How the USACE's Overall Hurricane Response Efforts Have Evolved, and the Specific Response and Observations Following Hurricane Matthew

Jason Engle, P.E.

Kevin Hodgens, P.E.

Jennifer Coor, Ph.D., P.G.

USACE – Jacksonville District

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Agenda

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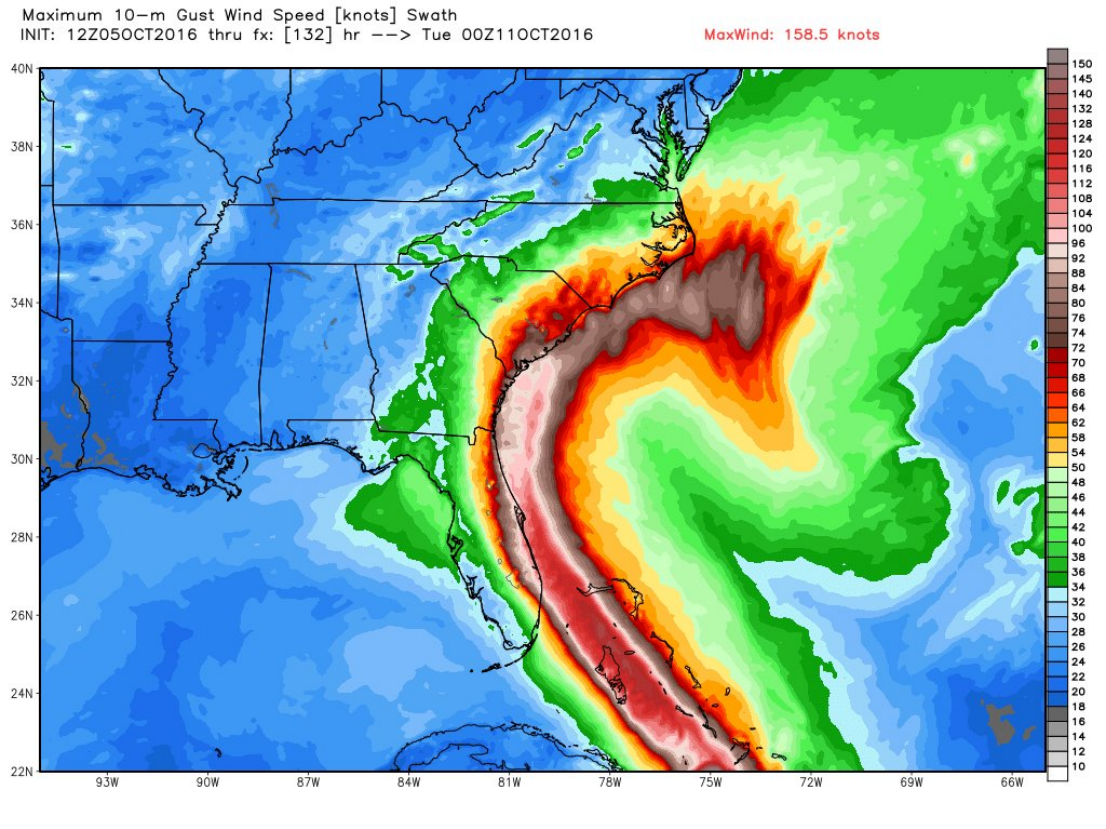
- Storm Overview
- USACE/FEMA project inspection mission
- Federal project impacts
- Lessons learned



Storm Chronology

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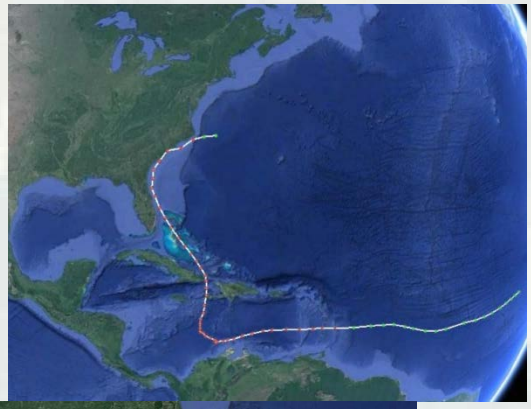
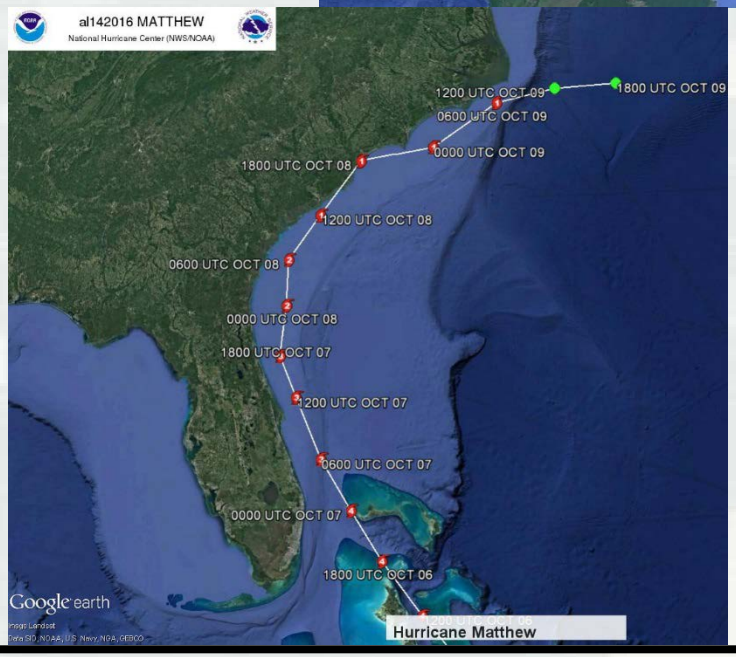
- Tracked from 24 September to 09 October
- TS - 28 September
- Hurricane - 29 September
- Major Hurricane - 30 September
- Cat 5 - 01 October
- Landfall – Haiti 04 October
- Landfall – Cuba 05 October
- Impacts – Bahamas 06 - 07 October
- Off FL Coast – 07 October as Cat 4/3
- Off GA Coast – 08 October as Cat 2
- Landfall – 08 October as Cat 1
  - McClellanville, SC north of Charleston
- Off NC Coast – 09 October as Cat 1





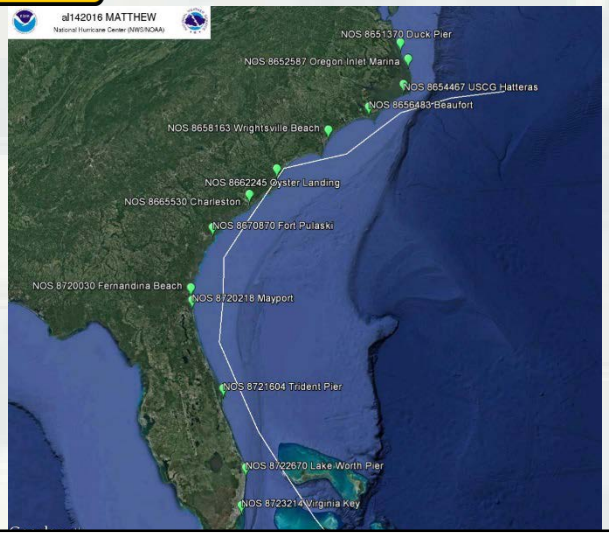
Extraordinary Storm

- ER 500-1-1 Paragraph 5-20(e)
  - To be eligible for Rehabilitation Assistance, *the HSPP must be substantially eroded/damaged by wind, wave, or water action of an other than ordinary nature.* USACE defines this as an "extraordinary storm". An extraordinary storm is a storm that, due to *length or severity*, creates weather conditions that cause significant amounts of damage to a Hurricane/Shore Protection Project

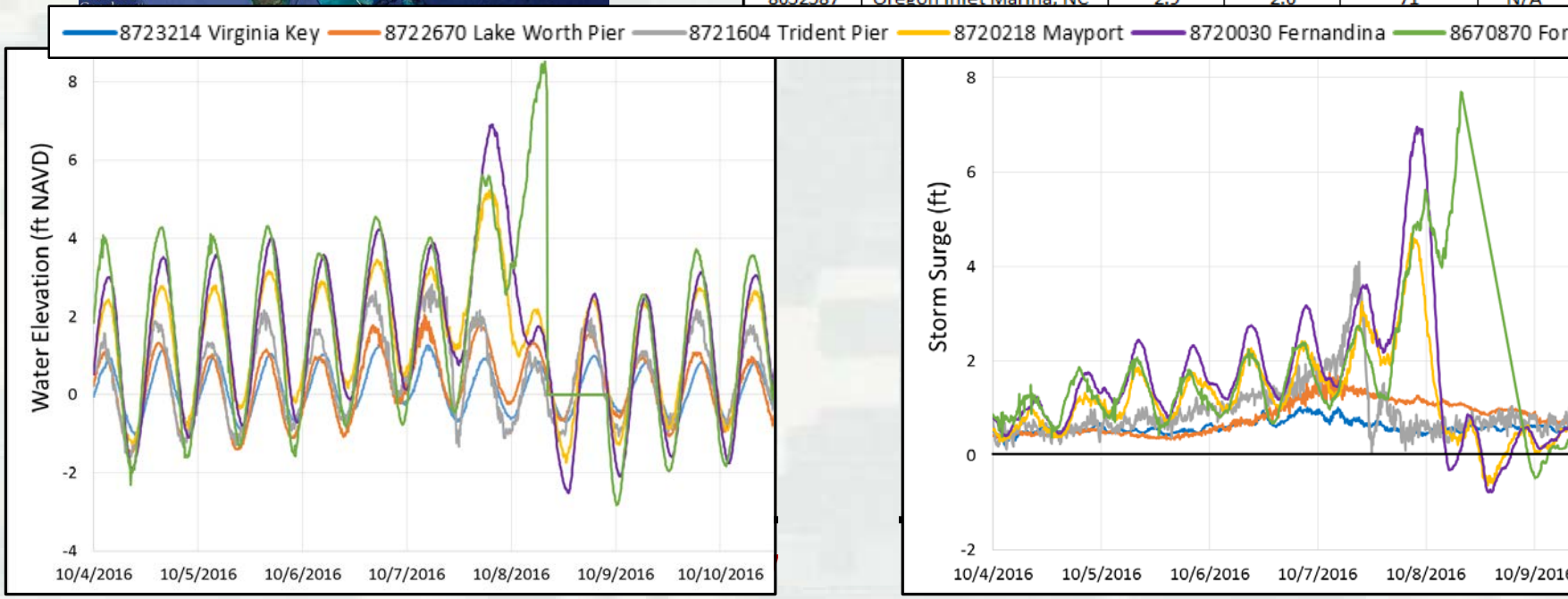
- ER 500-1-1 Paragraph 5-20(e)(1)
  - "Length or severity" refers to a **Category 3 or higher** hurricane as measured on the Saffir-Simpson scale, or a storm that has an exceedance frequency equal to or greater than the design storm of the project.

- Matthew was extraordinary storm
  - Category 4/3 in FL
  - WL and Wave data support Extraordinary for GA, SC, NC

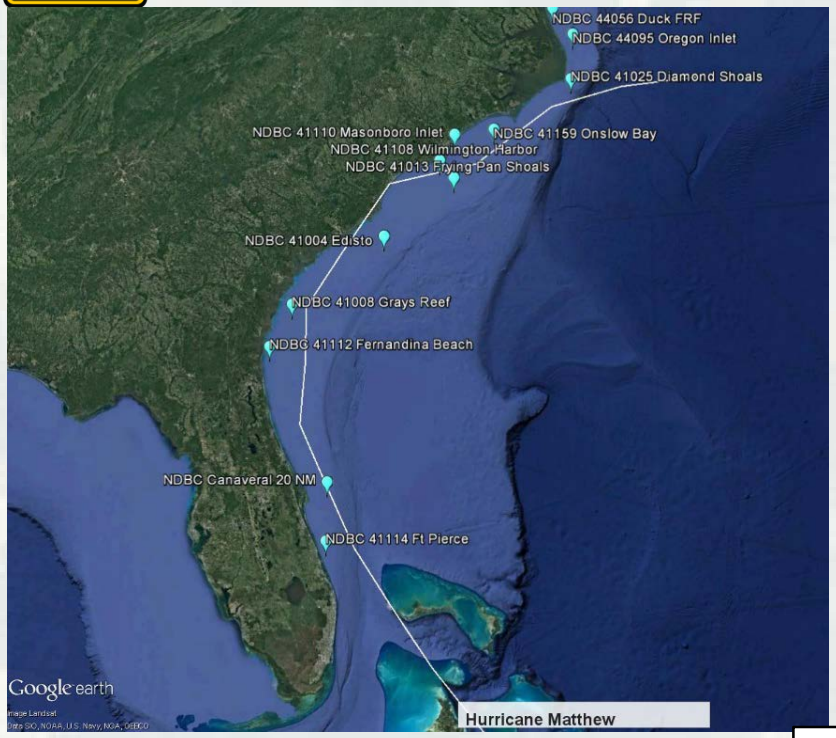
Verified Water Levels

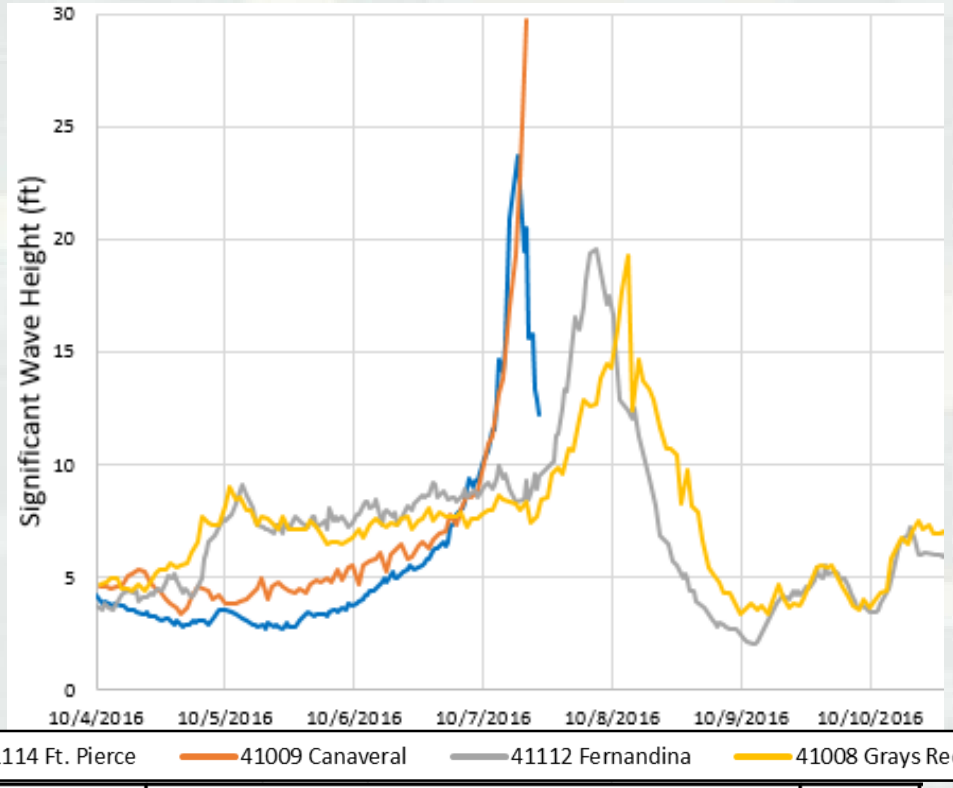


NOS Station	Location	Peak Water Level (ft NAVD88)	Storm Surge (ft)	Duration of Surge > 1 ft (hours)	Exceedance Probability Level (ft NAVD88)	
					100 Yr	10 Yr
8723214	Virginia Key, FL*	1.3	1.0	0.2	N/A	N/A
8722670	Lake Worth Pier, FL*	2.1	1.8	42.1	N/A	N/A
8721604	Trident Pier, FL	2.8	4.1	61.7	N/A	N/A
8720218	Mayport, FL*	5.2	4.7	81	4.6	4.1
8720030	Fernandina, FL	6.9	7.0	95.7	6.8	5.5
8670870	Fort Pulaski, GA	**8.5**	**7.7**	96.2	7.0	6.2
8665530	Charleston, SC	6.2	6.2	97.1	7.1	5.5
8662245	Oyster Landing, SC*	7.1	5.5	84.2	N/A	N/A
8658163	Wrightsville Beach, NC	4.4	3.1	88.5	N/A	N/A
8656483	Beaufort, NC*	3.6	3.0	84.6	6.0	4.3
8654467	USCG Station Hatteras, NC*	6.0	6.0	**133.6**	N/A	N/A
8652587	Oregon Inlet Marina, NC*	2.9	2.6	71	N/A	N/A



Significant Wave Height





NDBC (Observed)					WIS (1980 - 2014 simulated)				
ID	Location	Water Depth (ft)	Maximum Significant Wave Height (ft)	Duration of Waves > 9.8 ft (3m)	Station	Water Depth (ft)	Max Wave Height in record (ft)	100 Yr Wave Height (ft)	Rank in WIS Record
41114	Ft. Pierce	53.0	23.7	17.0	63449	62.3	24.0	28.9	2
41009	Canaveral	132.9	29.8	8.0	63436	82.0	28.3	32.1	1
41112	Fernandina	51.0	19.6	25.0	63401	55.8	18.5	21.7	1
41008	Grays Reef	60.0	19.3	21.0	63383	55.8	19.1	22.6	1

Preliminary Damage Assessments, Federal and Non-Federal Beaches

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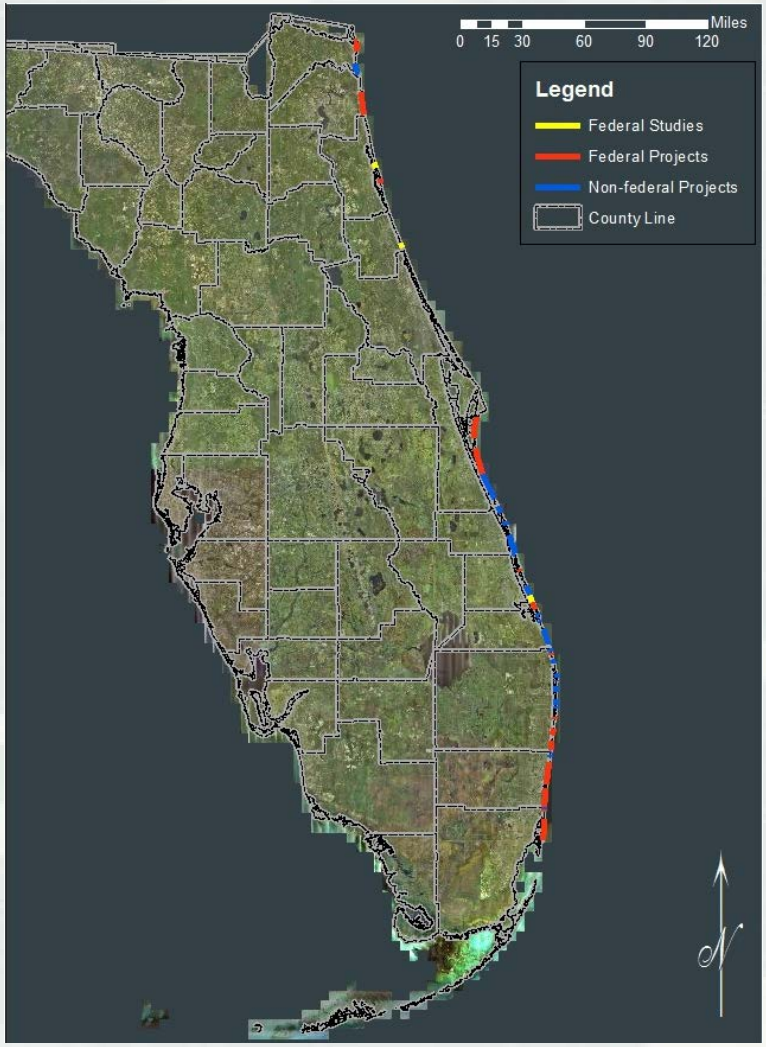
- Assessment area
  - Federal projects: Nassau Co to Miami-Dade Co
  - Joint deployment with FDEP: Duval Co – St Lucie Co
- Federal projects
  - Visual inspections
  - USACE funded
  - Damages assessed to full design template
- Non-federal engineered beaches
  - Visual inspections
  - FEMA funded
  - Damages assessed above MHWL



Nassau County

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- Federal Projects
  - King's Bay Entrance Channel O&M (R-1 to R-9)
  - Nassau County SPP (R-9 to R-33)
- Non-federal Projects
  - Amelia Island (R-60 to R-80)

Nassau Co SPP

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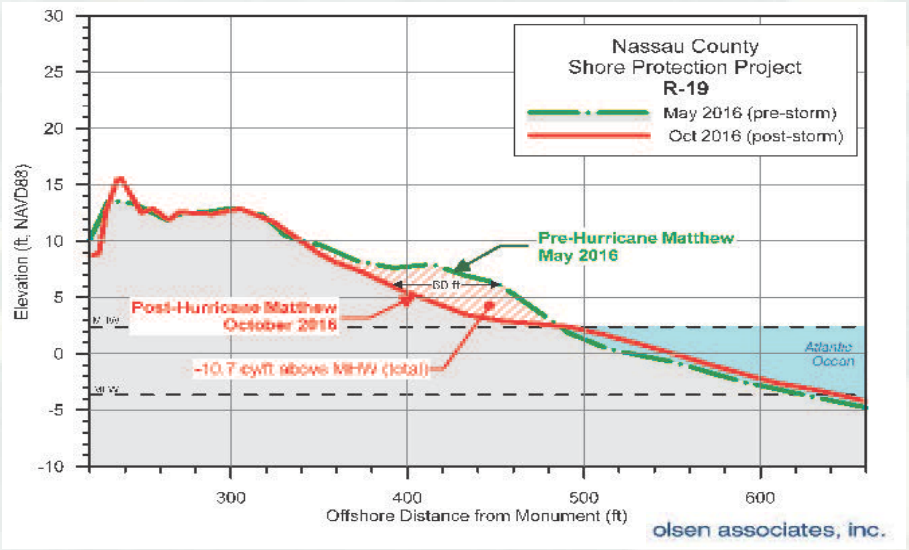
Pre-to-post storm Volume Loss (CY)	Post-storm to design template (CY)	Pre-to-post storm Volume Loss within design template (CY)	Post-storm to construction template (CY)
152,828	203,327	53,340	369,788



Duval County

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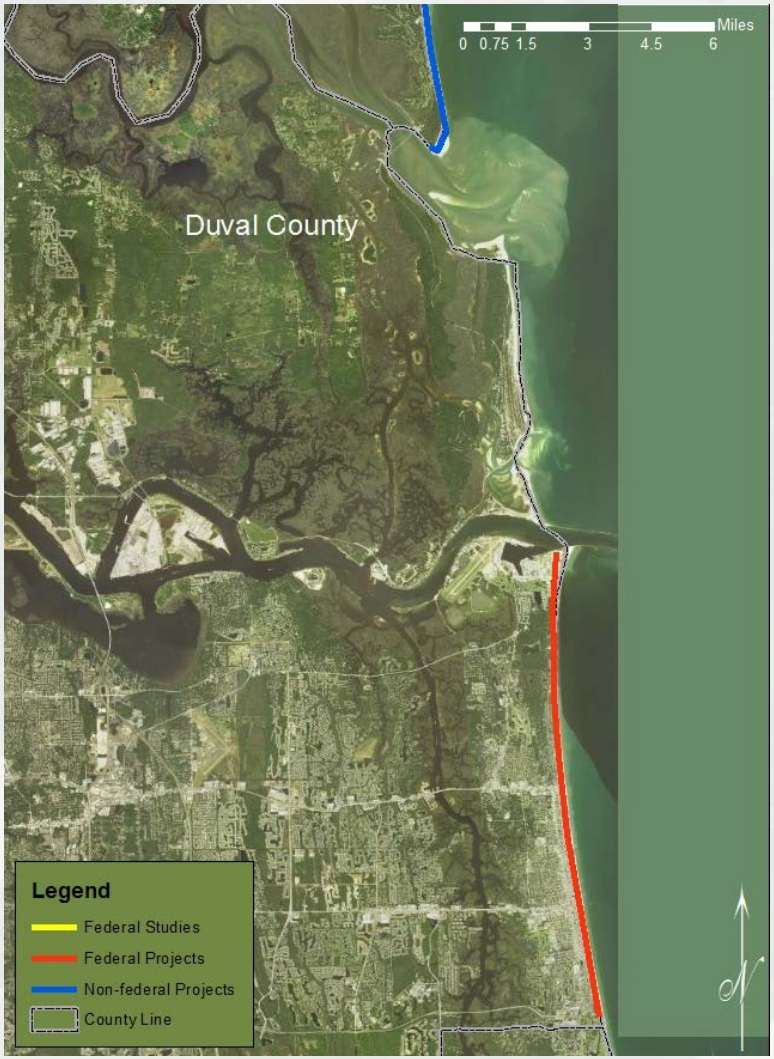
- Federal Projects
  - Duval County SPP (V-501 to R-80)



Duval Co SPP

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Duval County SPP

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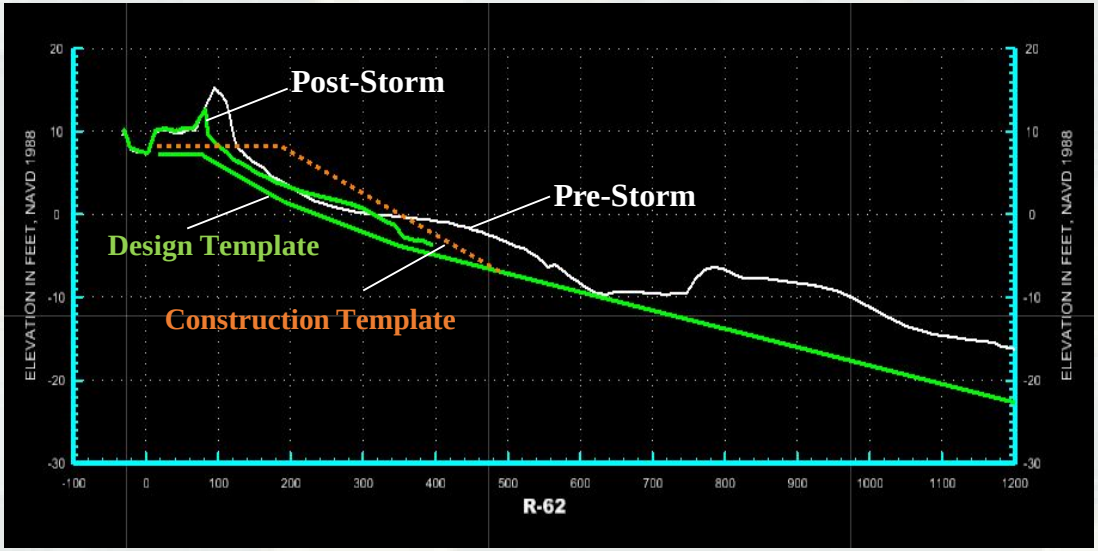
- Construction of the 6th periodic nourishment began on 18 Sep 2016
- Planned 700,000 cy between R-45 and R-80
- Completed 160,000 cy between R-72 to R-80 prior to Matthew



Project Segment	R-monuments	Pre- to Post-Storm Overall Loss (CY)	Post-Storm to Design Template (FCCE volume) (CY)	Post-Storm to Construction Template (CY)	Dune Loss (CY)
NAS Mayport	V-501 to R-31	60,000	500	3,500	9,000
Hannah Park & North end of Atlantic Beach	R-31 to R-45	175,000	500	26,500	90,000
Atlantic, Neptune, & Jax Beaches (6th periodic nourishment contract)	R-45 to R-80	365,000	6,500	710,000	210,000
Total	**V-501 to R-80**	**600,000**	**7,500**	**740,000**	**309,000**

St. Johns County

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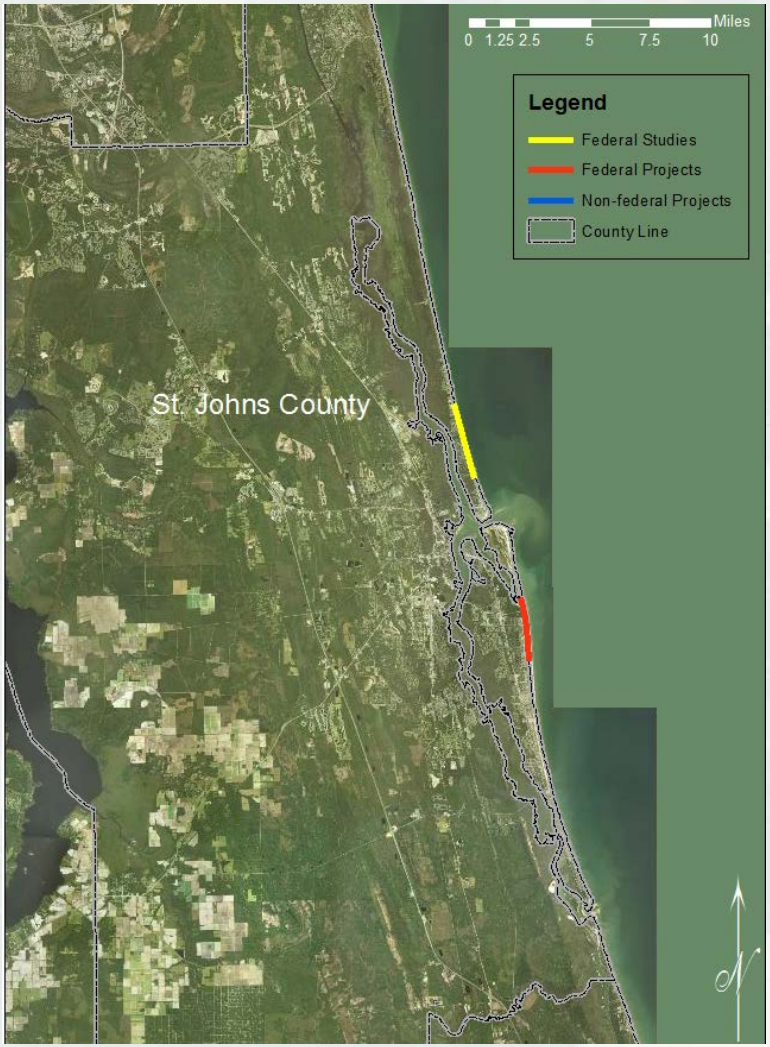
- Federal Projects
  - Feasibility Study (Vilano Beach, R-102 to R-117)
    - 60 ft berm plus dune
    - ~1.31 million CY initial construction
    - 866k CY/12 year periodic nourishment
    - Chief's Report scheduled June 2017
  - Existing project, St. Johns SPP (St. Augustine Beach, R-137 to R-150)



Vilano Beach (Feasibility Study Area)

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St. Johns SPP

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Pre-to-Post Storm Volume (CY)	Pre-Storm to Authorized Design Template (CY)	Post-Storm to Authorized Design Template (CY)	Difference in Authorized Design Template Pre to Post (CY)	Construction Template (CY)
217,512	33,851	62,045	-28,194	775,000

St. Johns Erosion Comparison

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St. Johns Feasibility

St. Johns SPP

Flagler County

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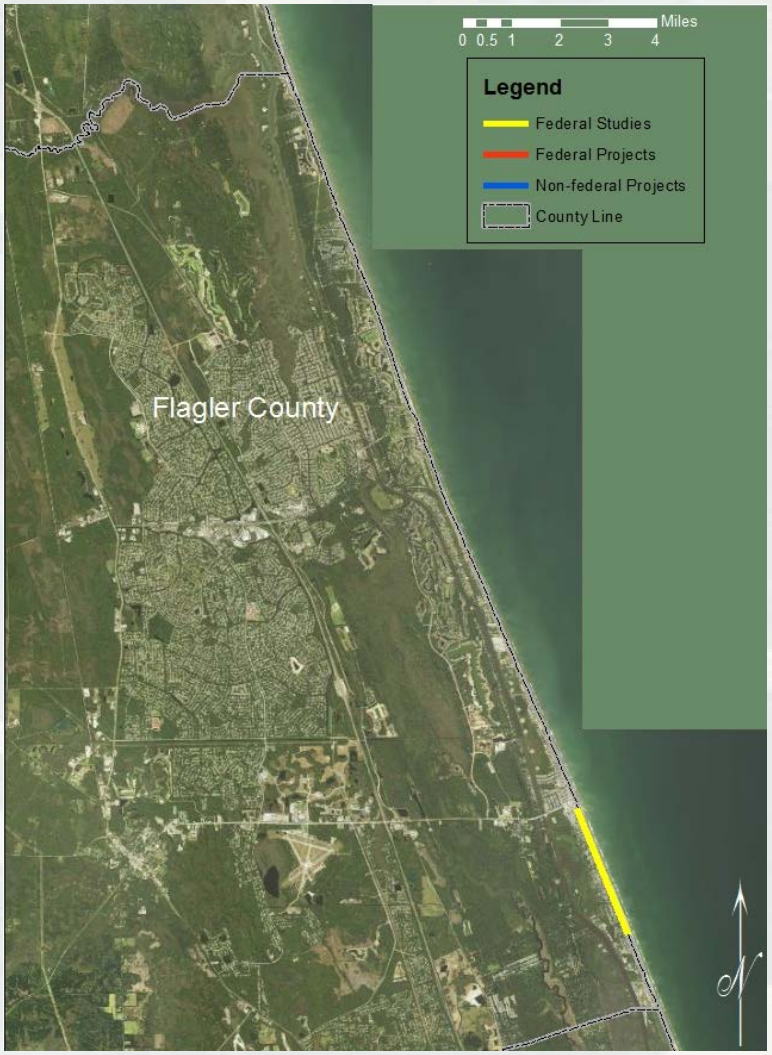
Federal Project

Authorized Hurricane and Storm Damage Reduction Project, (Flagler Beach, R-80 to R-94)

- 10 ft dune and beach profile extension
- 330 kcy initial construction
- 320 kcy periodic nourishment
  - ▷ 11 year intervals
- WRDA/WIIN 2016 Authorization
- Initial Construction awaiting appropriation



Flagler Co HSDR

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Flagler County, Florida
Hurricane and Storm Damage Reduction Project

Brevard County

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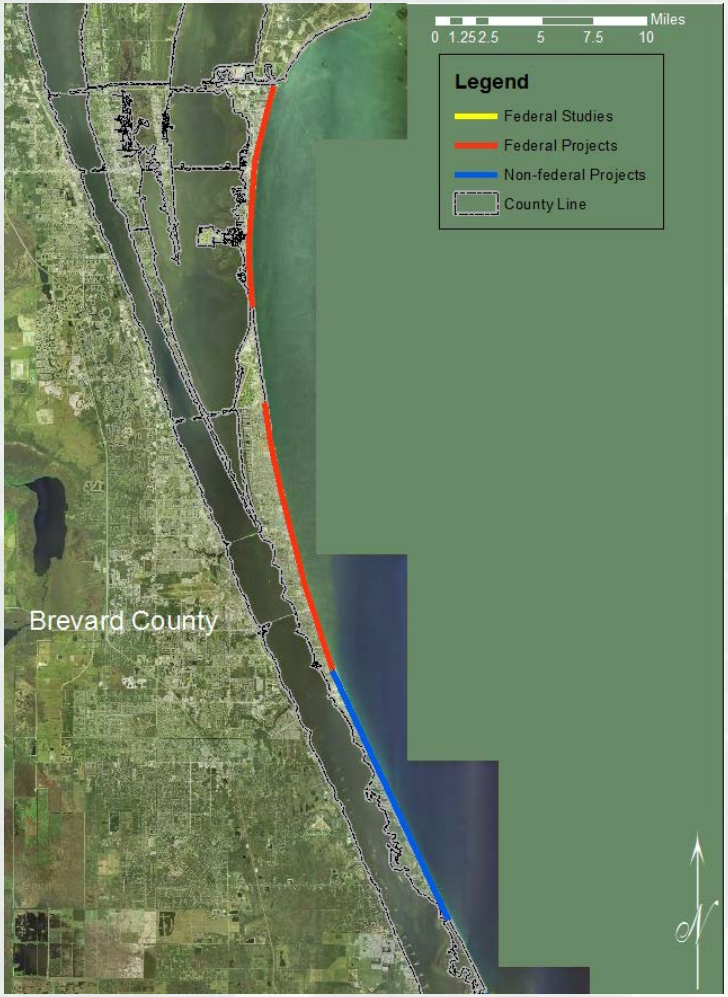
- Federal Projects
  - Brevard County – North Reach, R-1 to R-53
  - Brevard County – Mid Reach, R-73.5 to R-118
  - Brevard County – South Reach, R-118 to R-139
- Non-federal Projects
  - South Beaches Dune Project



Brevard County

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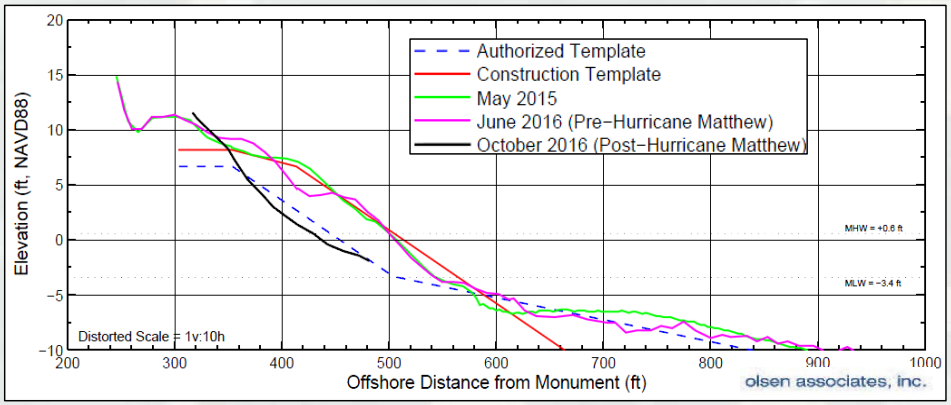
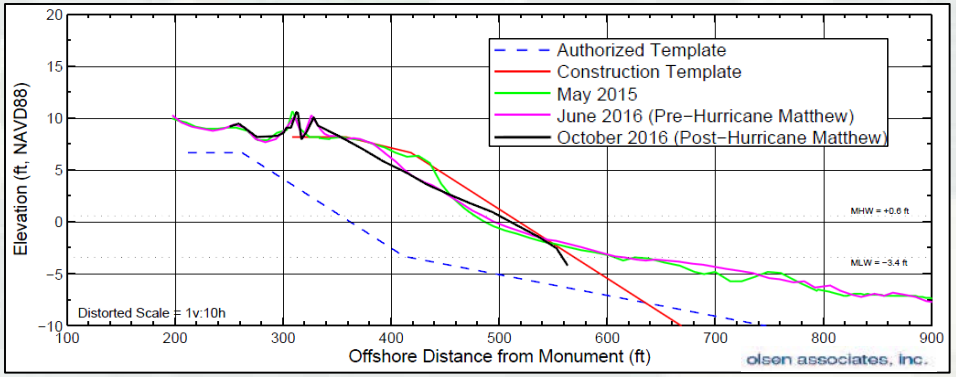
Project	Pre-to-post storm Volume (CY)	Post-storm to design template (FCCE volume) (CY)	Post-storm to construction template (CY)
North Reach (R-1 to R-53)	2,144	1,705	316,291
South Reach (R-119 to R-139)	277,209	39,893	383,605





St. Lucie County

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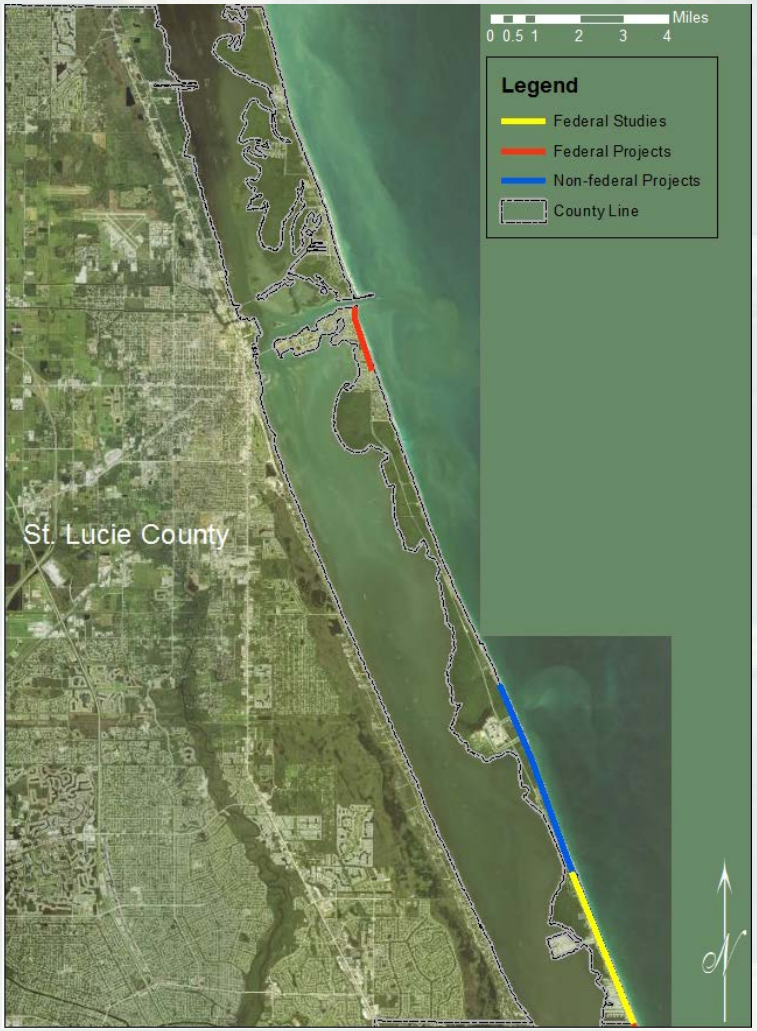
- Federal Projects
  - Ft. Pierce SPP (R-34 to R-41)
  - St. Lucie County Feasibility Study (R-98.5 to R-1)
    - 20 ft berm
    - 422 kcy initial construction
    - 390 kcy periodic nourishment
      - 18 year intervals
    - Chief's Report expected October 2017
    - WRDA/WIIN 2018 Authorization???
- Non-federal Projects
  - Southern St. Lucie South Beaches (R-77 to R-114)



Ft. Pierce SPP

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Project	R-monuments	Method of Computation	Pre- to Post-Storm Overall (CY)	Post-Storm to Design Template (FCCE volume) (CY)	Post-Storm to Construction Template (CY)
Fort Pierce	R-34 to R-41	Triangle	-42,794	77,523	412,059
		End Area	-45,773	81,284	420,787
		Average	-44,284	79,404	416,423
			Net Loss (between pre- and post- storm)	5,738	33,042

Broward County Segment III

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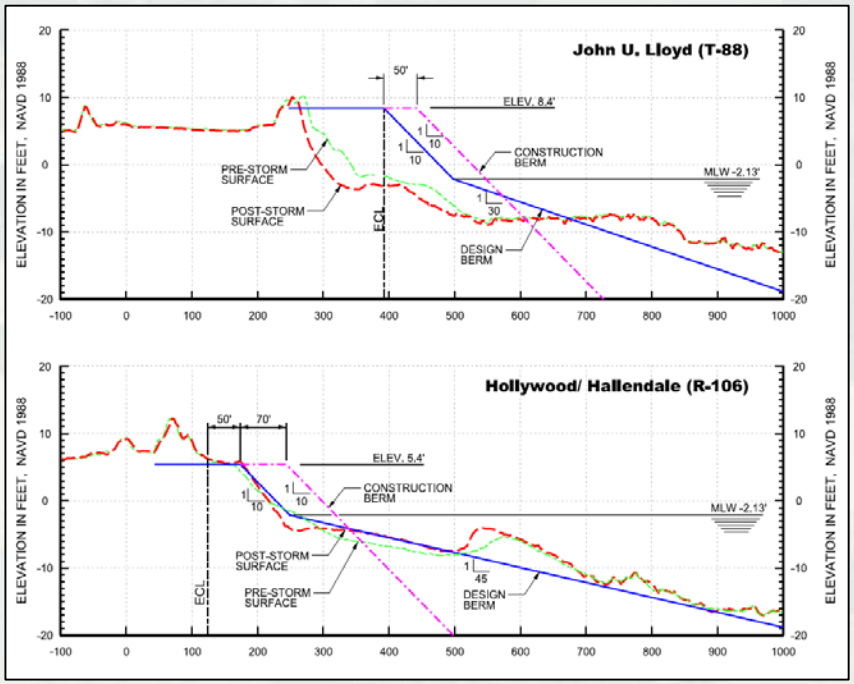
Project Segment	R-monuments	Pre- to Post-Storm Overall Loss (CY)	Pre- to Post-Storm Loss within Design Template (CY)	Post-Storm to Design Template (CY)	Post-Storm to Construction Template (CY)
John U Lloyd	R86 - R94	36,557	54,507	380,782	489,167
Hollywood/ Hallendale	R101 - R128	11,149	84,064	593,515	956,696
Total	**R86 - R94; R101 - R128**	**47,706**	**138,571**	**974,297**	**1,445,863**

Note: negative (-) values for volume loss indicates volume gain.



Miami-Dade County

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- Federal Projects
- Miami-Dade County SPP
  - Sunny Isles (R-7 to R-12)
  - Bal Harbor (R-27 to R-31)
  - Surfside (R-31 to R-38)
  - Miami Beach (R-38 to R-74.4)
    - 65th Street (R-43 to R-44+500')
    - 55th Street (R-48+700' to R-50+700')
      - On-going truck haul renourishment (~225kcy)
    - 29th Street (R-60 to R-61)
- Non-federal Projects
  - Golden Beach (R-1 to R-7)

Dade County (Federal)

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Project	Pre-to-post storm Volume (CY)	Post-storm to design template (FCCE volume) (CY)	Post-storm to construction template (CY)
Dade Co BEC - Sunny Isles (2.5 mi, R7 to R19.5)	26400 [1]	3960 [2]	450000 [4]
Dade Co BEC - Main Segment (10.5 mi, R27 to R74)	100880 [1]	0 [3]	1400000 [4]

FCCE Status

- Project Information Reports (PIR's) have been drafted and are under review
- Guidance on designation of FCCE (100% Federal) erosion volumes is still being coordinated with our headquarters
- PIR erosion volumes are based on the figures shown here, but subject to change
- Potential for a supplemental funding bill and usace 'work plan' funding for cost-shared renourishments
- Jacksonville District continues to work FCCE guidance and we will release any FCCE/supplemental/work plan information as soon as we can

Lessons Learned

What continues to work

- Early engagement with local county/city beach points of contact—starting during pre-storm approach
- Immediate post-storm deployment of Preliminary Damage Assessment teams
- Joint USACE, FEMA and FDEP assessments
- Experienced USACE Project Information Report (PIR) teams
  - Common ‘Extraordinary’ storm analysis for all South Atlantic USACE districts
  - Dedicated beach nourishment design engineer support—rapid volume estimates pending receipt of data
  - USACE Planning Technical Leads with PIR guidance and writing experience
- Engagement of FSBPA at State and Federal level

Lessons Learned

Challenges

- Pre- and post-storm surveys
  - Wading depth ok
  - Pre-storm at beginning of hurricane season
  - Collect ASAP post-storm
- Need letters requesting FCCE support from non-Federal sponsors to Jacksonville District as soon as possible after storm
- Continued need for refinement of USACE guidance on FCCE—Jacksonville is and will continue to be engaged
  - Storm significant based on erosion potential vs. Saffir Simpson category
  - Establish clear guidance on storm damage and restoration volume computations

Takeaways

- Hurricane Matthew produced combined storm surge and wave impacts to the Atlantic coast of Florida that were catastrophic to the first line of defense
- Beaches in central and north Florida that lacked robust berm and dune systems were overwhelmed by the combined tide/surge/waves and those communities suffered significant damage from erosion, flooding or both
- Coastal armor sustained significant damage and in many cases did not protect as intended; many failed bulkheads/seawalls and revetments with structure damage behind them
- Healthy beach systems sustained significant damage to the beach and dune system but the communities that they protected sustained little or no damage
- The contrasts in community resilience in locations with healthy dunes and beaches as a first line of defense and those with eroded beach systems cannot be ignored
- 'Resilience' is a current buzzword, but there is a significant opportunity to demonstrate the value of our engineered beaches on community resilience using the Hurricane Matthew; it impacted a large area with highly variable coastal defenses and coastal development and there are large contrasts in coastal damage in adjacent communities

Thank You

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Jason Engle, P.E.

Kevin Hodgens, P.E.

Jennifer Coor, Ph.D., P.G.

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FEMA Volume Loss

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