study, Baird's tasks, key findings, FEMA's appeals process, and activities of other affected counties. Following the presentation, the BCC directed staff to continue to coordinate with local stakeholders and other affected Counties, initiate coordination with and transmit Baird's review and evaluation deliverables to FEMA, and provide a future BCC briefing on the results of FEMA coordination and potential forward paths related to a formal appeal. See Attachment 3 for the presentation to the BCC.

FEMA and Palm Beach County Technical Discussion Webmeeting (November 17, 2020)

Palm Beach County transmitted Baird's review and evaluation deliverables for Tasks 2, 4, and 5 to FEMA on October 5, 2020 and requested a teleconference or webmeeting to discuss the key findings and related issues identified. A webmeeting was held on November 17, 2020. Attendees included representatives from FEMA, FEMA's mapping partner (the Compass/AECOM Team), County staff, and Baird. A number of the key findings were discussed. Below is a summary of the discussion and feedback provided by FEMA and the Compass/AECOM Team.

- FEMA explained that Baird's review and evaluation deliverables had been received, but the Compass/AECOM Team had not yet reviewed or analyzed all of the issues in detail. The Compass/AECOM Team stated that they would take another look at the technical issues identified by Baird. FEMA stated that some of the issues may require considerable time and budget to thoroughly review and did not commit to investigating any of the findings further due to budget and other constraints.
- A number of key findings were discussed briefly during the webmeeting for which FEMA and the Compass/AECOM team provided limited feedback and stated additional time would be needed to review. Compass/AECOM explained that the webmeeting was intended to facilitate coordination with the County and that the goal was to provide feedback on the issues identified and communicated by the County to FEMA following the webmeeting.
- FEMA did not provide direction regarding particular key findings that would need to be advanced and/or substantiated in greater detail to support an appeal if pursued by the County. Baird requested that FEMA provide the County with specific information on which of the technical issues that FEMA was planning to re-evaluate to enable the County to better focus future efforts.
- The County expressed a strong desire to work collaboratively with FEMA and their mapping partner to continue to understand potential forward paths, explore issues and concerns identified and submitted by

the County to FEMA, and attempt to address and/or resolve the issues and concerns prior to the start of the formal appeal period.

- FEMA recommended that if the County wanted to pursue its key findings further, FEMA's formal appeal process was the appropriate mechanism. FEMA disclosed that they anticipated that the 90-day appeal period would likely begin in March/April 2021. FEMA advised that the County submit appeals as early as possible during the appeal period to allow FEMA to coordinate and obtain supporting documents from the County.

Other Coordination

The Florida State Floodplain Management Office (FSFMO) was contacted in August 2020 to gain insight on its involvement with FEMA studies. The FSFMO offered to attend meetings and/or conversations between FEMA and local municipalities, but that municipalities are ultimately responsible for funding, developing documentation, and submitting the necessary paperwork if an appeal is pursued. The FSFMO explained that FEMA studies must comply with FEMA regulations and federal legislation.

Additional Findings that May Warrant Further FEMA Coordination

Sea Level Rise Exclusion

FEMA's SFL study did not consider the impact of sea level rise, which appears to be in direct violation of Public Law 112-141. Review of federal legislation revealed that the Public Law 112-141-July 6, 2012 a.k.a. "Moving Ahead for Progress in the 21st Century Act (MAP-21)" directs the Administrator of FEMA to consider sea level rise in their mapping studies. Pertinent language is found in the following sections under Division F (Miscellaneous); Title II (Flood Insurance); Subtitle A (Flood Insurance Reform and Modernization).

- Section 100125 (Technical Mapping Advisory Council); (d) Future Conditions Risk Assessment and Modeling Report states:

  "(1) IN GENERAL. – The Council shall consult with scientists and technical experts, other Federal agencies, States, and local communities to –

  (A) Develop recommendations on how to –

  (i) Ensure that flood insurance rate maps incorporate the best available climate science to assess flood risk; and

  (ii) Ensure that the Federal Emergency Management Agency uses the best available methodology to consider the impact of –

  (I) the rise in the sea level; and

  (II) future development on flood risk; and

  (B) not later than 1 year after the date of enactment of this Act, prepare written recommendations in a future condition risk assessment and modeling report and to submit such recommendations to the Administrator."

- Section 100216 (National Flood Mapping Program); (b) Mapping states:

  "(3) OTHER INCLUSIONS. – In updating maps under this section, the Administrator shall include –

  (D) any relevant information or data of the National Oceanic and Atmospheric Administration and the United States Geological Survey relating to the best available science regarding future changes in sea levels, precipitation, and intensity of hurricanes; and

  (E) any other relevant information as may be recommended by the Technical Mapping Advisory Committee."

- The Technical Mapping Advisory Committee (TMAC) produced the following reports recommending that sea level rise be incorporated into FEMA's mapping.
  - Future Conditions Risk Assessment and Modeling Report (December 2015)
  - 2017 Annual Report (December 2017)

FEMA's schedule presented at the CCO Meeting indicated that FEMA's discovery meetings were held June 2014, model mesh review meetings in May 2016 and May 2017, and storm surge analysis meetings in April 2018. Storm surge analysis commences after development of the model mesh. Thus, FEMA's storm surge analysis commenced sometime after May 2017 at least 1.5 years after the TMAC's 2015 report and close to the publication date of the TMAC's 2017 report.

Path Forward

FEMA has performed a cursory review of Baird's findings but has not committed to investigating any of the findings further due to budget and other constraints. FEMA indicated that any concerns and data should be submitted during the formal appeal period, which is anticipated to begin in March/April 2021.

Attachment 1 FEMA Consultation Coordination Officer (CCO) Meeting Presentation – February 4, 2020

FEMA

Palm Beach County, Florida

Consultation Coordination Officer (CCO) Meeting

FEMA

February 4, 2020
West Palm Beach, Florida

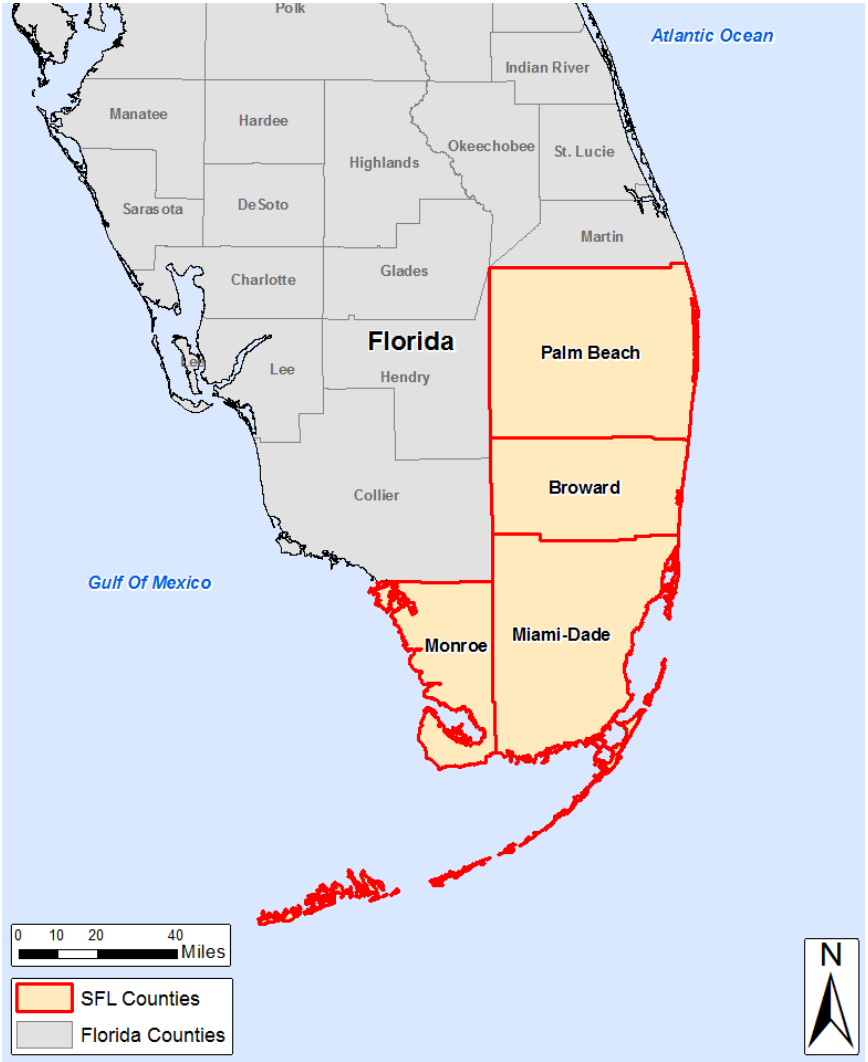
RiskMAP
Increasing Resilience Together

Agenda

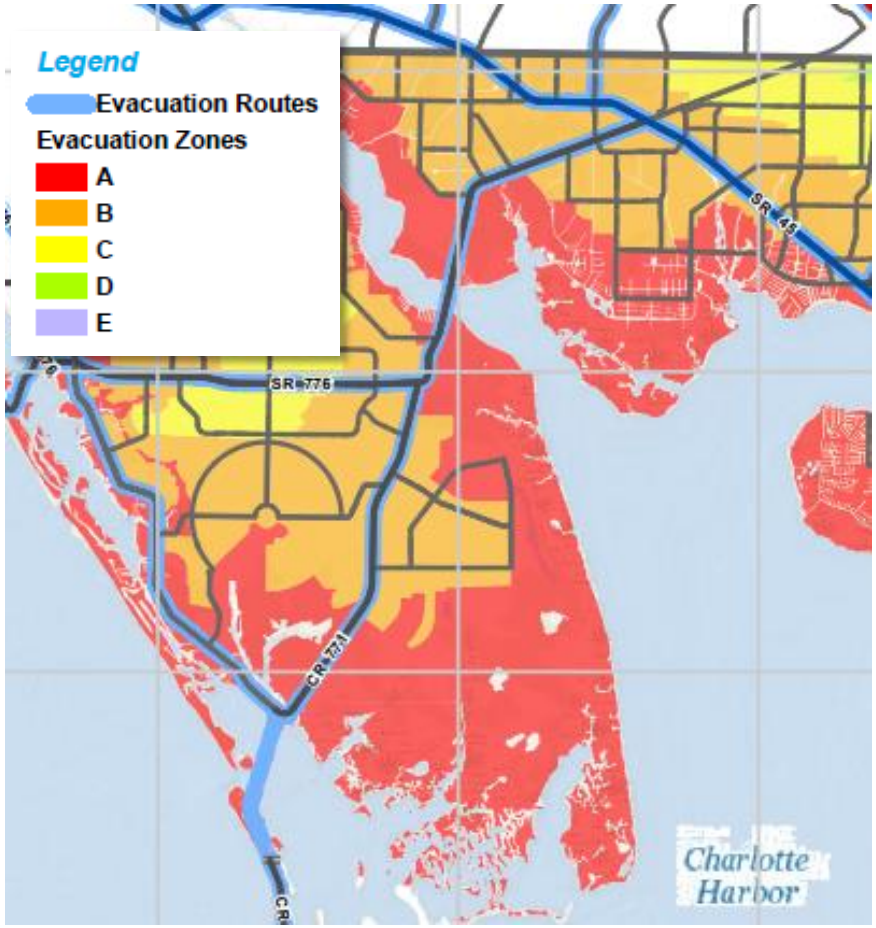
- **Introductions**
- **Coastal Flood Risk Study Review**
  - Data Collected
  - Storm Surge Modeling
  - Overland Wave Modeling
  - Mapping
- **Milestones & Schedule Moving Forward**
- **Map Update Options**
- **Flood Insurance Implications**
- **Flood Risk Open House Information**
- **Questions & Answers – Now & Later**

Project Area
South Florida (SFL) Study

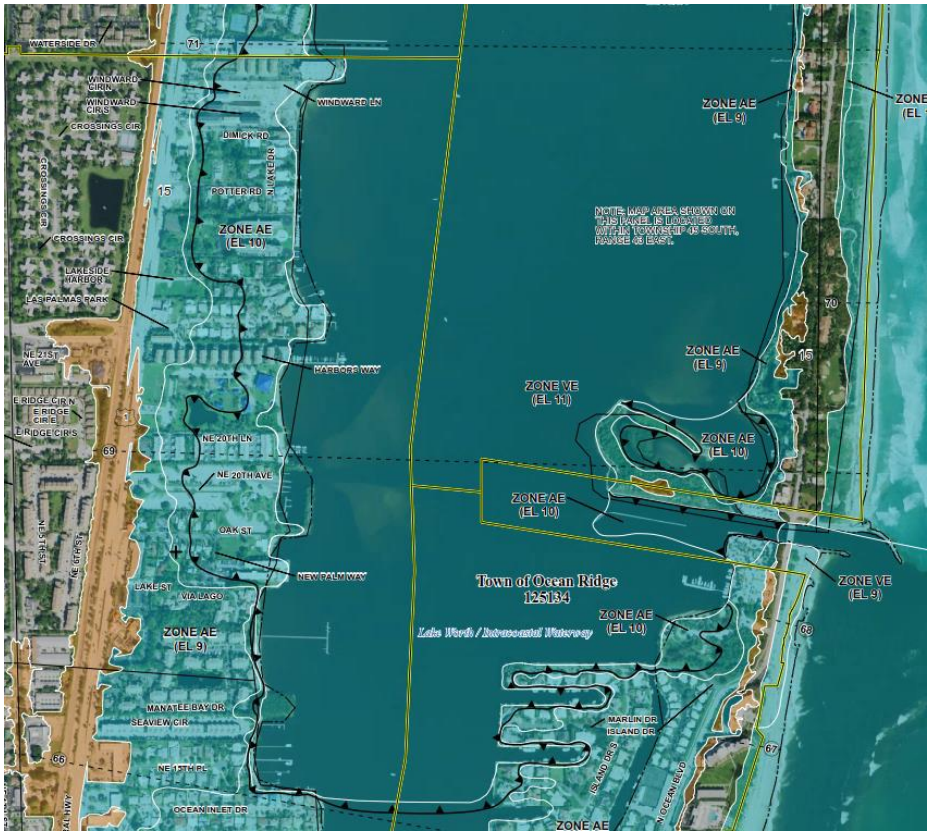
- **Palm Beach**
- Broward
- Miami-Dade
- Monroe County



FEMA Coastal Flood Risk Study Is Not an Evacuation Study



Example Evacuation Map



Example Preliminary FIRM

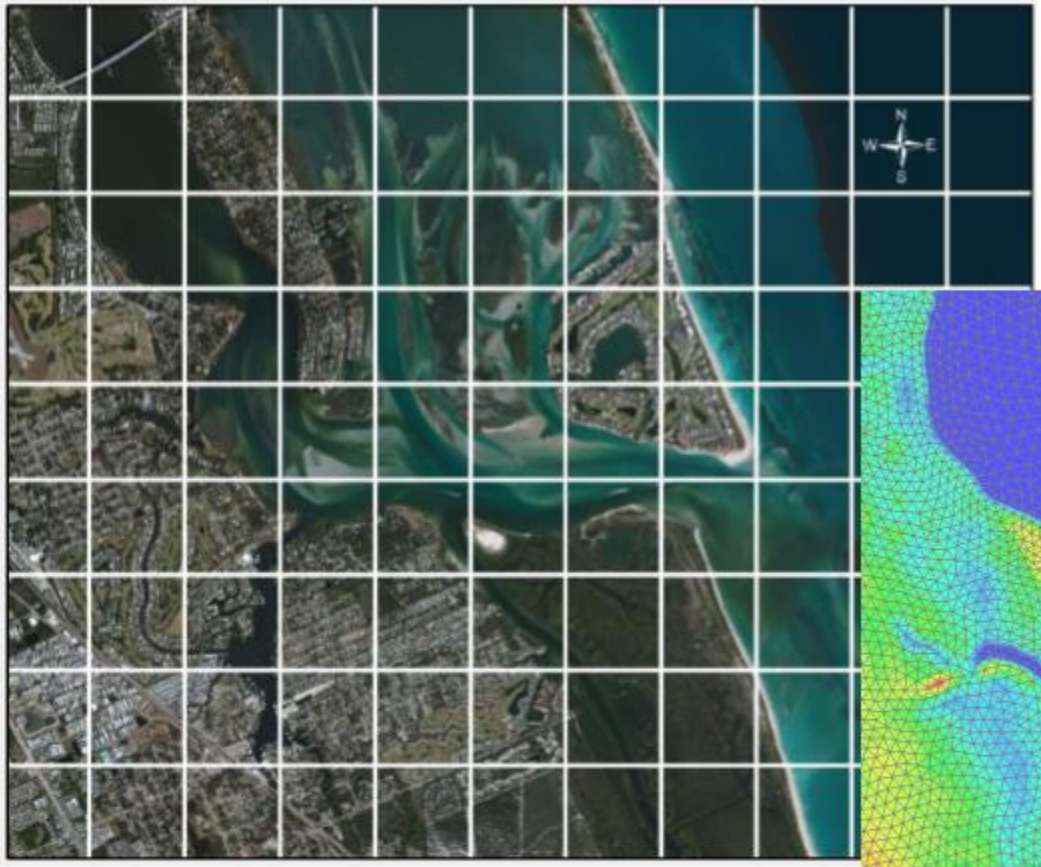
Why the Coastal Flood Risk Study Is Being Updated

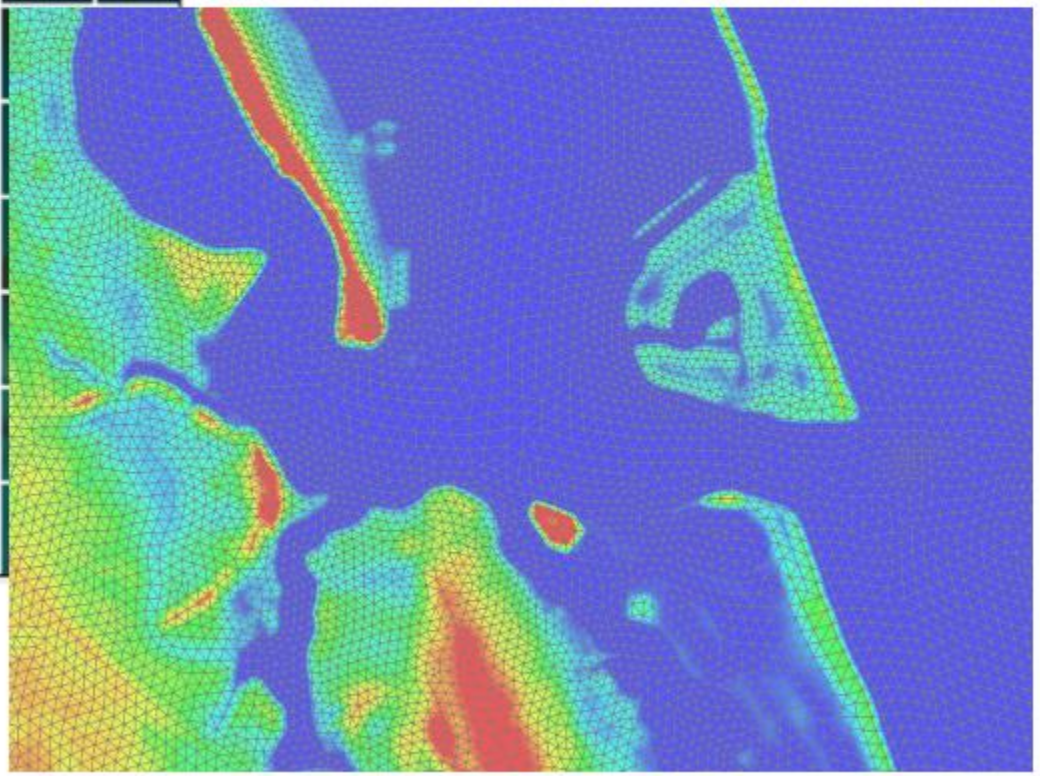
- **Current surge analysis is 30 to 40+ years old**
  - SURGE – FEMA Coastal Flood Storm Surge Model, last updated in 1978
  - Climate data from 1970's and NOAA reports
  - Topographic data from quad maps
- **Overland modeling and mapping outdated**
  - Topographic data from 1970's (newer data in limited areas, transects)
  - SWELs based on surge modeling
  - Limited number of modeling transects (37)
  - No LiMWA

Why the Coastal Flood Risk Study Is Being Updated

- **Today's risk is better defined through**
  - More advanced and highly-resolved modeling methods
  - Updated elevation data
  - New climatological data
  - Super computing resources
  - Updated coastal hazard methodologies
  - More modeling transects (now 200)
  - Improvement in Geographic Information System (GIS) technologies for mapping

Why the Coastal Flood Risk Study Is Being Updated





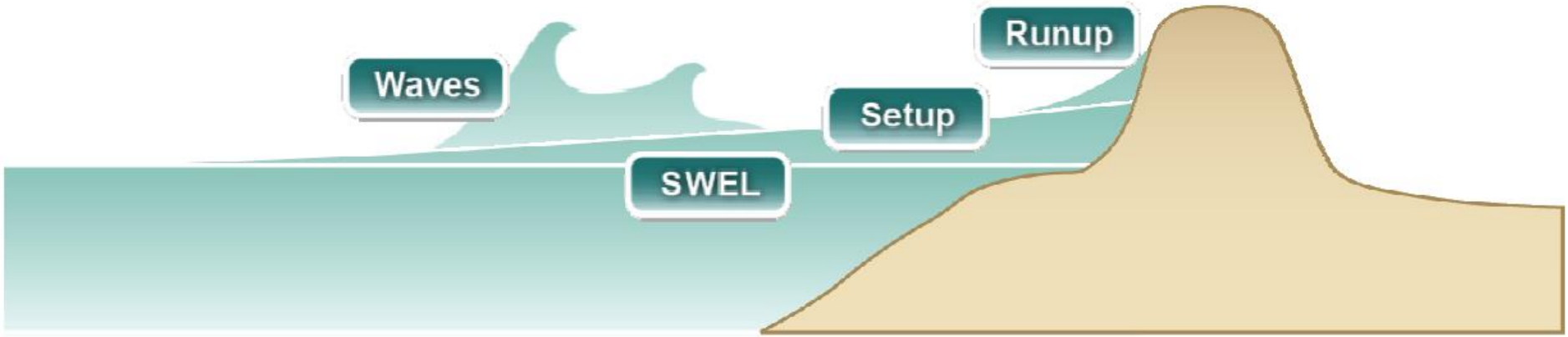
Basic Elements of a Coastal Flood Risk Study

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

1. Storm surge stillwater elevation (SWEL)
2. Amount of wave setup

Determined from storm surge model

3. Wave height above storm surge (SWEL) elevation
4. Wave runup above storm surge elevation (where present)

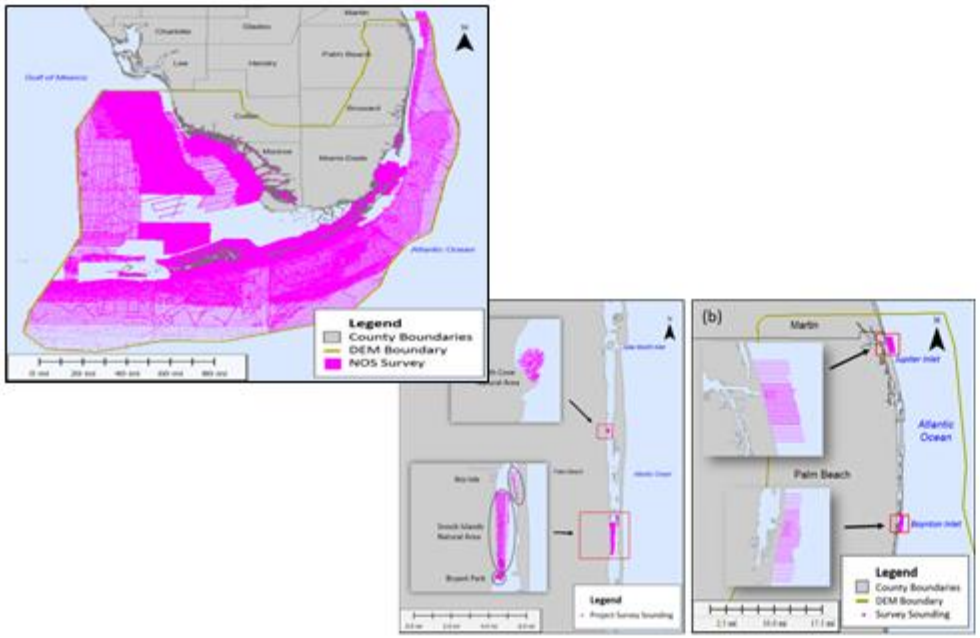


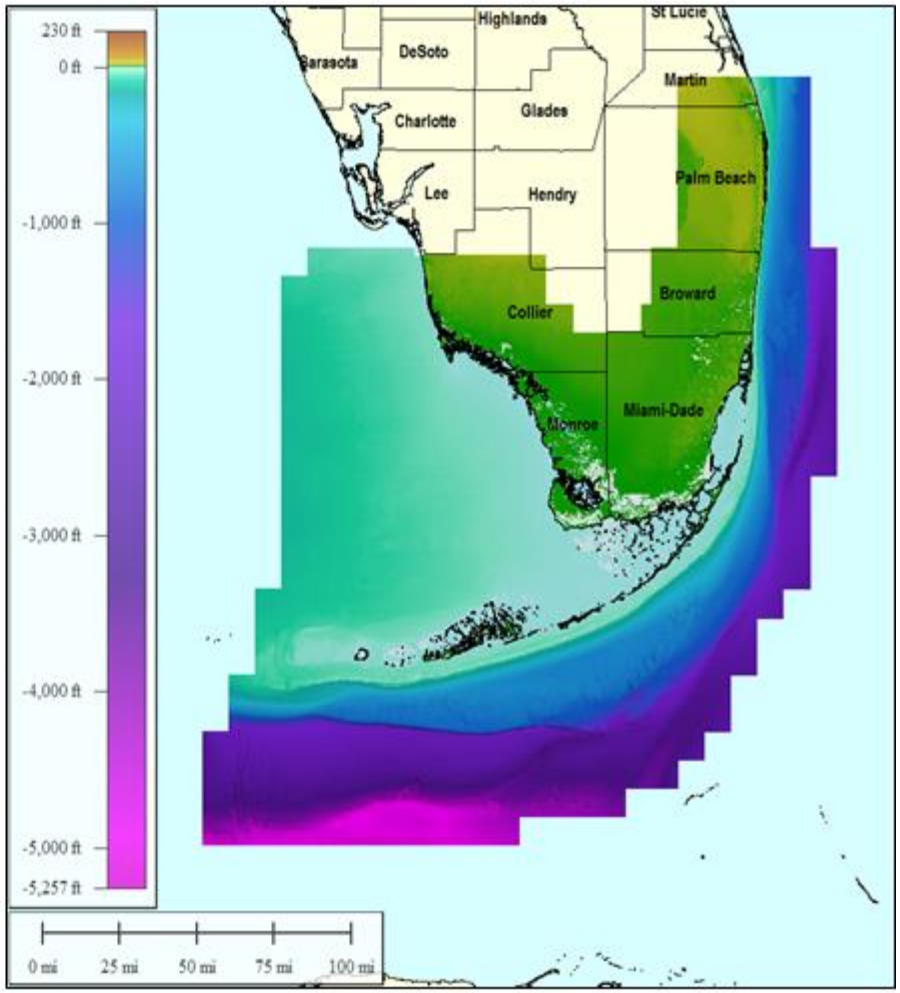
Gathered Field Data

- Topographic Features (e.g., PFD)
- Coastal Structures
- Vegetation & Land Use Cover
- Building Density
- GIS-based Data Capture

Topographic and Bathymetric Data

Year	Description	Data Type	Source/Owner
2007	St. Lucie and Martin Counties, FL LIDAR	Airborne LIDAR	FDEM
2007	Palm Beach County, FL LIDAR	Airborne LIDAR	FDEM
2007	Herbert Hoover Dike Project, FL LIDAR	Airborne LIDAR	FDEM
2001	Palm Beach County, FL LIDAR (DEM)	Airborne LIDAR	SFWMD
2007	Broward County, FL LIDAR	Airborne LIDAR	FDEM
2007	MiamiDade County, FL LIDAR	Airborne LIDAR	FDEM
2008	Florida Keys Project, FL LIDAR	Airborne LIDAR	FDEM
2007	Monroe County, FL LIDAR	Airborne LIDAR	FDEM
2007	Collier County, FL LIDAR	Airborne LIDAR	FDEM
Various	USGS National Elevation Data (10 meter DEMs)	Digital Elevation Model	USGS
2014	South FL Composite Topography	Digital Elevation Model	SFWMD



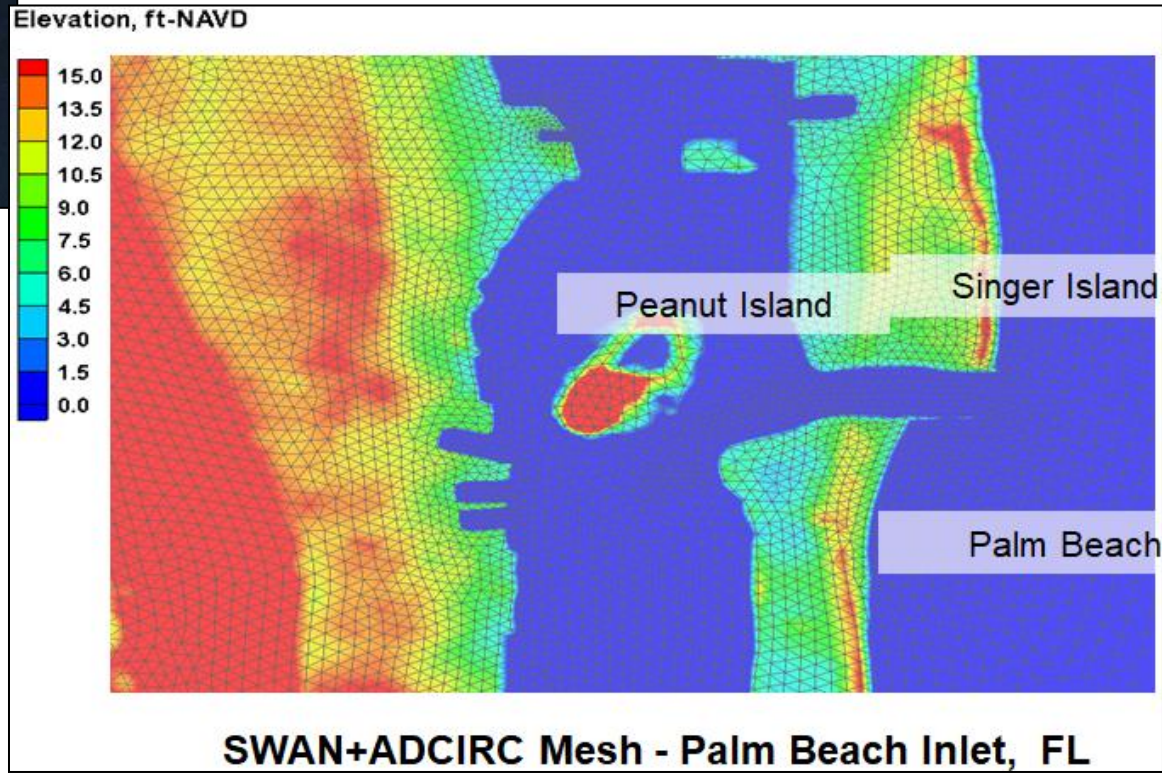


Surge Model Mesh Development

ADCIRC = ADvanced CIRCulation model

- 2.2 million nodes
- 200-foot minimum node spacing

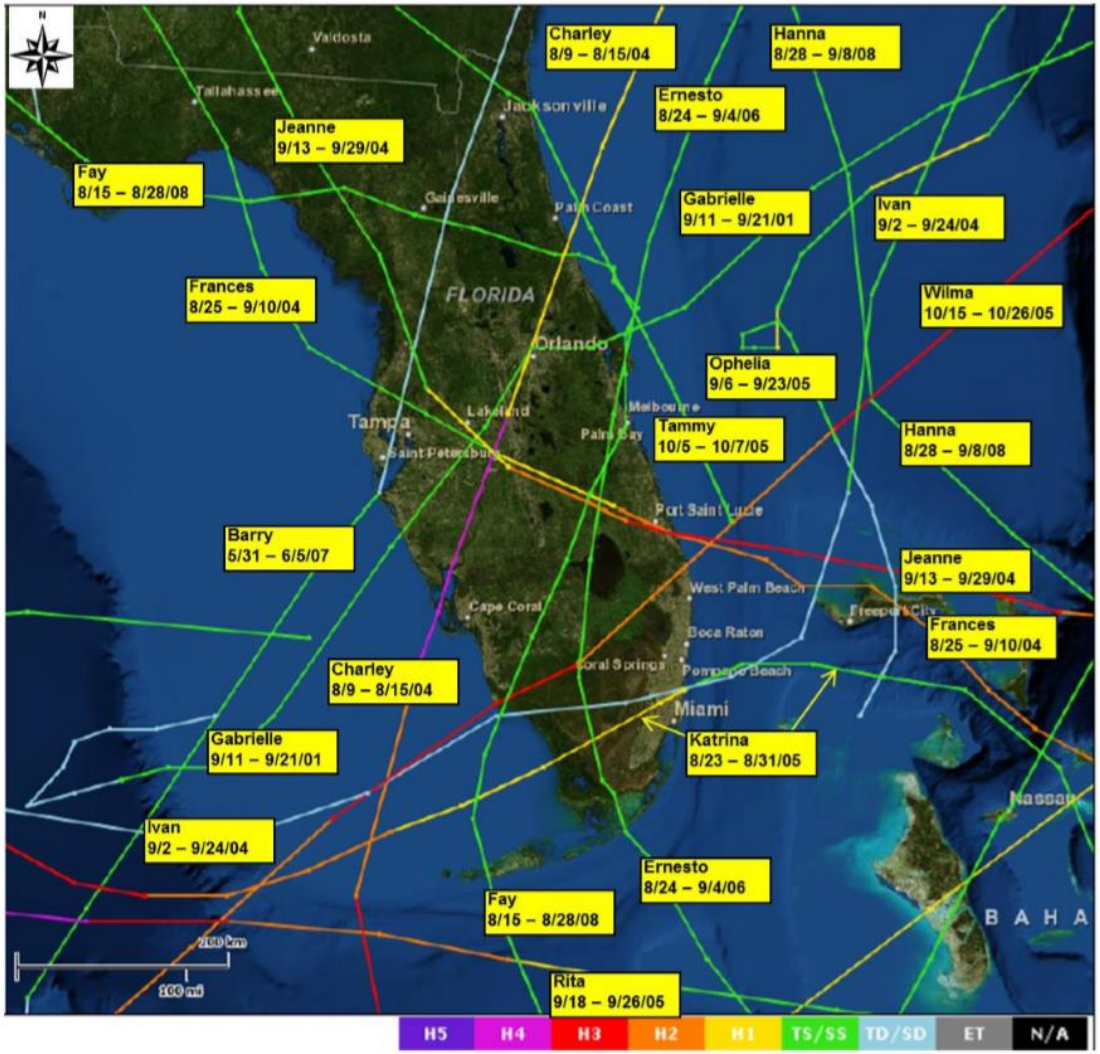
- Finite element model
- Unstructured, triangulated mesh
- Node spacing set to accurately represent underlying topo/bathy
- Feature arcs created to represent important topographic features



SWAN+ADCIRC Mesh - Palm Beach Inlet, FL

Storm Climatology

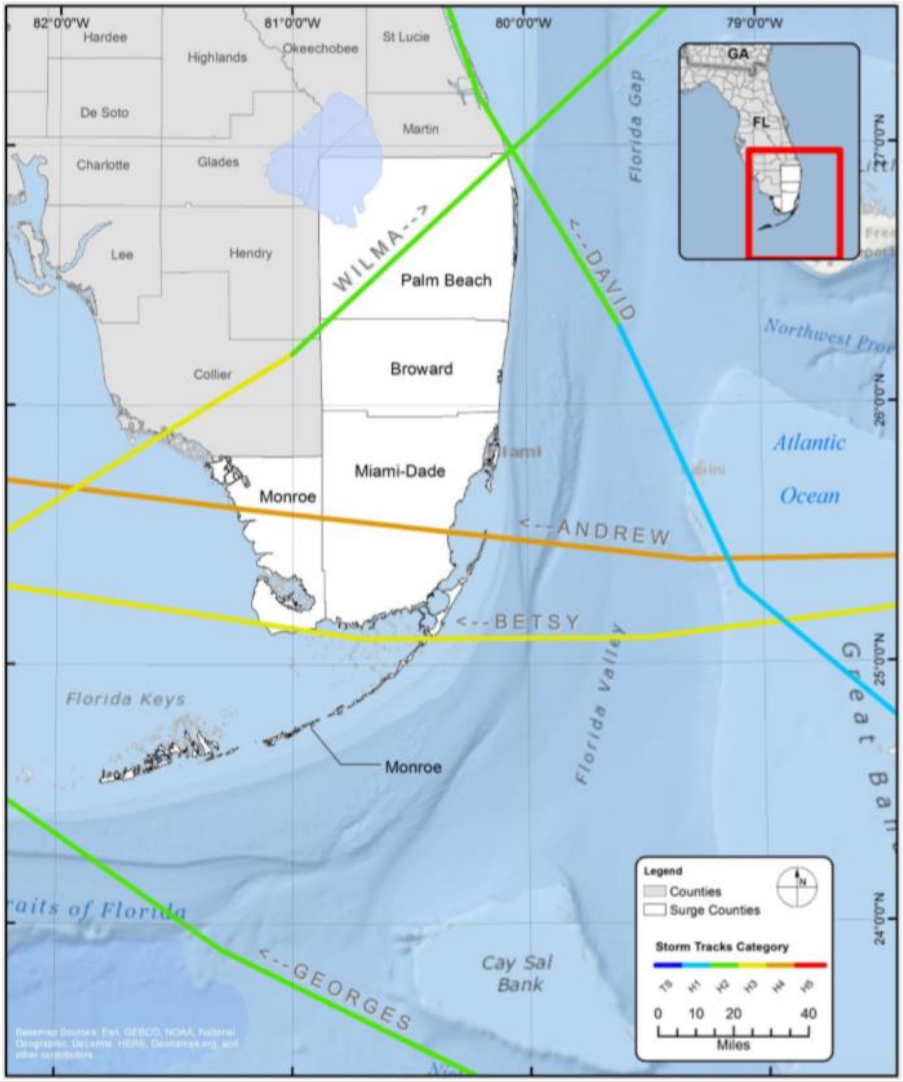
- Tropical storms: 1950 – 2012
- Passing within 200 miles of Miami, FL
- Landfalling, exiting, and bypassing storms



Validation Storms

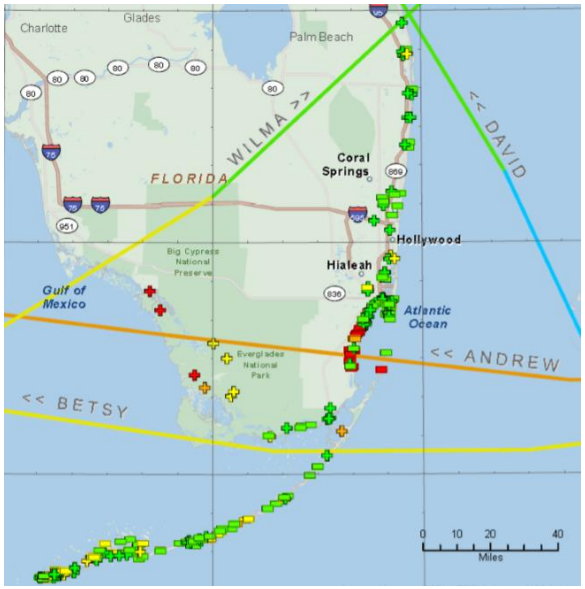
- **Storms Selected:**
  - Hurricane Betsy (1965)
  - Hurricane David (1979)
  - Hurricane Andrew (1992)
  - Hurricane Georges (1998)
  - Hurricane Wilma (2005)

- **Selected based on peak surge and available data**

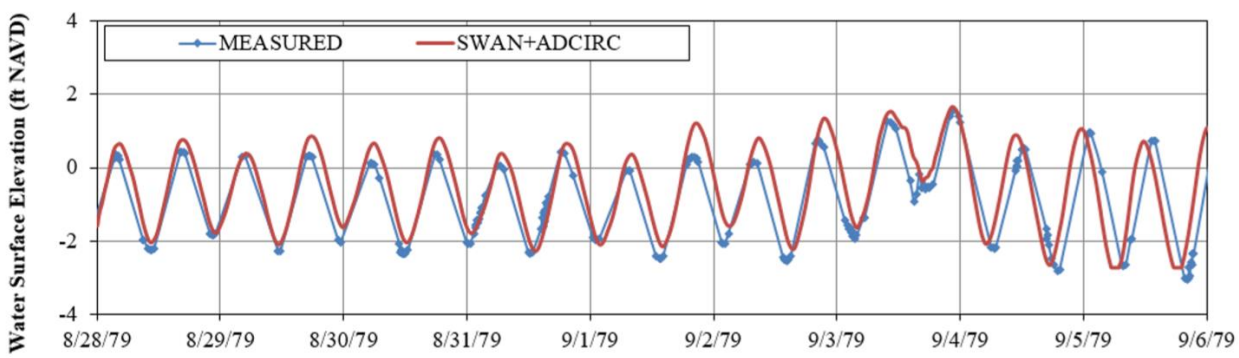


Tide and Storm Validation

- **Validation Data:**
  - Tide harmonic constituent data
  - Surge descriptions and measurements
  - Water level gages
  - High Water Marks
  - Wave buoy data
- **Simulated and known tides**
- **Simulated and recorded surge elevations and wave characteristics for five historic storms**

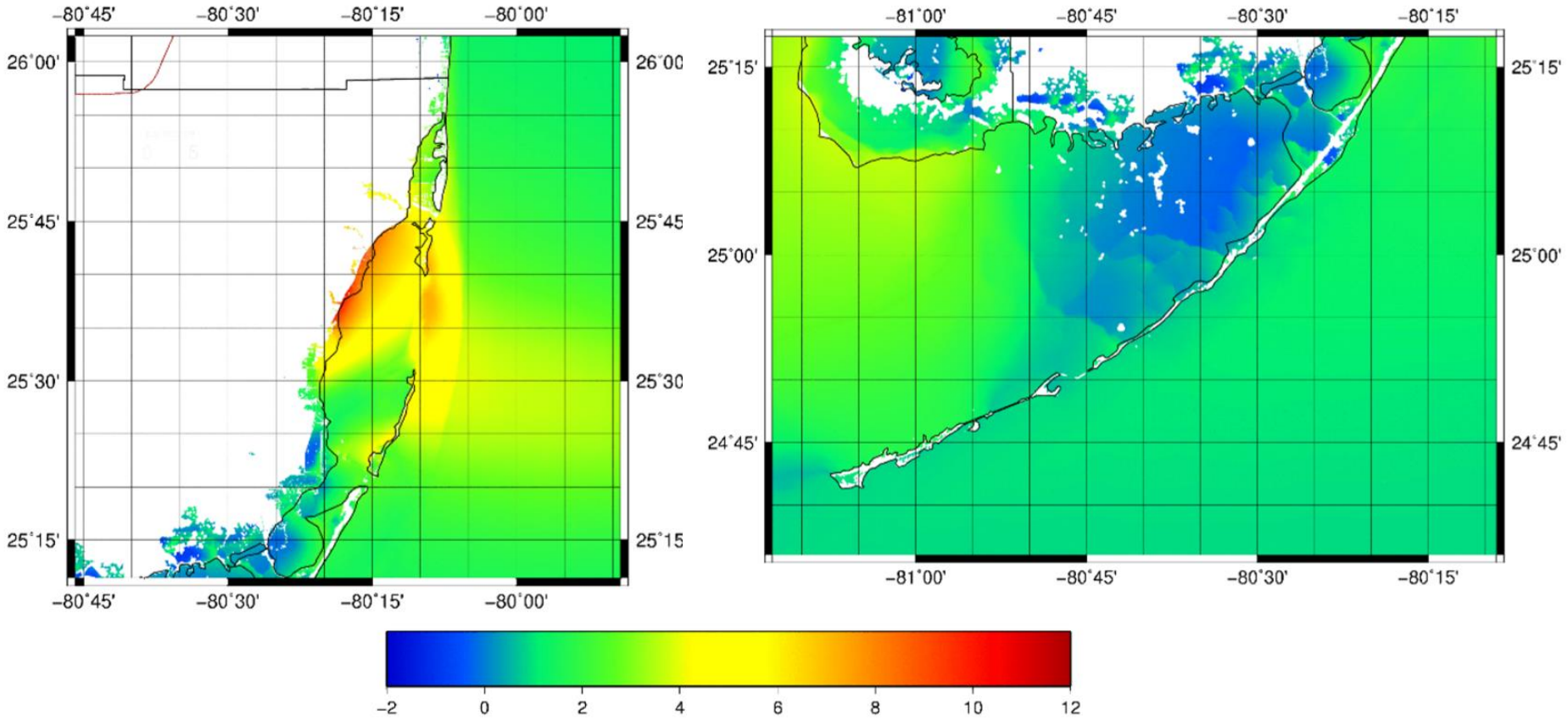


Surge Elevations at Palm Beach during Hurricane Georges



ADCIRC and SWAN Surge Modeling

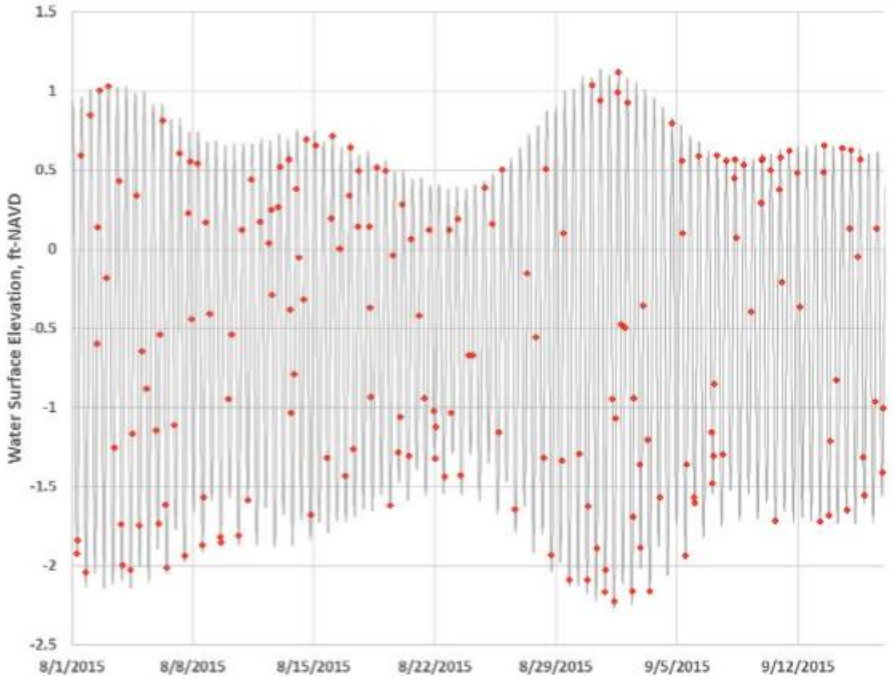
Modeled maximum surge during Hurricane Andrew



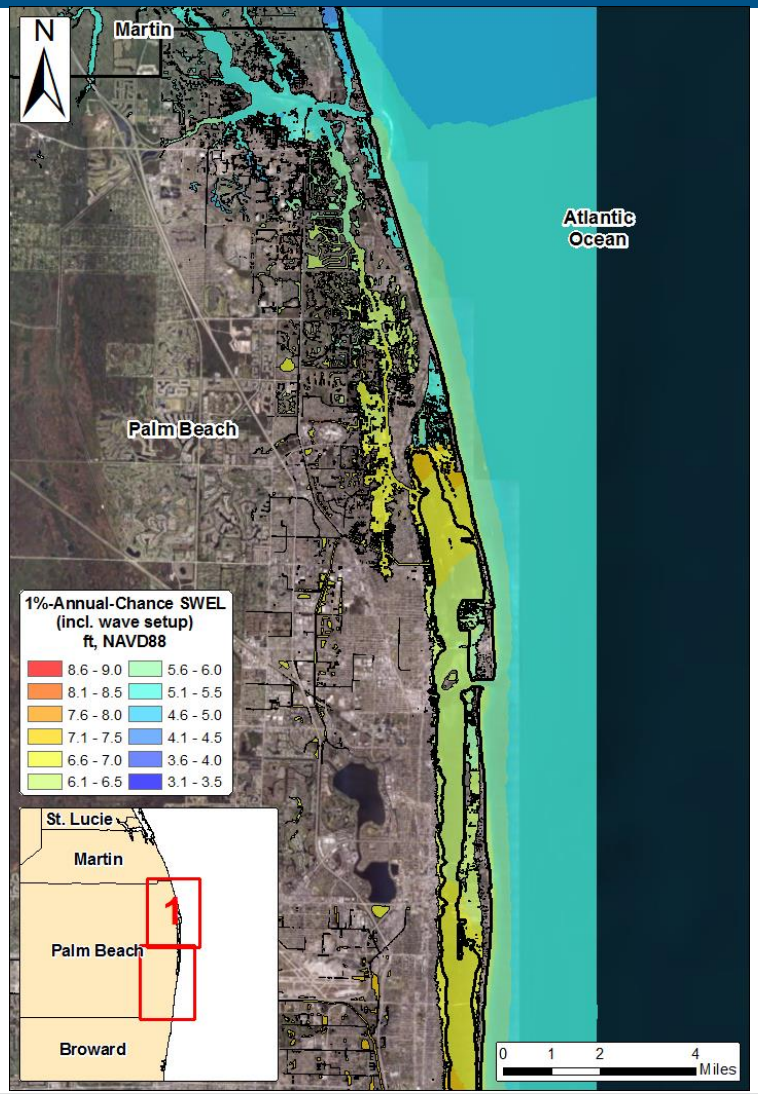
Synthetic Storms

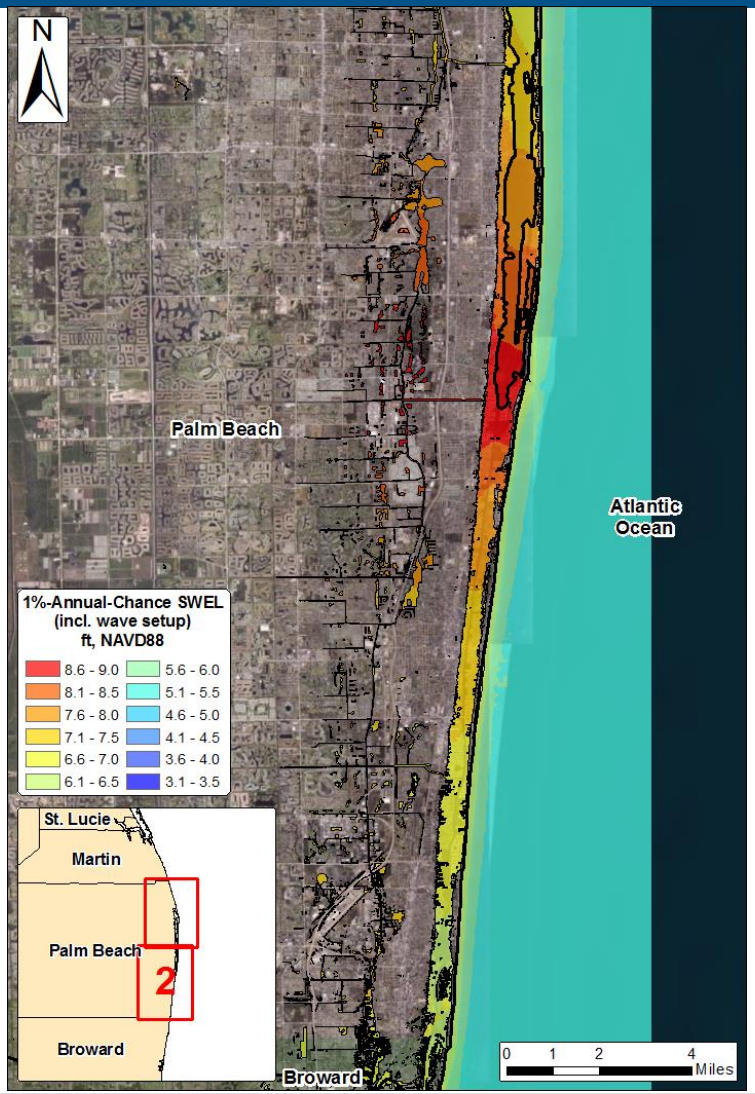
- **Developed using six parameters**
  1. Central pressure
  2. Radius to maximum winds
  3. Forward speed
  4. Storm heading
  5. Holland B (shape parameter)
  6. Landfall location
- **Simulation of synthetic tropical cyclones using ADCIRC+SWAN**
  - Total of 392 synthetic storms (hurricanes and tropical storms)
- **Simulations executed at random start times to represent the effects of astronomical tides**
- **Steric effect determined using NOAA's seasonal trend data**

Production run landfalling times, relative to tide:

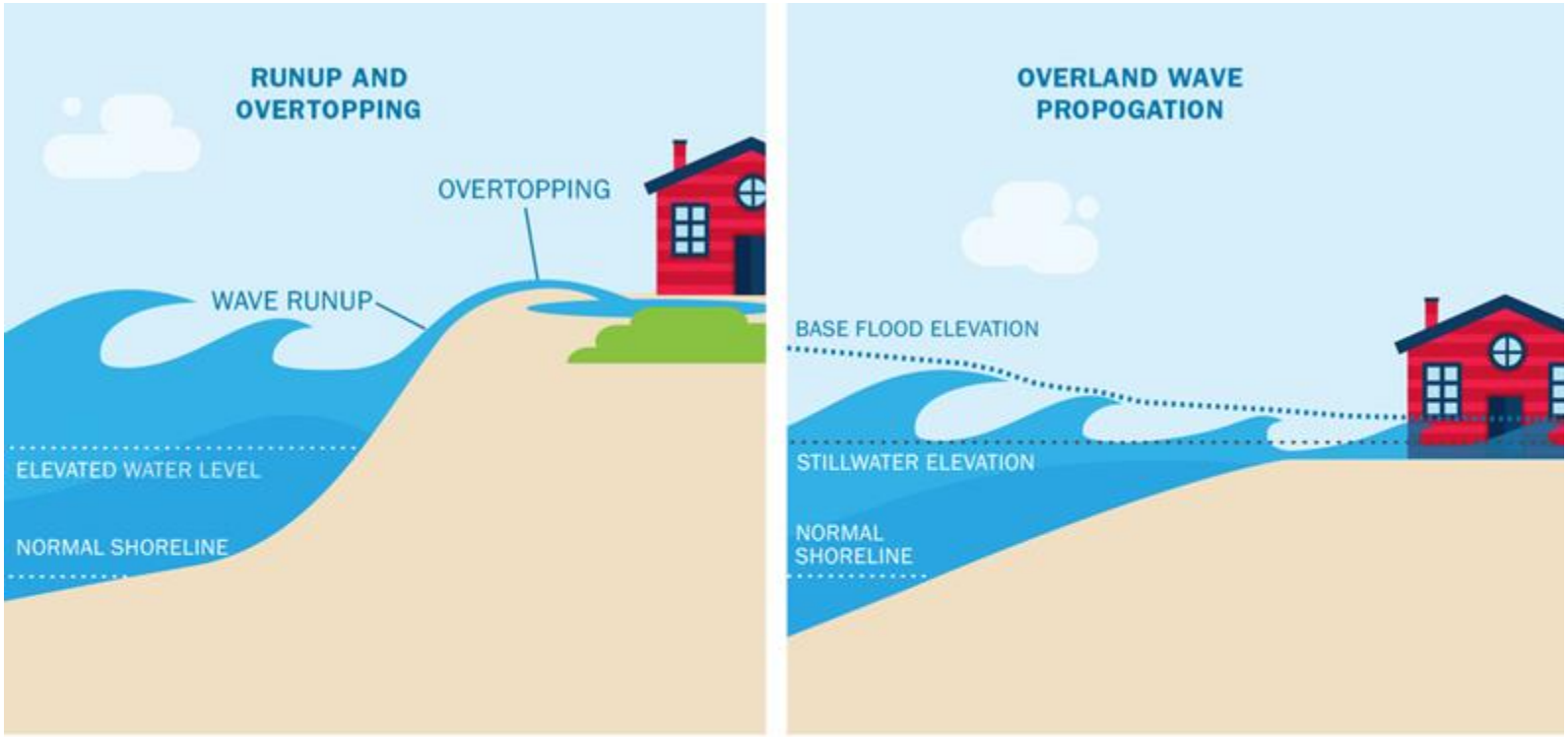


1% Annual-Chance SWELs





Transect-Based Modeling: Overland Wave Modeling and Runup Modeling



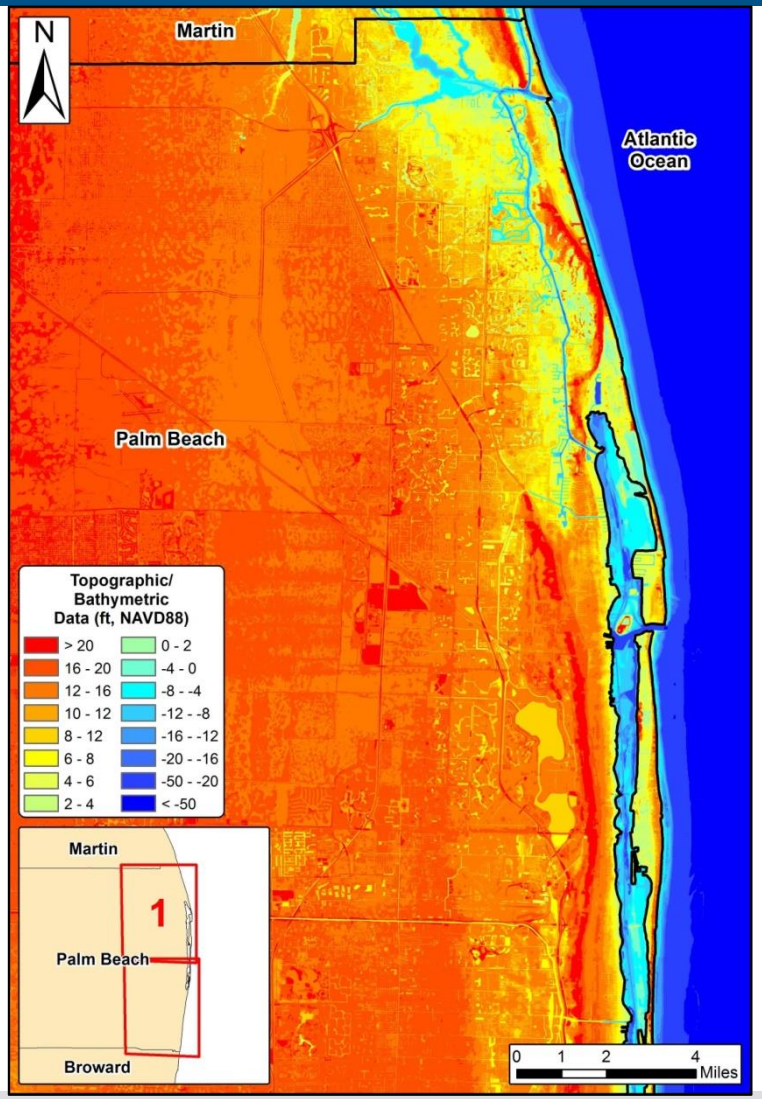
WAVE HAZARD MODELING

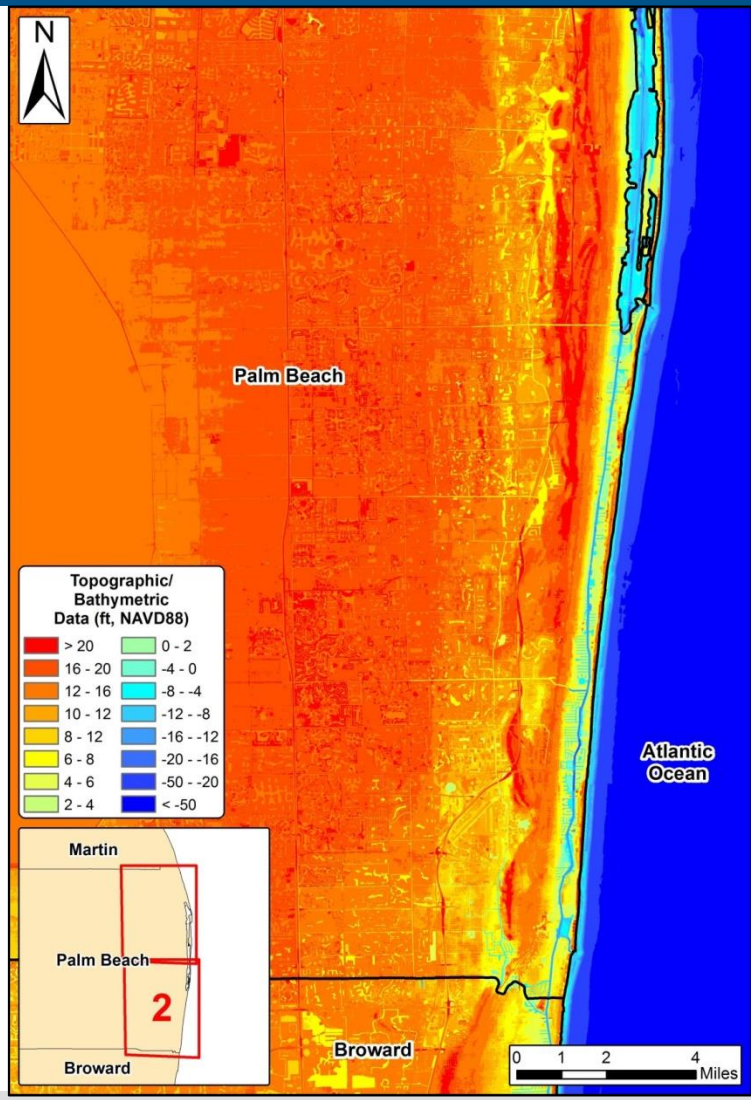
During a flood, waves ride on elevated water levels and can impact buildings located on land that is normally high and dry. FEMA conducts wave hazard modeling to evaluate the risks from overland wave propagation, runup, and overtopping and to determine base flood elevations (BFEs).

Updated Topographic Datasets

Along the barrier island:
2016 USACE topo/bathy Lidar

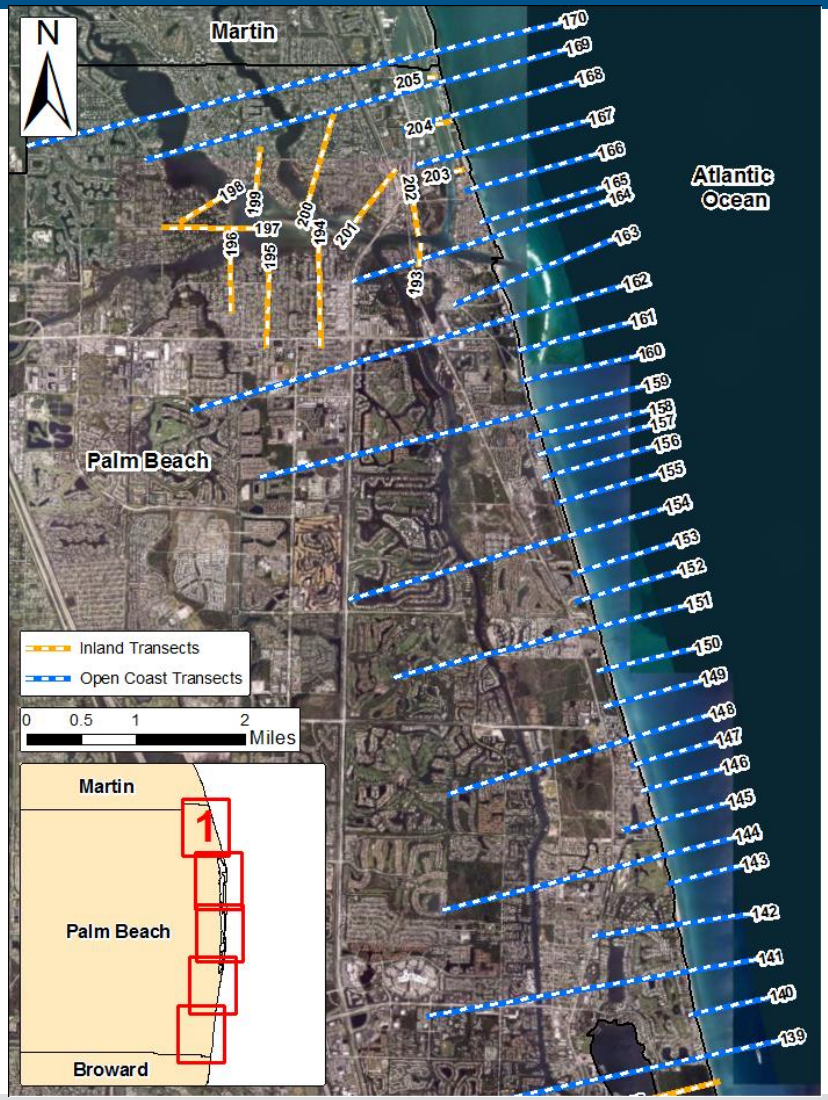
Inland areas:
2007 FDEM Lidar



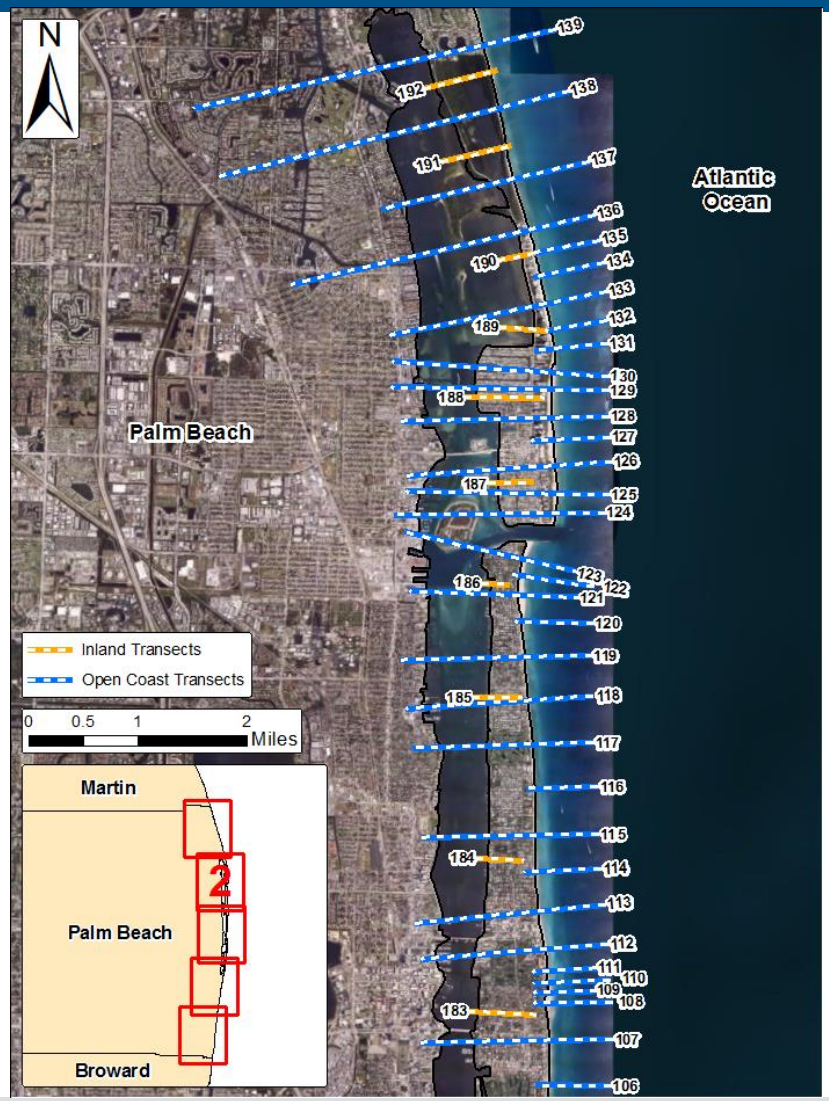


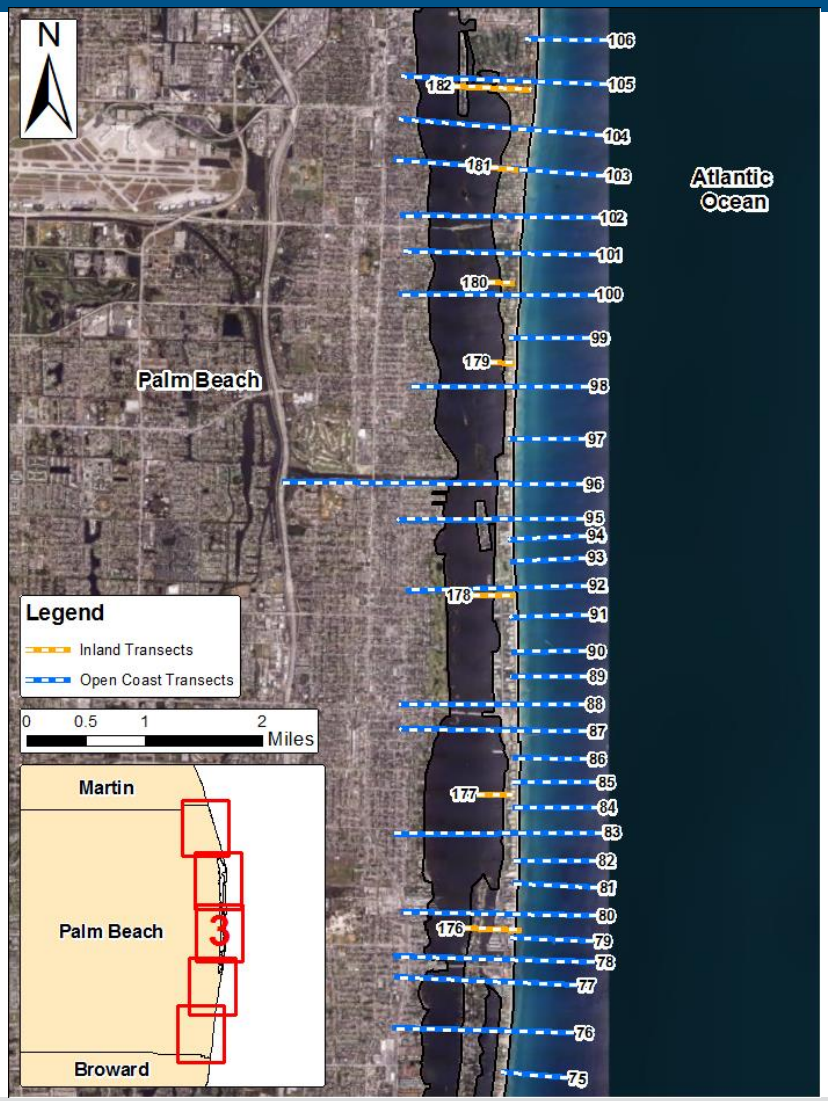
Overland Wave Analysis: Transects

- **170 Open Coast Transects**
- **30 Inland Transects**
- **Transects spaced 500 to 3500 feet apart**

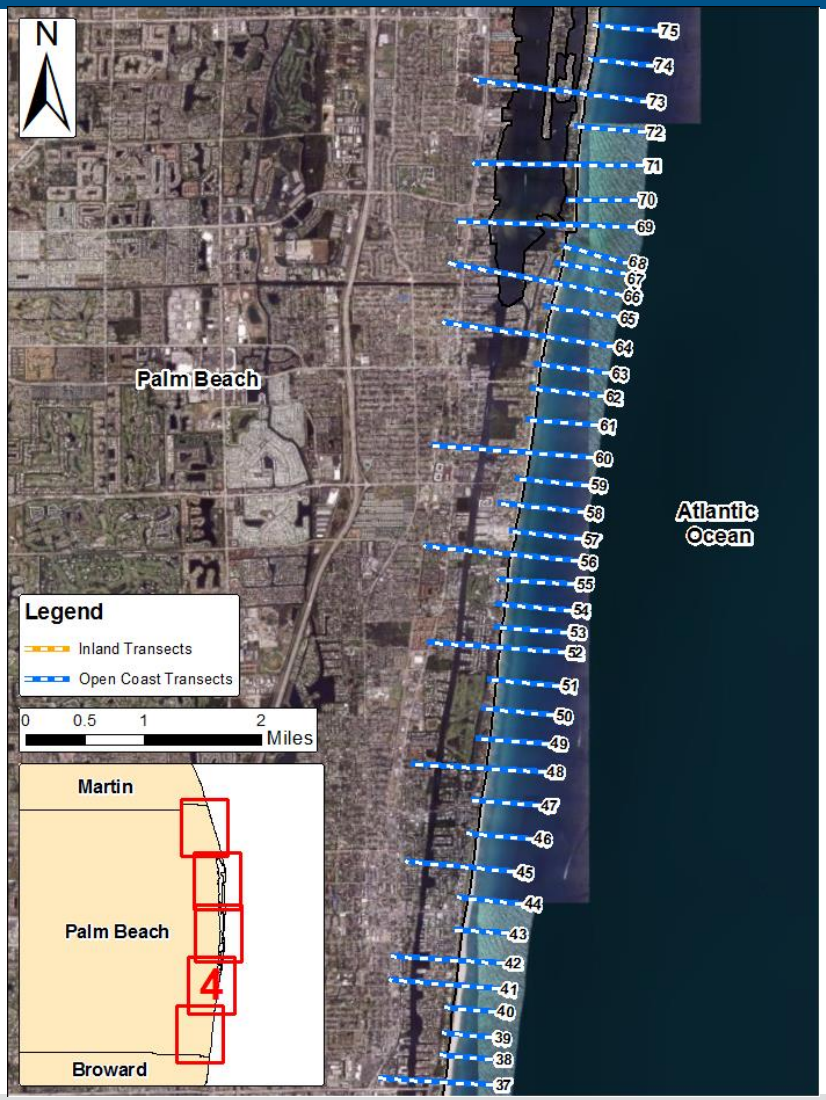


Overland Wave Analysis: Transects



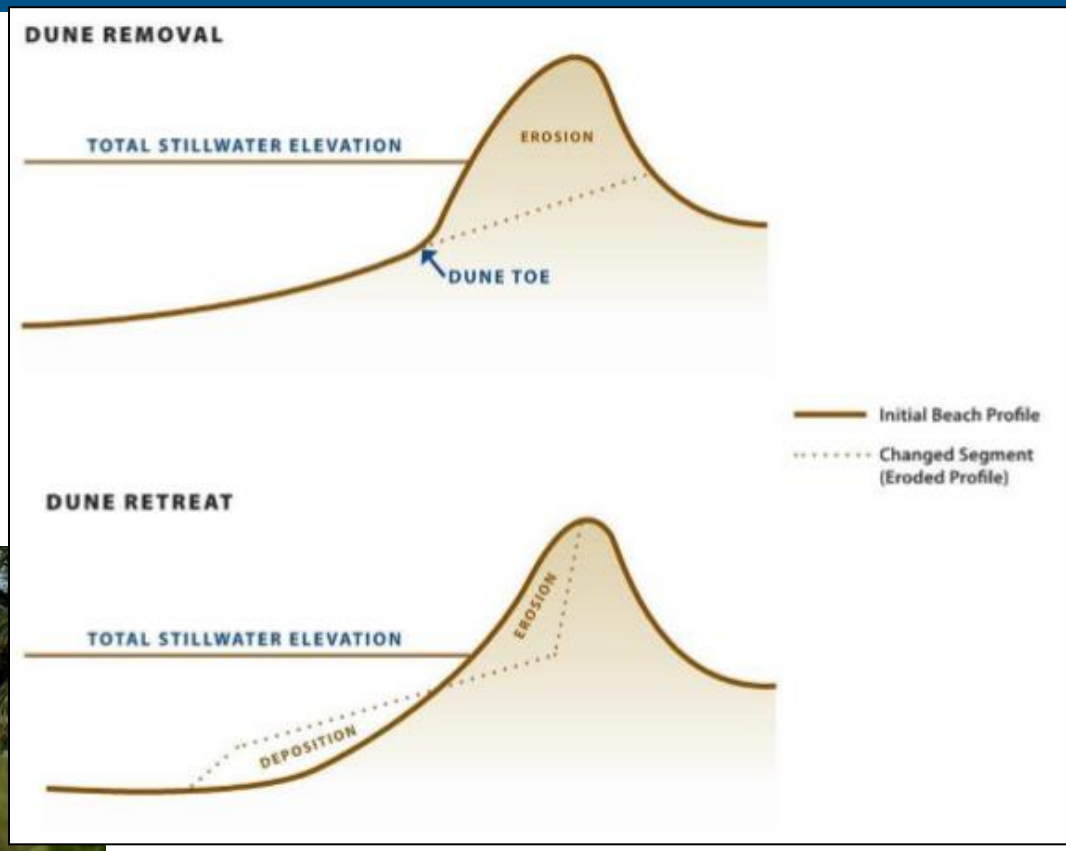


Overland Wave Analysis: Transects



Erosion in Palm Beach

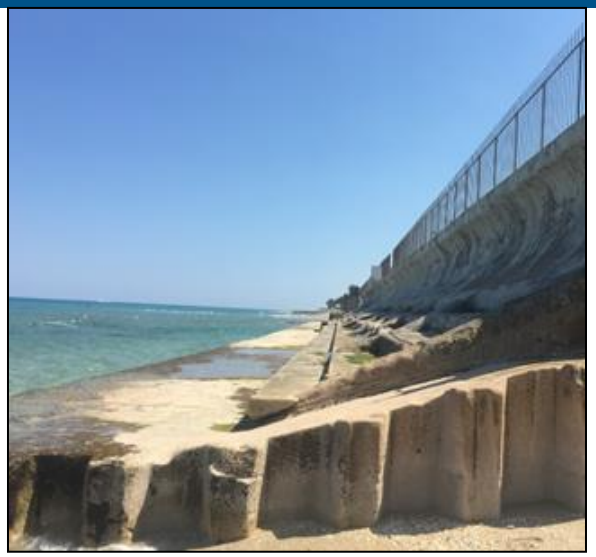
- FEMA's erosion methodology designed for use on dune features
- Traditional erosion analysis results in retreat or removal of dune, depending on dune reservoir volume

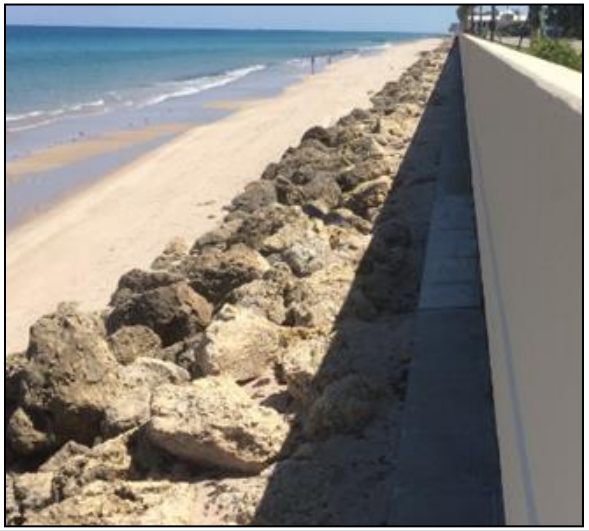


Palm Beach Erosion, Hurricane Dorian
(Palm Beach Post)

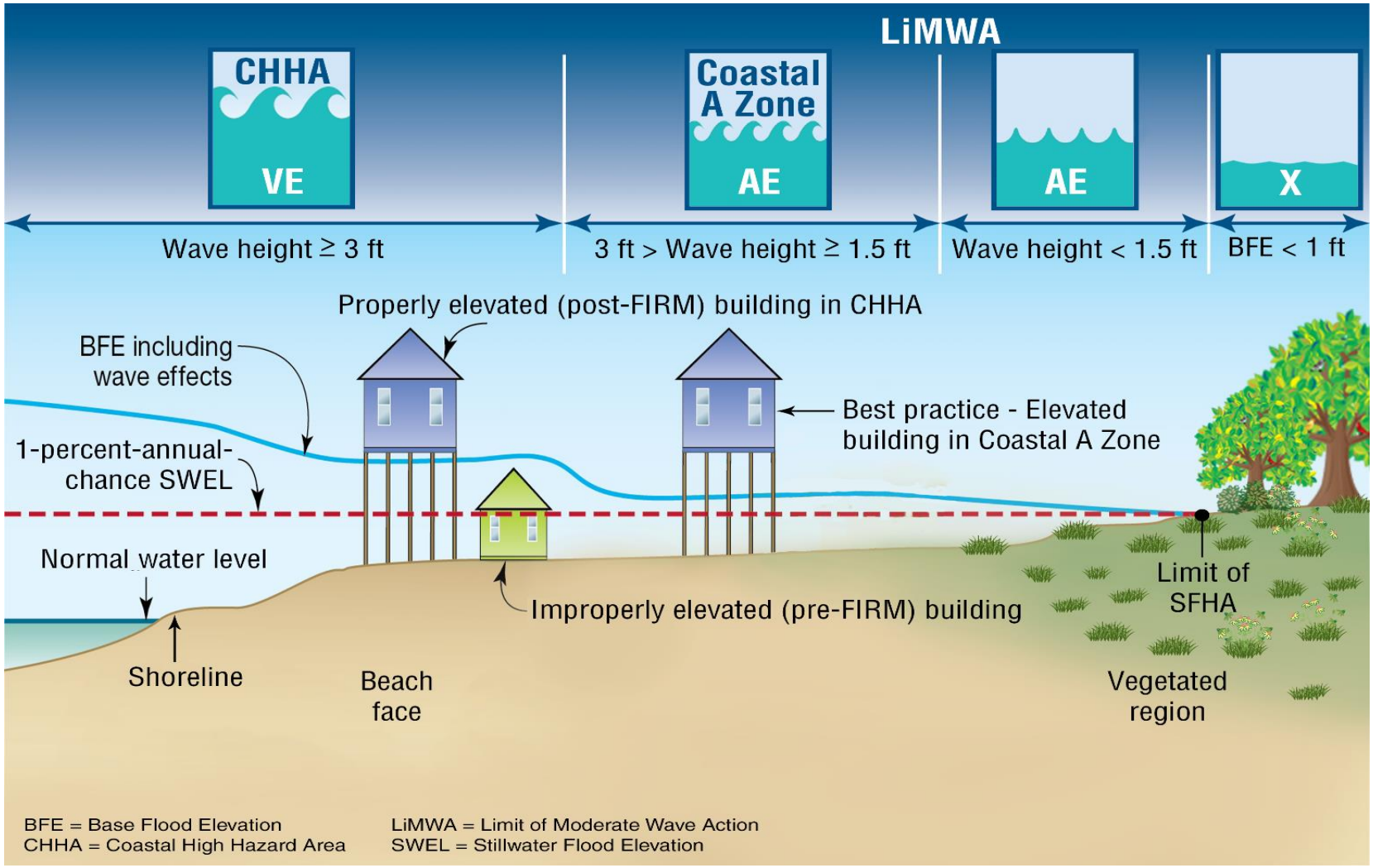
Structures Analysis in Palm Beach

- Structures were evaluated at 52 transects
- Intact and failed profiles were modeled and the more conservative result was mapped
- FDEP historic survey datasets were leveraged to confirm structure elevations and historic levels of exposure

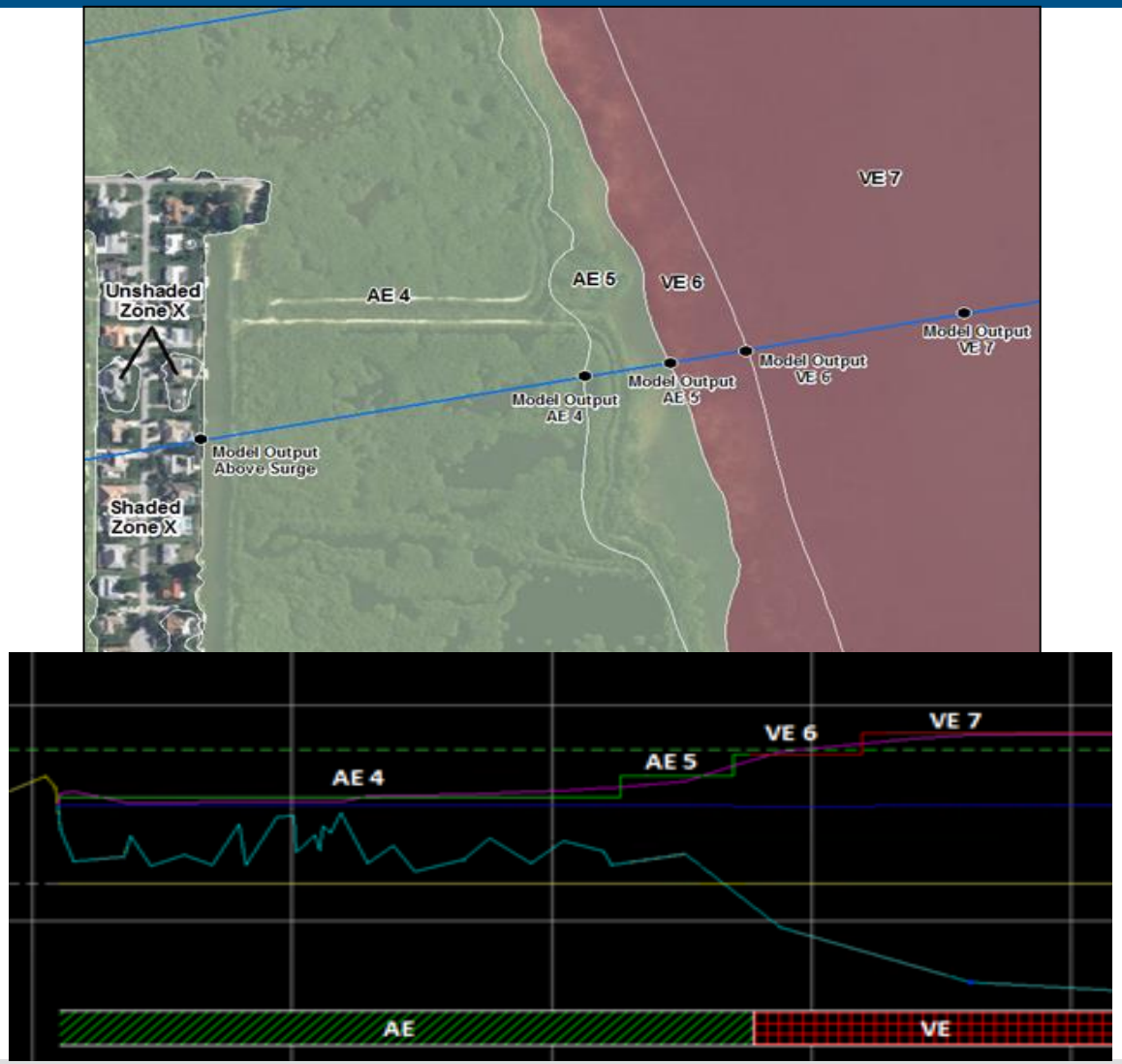




Overland Wave Analysis: WHAFIS



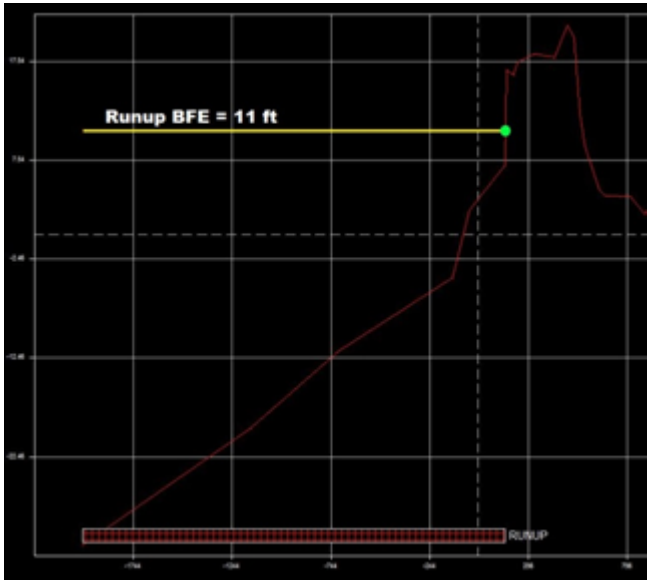
Overland Wave Analysis: WHAFIS Mapping

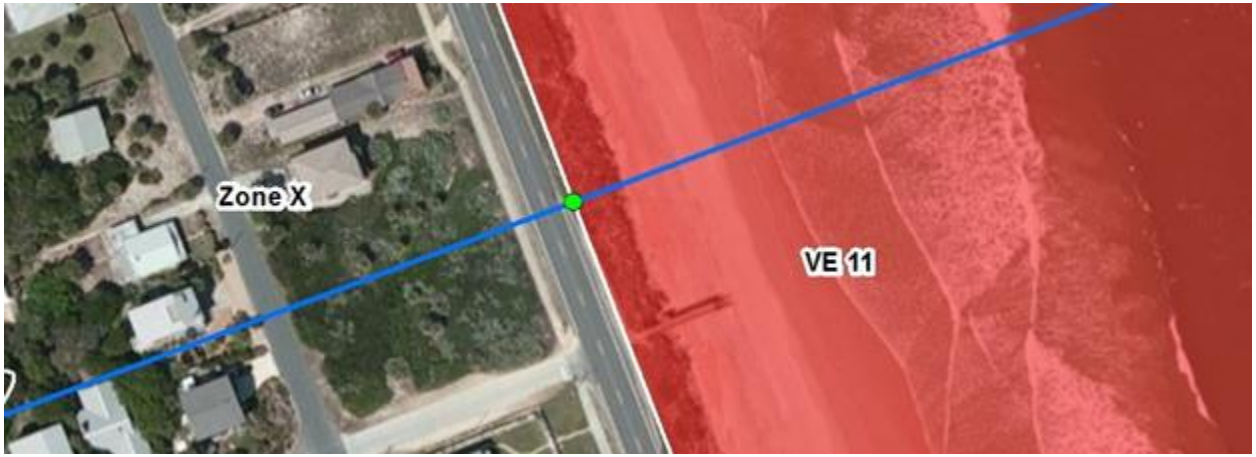


Wave Runup

- Runup modeled for beaches and coastal structures that have crest elevations above 1% SWEL
- Methods:
  - TAW (for armored shorelines)
  - Runup 2.0 (for natural shorelines)

Wave Runup





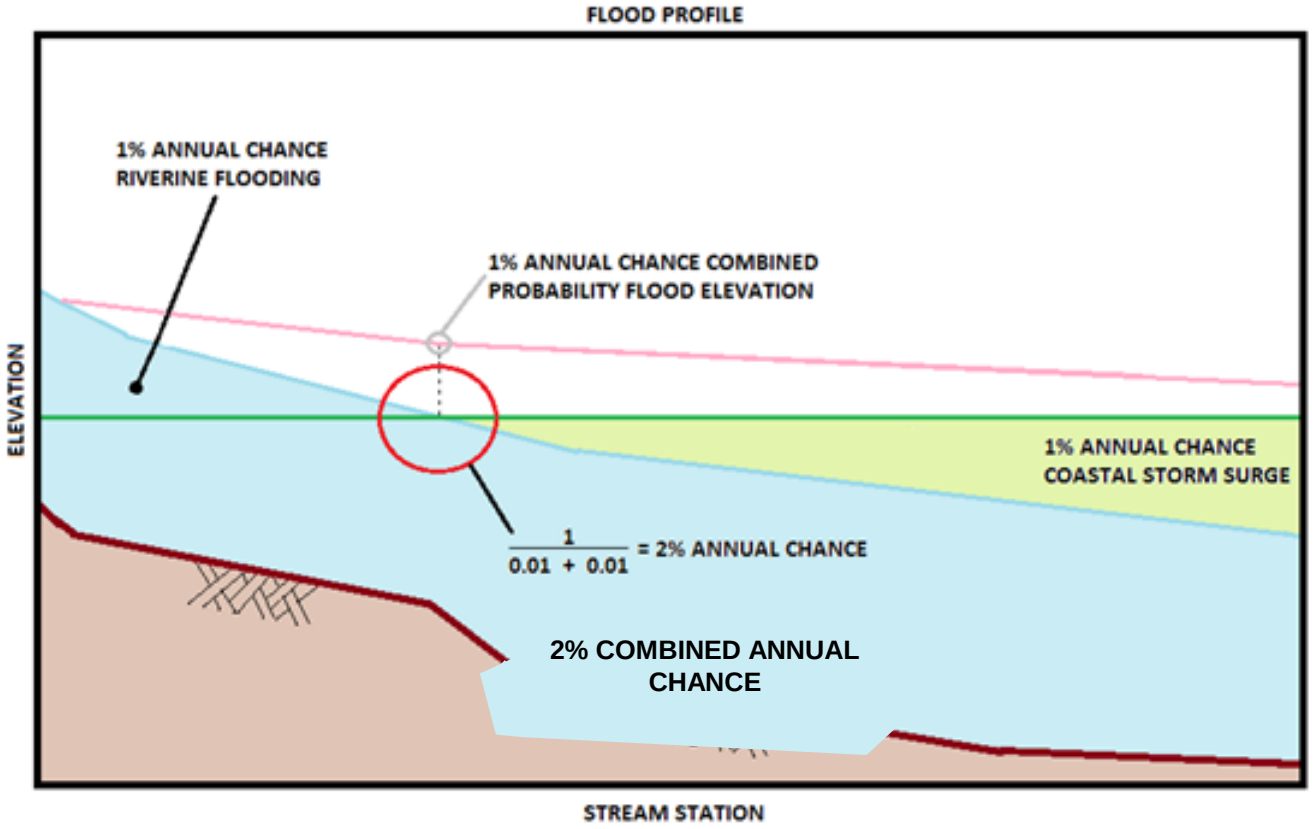
Primary Frontal Dune (PFD)

"*a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms*"
–NFIP regulations

Limit of Moderate Wave Action (LiMWA)

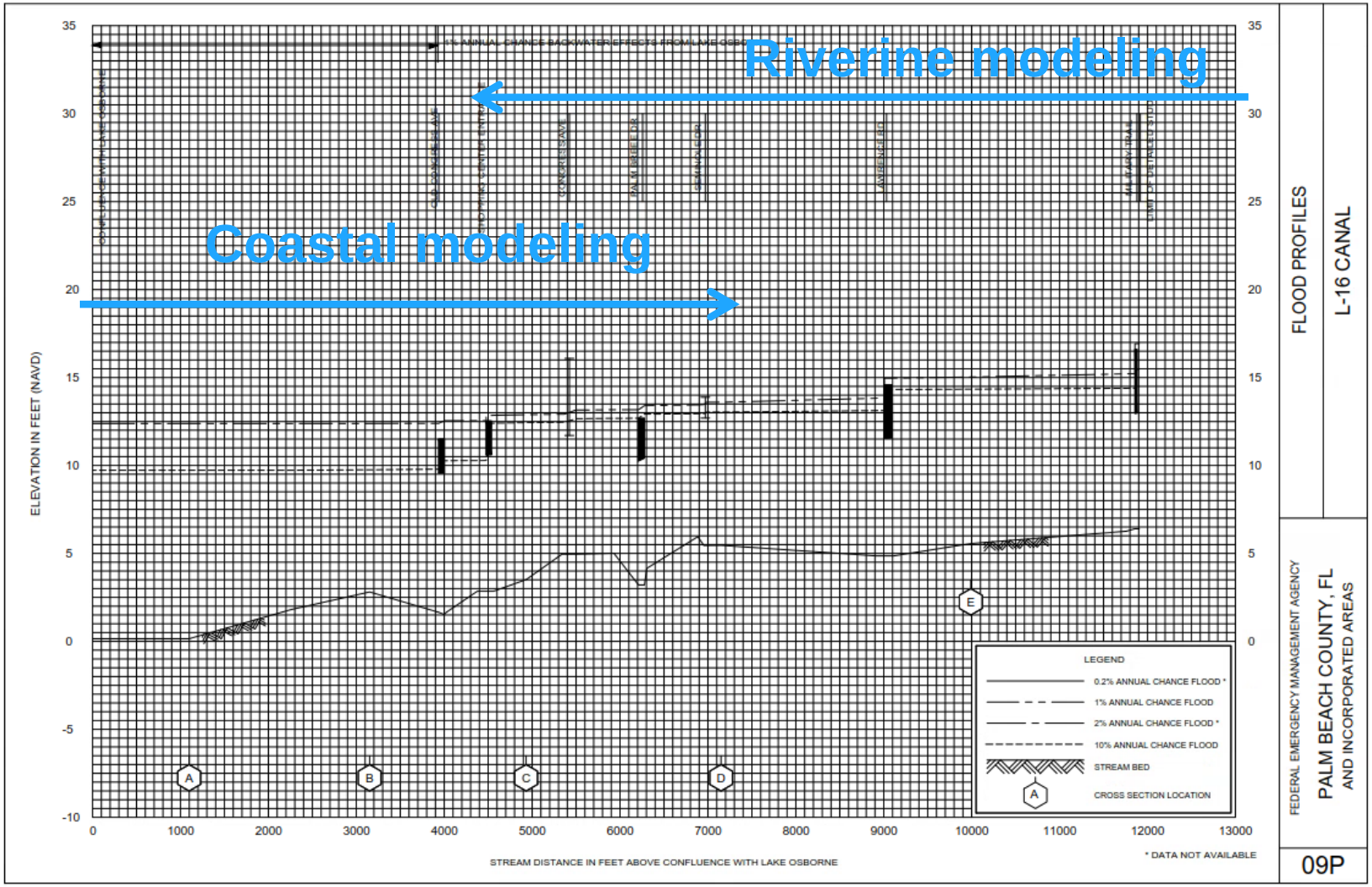
- FEMA Procedure Memorandum No. 50, 2008 and Operating Guidance 13-13
- No Federal insurance regulatory requirement (at present) tied to LiMWA
- Florida Building Code now requires VE zone construction standards in areas defined by LiMWA or areas subject to waves greater then 1.5 feet
- CRS benefit for the requirement

Combined Probability – Mapping

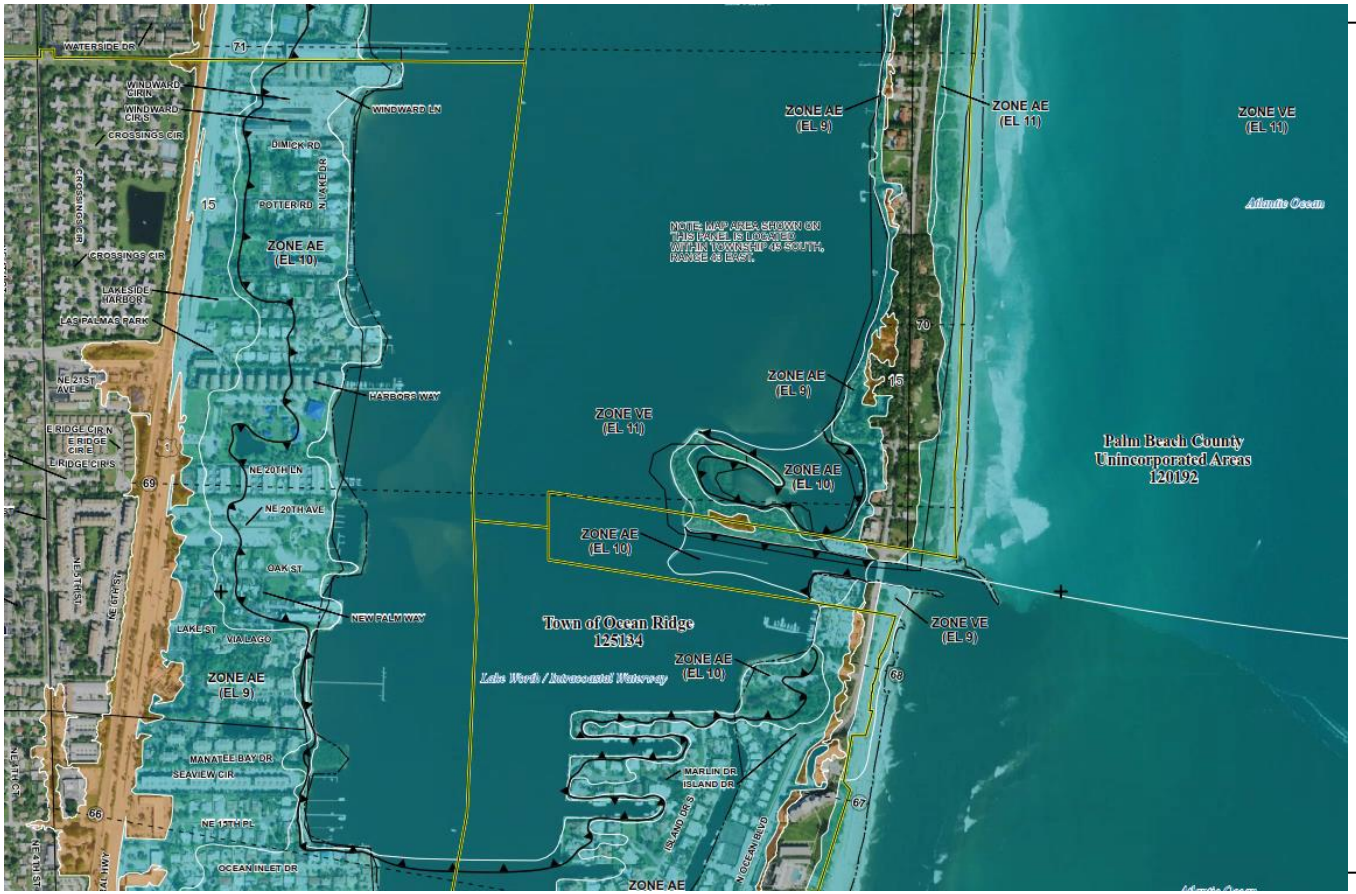


- Jupiter Creek
- Canal E-4
- Canal E-2 (not mapped; riverine dominant)
- Canal E-3 (not mapped; riverine dominant)

Combined Probability – Mapping



Example FIRM



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A,V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

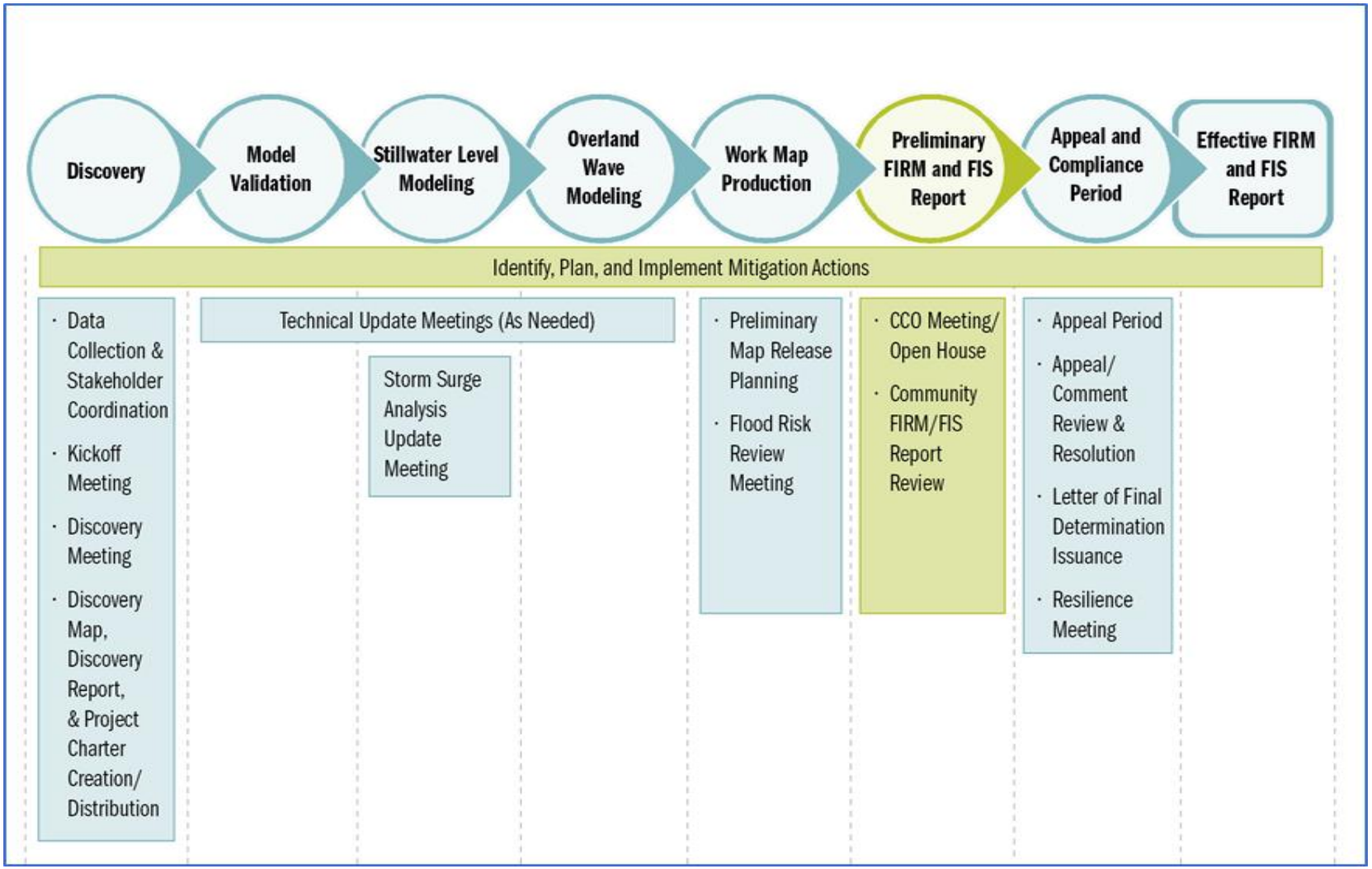
OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

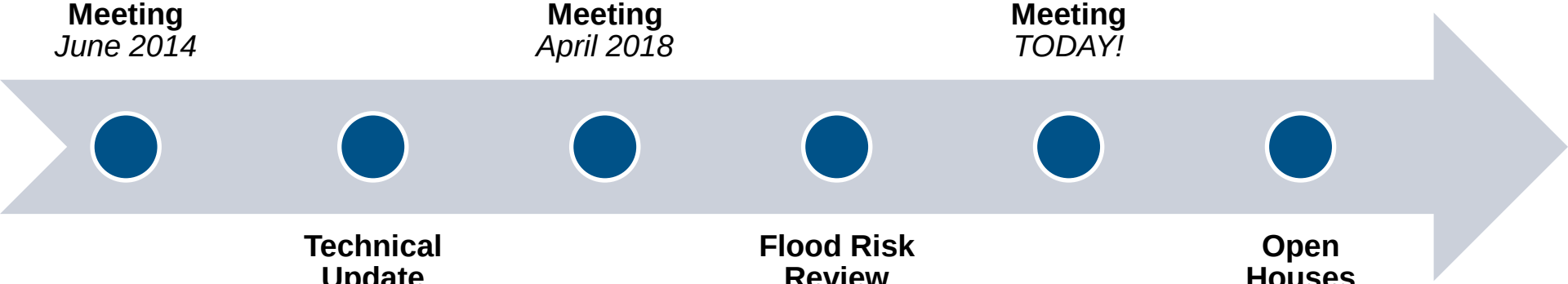
GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- E 18.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 — Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

Milestones and Schedule: Study Phases



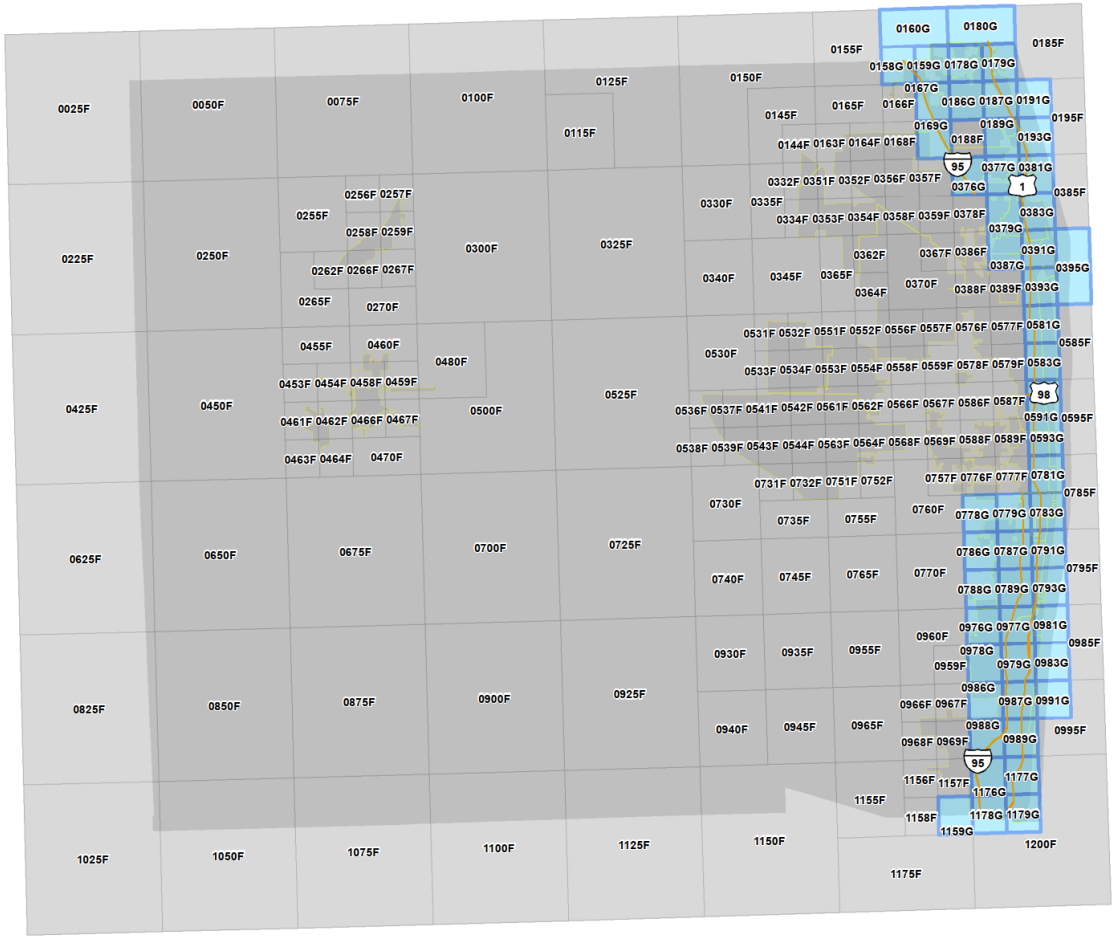
Milestones and Schedule: Outreach Meetings



Preliminary Map Package

- **Sent to each community (CEOs and FPAs)**
  - Palm Beach County: sent December 20, 2019
- **Package included:**
  - Updated Palm Beach County FIRM Index panel
  - Updated FIRM panels for community
  - Updated Flood Insurance Study (FIS) report
  - Preliminary Summary of Map Actions (SOMA)
  - Digital data

Updated FIRM Panels:



Unrevised Panels

New Coastal Analysis and Mapping

Palm Beach County Coastal Study: Post Preliminary Processing

- **Preliminary Maps Issued – December 20, 2019**
- **Consultation Coordination Officer (CCO) Meeting / Public Open Houses – February 4-5, 2020**
- **End of Appeal & Comment Period**
- **Letter of Final Determination**
- **Effective Maps**

Appeal and Comment Period

- Communities in Palm Beach County will have a **90-day appeal period** for all changes to Special Flood Hazard Areas.
  - **SFHA changes will be published in the Federal Register**
  - **SFHA changes will be published in your local newspapers twice within a 10-day period**
  - **The second newspaper publication will begin the 90-day appeal period**

Appeals are for all SFHA changes

What is An Appeal?

- **The new or revised BFEs are believed to be scientifically or technically incorrect**
- **The BFEs are scientifically incorrect if:**
  - The methodology used and assumptions made in the determination of the BFEs is inappropriate or incorrect
- **The BFEs are technically incorrect if:**
  - The methodology was not applied correctly or was based on insufficient or poor-quality data.
  - The methodology did not account for the effects of physical changes that have occurred in the floodplain.
- **Must be certified by Professional Engineer and reviewed/approved by community**

Appeal and Comment Period

- Communities in Palm Beach County will also have a **comment period.**
- Comments do not involve BFEs.
- Comments include, but are not limited to, the following:
  - **Channels Names and Locations**
  - **Road Names and Locations**
  - **Corporate Limit Changes**

All other changes are considered Comments

Where to Submit Appeals and Comments

- **Please have appeals and comments directed to your local floodplain administrator.**
- **Your local floodplain administrator can submit all appeals and comments to:**

Michael Taylor
AECOM
1360 Peachtree St NE, Suite 500
Atlanta, GA 30309
Michael.Taylor@aecom.com

FEMA will not move forward until your appeals and comments are resolved.

Appeal Resolution Process

- **During the appeal period process, FEMA will:**
  - Acknowledge receipt of appeal(s)/comment(s) via letter(s) to CEO(s)
  - Send CEO(s) letter(s) to explain resolution of appeal(s)/ comment(s)
  - Send communities updated FISs and FIRMs (if applicable).

FEMA will deny appeals and comments that are <u>not</u> adequately supported by data/information.

Letter of Final Determination (LFD) and Adoption/Compliance

- LFDs follow the appeal period and begin the 6-month adoption/compliance period.
- Adoption/compliance: communities adopt the new FIRM(s) into floodplain ordinances.
- FDEM or FEMA Region IV staff may contact communities and offer assistance with reviewing and updating their floodplain ordinances.
- If a compliant ordinance is not received before the FIRM effective date, the community will be suspended from NFIP

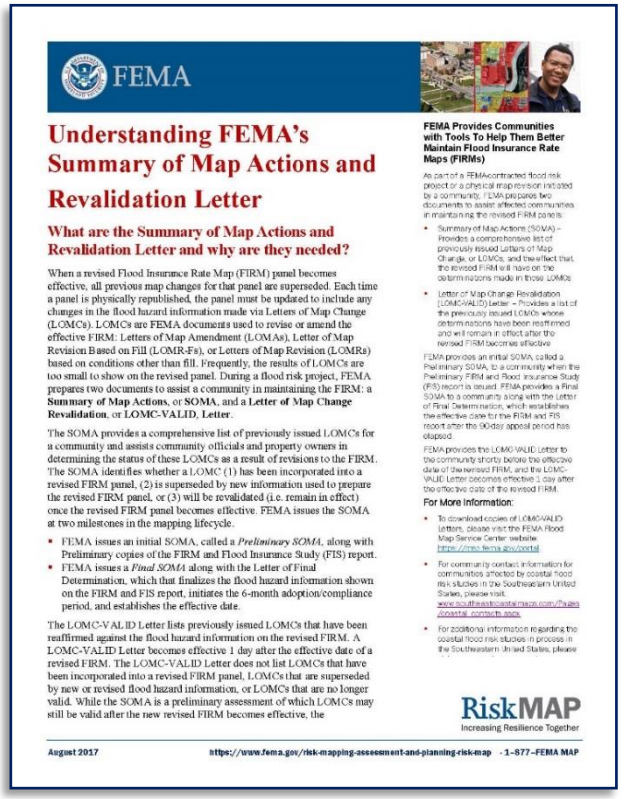
Adoption/Compliance Period (Cont'd)

- **Communities can obtain technical support from FDEM staff by telephone at 1-800-595-0724 or by email at flordinance@gmail.com**
- **For more information, please contact the Florida State NFIP Coordinator:**

Steve Martin
steve.martin@em.myflorida.com

Effective FIRM

- **<u>During</u> the adoption/compliance period, before the FIRM effective date, communities receive:**
  - Paper copies of effective FIRM Index, FIRM panels, and FIS report
  - Digital data
  - Revalidation Letter, effective 1 day after new FIRM effective date, informing community of LOMCs that are revalidated or superseded by new FIRM



FEMA

Understanding FEMA's Summary of Map Actions and Revalidation Letter

What are the Summary of Map Actions and Revalidation Letter and why are they needed?

When a revised Flood Insurance Rate Map (FIRM) panel becomes effective, all previous map changes for that panel are superseded. Each time a panel is physically republished, the panel must be updated to include any changes in the flood hazard information made via Letters of Map Change (LOMCs). LOMCs are FEMA documents used to revise or amend the effective FIRM: Letters of Map Amendment (LOMAs), Letter of Map Revision Based on Fill (LOMR-Fs), or Letters of Map Revision (LOMRs) based on conditions other than fill. Frequently, the results of LOMCs are too small to show on the revised panel. During a flood risk project, FEMA prepares two documents to assist a community in maintaining the FIRM: a **Summary of Map Actions**, or **SOMA**, and a **Letter of Map Change Revalidation**, or **LOMC-VALID Letter**.

The SOMA provides a comprehensive list of previously issued LOMCs for a community and assists community officials and property owners in determining the status of these LOMCs as a result of revisions to the FIRM. The SOMA identifies whether a LOMC (1) has been incorporated into a revised FIRM panel, (2) is superseded by new information used to prepare the revised FIRM panel, or (3) will be revalidated (i.e. remain in effect) once the revised FIRM panel becomes effective. FEMA issues the SOMA at two milestones in the mapping lifecycle.

- FEMA issues an initial SOMA, called a *Preliminary SOMA*, along with Preliminary copies of the FIRM and Flood Insurance Study (FIS) report.
- FEMA issues a *Final SOMA* along with the Letter of Final Determination, which that finalizes the flood hazard information shown on the FIRM and FIS report, initiates the 6-month adoption/compliance period, and establishes the effective date.

The LOMC-VALID Letter lists previously issued LOMCs that have been reaffirmed against the flood hazard information on the revised FIRM. A LOMC-VALID Letter becomes effective 1 day after the effective date of a revised FIRM. The LOMC-VALID Letter does not list LOMCs that have been incorporated into a revised FIRM panel, LOMCs that are superseded by new or revised flood hazard information, or LOMCs that are no longer valid. While the SOMA is a preliminary assessment of which LOMCs may still be valid after the new revised FIRM becomes effective, the

FEMA Provides Communities with Tools To Help Them Better Maintain Flood Insurance Rate Maps (FIRMs)

As part of a FEMA-contracted flood risk project or a physical map revision initiated by a community, FEMA prepares two documents to assist affected communities in maintaining the revised FIRM panels:

- Summary of Map Actions (SOMA) – Provides a comprehensive list of previously issued Letters of Map Change, or LOMCs, and the effect that the revised FIRM will have on the determinations made in those LOMCs.
- Letter of Map Change Revalidation (LOMC-VALID) Letter – Provides a list of the previously issued LOMCs whose determinations have been reaffirmed and will remain in effect after the revised FIRM becomes effective.

FEMA provides an initial SOMA, called a Preliminary SOMA, to a community when the Preliminary FIRM and Flood Insurance Study (FIS) report is issued. FEMA provides a Final SOMA to a community along with the Letter of Final Determination, which establishes the effective date for the FIRM and FIS report after the 90-day appeal period has elapsed.

FEMA provides the LOMC-VALID Letter to the community shortly before the effective date of the revised FIRM, and the LOMC-VALID Letter becomes effective 1 day after the effective date of the revised FIRM.

For More Information:

- To download copies of LOMC-VALID Letters, please visit the FEMA Flood Map Service Center website: https://msc.fema.gov/portal
- For community contact information for communities affected by coastal flood risk studies in the Southeastern United States, please visit: www.southeastcoastalmaps.com/Pages/Coastal_contacts.aspx
- For additional information regarding the coastal flood risk studies in process in the Southeastern United States, please

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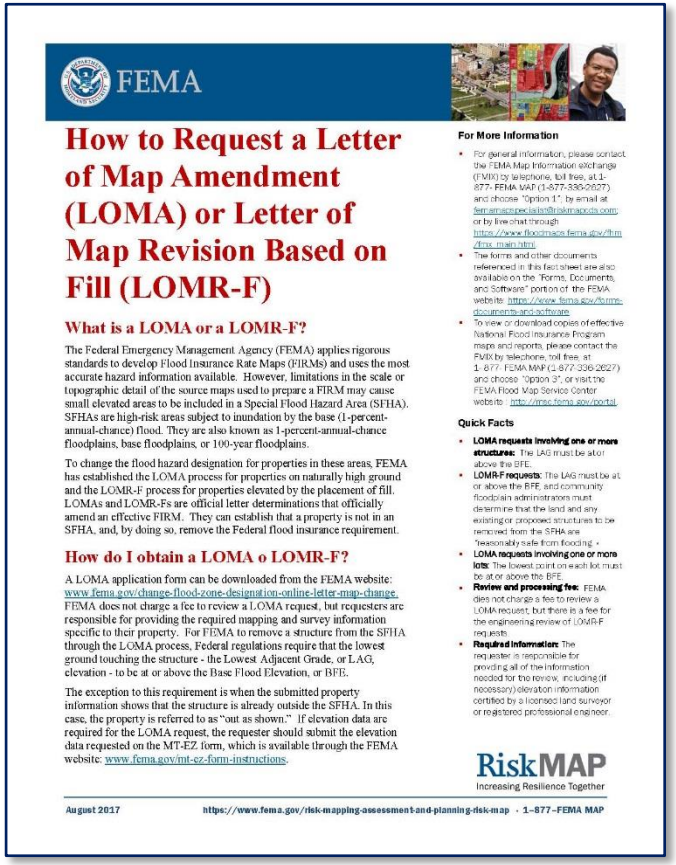
August 2017 https://www.fema.gov/risk-mapping-assessment-and-planning-risk-map - 1-877-FEMA MAP

Opportunities to Update Effective FIRM

- **A FEMA flood hazard study update is NOT the only time the effective FIRM can be updated.**
- **The effective FIRM can be updated by LOMC:**
  - Letter of Map Amendment (LOMA)
  - Letter of Map Revision Based on Fill (LOMR-F)
  - Letter of Map Revision (LOMR)



FEMA

How to Request a Letter of Map Amendment (LOMA) or Letter of Map Revision Based on Fill (LOMR-F)

What is a LOMA or a LOMR-F?

The Federal Emergency Management Agency (FEMA) applies rigorous standards to develop Flood Insurance Rate Maps (FIRMs) and uses the most accurate hazard information available. However, limitations in the scale or topographic detail of the source maps used to prepare a FIRM may cause small elevated areas to be included in a Special Flood Hazard Area (SFHA). SFHAs are high-risk areas subject to inundation by the base (1-percent-annual-chance) flood. They are also known as 1-percent-annual-chance floodplains, base floodplains, or 100-year floodplains.

To change the flood hazard designation for properties in these areas, FEMA has established the LOMA process for properties on naturally high ground and the LOMR-F process for properties elevated by the placement of fill. LOMAs and LOMR-Fs are official letter determinations that officially amend an effective FIRM. They can establish that a property is not in an SFHA, and, by doing so, remove the Federal flood insurance requirement.

How do I obtain a LOMA o LOMR-F?

A LOMA application form can be downloaded from the FEMA website: www.fema.gov/change-flood-zone-designation-online-letter-map-change. FEMA does not charge a fee to review a LOMA request, but requesters are responsible for providing the required mapping and survey information specific to their property. For FEMA to remove a structure from the SFHA through the LOMA process, Federal regulations require that the lowest ground touching the structure - the Lowest Adjacent Grade, or LAG, elevation - to be at or above the Base Flood Elevation, or BFE.

The exception to this requirement is when the submitted property information shows that the structure is already outside the SFHA. In this case, the property is referred to as "out as shown." If elevation data are required for the LOMA request, the requester should submit the elevation data requested on the MT-EZ form, which is available through the FEMA website: www.fema.gov/mt-ez-form-instructions.

For More Information

- For general information, please contact the FEMA Map Information eXchange (FMIX) by telephone, toll free, at 1-877- FEMA MAP (1-877-336-2627) and choose "Option 1", by email at fema-amsspecialist@riskmapcds.com or by live chat through https://www.floodmaps.fema.gov/fhm/fmx_main.html.
- The forms and other documents referenced in this fact sheet are also available on the "Forms, Documents, and Software" portion of the FEMA website: https://www.fema.gov/forms-documents-and-software.
- To view or download copies of effective National Flood Insurance Program maps and reports, please contact the FMIX by telephone, toll free, at 1-877- FEMA MAP (1-877-336-2627) and choose "Option 3", or visit the FEMA Flood Map Service Center website: http://msc.fema.gov/portal.

Quick Facts

- **LOMA requests involving one or more structures:** The LAG must be at or above the BFE.
- **LOMR-F requests:** The LAG must be at or above the BFE, and community floodplain administrators must determine that the land and any existing or proposed structures to be removed from the SFHA are "reasonably safe from flooding."
- **LOMA requests involving one or more lots:** The lowest point on each lot must be at or above the BFE.
- **Review and processing fee:** FEMA does not charge a fee to review a LOMA request, but there is a fee for the engineering review of LOMR-F requests.
- **Required Information:** The requester is responsible for providing all of the information needed for the review, including (if necessary) elevation information certified by a licensed land surveyor or registered professional engineer.

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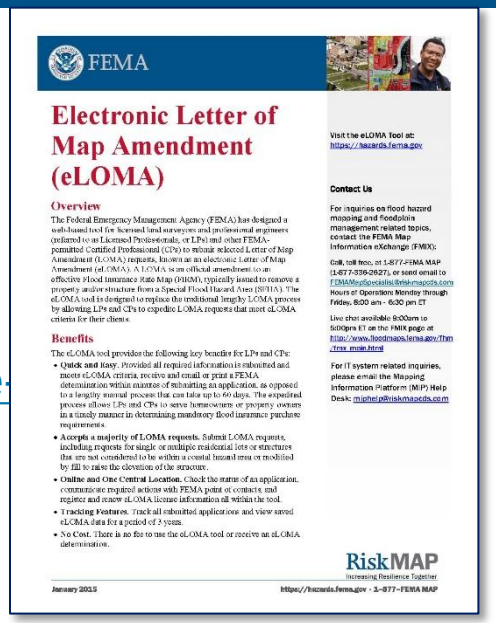
LOMA, LOMR-F, and LOMR's

- **LOMA & LOMR-F:**
  - For property owners who believe property has been
  - inadvertently included in a designated Special Flood Hazard Area (SFHA)
  - Can be submitted using paper form (MT-EZ or MT-1) or online (www.fema.gov/change-flood-zone-designation-online-letter-map-change)



FEMA

Electronic Letter of Map Amendment (eLOMA)

Overview

The Federal Emergency Management Agency (FEMA) has designed a web-based tool for licensed land surveyors and professional engineers (referred to as Licensed Professionals, or LPs) and other FEMA-permitted Certified Professional (CPs) to submit selected Letter of Map Amendment (LOMA) requests, known as an electronic Letter of Map Amendment (eLOMA). A LOMA is an official amendment to an effective Flood Insurance Rate Map (FIRM), typically issued to remove a property and/or structure from a Special Flood Hazard Area (SFHA). The eLOMA tool is designed to replace the traditional lengthy LOMA process by allowing LPs and CPs to expedite LOMA requests that meet eLOMA criteria for their clients.

Benefits

The eLOMA tool provides the following key benefits for LPs and CPs:

- **Quick and Easy.** Provides all required information is submitted and meets eLOMA criteria, receive and email or print a FEMA determination within minutes of submitting an application, as opposed to a lengthy manual process that can take up to 60 days. The expedited process allows LPs and CPs to serve homeowners or property owners in a timely manner in determining mandatory flood insurance purchase requirements.
- **Accepts a majority of LOMA requests.** Submit LOMA requests, including requests for single or multiple residential lots or structures that are not considered to be within a coastal hazard area or modified by fill to raise the elevation of the structure.
- **Online and One Central Location.** Check the status of an application, communicate required actions with FEMA point of contacts, and register and renew eLOMA license information all within the tool.
- **Tracking Features.** Track all submitted applications and view saved eLOMA data for a period of 3 years.
- **No Cost.** There is no fee to use the eLOMA tool or receive an eLOMA determination.

Visit the eLOMA Tool at: https://hazards.fema.gov

Contact Us

For inquiries on flood hazard mapping and floodplain management related topics, contact the FEMA Map Information eXchange (FMIX):

Call, toll free, at 1-877-FEMA MAP (1-877-336-2627), or send email to FEMAMapSpecialist@riskmapcds.com

Hours of Operations Monday through Friday, 8:00 am - 6:30 pm ET

Live chat available 9:00am to 5:00pm ET on the FMIX page at http://www.floodmaps.fema.gov/fhm/fmx_main.html

For IT system related inquiries, please email the Mapping Information Platform (MIP) Help Desk: miphelp@riskmapcds.com

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- **LOMR:**
  - Applicable any time better data available
  - Based on changes to hydrologic or hydraulic characteristics of flooding source that results in modification of BFE's, regulatory floodway, or SFHA
  - Officially revises the FIRM and/or FIS Report
  - Can be submitted using paper forms or online (www.fema.gov/change-flood-zone-designation-online-letter-map-change)

Risk and Flood Insurance

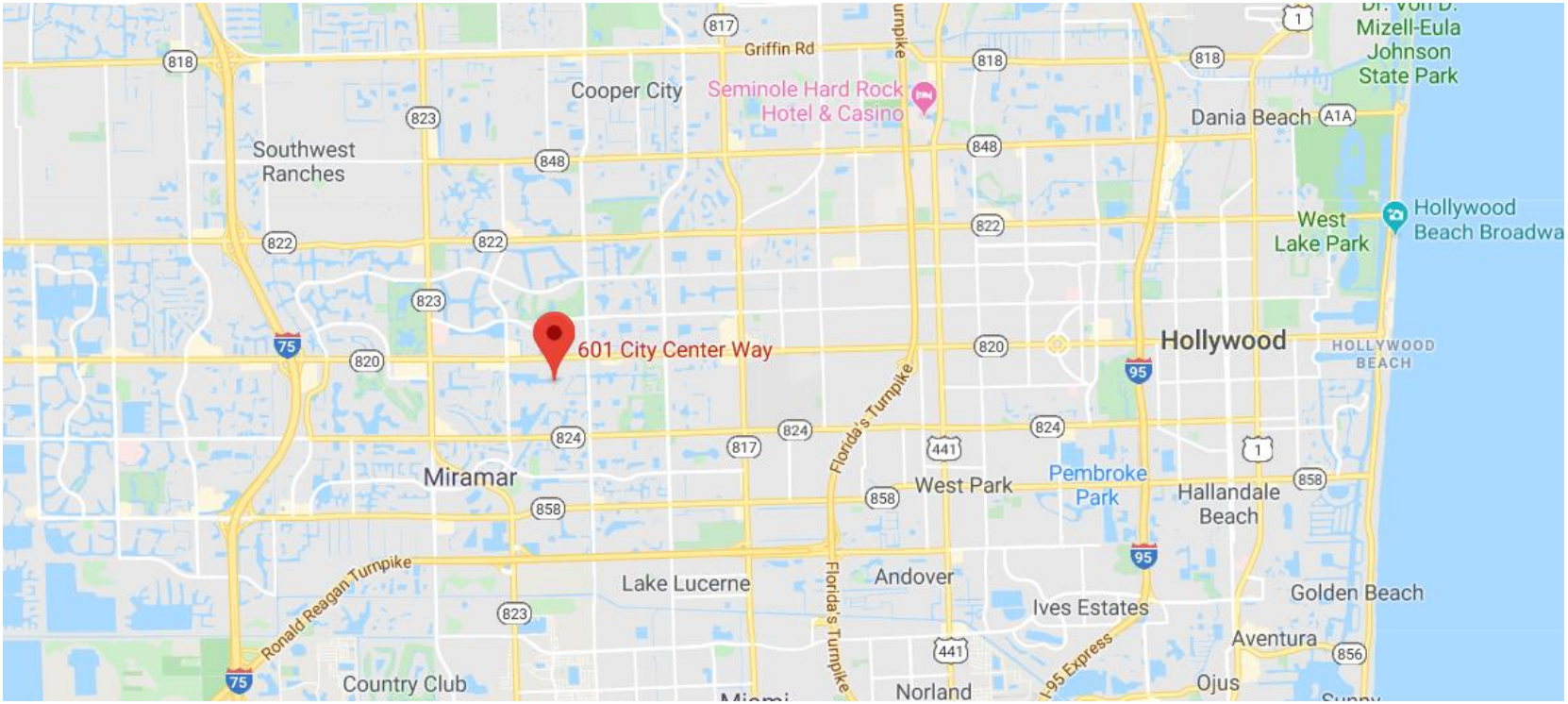
Determine your flood risk

- **Nearly everyone is at some risk of flooding:**
  - High Risk – SFHA, identified as Zone A, Zone AE, Zone V, or Zone VE on FIRM
    - Federally regulated lenders making new loans or modifying existing loans secured by buildings in SFHAs must require borrowers to purchase flood insurance for the term of the loan
  - Moderate Risk – Identified as shaded Zone X on FIRM
  - Low Risk – Identified as unshaded Zone X on FIRM

Palm Beach County Public Open Houses

Palm Beach County Public Open House Meeting #1:

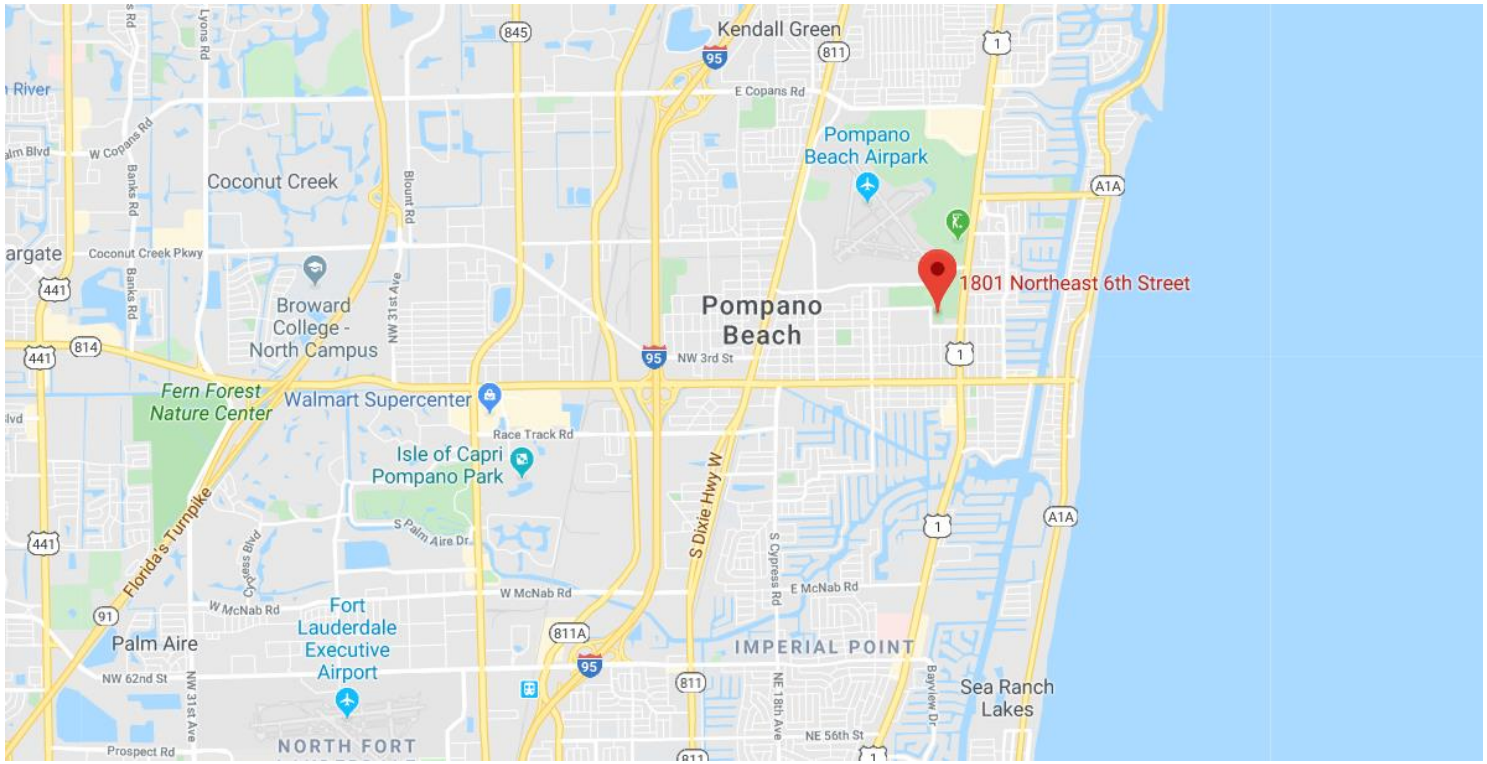
- Monday February 3, 2020 (4:00pm – 7:00pm)
- Charles F. Dodge City Center – Mezzanine
- 601 City Center Way, Pembroke Pines, FL 33025



Palm Beach County Public Open Houses

Palm Beach County Public Open House Meeting #2:

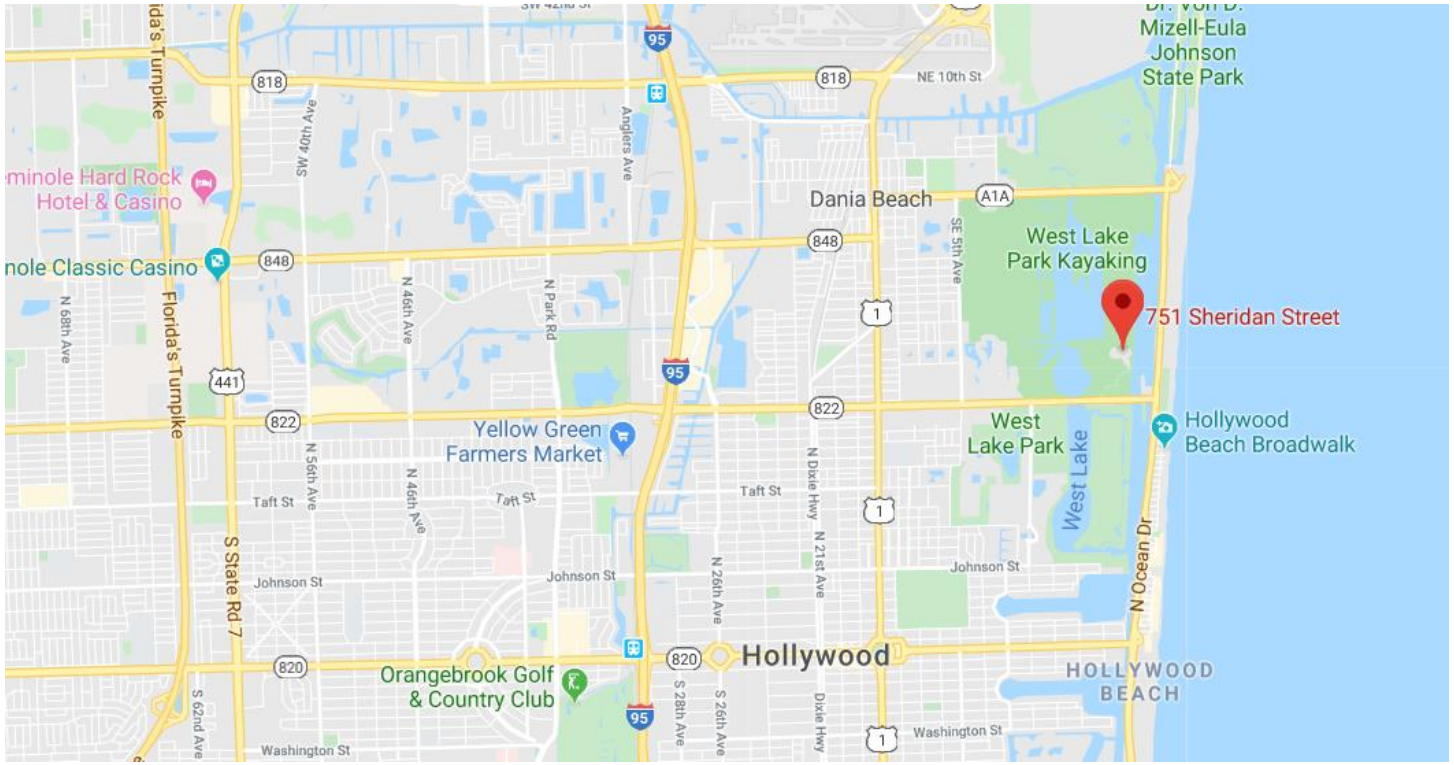
- Thursday February 6, 2020 (9:00am – 12:00pm)
- Emma Lou Olsen Center Auditorium
- 1801 N.E. 6th Street, Pompano Beach, FL 33060



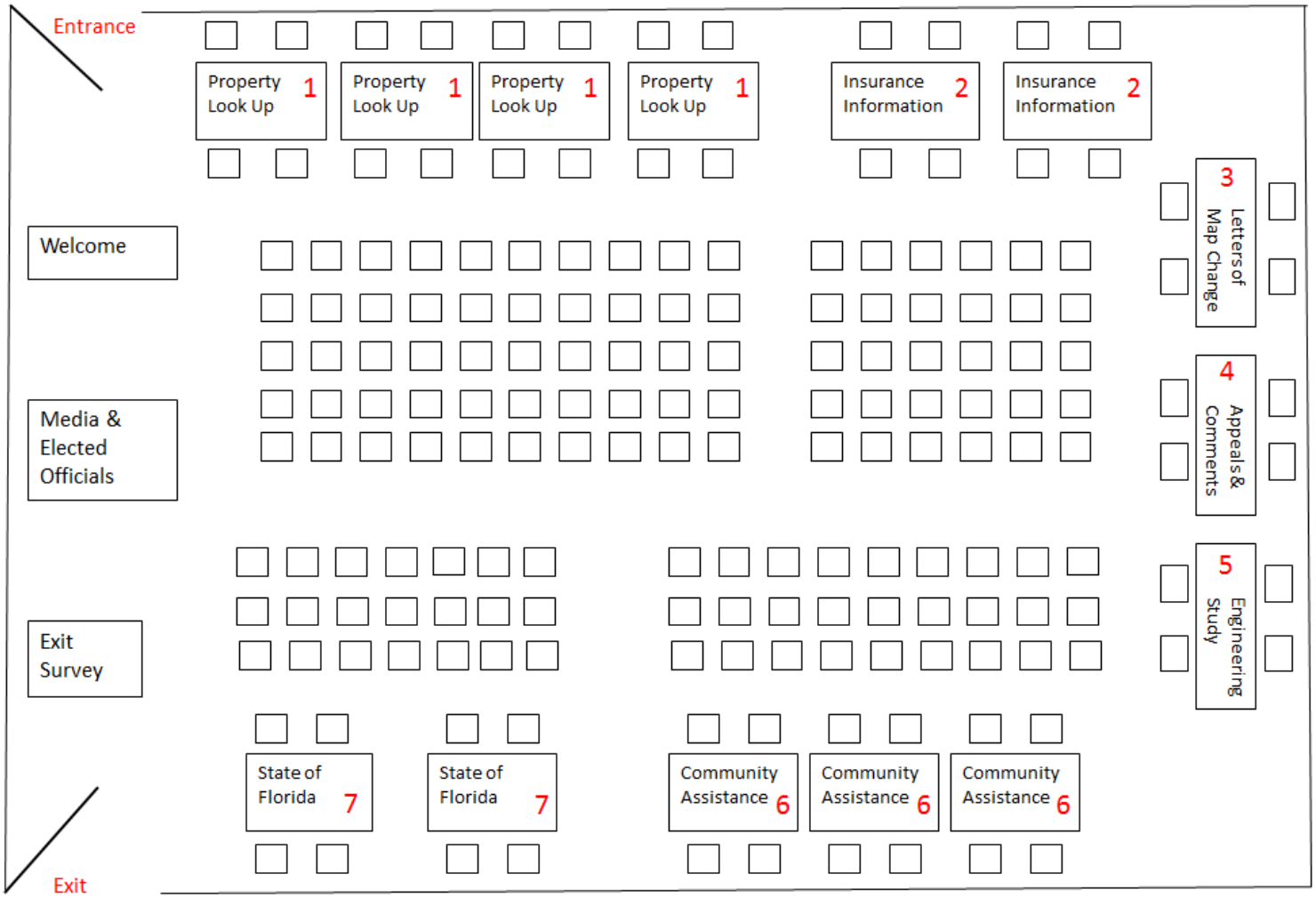
Palm Beach County Public Open Houses

Palm Beach County Public Open House Meeting #3:

- Thursday February 6, 2020 (4:00pm – 7:00pm)
- Anne Kolb Nature Center - Mangrove Hall
- 751 Sheridan Street, Hollywood, FL 33019



Palm Beach County Public Open Houses



Team Contact Information

FEMA

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dewana.davis@fema.dhs.gov

Danon Lucas – External Affairs
danon.lucas@fema.dhs.gov

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A JOINT VENTURE OF OGILVY & MICHAEL BAKER INTERNATIONAL

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Compass
Identify, Interpret, Integrate

AECOM

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Adam Clinch – Coastal Engineer
Adam.Clinch@aecom.com

Zachariah Cohoon – Floodplain Mapping
Zachariah.Cohoon@aecom.com

Corey Diamond – Outreach Specialist
Corey.Diamond@aecom.com

Attachment 2 Palm Beach County Water Resources Task Force Meeting Presentation – July 23, 2020

Baird.

Innovation Engineered.

Review & Evaluation of FEMA's Coastal Flood Risk Study

Palm Beach County

Water Resources Task Force Meeting

July 23, 2020

Baird.
Innovation Engineered.

baird.com

Agenda

- FEMA's Studies
  - Purpose
  - Framework
- FEMA's Coastal Analysis
- Baird's Technical Review
  - Scope
  - Preliminary Findings
  - Next Steps

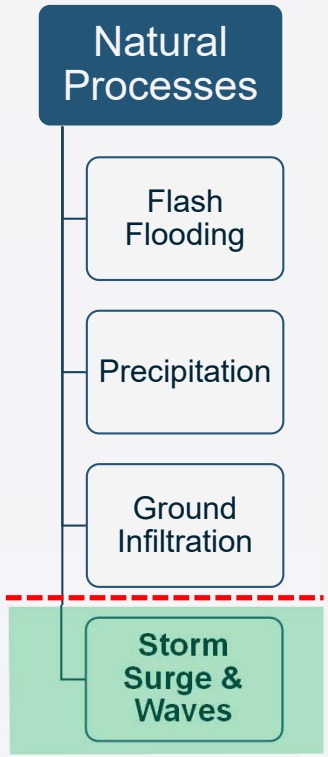
FEMA's Studies (Purpose)

- "The flood insurance study (FIS) report revises and updates information on the existence and severity of flood hazards for the study area."

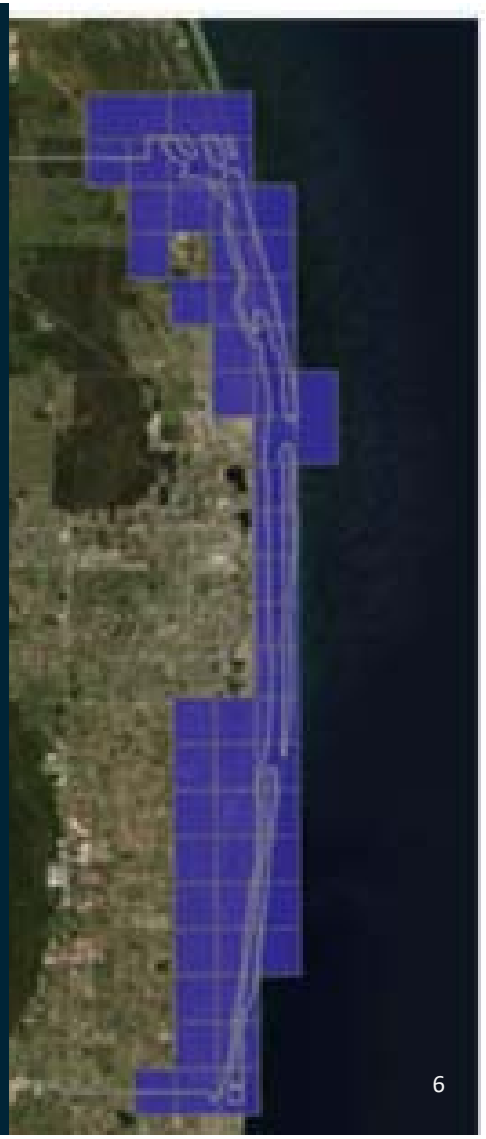
- FIS report defines special flood hazard areas (SFHA) for the 1% annual chance (100-year) event
  - Basis for rating flood insurance premiums

- FEMA is updating the SFHA for Palm Beach County

FEMA's Studies (Framework)



FEMA's Coastal Analysis (FIRM Panels)

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OLD S OCEAN
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BELLA VISTA AVE
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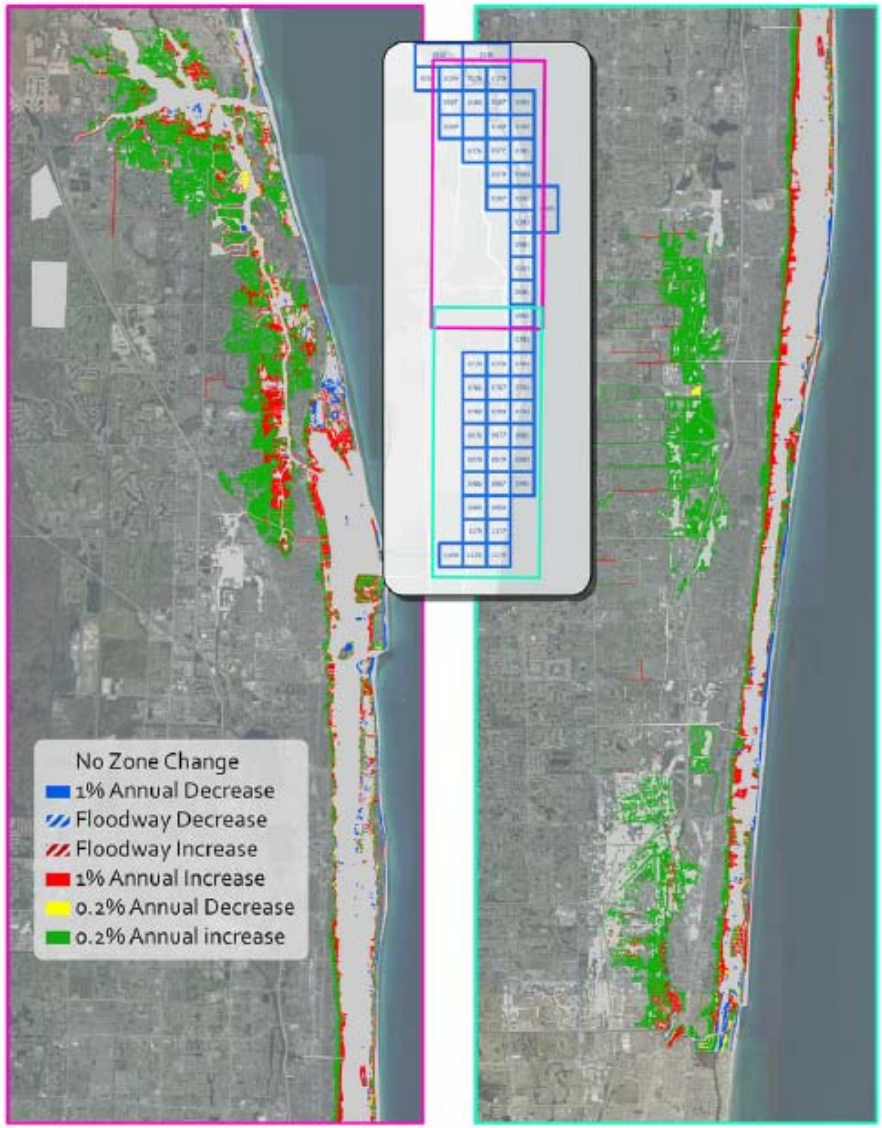
(EL 8)
ZONE AE
(EL 9)

FEMA's Coastal Analysis

- FIRM changes…2017 → 2020…
  - SFHA increased by ~1,900 acres (net)
  - Higher rating on insurance premiums

- Municipalities Affected

Boca Raton	Jupiter	Palm Beach
Boynton Beach	Jupiter Inlet Colony	Palm Beach County
Briny Breezes	Lake Park	Palm Beach Gardens
Delray Beach	Lake Worth Beach	Palm Beach Shores
Gulfstream	Lantana	Riviera Beach
Highland Beach	Manalapan	South Palm Beach
Hypoluxo	North Palm Beach	Tequesta
Juno Beach	Ocean Ridge	West Palm Beach



Baird's Technical Review (scope)

- Topographic Elevation Data Evaluation (Task 2)
- Study Document Review (Task 4)
- Model and Map Evaluation (Task 5)

Drafts Complete

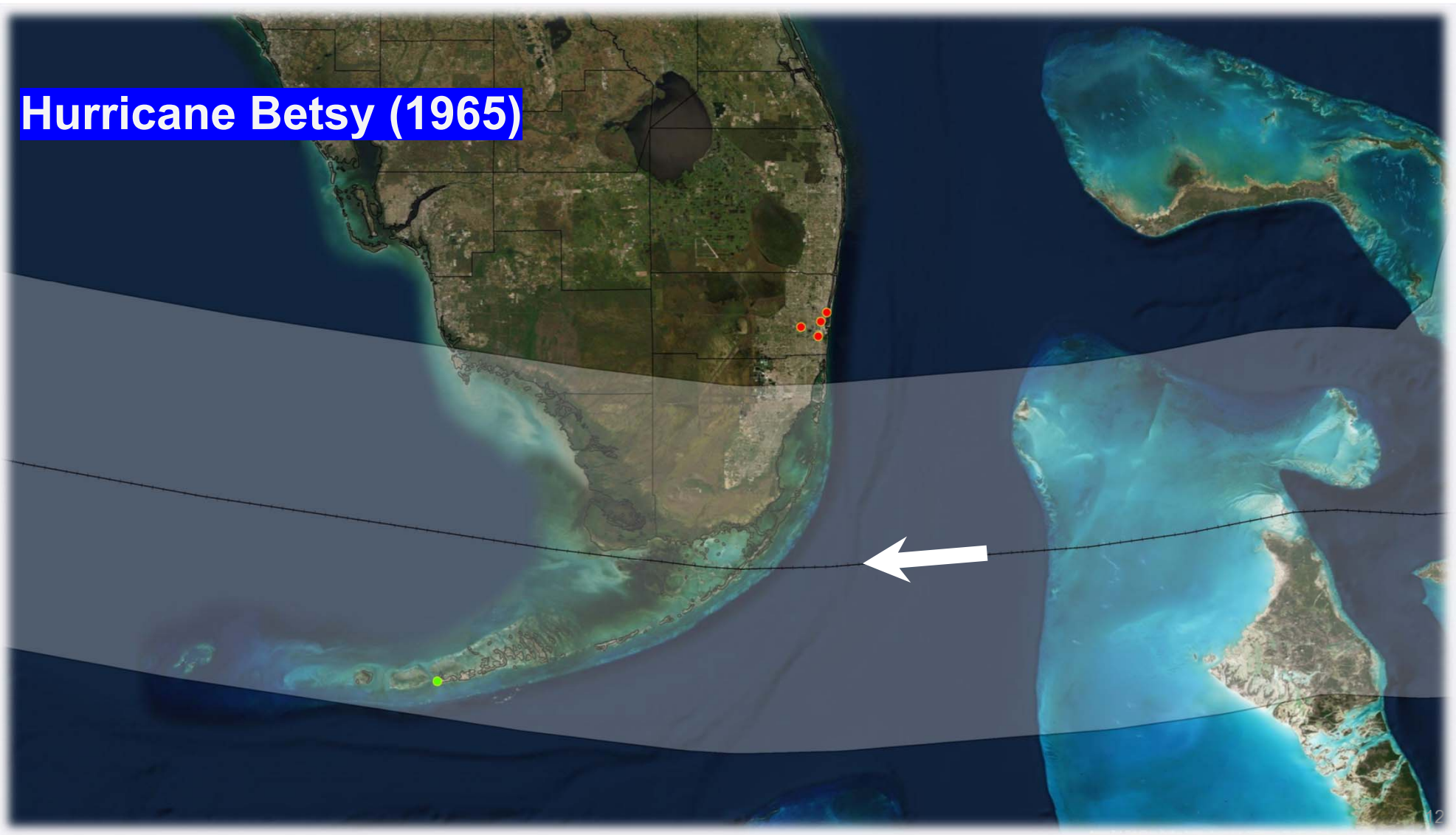
- FEMA and Stakeholder Coordination (Task 3) → **In Progress**
- Final Summary (Task 6)

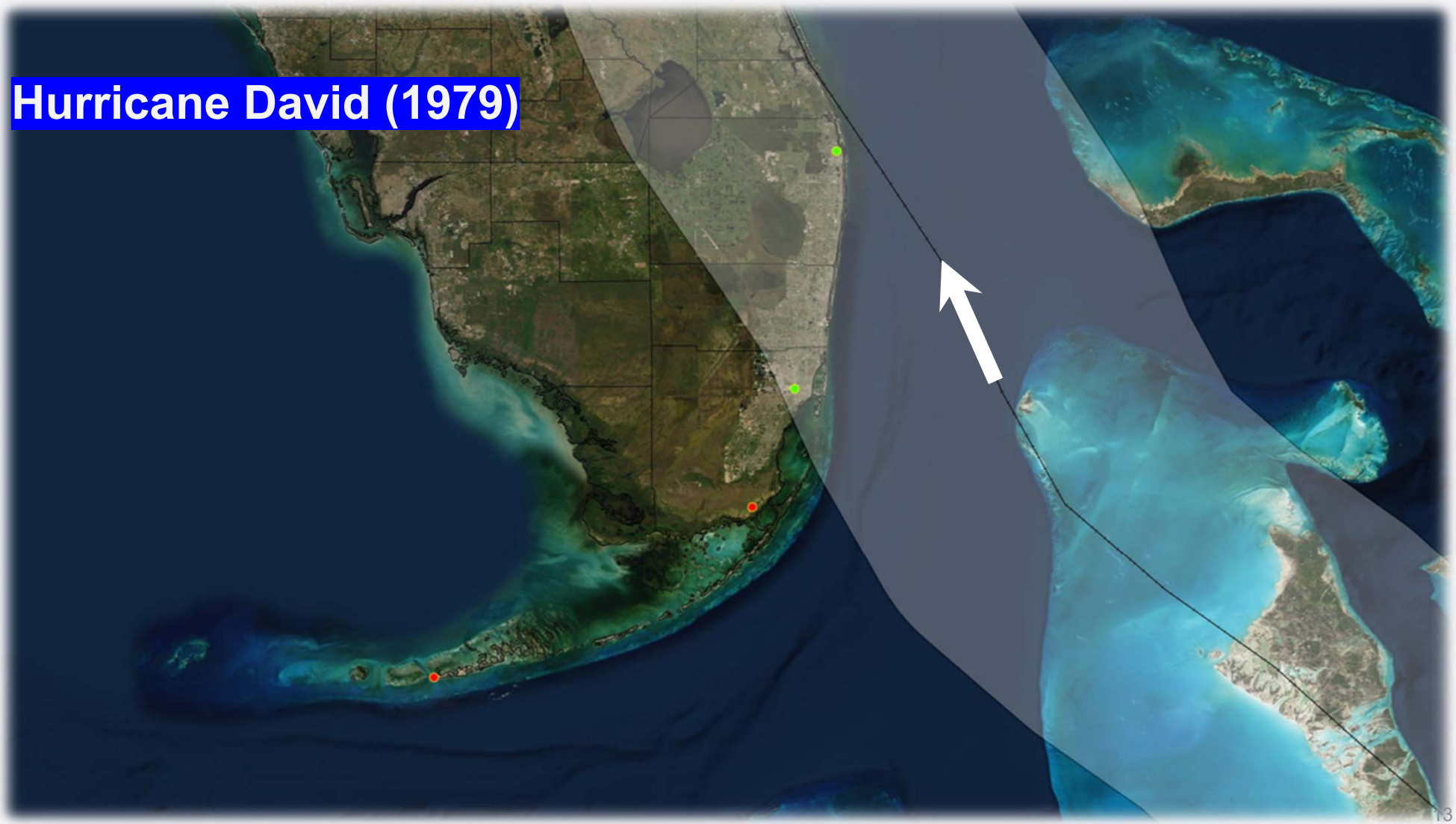
Baird's Technical Review (preliminary findings)

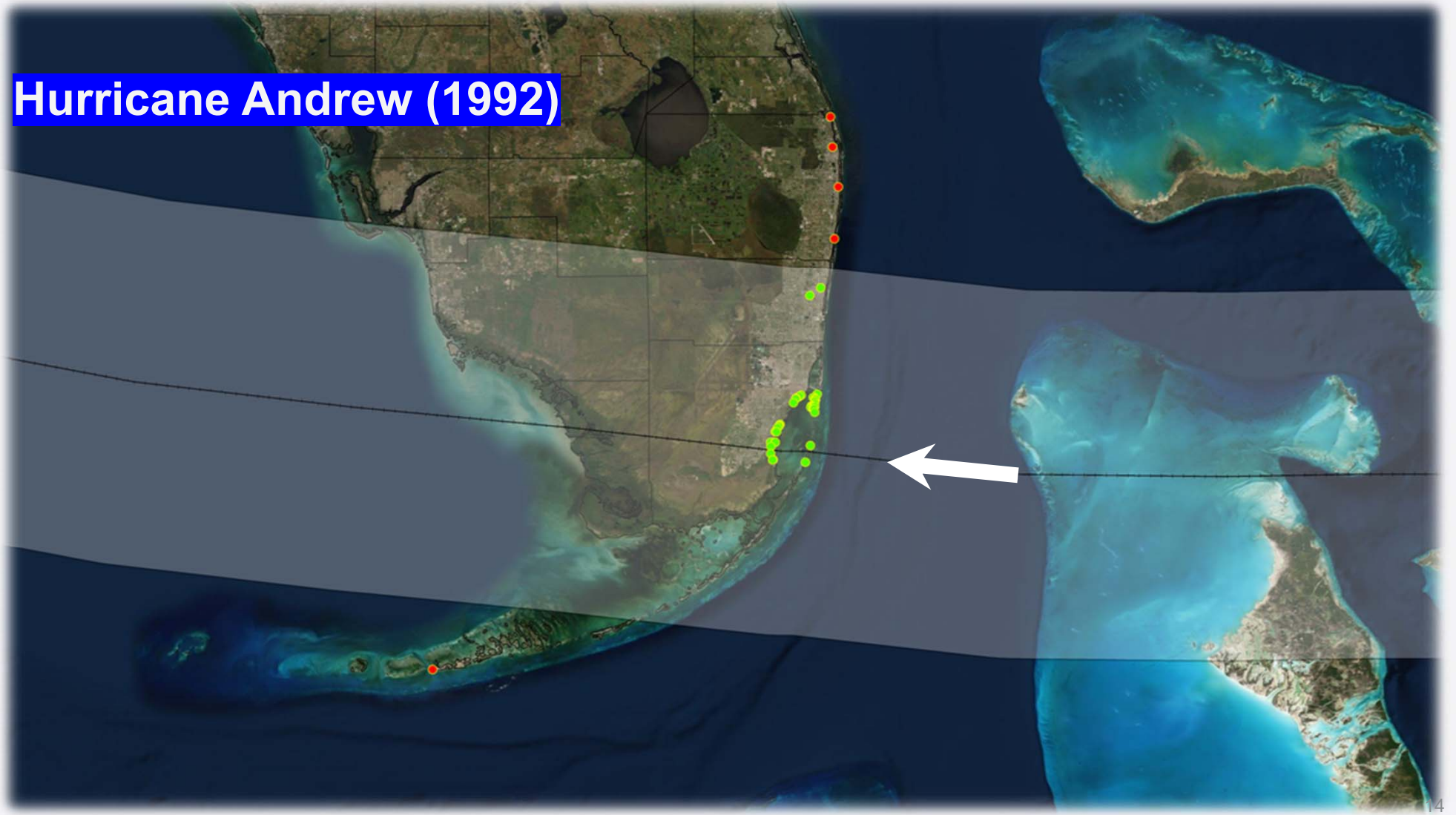
- County's 2017 LiDAR survey was compared to FEMA's elevation model used for mapping. Differences within the areas of FIRM changes…
  - 14% of area…County LiDAR above FEMA (≥ 0.5 feet)
  - 79% of area…within survey tolerance (+/-0.5 feet)
  - 7% of area…County LiDAR below FEMA (≥ 0.5 feet)

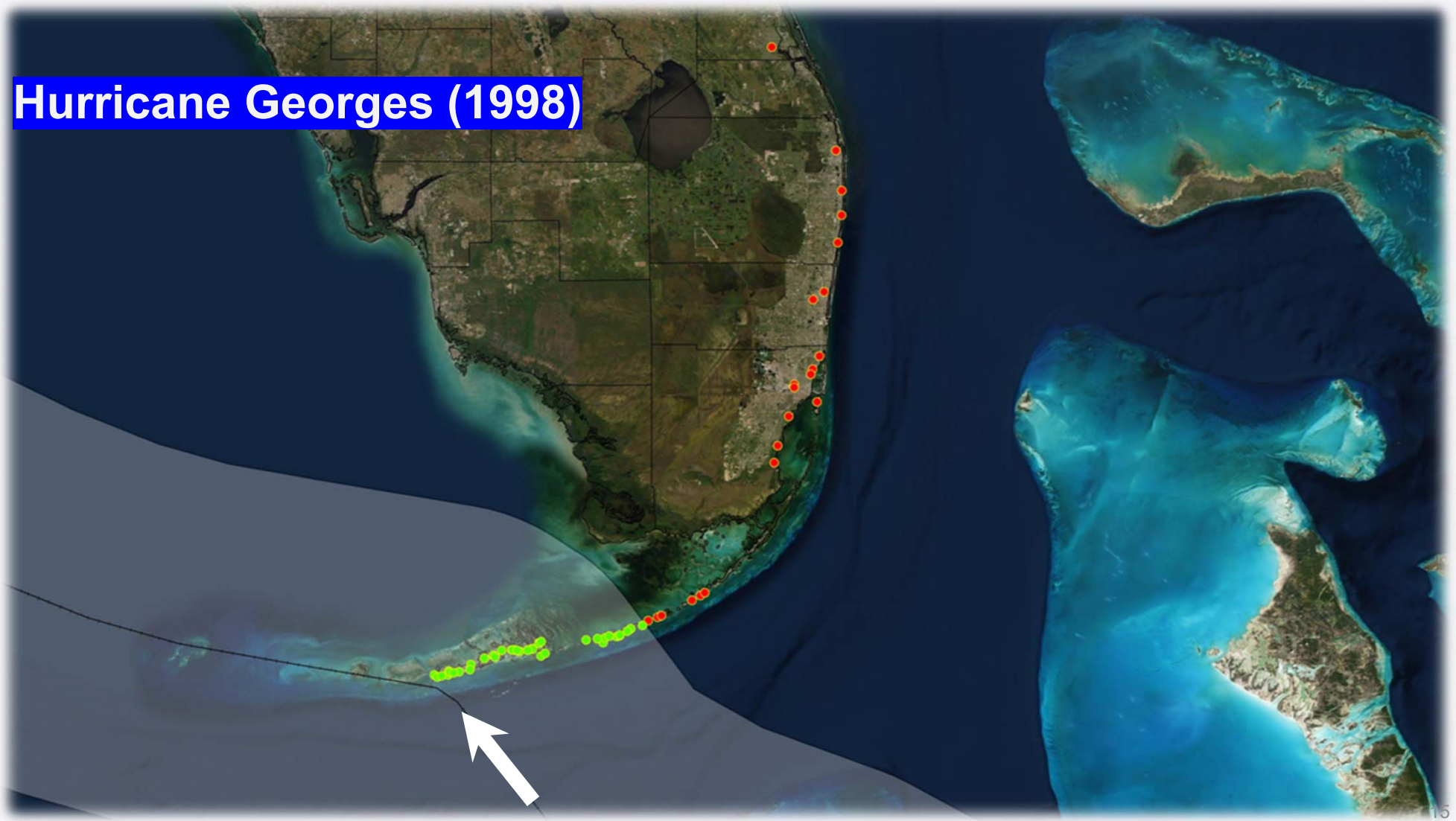
Baird's Technical Review (preliminary findings)

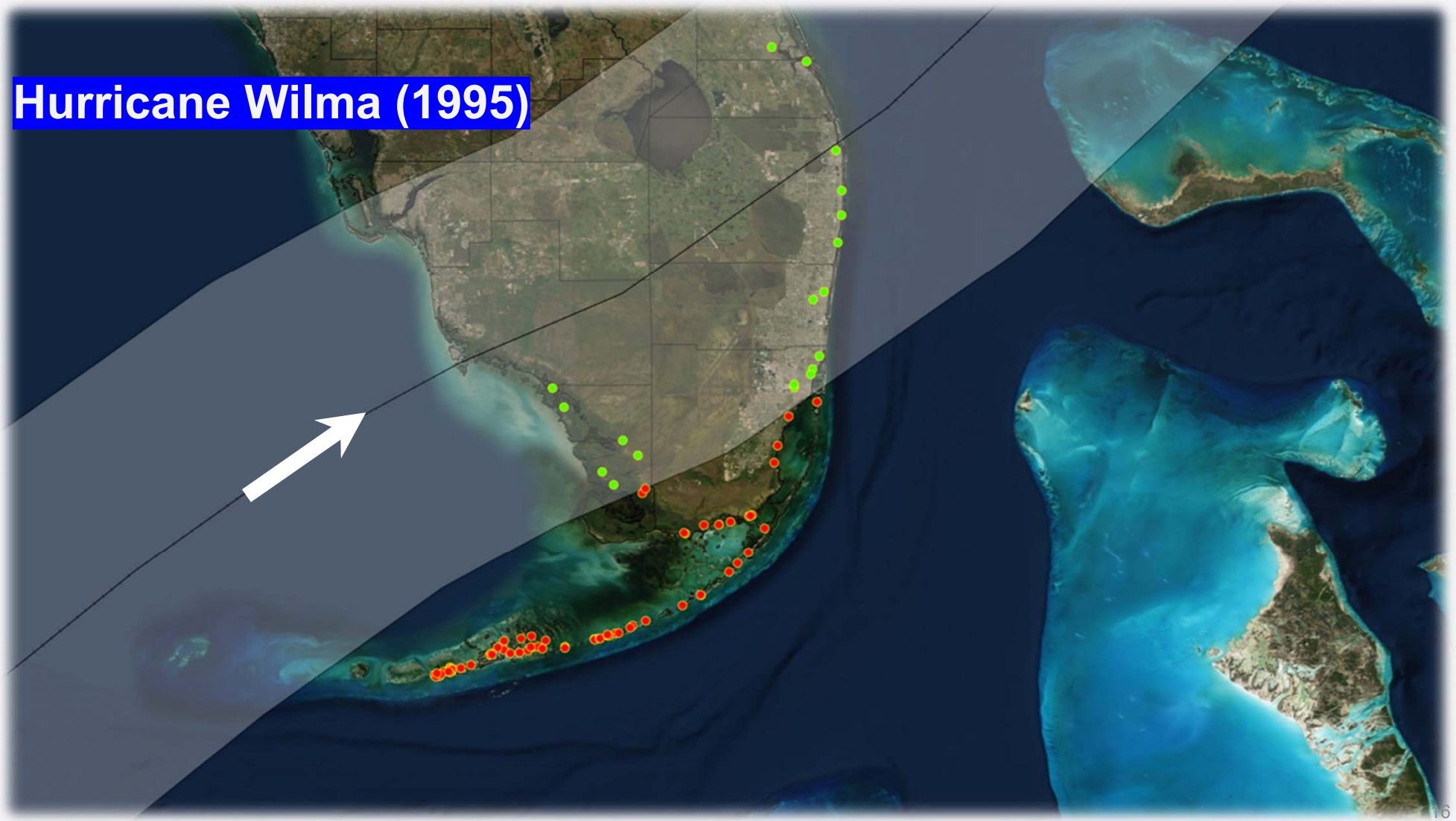
- FEMA's validation storms not representative for Palm Beach County
  - Hurricane Betsy (1965)
  - Hurricane David (1979)
  - Hurricane Andrew (1992)
  - Hurricane Georges (1998)
  - Hurricane Wilma (2005)
- FEMA's model setup had limited accuracy in simulating storm surge


Hurricane Betsy (1965)


Hurricane David (1979)


Hurricane Andrew (1992)

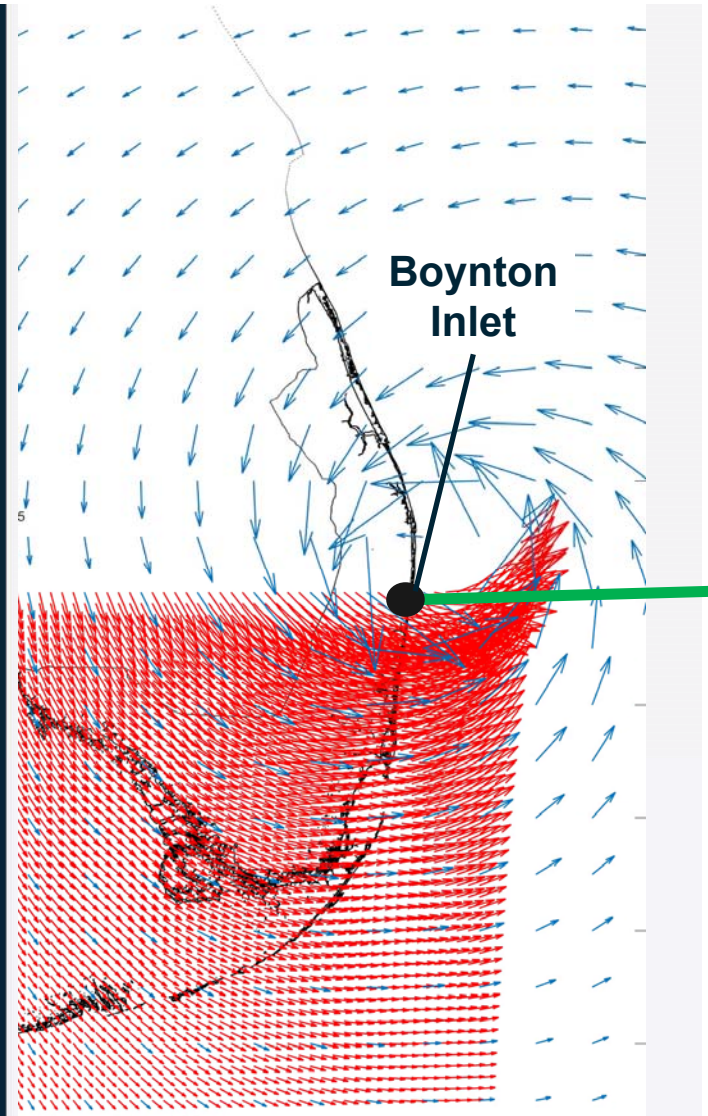

Hurricane Georges (1998)

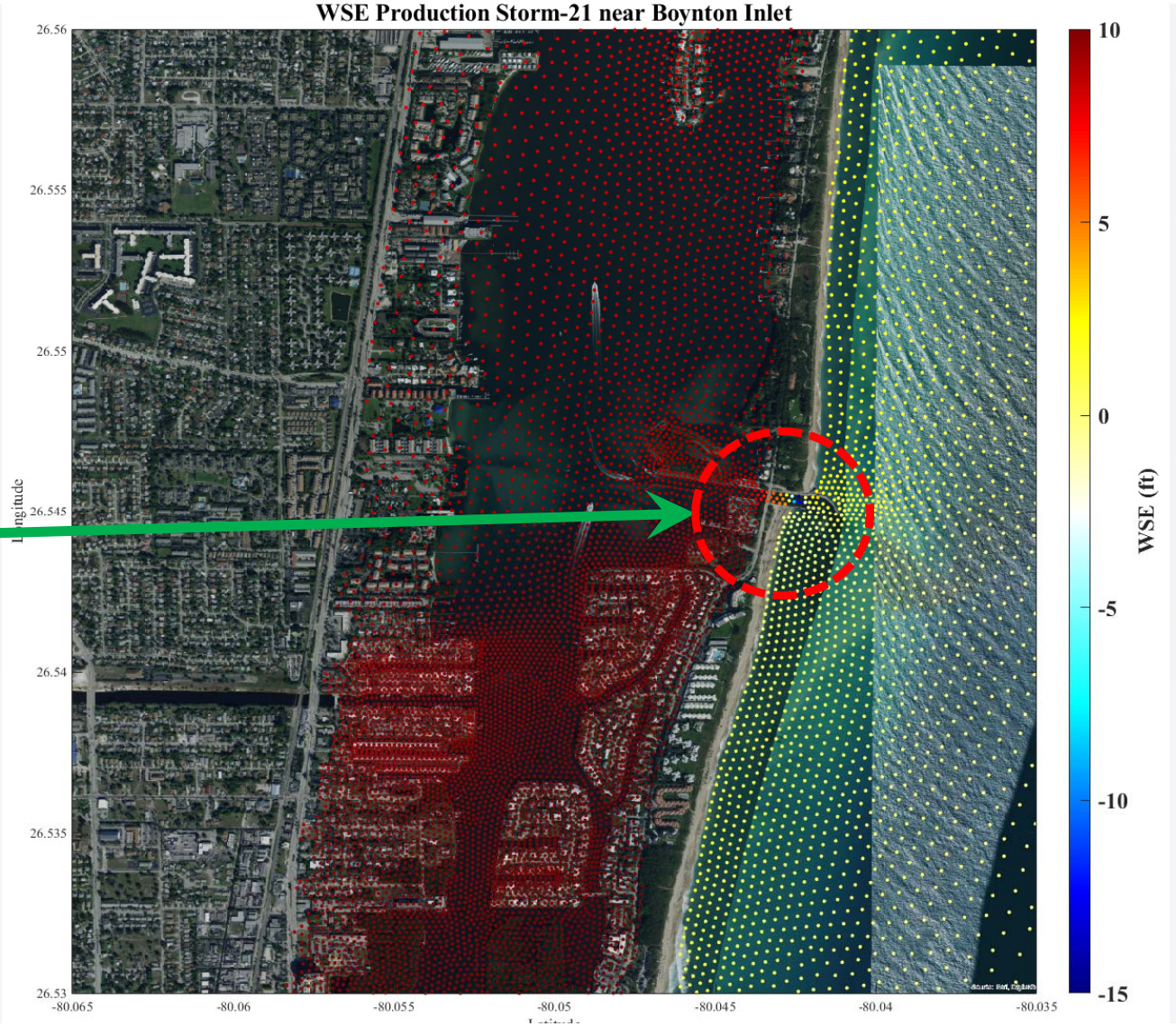

Hurricane Wilma (1995)

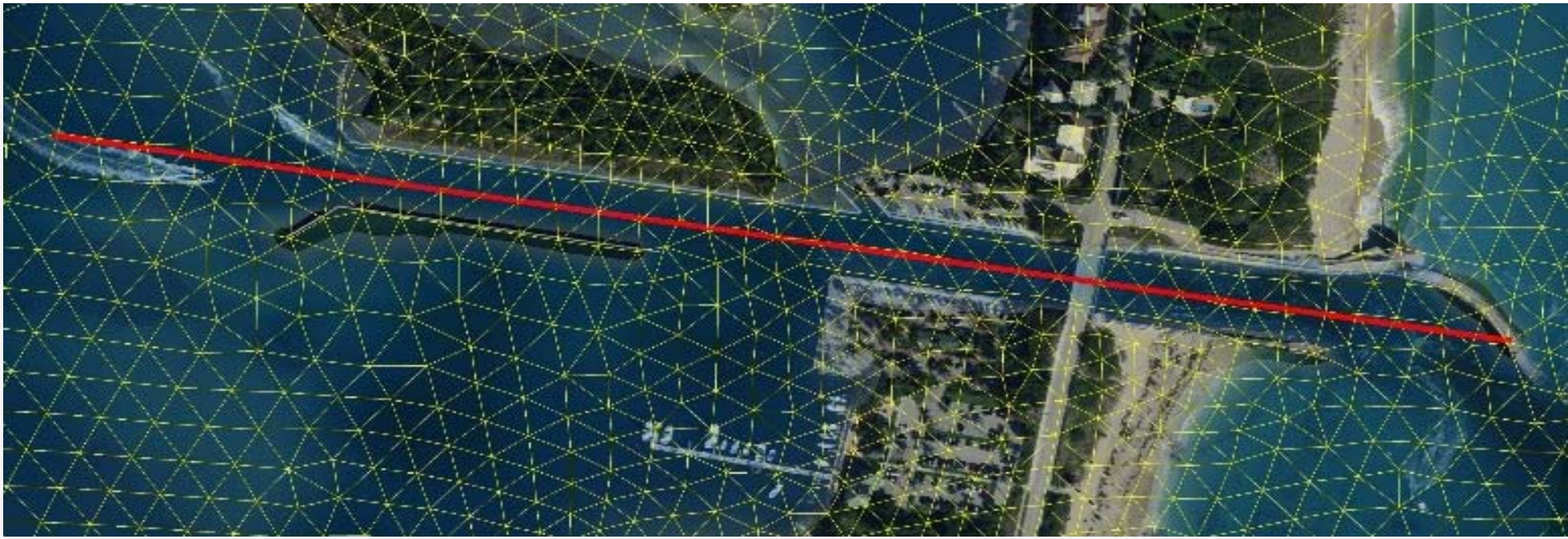
Baird's Technical Review (preliminary findings)

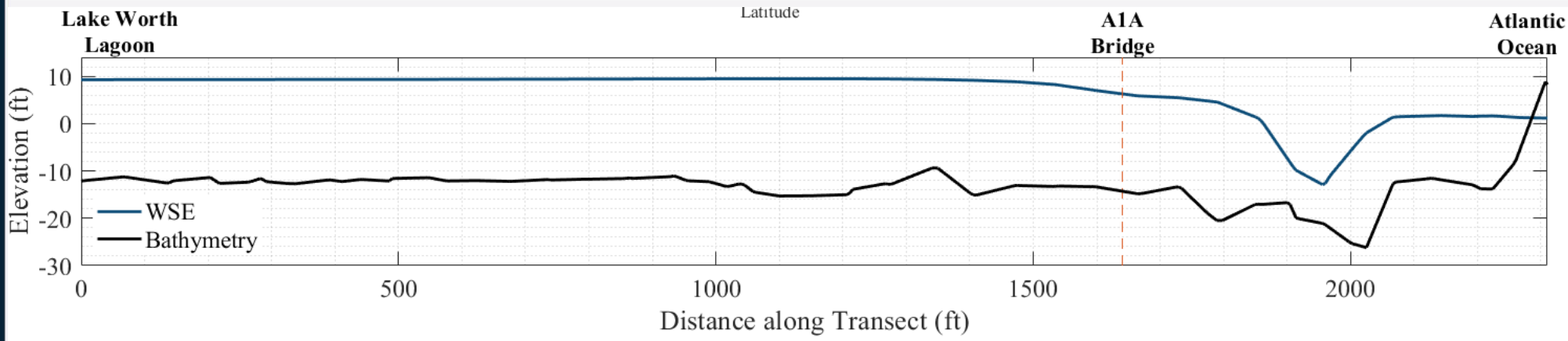
- FEMA's 1% annual chance stillwater elevations (SWEL) offshore of Palm Beach County appear high

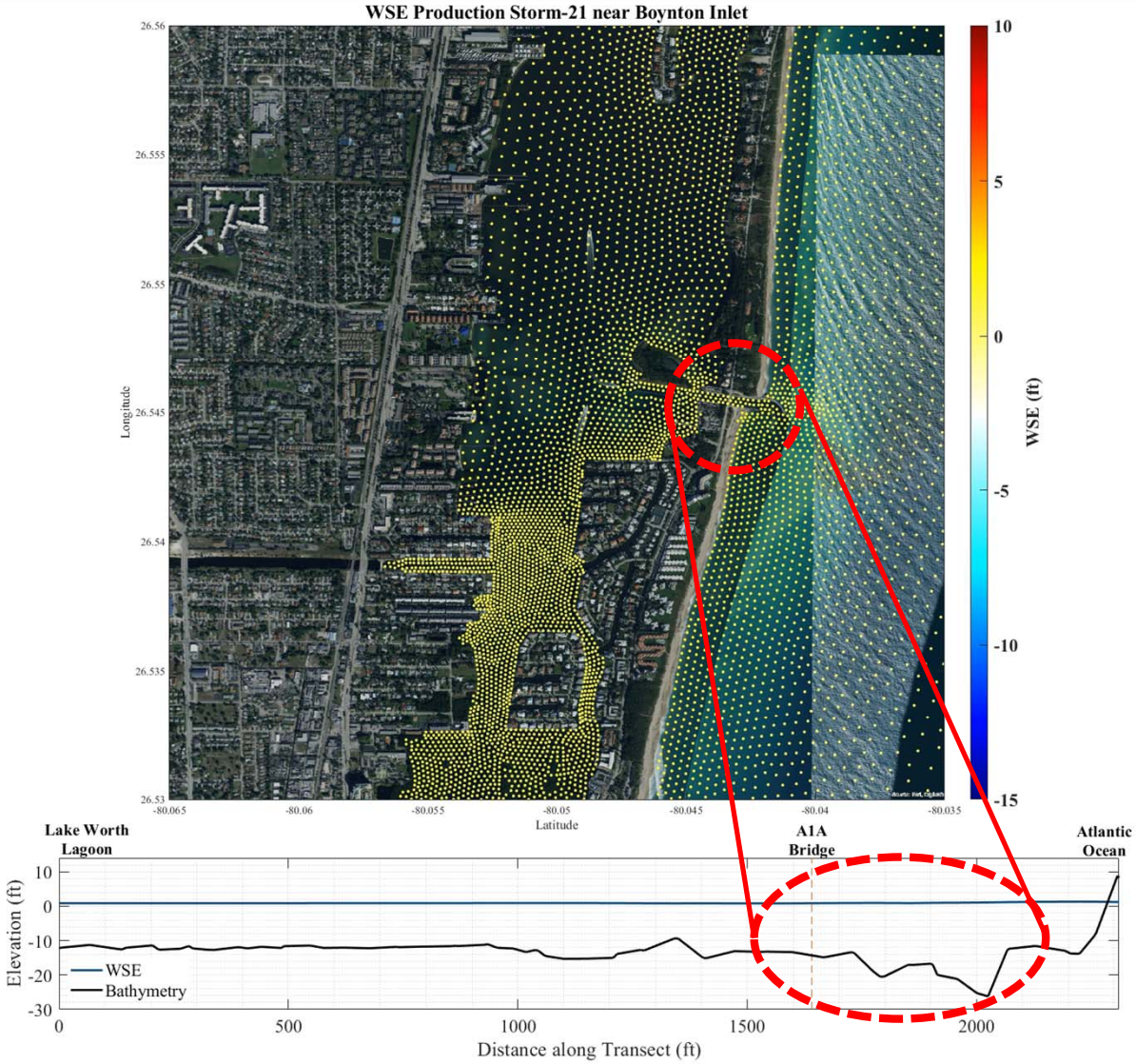
- FEMA's results appears to have been impacted by the selected model grids


Boynton
Inlet


WSE Production Storm-21 near Boynton Inlet
26.56
26.555
26.55
26.545
26.54
26.535
26.53
-80.065
-80.06
-80.055
-80.05
-80.045
-80.04
-80.035
10
5
0
-5
-10
-15
WSE (ft)




Latitude
Lake Worth Lagoon
A1A Bridge
Atlantic Ocean
Elevation (ft)
10
0
-10
-20
-30
WSE
Bathymetry
0
500
1000
1500
2000
Distance along Transect (ft)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26.56
26.555
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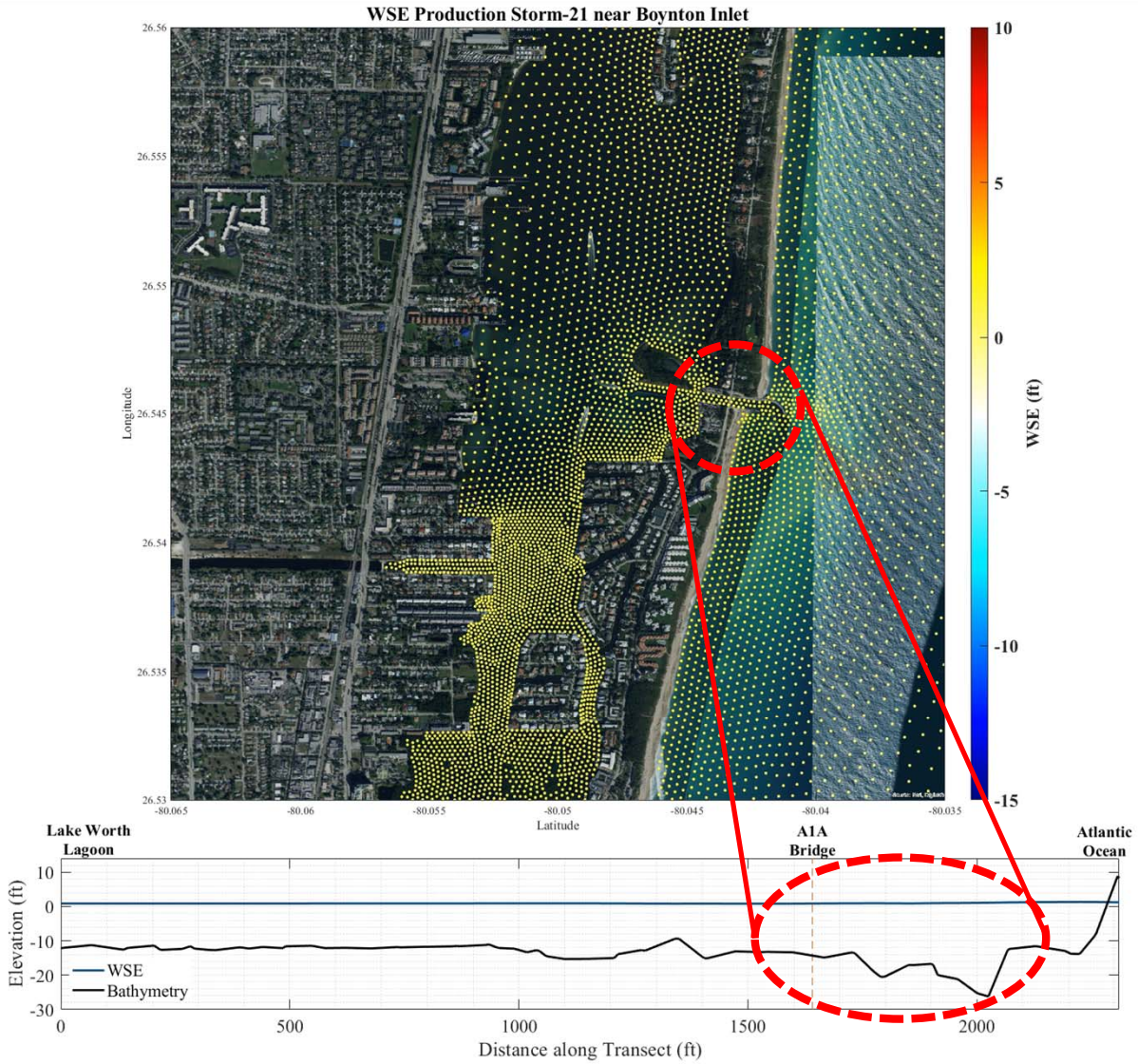
26.535
26.53
Longitude
-80.065
-80.06
-80.055
-80.05
-80.045
-80.04
-80.035
Latitude
10
5
0
-5
-10
-15
WSE (ft)
Lake Worth Lagoon
A1A Bridge
Atlantic Ocean
Elevation (ft)
10
0
-10
-20
-30
WSE
Bathymetry
0
500
1000
1500
2000
Distance along Transect (ft)

Baird's Technical Review (next steps)

- Finalize technical review
- Continued coordination with stakeholders (WRTF, local governments, FEMA)
- Determine path forward

Questions?


WSE Production Storm-21 near Boynton Inlet
Longitude
Latitude
WSE (ft)
Lake Worth Lagoon
A1A Bridge
Atlantic Ocean
Elevation (ft)
WSE
Bathymetry
Distance along Transect (ft)

Review & Evaluation of FEMA's Coastal Flood Risk Study

Palm Beach County

Water Resources Task Force Meeting

July 23, 2020

Baird.
Innovation Engineered.

baird.com

Attachment 3 Palm Beach County Board of County Commissioners Workshop Meeting Presentation – September 22, 2020

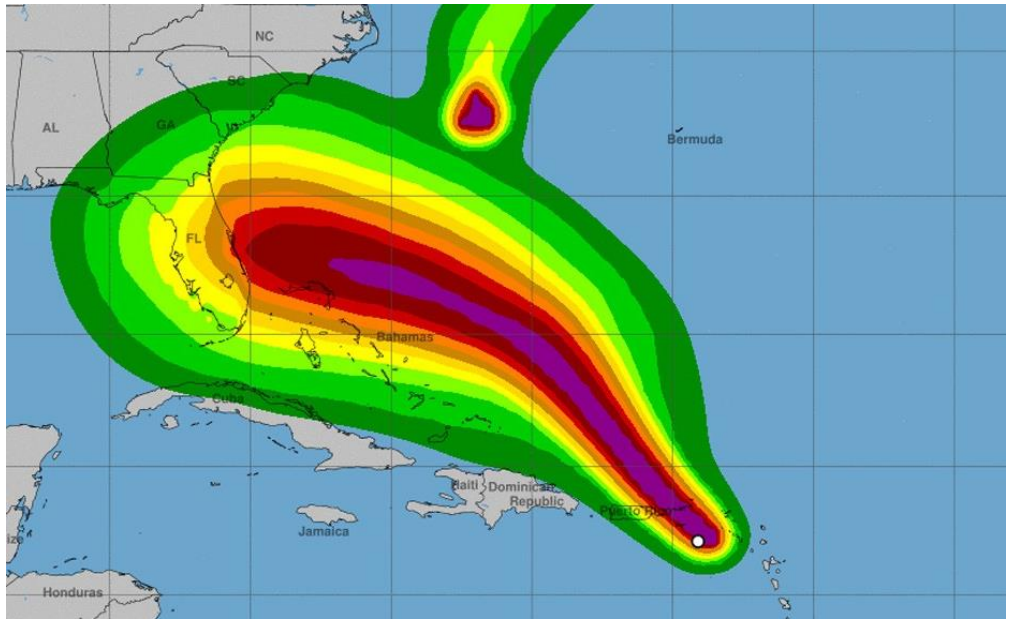
REVIEW AND EVALUATION OF FEMA'S COASTAL FLOOD RISK STUDY

BCC Workshop
September 22, 2020

Baird.
Innovation Engineered.

AGENDA

- Background and History
- FEMA's Coastal Study
- Review and Evaluation Tasks
- Key Findings
- Process and Appeals
- Activities of Other Affected Counties
- Completed and Future Coordination
- Direction Requested / Discussion



BACKGROUND AND HISTORY

The National Flood Insurance Program (NFIP) is a voluntary Federal program intended to:

- Reduce future flood damage through community floodplain management ordinances, and
- Provide protection for property owners by enabling the purchase of flood insurance

The Federal Emergency Management Agency (FEMA) is responsible for administering the NFIP

Flood Insurance Study (FIS) reports and Flood Insurance Rate Maps (FIRMs), prepared by FEMA, provide flood hazard information that is used to establish flood insurance premiums

FEMA periodically updates information on flood hazards

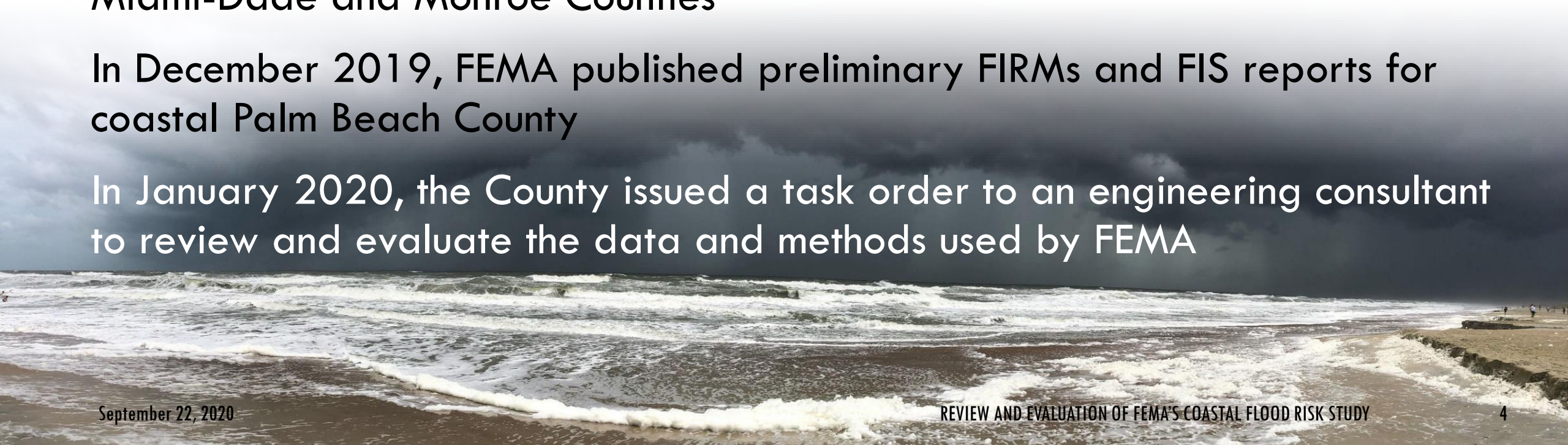
BACKGROUND AND HISTORY (CONT'D)

The most recent coastal storm surge analysis for south Florida used data and tools from the 1970s

In 2013, FEMA initiated the Coastal Flood Risk Study Project for the South Florida Study Area (Coastal Study), which includes Palm Beach, Broward, Miami-Dade and Monroe Counties

In December 2019, FEMA published preliminary FIRMs and FIS reports for coastal Palm Beach County

In January 2020, the County issued a task order to an engineering consultant to review and evaluate the data and methods used by FEMA

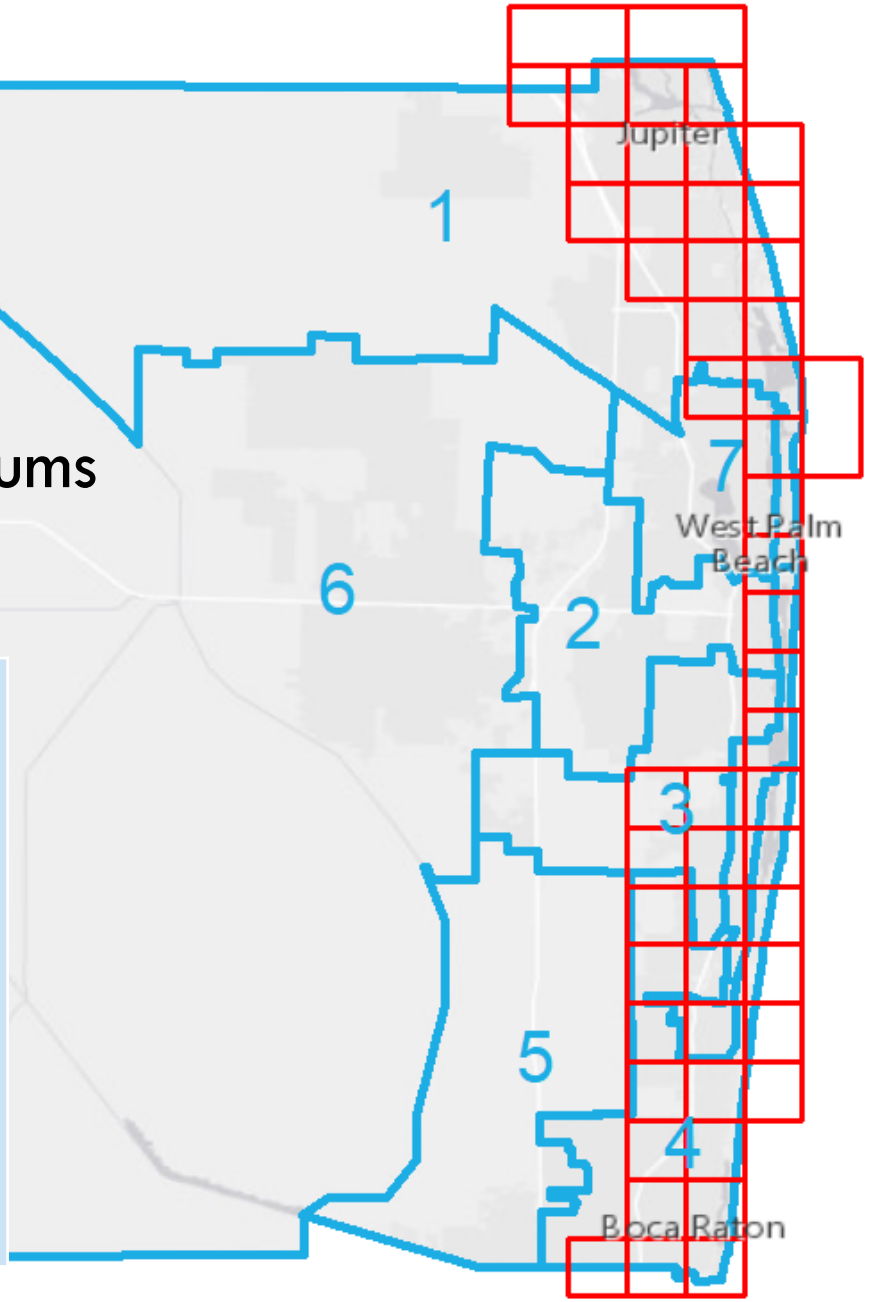


FEMA'S COASTAL STUDY

FEMA is updating the Special Flood Hazard Area (SFHA) for the 1% annual chance (aka 100-year) event – which is the basis for flood insurance premiums

Municipalities Affected:

Boca Raton	Jupiter	Palm Beach
Boynton Beach	Jupiter Inlet Colony	Palm Beach County
Briny Breezes	Lake Park	Palm Beach Gardens
Delray Beach	Lake Worth Beach	Palm Beach Shores
Gulfstream	Lantana	Riviera Beach
Highland Beach	Manalapan	South Palm Beach
Hypoluxo	North Palm Beach	Tequesta
Juno Beach	Ocean Ridge	West Palm Beach



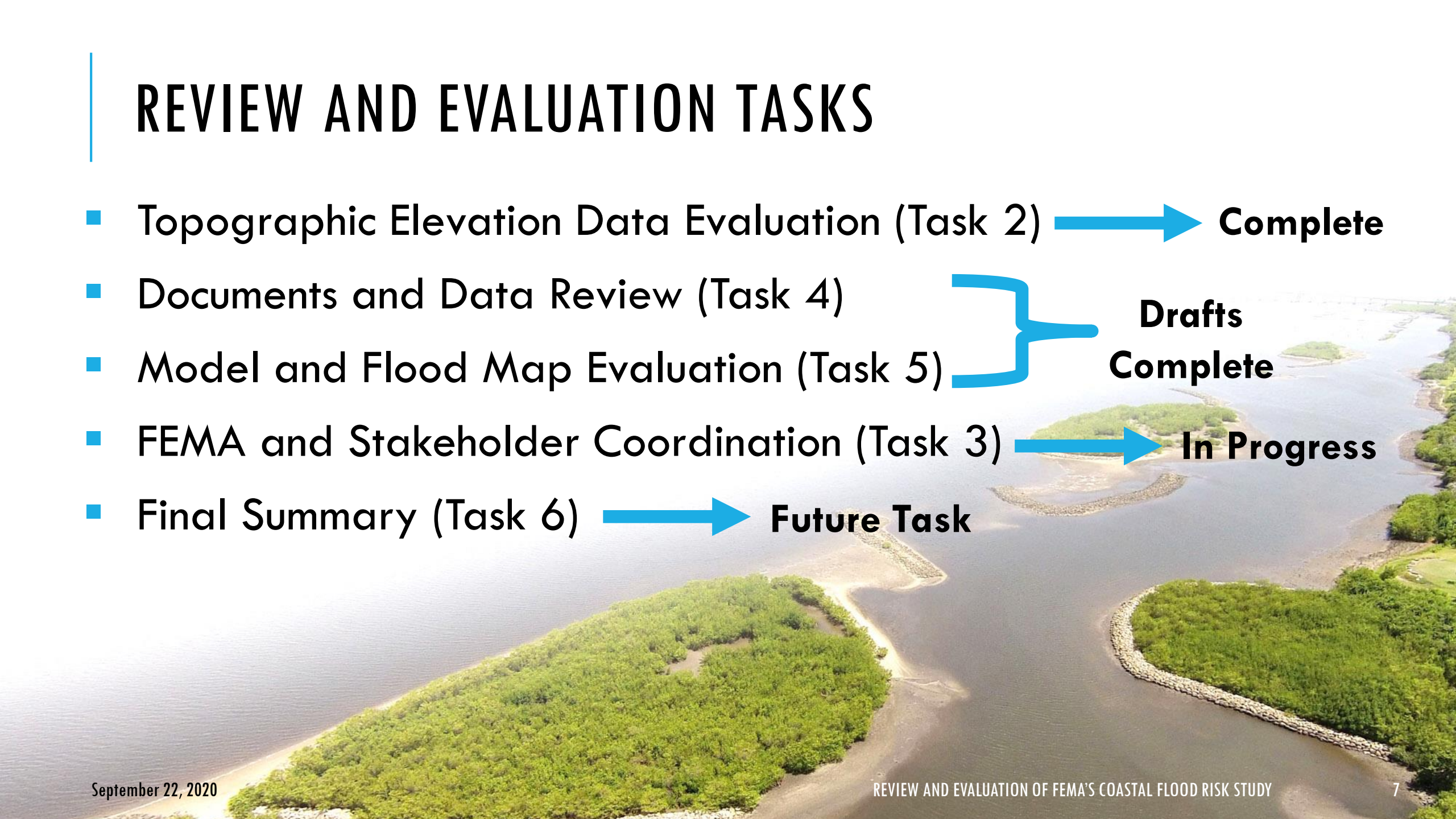

95
ZONE AE
(EL 7)
AUBURN DR
ZONE AE
(EL 9)
15
N R ST
N PALM WAY
N LAKESIDE DR
18TH AVE N
17TH AVE N
BELLA VISTA AVE
16TH AVE N
N I ST
N LAKESIDE DR
AN BREEZE
14TH AVE N
ZONE VE
(EL 10)
ZONE AE
(EL 9)
IBIS WAY
15
IBIS ISLE DR E
IBIS WAY
IBIS ISLE RD W
94
ZONE AE
(EL 7)
OLD S OCEAN
ZONE AE
(EL 9)
ZONE AE
(EL 7)
93
14
ZONE AE
(EL 9)
ZONE AE
(EL 7)
ZONE AE
(EL 8)

REVIEW AND EVALUATION TASKS

- Topographic Elevation Data Evaluation (Task 2) → **Complete**
- Documents and Data Review (Task 4)
- Model and Flood Map Evaluation (Task 5)

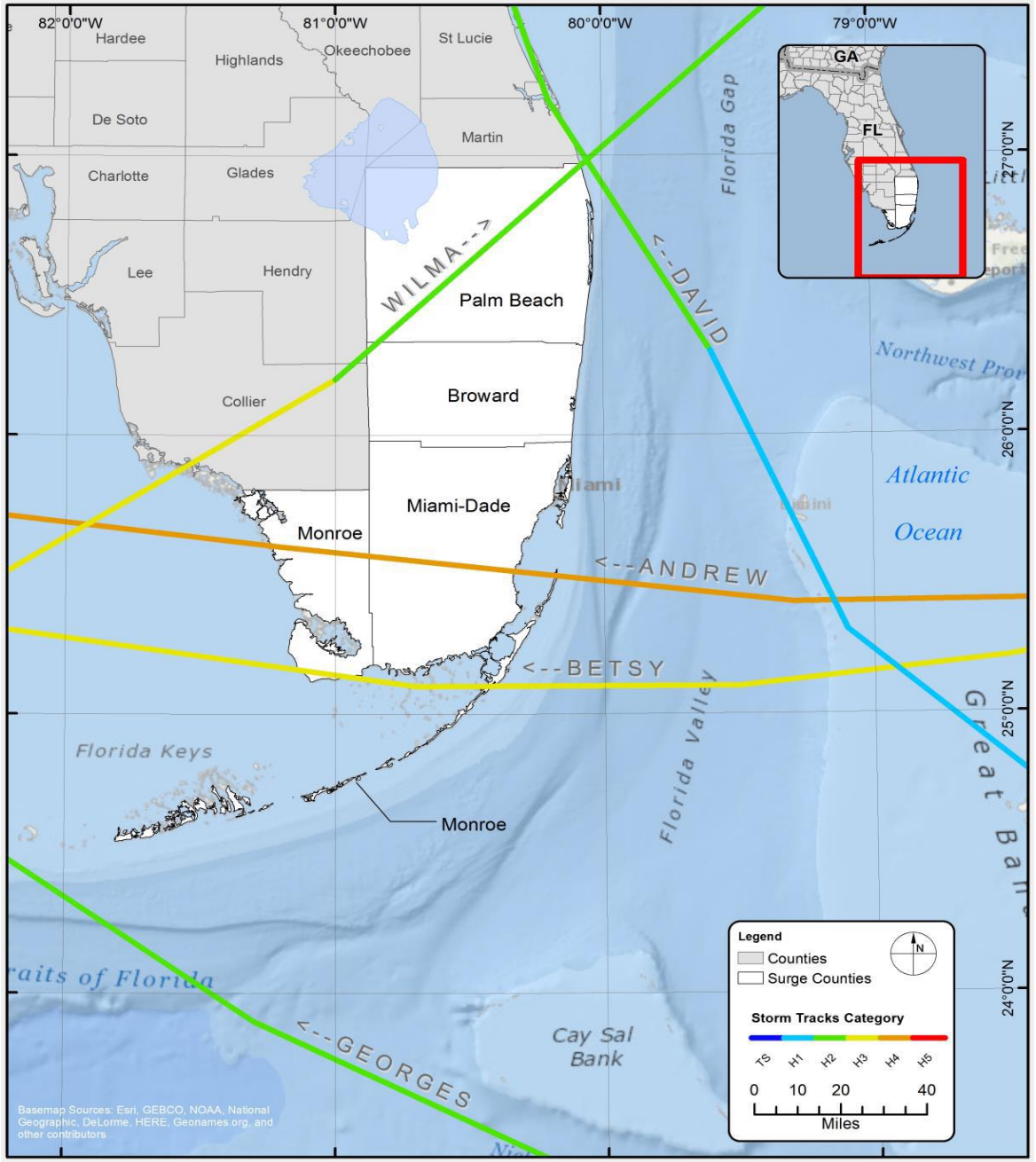
  } **Drafts Complete**

- FEMA and Stakeholder Coordination (Task 3) → **In Progress**
- Final Summary (Task 6) → **Future Task**



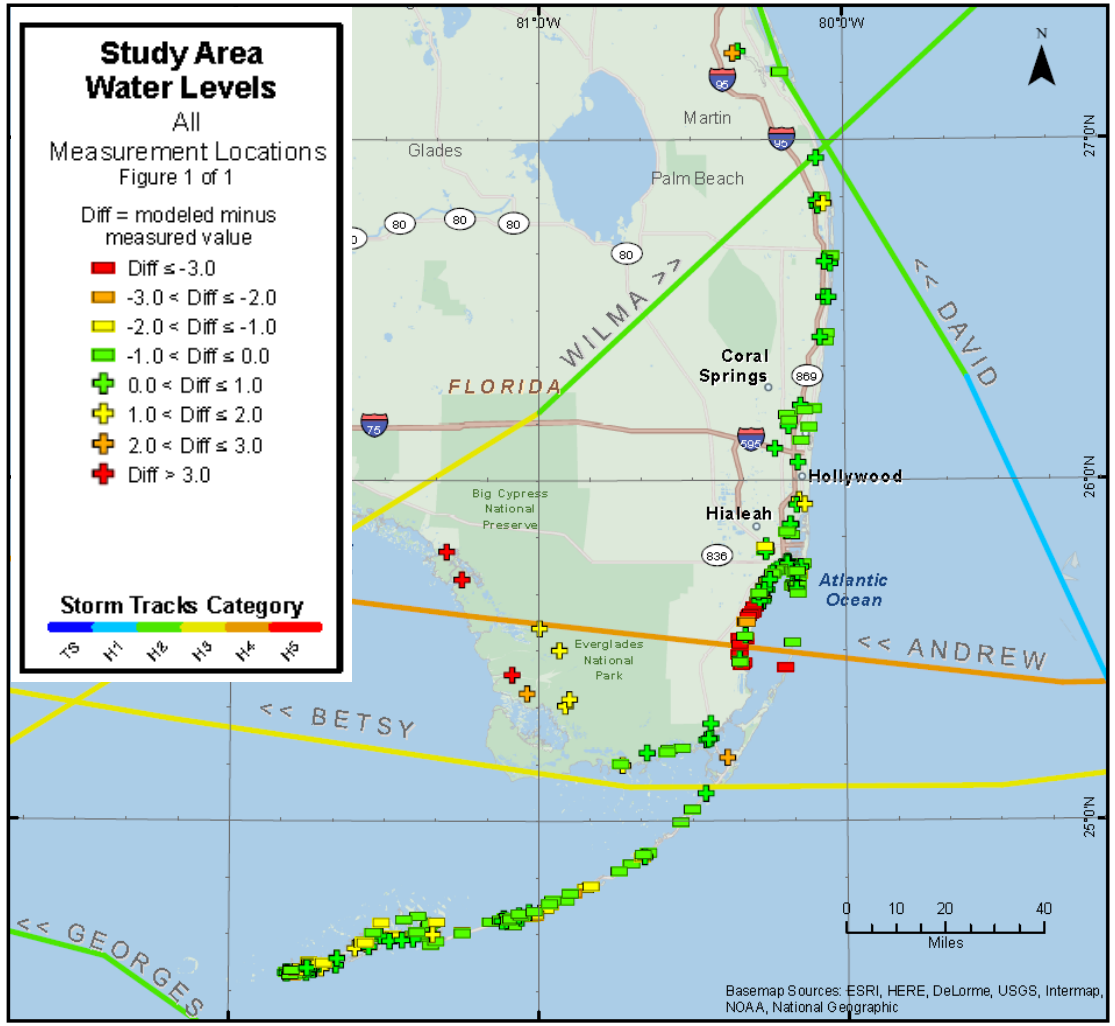
KEY FINDINGS

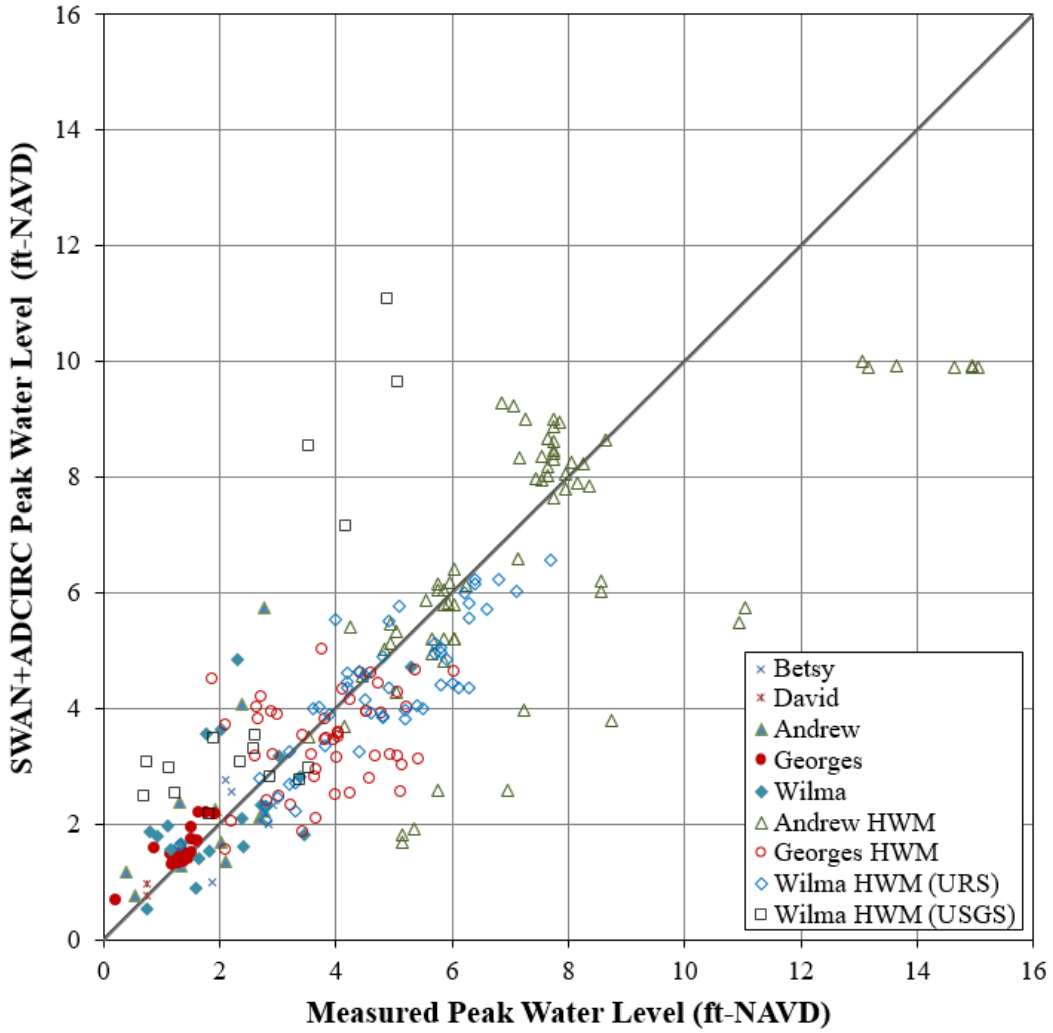
- FEMA's validation storms are not representative for Palm Beach County
  - Hurricane Betsy (1965)
  - Hurricane David (1979)
  - Hurricane Andrew (1992)
  - Hurricane Georges (1998)
  - Hurricane Wilma (2005)



KEY FINDINGS (CONT'D)

- FEMA's model setup had limited accuracy in simulating storm surge

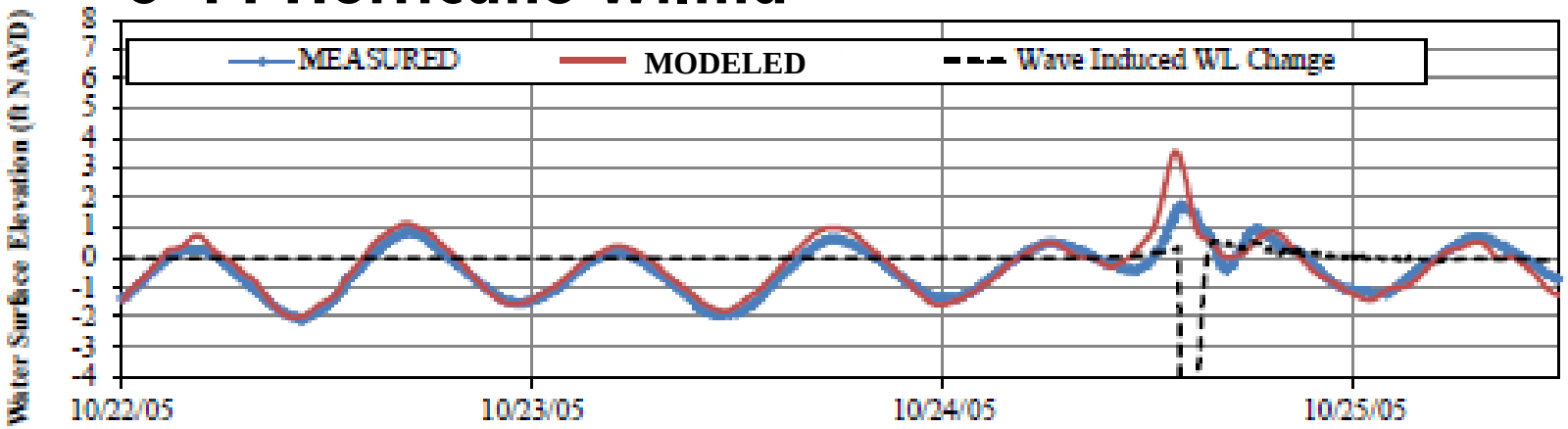




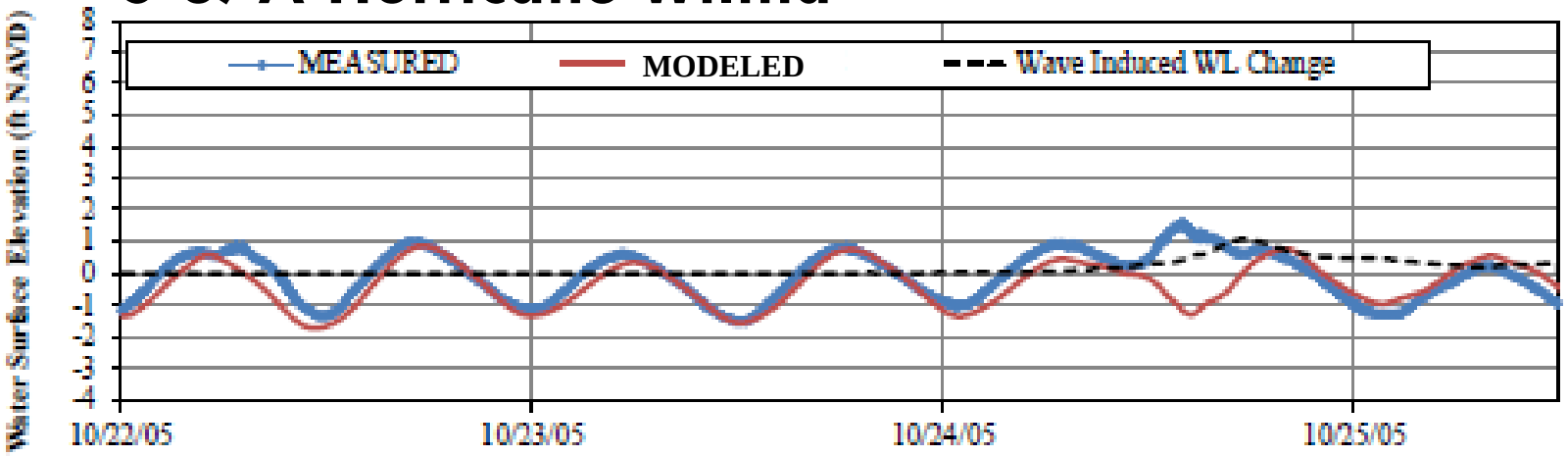
KEY FINDINGS (CONT'D)

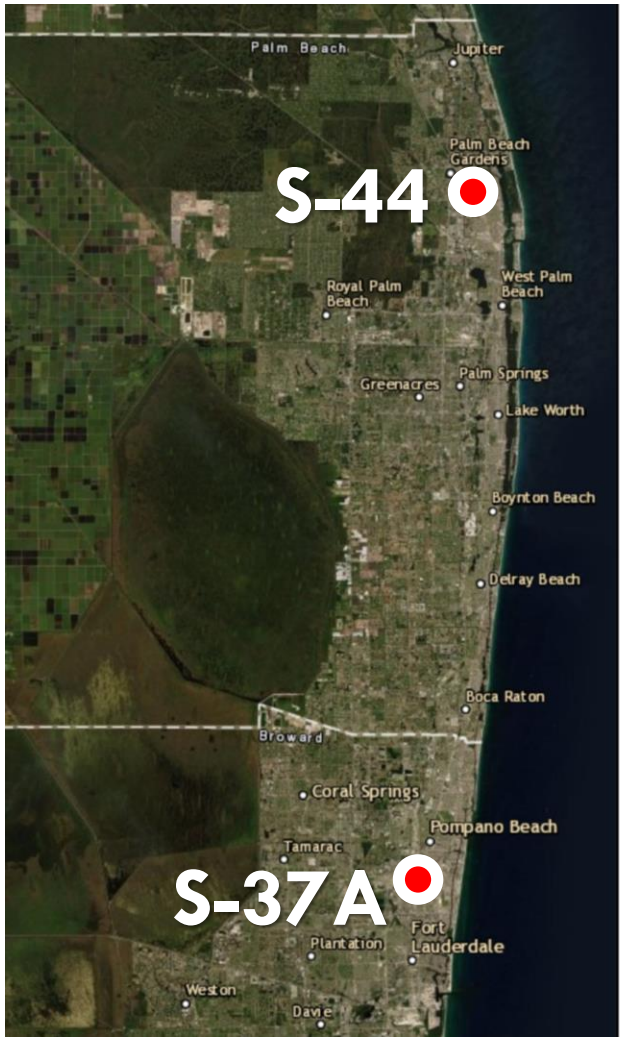
- FEMA's model setup had limited accuracy in simulating storm surge (cont'd)

S-44 Hurricane Wilma



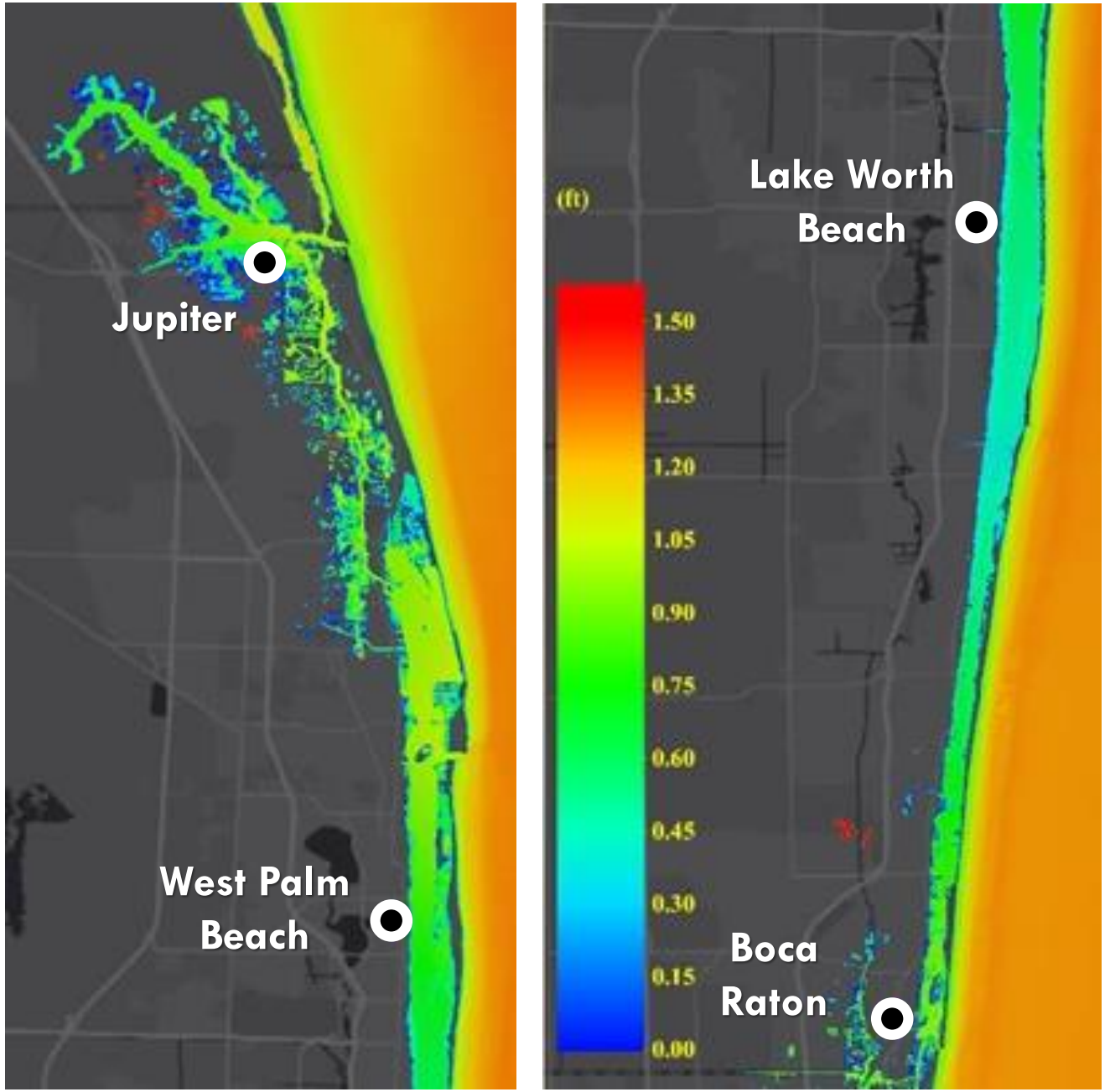
S-37A Hurricane Wilma





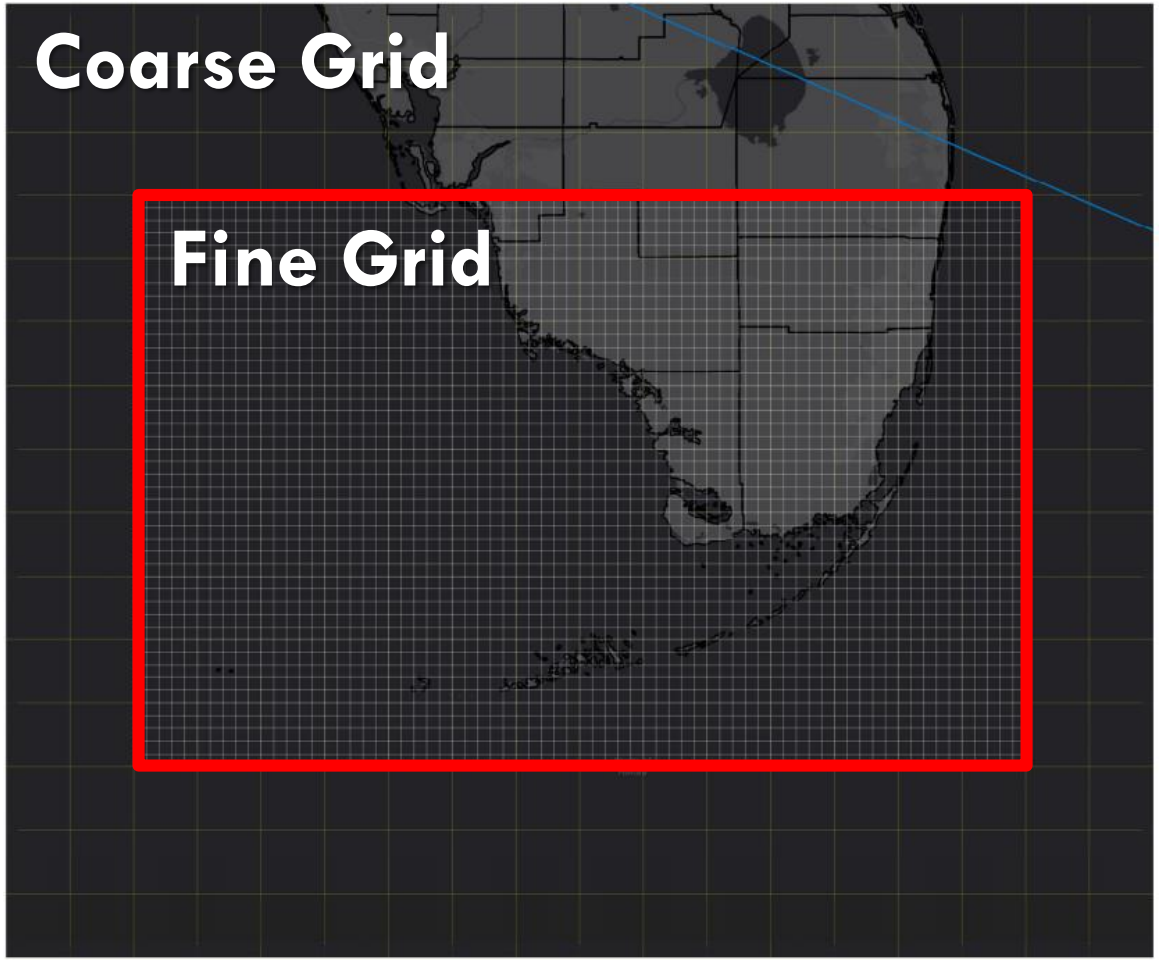
KEY FINDINGS (CONT'D)

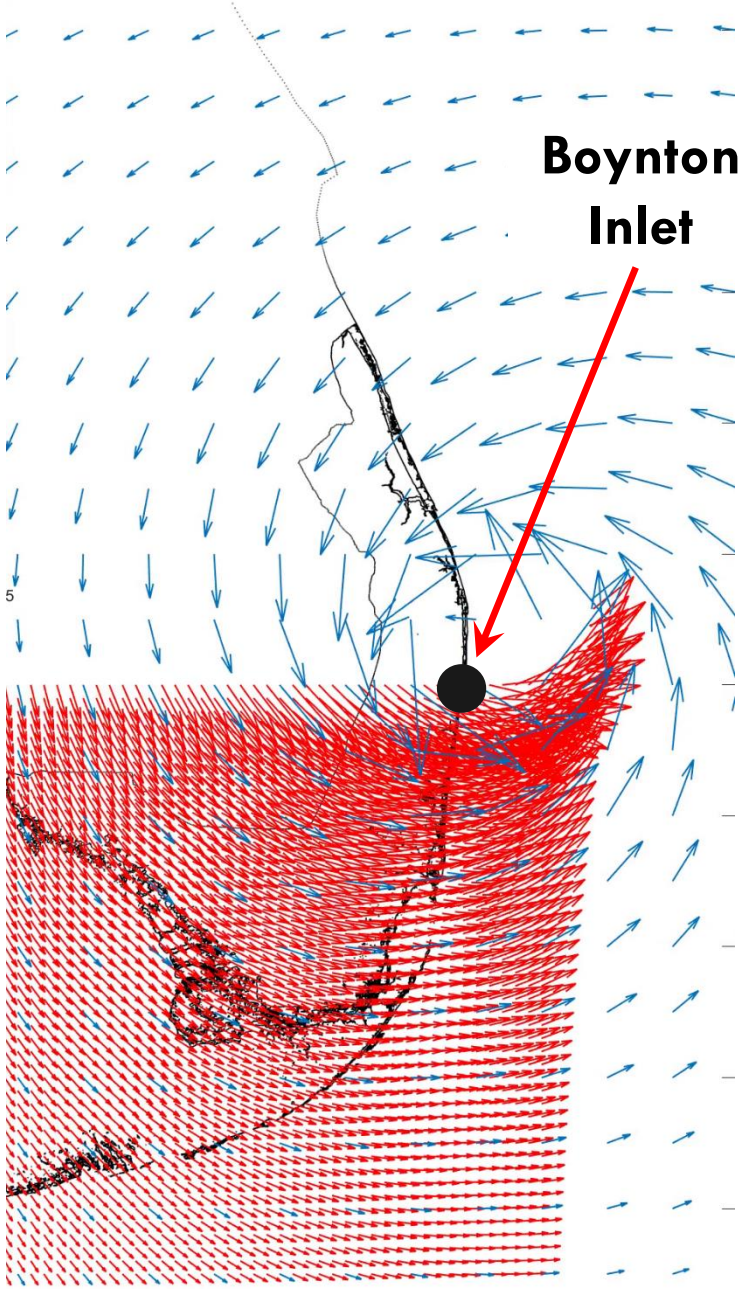
- FEMA's 1% annual chance stillwater elevations (SWEL) offshore of Palm Beach County appear high due to combined effects of model validation and inclusion of west coast storms



KEY FINDINGS (CONT'D)

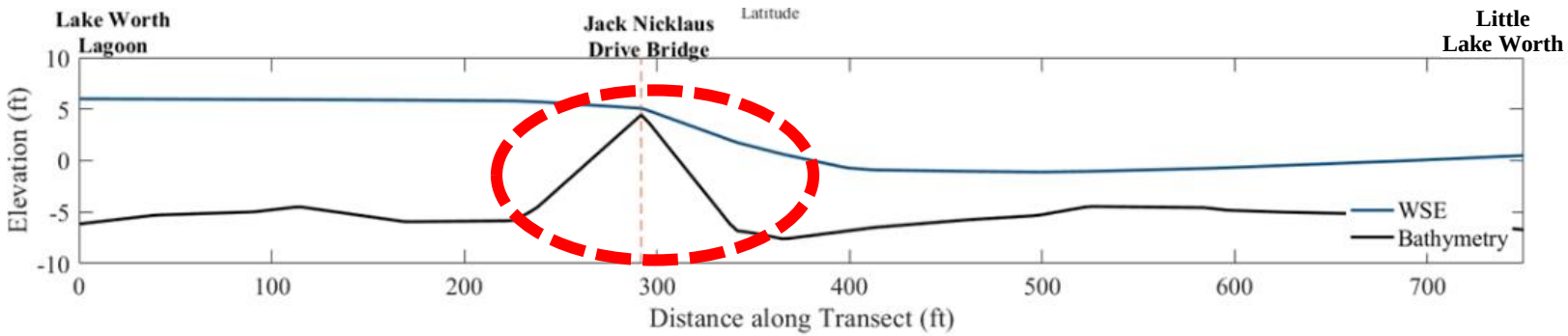
- FEMA's results appear to have been impacted by model grids





KEY FINDINGS (CONT'D)

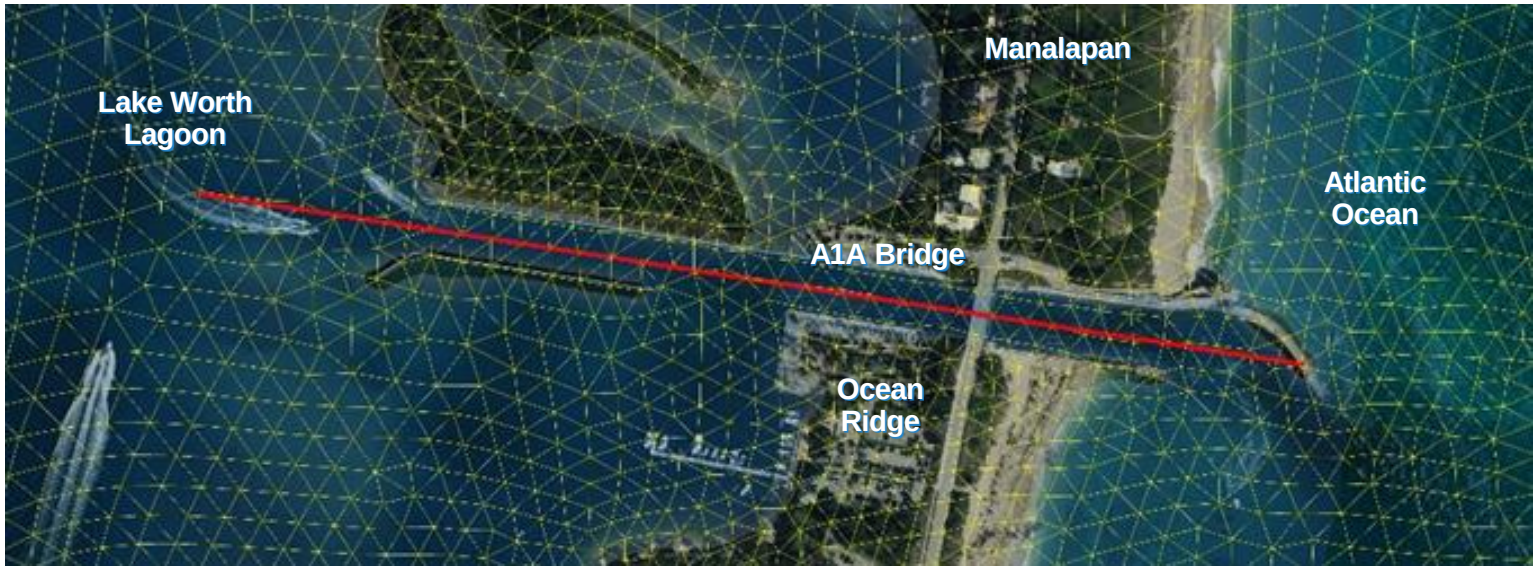
- FEMA's model indicated a channel bottom elevation of +4 feet NAVD88 at **Jack Nicklaus Drive (A1a) Bridge,** which would render the 75+ foot wide channel unnavigable to boat traffic

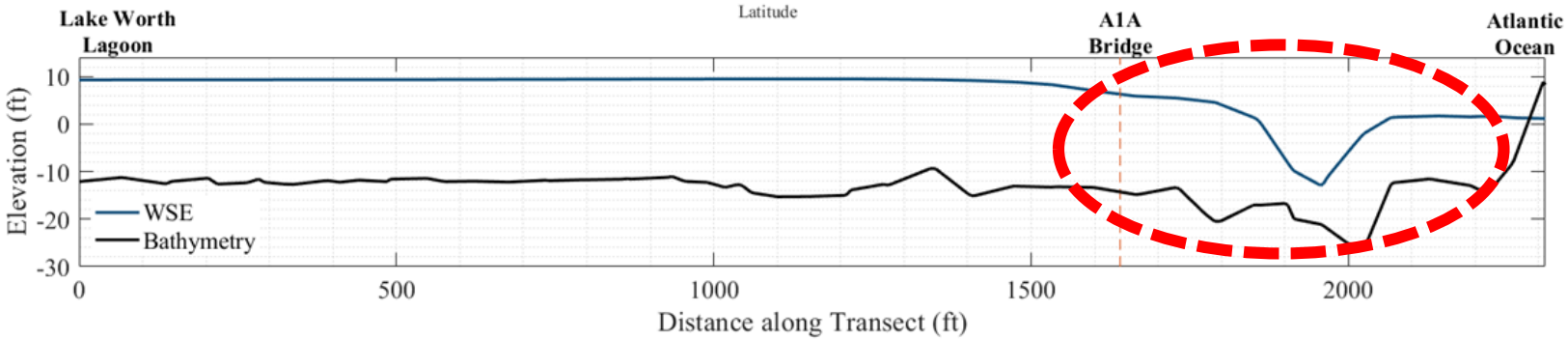


WSE = Water Surface Elevation
Bathymetry = elevation of underwater terrain

KEY FINDINGS (CONT'D)

- FEMA's model did not allow water to flow out through the **Boynton Inlet** creating unrealistic water surface elevations in the inlet and **Lake Worth Lagoon**





WSE = Water Surface Elevation

Bathymetry = elevation of underwater terrain

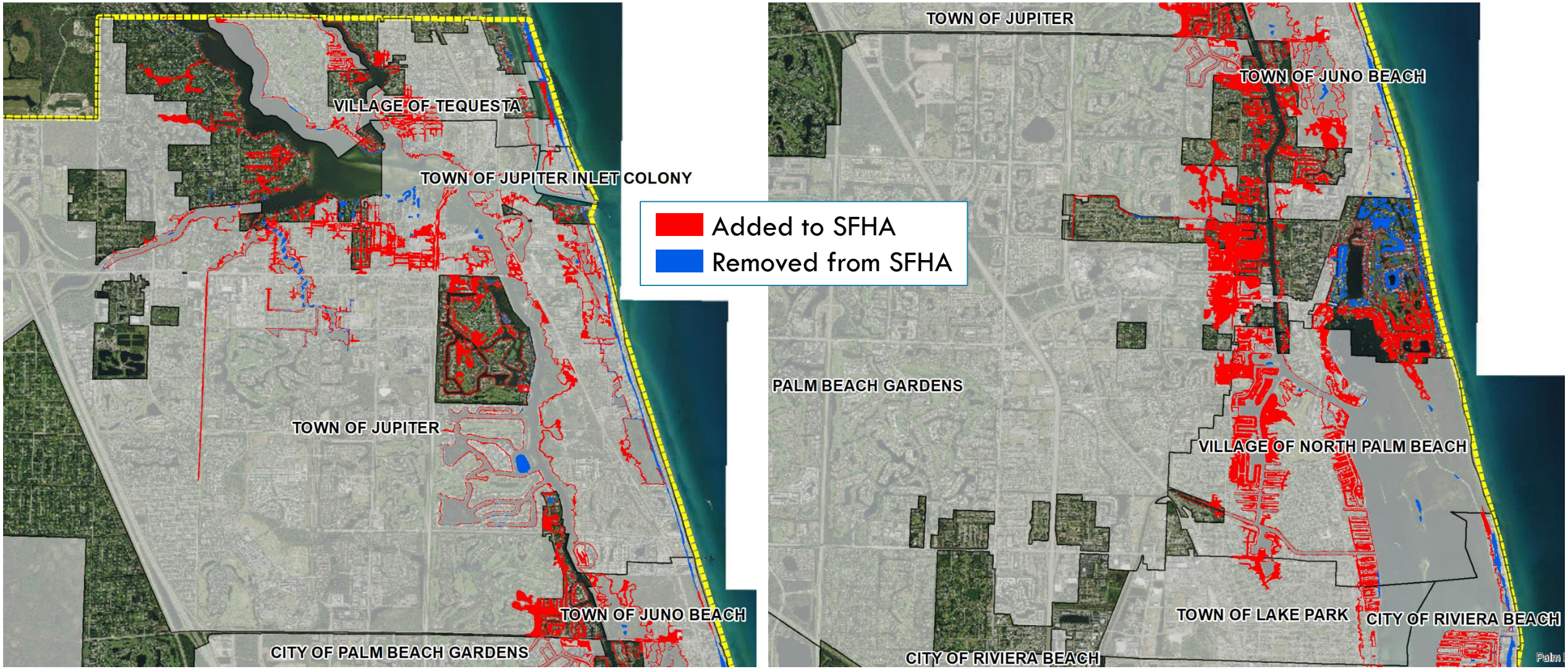
KEY FINDINGS (CONT'D)

- The County's LiDAR-based ground elevation data acquired in 2016-2017 was not able to be used by FEMA
- Differences were observed between the County's elevation data and FEMA's elevation data within the Special Flood Hazard Area (SFHA):
  - 78% of area: within survey tolerance (± 0.5 feet)
  - 15% of area: County elevations are above FEMA elevations (≥ 0.5 feet)
  - 7% of area: County elevations are below FEMA elevations (≥ 0.5 feet)

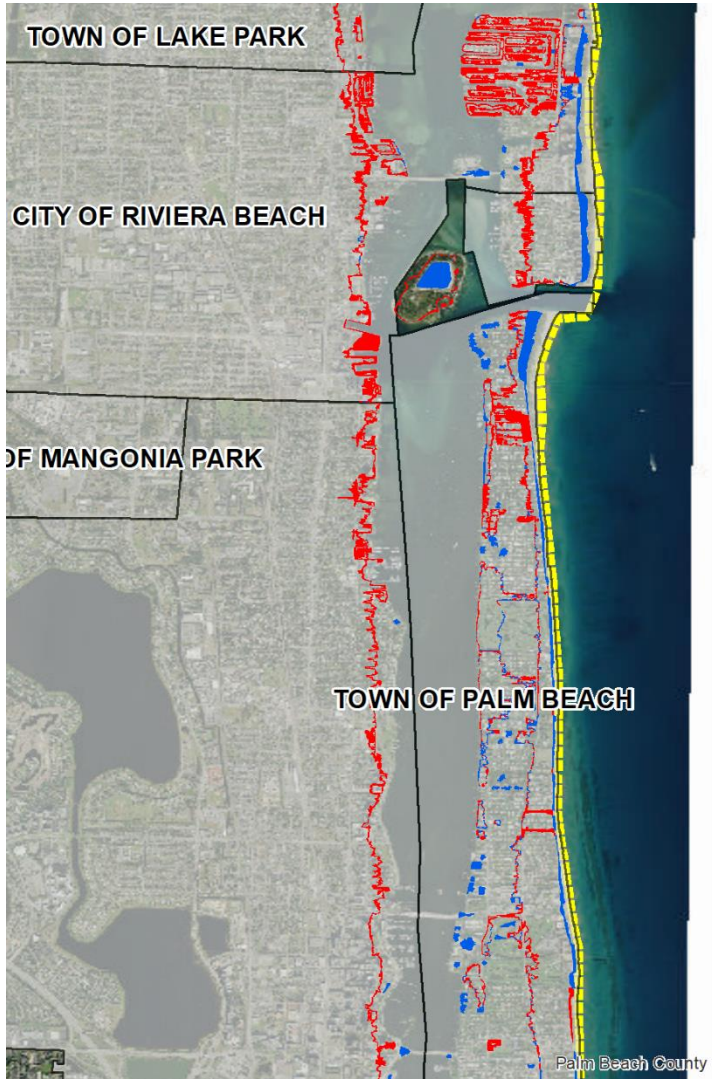
KEY FINDINGS (CONT'D)

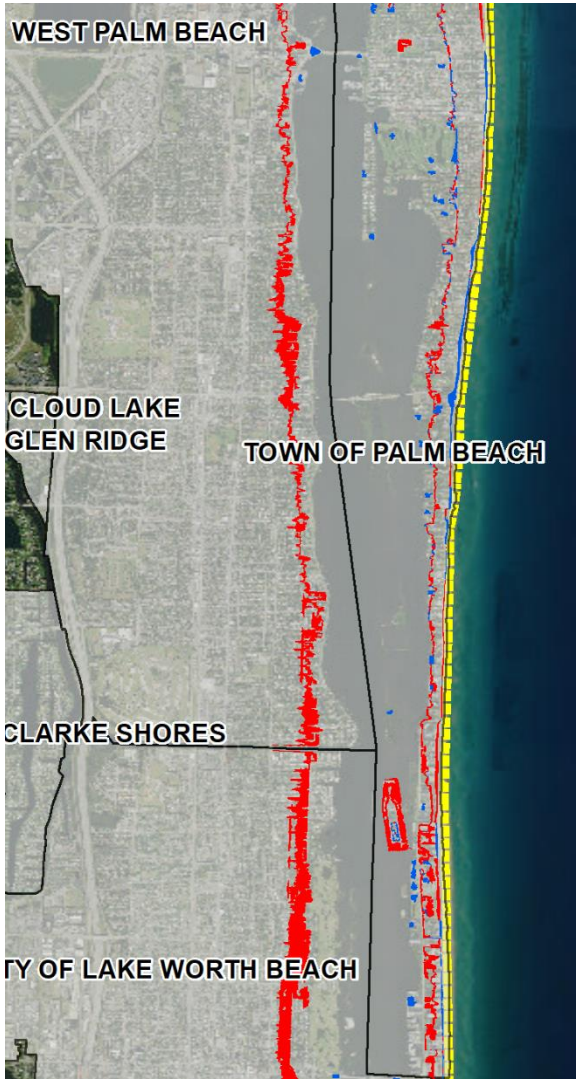
- Special Flood Hazard Area (SFHA) net increase of ~1,900 acres (as compared to 2017 FIRMs)
- Properties with mortgages within SFHA are required to have flood insurance
- Higher flood insurance premiums can be expected for affected properties

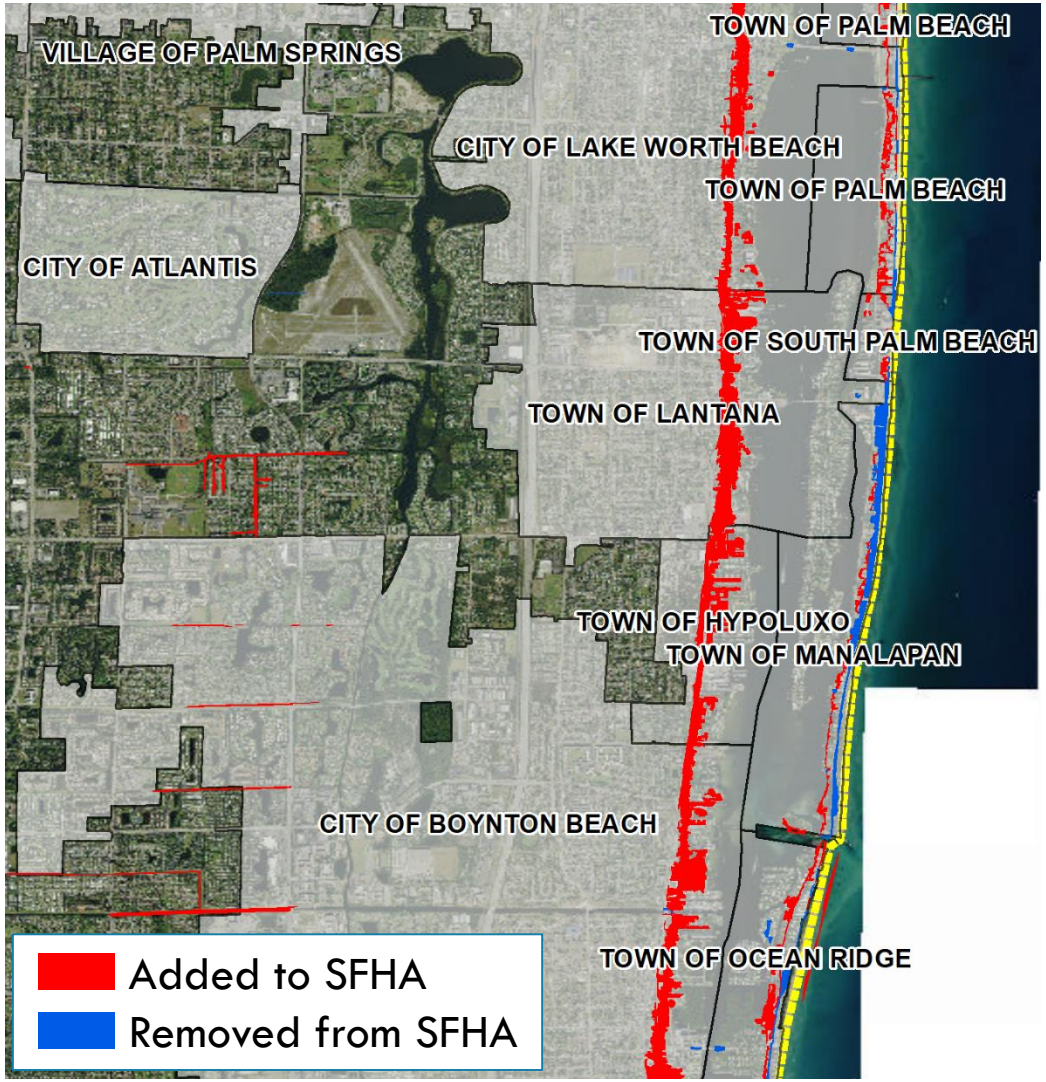
KEY FINDINGS (CONT'D)
SPECIAL FLOOD HAZARD AREA CHANGES SINCE LAST FIRM (1 OF 3)



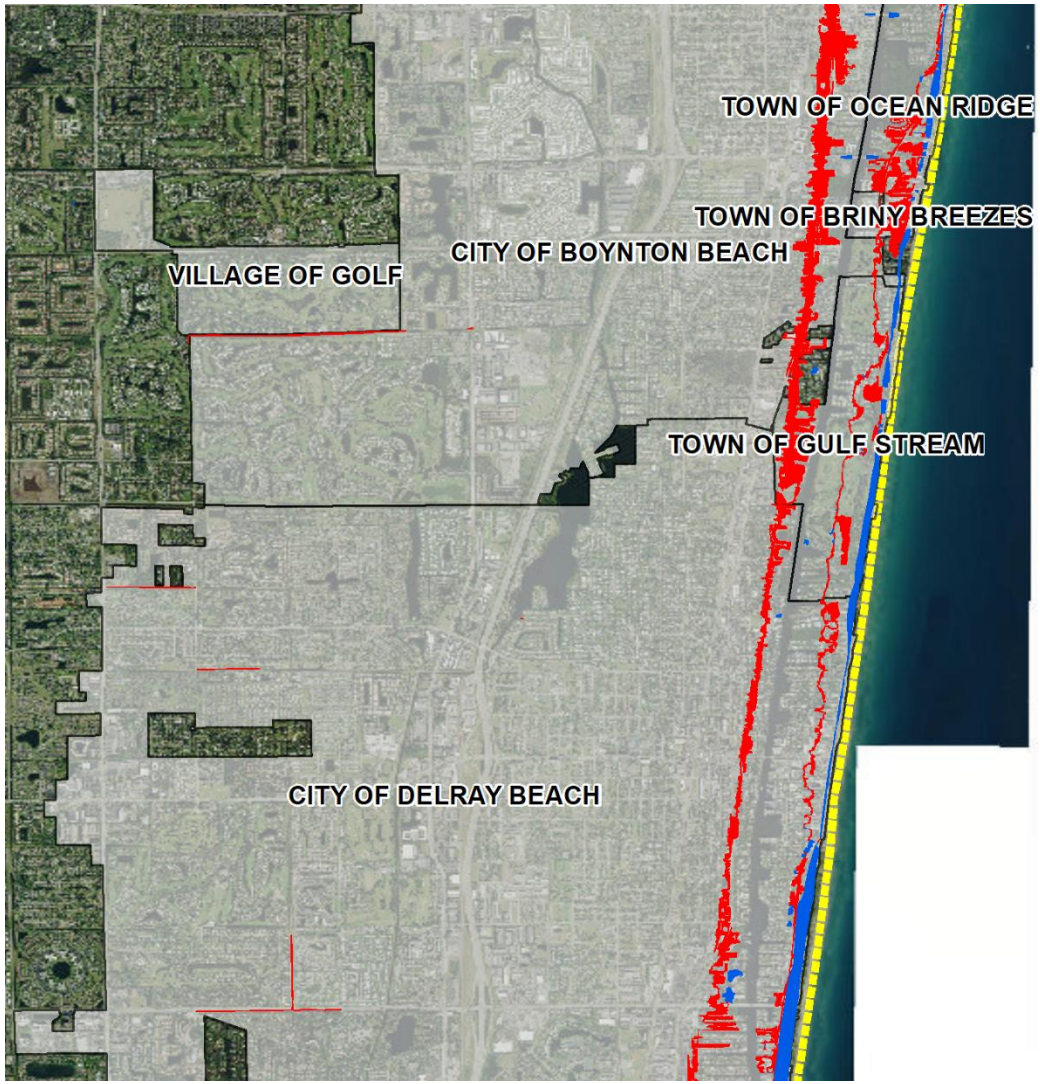
KEY FINDINGS (CONT'D)
SPECIAL FLOOD HAZARD AREA CHANGES SINCE LAST FIRM (2 OF 3)

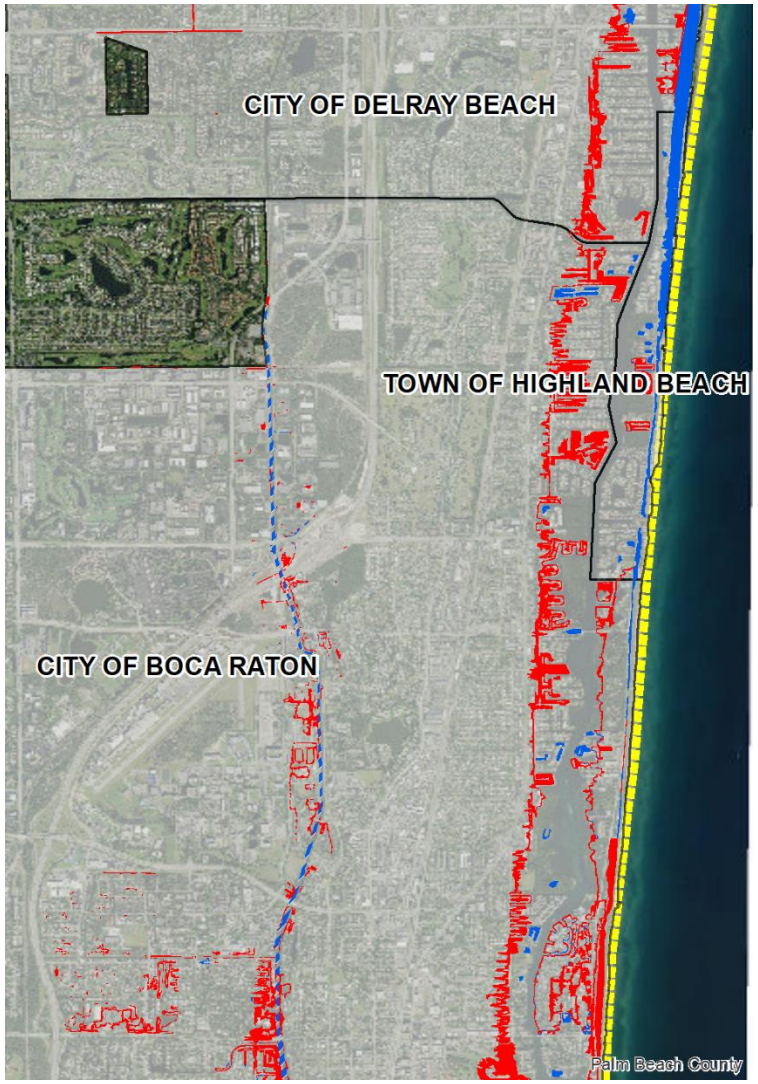


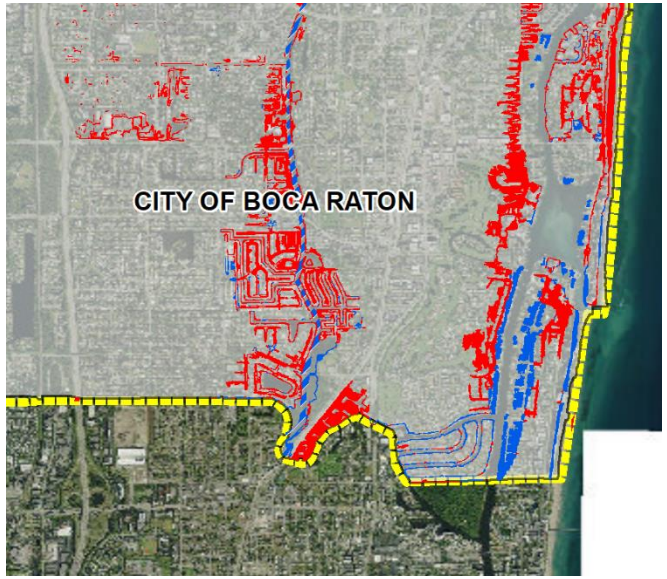




KEY FINDINGS (CONT'D)
SPECIAL FLOOD HAZARD AREA CHANGES SINCE LAST FIRM (3 OF 3)



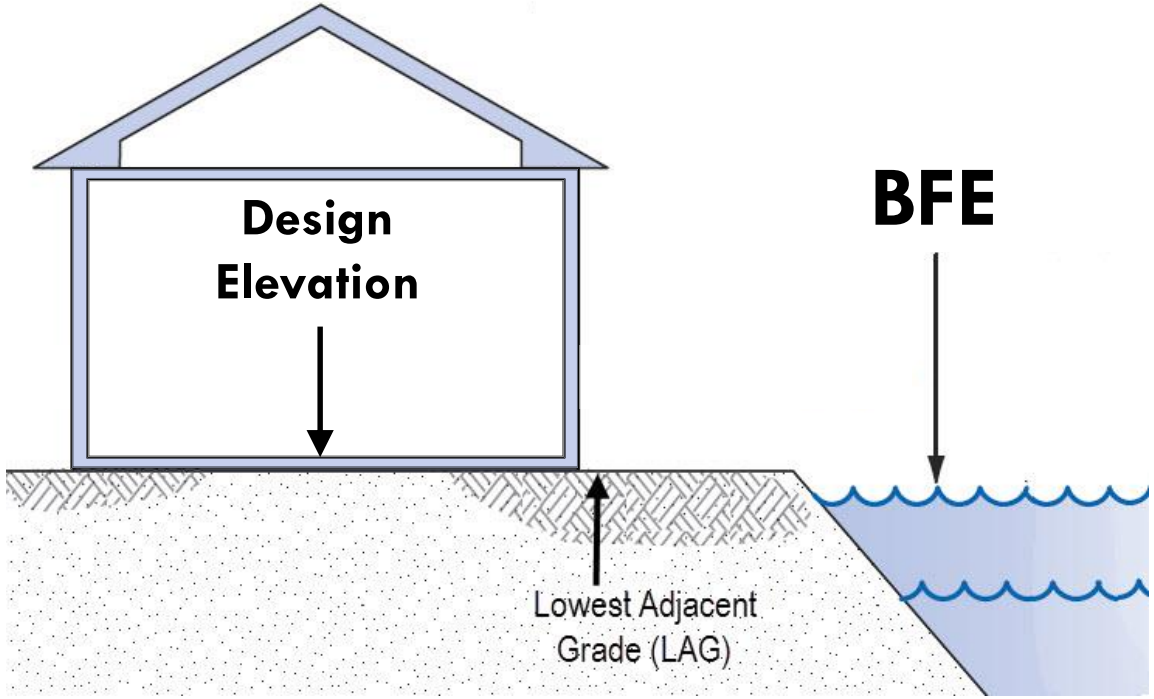




Added to SFHA
Removed from SFHA

KEY FINDINGS (CONT'D)
BASE FLOOD ELEVATIONS (1 OF 3)

- FEMA defines **Base Flood Elevations (BFEs)** within the SFHA
- **BFEs** are elevations to which surface water is expected to rise to or exceed during the base flood (aka 1% annual chance flood or 100-year flood)
- The **design elevation** is the elevation that all new and substantially improved buildings must be elevated to in order to lower the risk of flood damage
- **Design elevations** are typically higher than **BFEs**
- Higher **BFEs** may prevent property owners from making improvements to existing structures

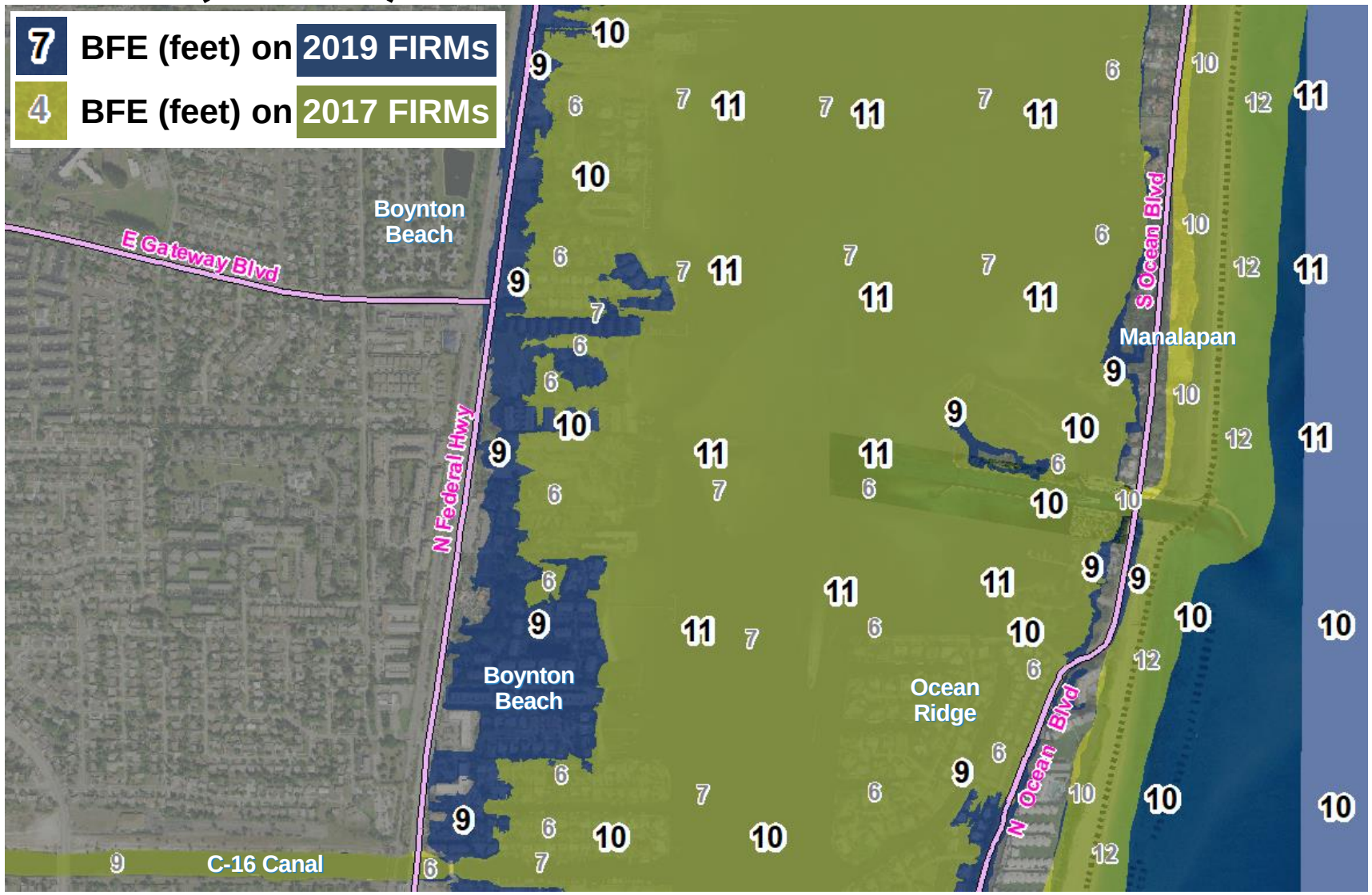


KEY FINDINGS (CONT'D)
BASE FLOOD ELEVATIONS (2 OF 3)

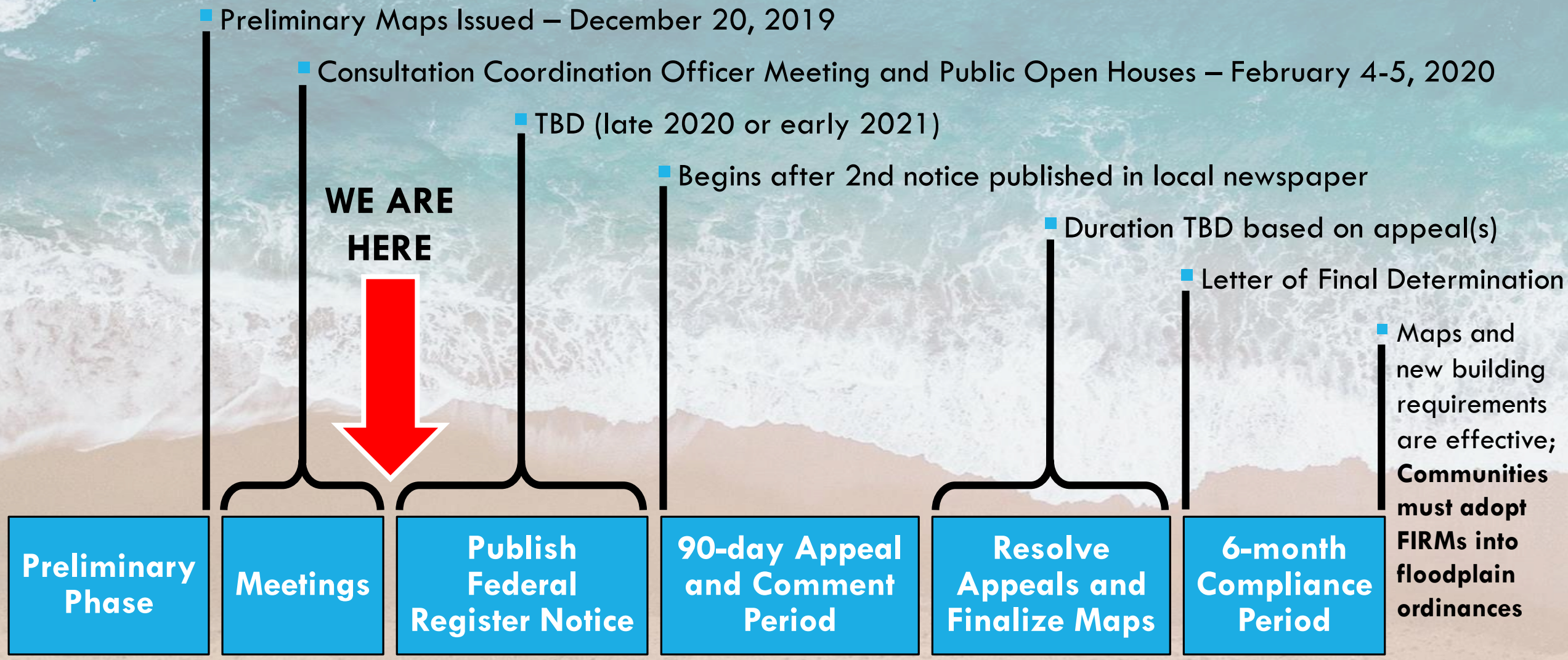
- While BFEs decreased or remained the same in some areas of the County, many areas have higher BFEs as compared to the 2017 FIRMs

KEY FINDINGS (CONT'D)
BASE FLOOD ELEVATIONS (3 OF 3)

- While BFEs decreased or remained the same in some areas of the County, many areas have higher BFEs as compared to the 2017 FIRMs



PROCESS AND APPEALS



PROCESS AND APPEALS (CONT'D)

- Any community or individual property owner can **appeal** proposed changes to flood hazard information or **comment** on preliminary FIRMs and FIS reports
- An appeal must be based on **data and documentation** showing the proposed flood hazard information shown on the preliminary FIRM or in the FIS report is **scientifically or technically incorrect**
- **Appellants need to demonstrate** better methodologies, assumptions or data exists and **provide alternative analyses** that incorporate those methodologies, assumptions, or data if appropriate
- The **results must show an overall change in the flood hazard information** shown on the preliminary FIRM and/or in the FIS report

ACTIVITIES OF OTHER AFFECTED COUNTIES

- **Broward County** – updated topography data and additional modeling information provided to FEMA and additional modeling requested; FEMA declined to do additional modeling and referred Broward County to the appeal process; appeal not expected
- **Miami-Dade County** – many concerns with draft work maps identified; preliminary FIRMs expected to be published in January 2021
- **Monroe County** – sent questions and requested additional information and analyses to FEMA in May 2020; FEMA responded in June 2020 that they would not be revising the study; County Commission voted in June 2020 to prepare an appeal; 90-day appeal period may start as early as Fall 2020

COMPLETED AND FUTURE COORDINATION

- **Water Resources Task Force** briefing – July 23, 2020 **COMPLETED**
- **League of Cities Environmental Committee** briefing – Sep. 2, 2020 **COMPLETED**
- **County Leadership** briefing – Sep. 9, 2020 **COMPLETED**
- **Board of County Commissioners** workshop – Sep. 22, 2020 **TODAY**
- **Stakeholder Coordination** – TBD
- **FEMA Coordination** – TBD

DIRECTION REQUESTED

Staff Recommendation

- Continue to coordinate with local stakeholders and other affected Counties
- Initiate coordination with and transmit consultant's review and evaluation deliverables to FEMA
- Provide future BCC briefing on results of FEMA coordination and potential forward paths related to a formal appeal

REVIEW AND EVALUATION OF FEMA'S COASTAL FLOOD RISK STUDY

DISCUSSION

BCC Workshop
September 22, 2020

PALM BEACH COUNTY FLORIDA

Baird.
Innovation Engineered.

Attachment 4 FEMA and Palm Beach County Technical Discussion Webmeeting Presentation – November 17, 2020

FEMA

Palm Beach County, Florida

Preliminary Study Review Discussion

November 17, 2020

FEMA

RiskMAP

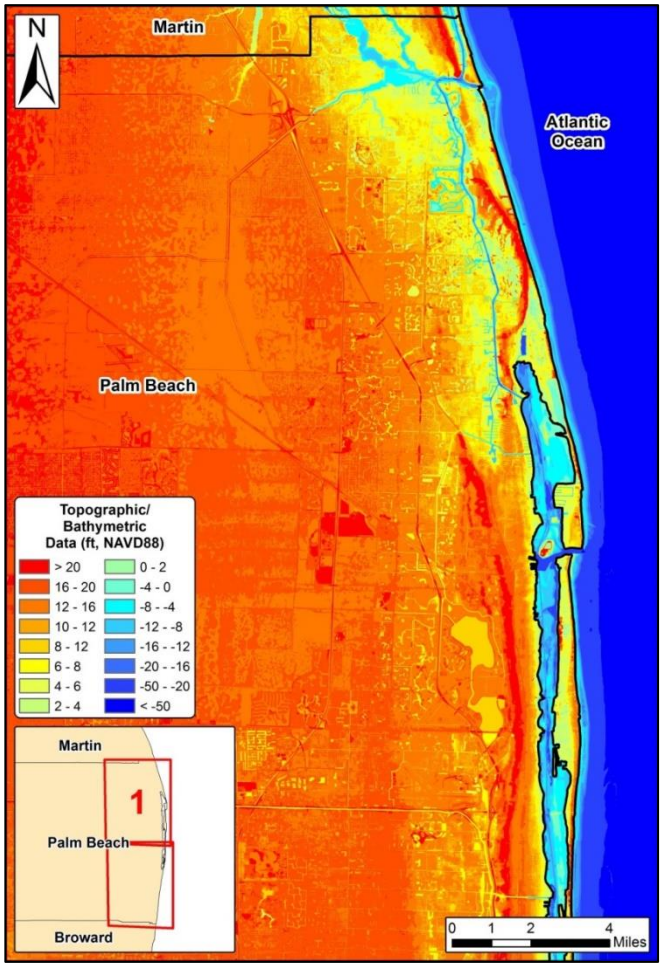
Increasing Resilience Together

Agenda

- **Introductions**
- **Topographic Data Report**
- **Data and Documentation Reports**
  - Model Validation
  - Statistical SWEL
  - Coastal Hazard Analysis
  - Grid Resolution
  - Model Grid Res
- **Project History – Effective vs Prelim**
- **Next Steps**

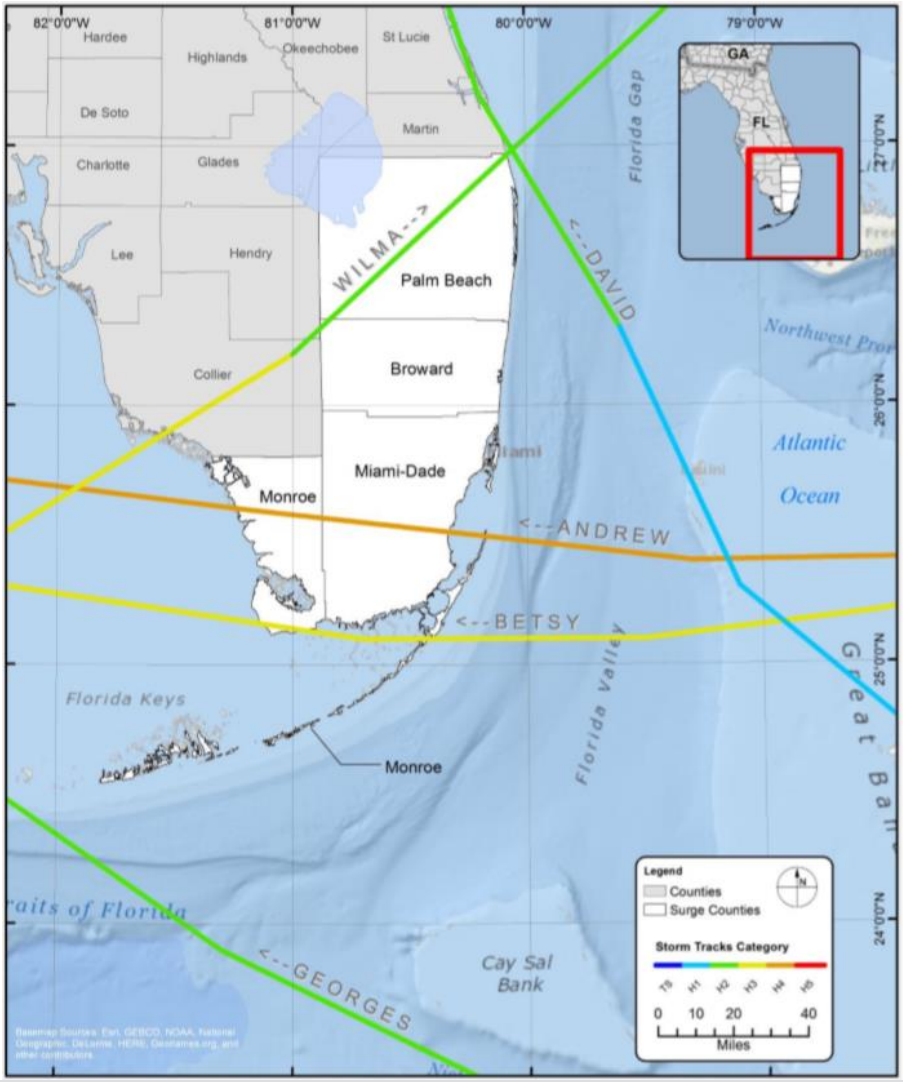
Topographic Data

- **Inland of ICW** – mostly 2007 Lidar
- **Open Coast** – 2016 USACE data (only covered barrier island)

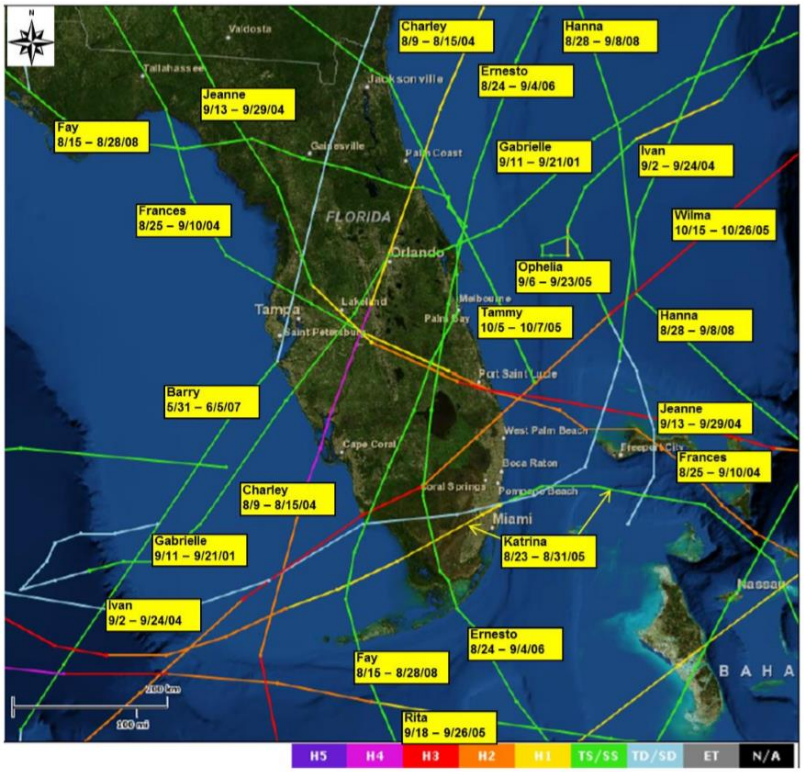


Validation Storms

- **Storms Selected:**
  - Hurricane Betsy (1965)
  - Hurricane David (1979)
  - Hurricane Andrew (1992)
  - Hurricane Georges (1998)
  - Hurricane Wilma (2005)



Validation Storm Selection



(IDS1 Section3)

Table 5.1 Criteria Sorting of Storms

1. Local Landfall (Category 1 or greater)	2. WL Data Availability[b]	3. Approximate Measured Surge Level[c]	High Water Mark Data Availability (marks)
Alma (1966)	Alma	Alma (<5 ft)	Andrew: USGS Report (87)
Andrew (1992)	Andrew	Andrew (10+ ft)	Georges: SEA Report (52)
Betsy (1965)	Betsy	Betsy (5 – 10 ft)	Wilma: URS Report (52)
Cleo (1964)	David	David (<5 ft)	Wilma: USGS Report (40)
David (1979)	Georges	Georges (5 – 10 ft)	
Donna (1960)	Irene	Irene (<5 ft)	
Easy (1950)	Wilma	Wilma (5 – 10 ft)	
Georges (1998)			
Irene (1999)			
Isabell (1964)			
King (1950)			
Wilma (2005)			

[a]Local landfall includes storms that made landfall or bypassed in close proximity to the study area
[b]Greater than 15 stations
[c]Based on available storm reports, hydrograph, or HWM (stillwater) data

Validation Storm Selection

- Hurricane Jeanne and Frances made landfall north of study area.

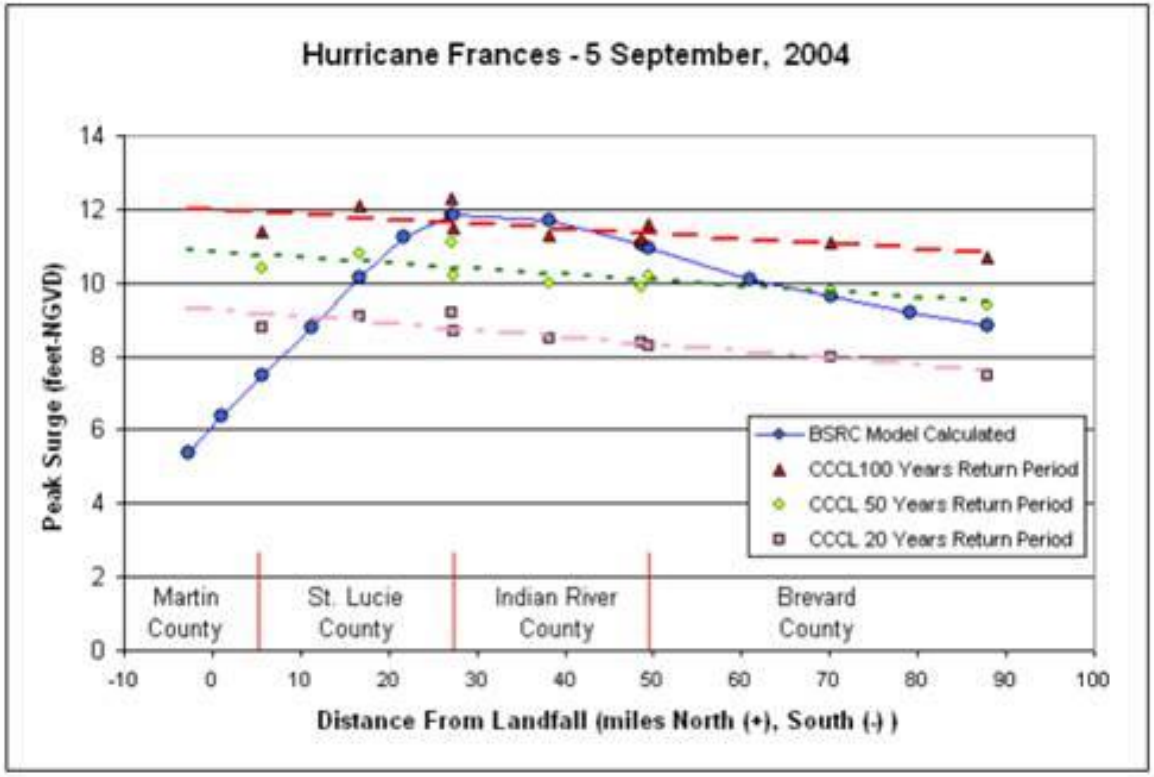


Figure 10. Hurricane Frances Storm Tide Return Period.

FDEP Report: Hurricane Frances

SWAN & ADCIRC Model Validation

- Location of measured data with respect to distance from storm.
- Differences Wilma Validation in ECCFL and SFL

Statistical SWEL

- Combined Storm Frequency Curves and Uncertainty Term
- Open Coast – 2016 USACE data (only covered barrier island)

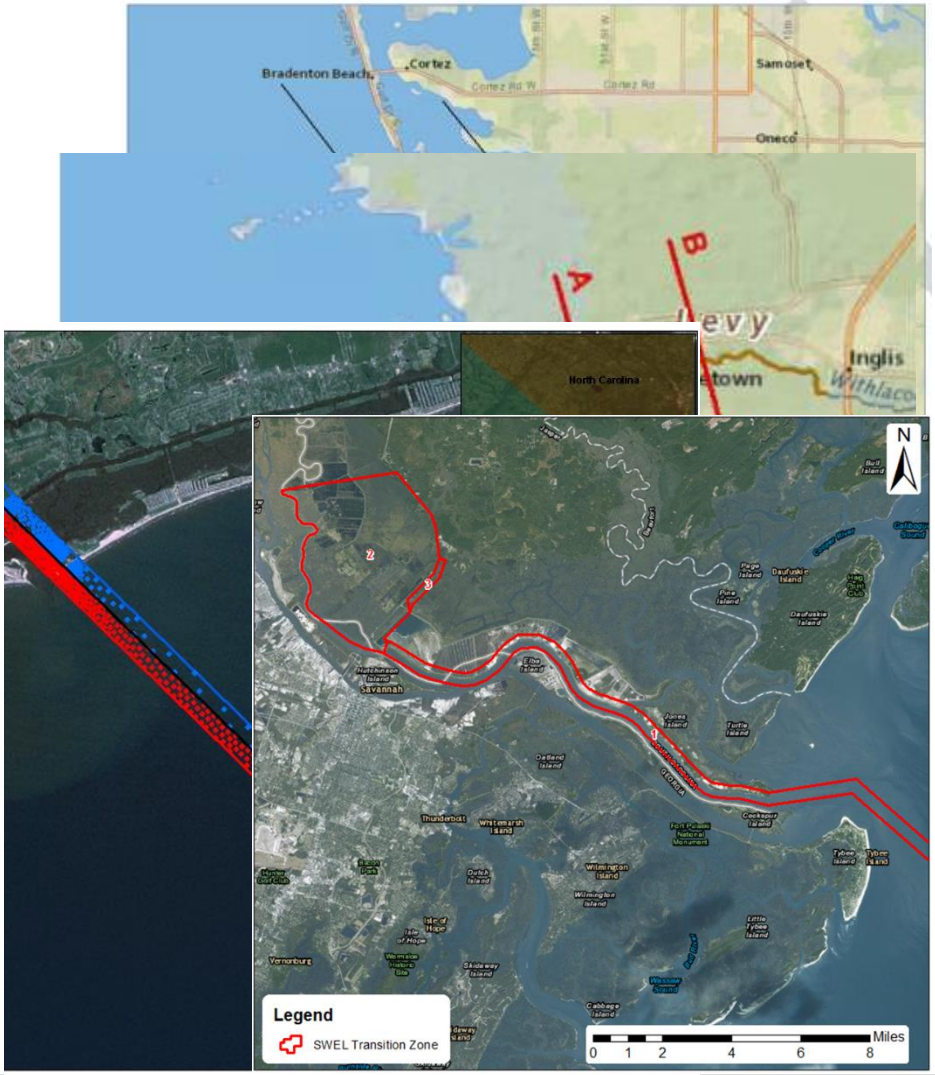
Statistical SWEL

- Combined Storm Frequency Curves and Uncertainty Term
  - Documented in IDS 3 Section 2

As described in IDS 1, Section 5, the need to create two storm suites is related to the fact that storms approaching the study area from the Gulf/Caribbean and making initial landfall/bypassing on the "west coast" have differences in their storm parameter distributions (i.e. pressure, forward velocity, heading, etc.) compared to storms approaching the study area from the Atlantic and making initial landfall on the "east coast". Thus, the storms from the different area had to be treated as independent storm sets in order to accurately reflect the respective distributions for the Atlantic storms and the Gulf/Caribbean – creation of a single storm set to represent both of these populations would have resulted in distributions that don't properly represent either.

Statistical SWEL – Transition boundary

- WFL/SWFL – 4.7 mile
- Big Bend/WFL – 1 mile
- SC/NC – 3000 ft
- GA/SC – 2000 ft
- ECCFL/NEFL – 25 mile
- ECCFL/SFL – 10 mile



Statistical SWEL – Transition boundary

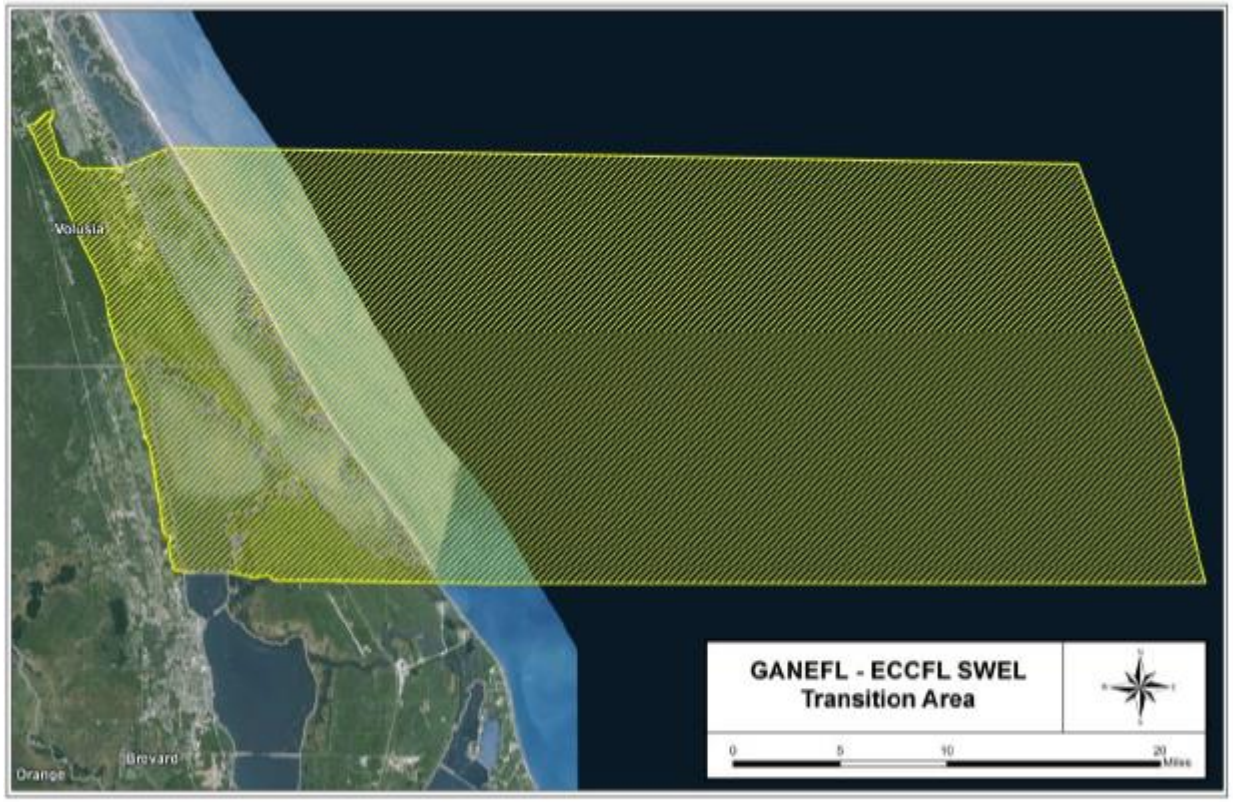


Figure 2.9. GANEFL–ECCFL SWEL Transition Area

Coastal Hazard Analysis

- Possible modeling adjustments due to SWEL conditions
- Excluded inland transects south of East Ocean Ave bridge in Lantana.
- PFD delineation

Model Grid Resolution

- Coarse wind field grid above Boynton Inlet
- Conveyance – Boynton Inlet and other areas.

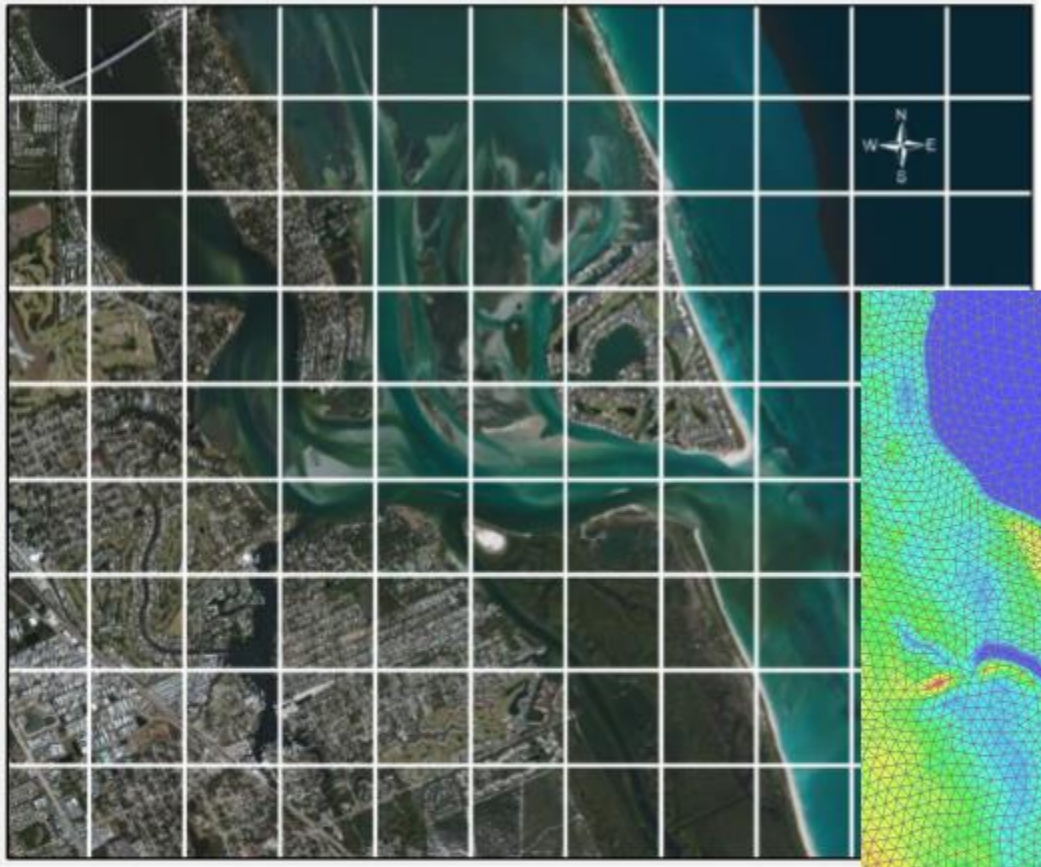
Why the Coastal Flood Risk Study Is Being Updated

- **Current surge analysis is 30 to 40+ years old**
  - SURGE – FEMA Coastal Flood Storm Surge Model, last updated in 1978
  - Climate data from 1970's and NOAA reports
  - Topographic data from quad maps
- **Overland modeling and mapping outdated**
  - Topographic data from 1970's (newer data in limited areas, transects)
  - SWELs based on surge modeling
  - Limited number of modeling transects (37)
  - No LiMWA

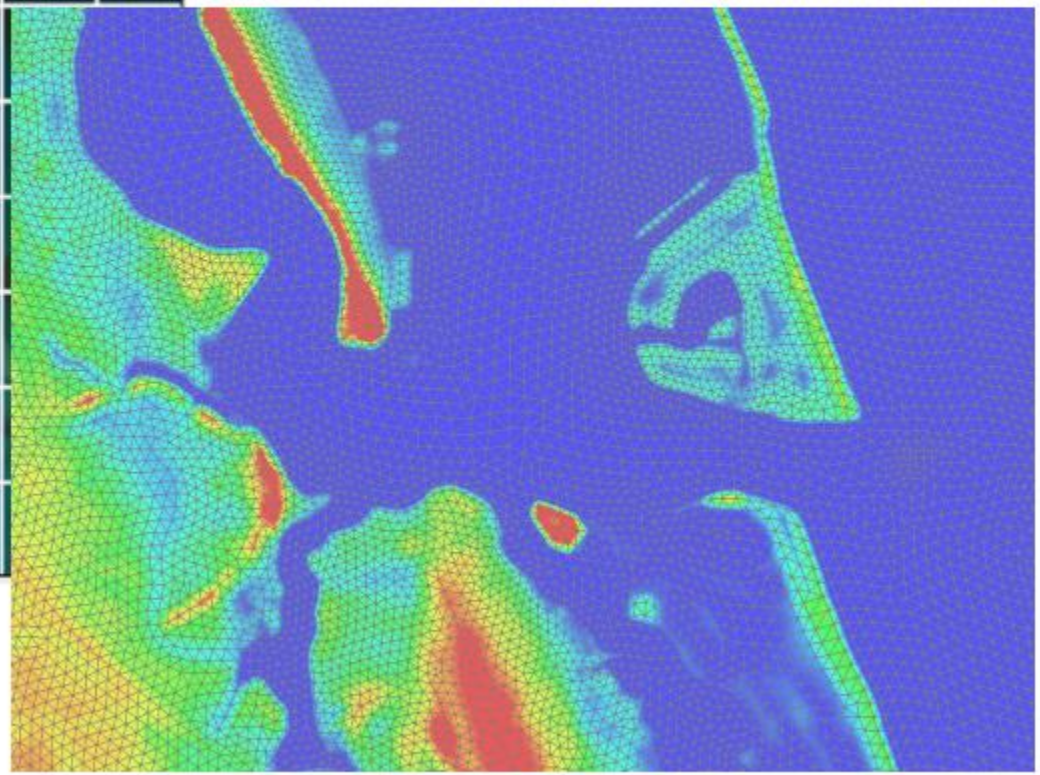
Why the Coastal Flood Risk Study Is Being Updated

- **Today's risk is better defined through**
  - More advanced and highly-resolved modeling methods
  - Updated elevation data
  - New climatological data
  - Super computing resources
  - Updated coastal hazard methodologies
  - More modeling transects (now 200)
  - Improvement in Geographic Information System (GIS) technologies for mapping

Why the Coastal Flood Risk Study Is Being Updated



Old Mesh



New Mesh

Next Steps