TAYLOR ENGINEERING, INC.

# Sea Level Rise Resilience & Living Shorelines

2019 FSBPA Technical Conference

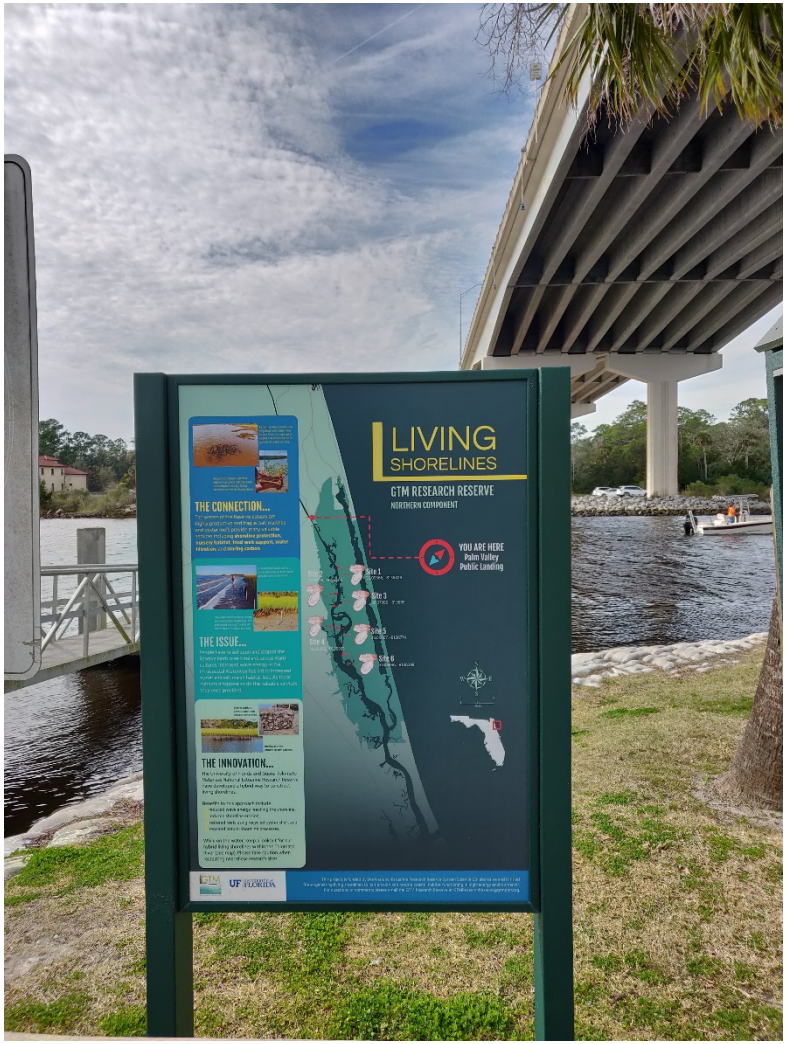
Presented by: Angela Schedel
February 7, 2019

# Overview

- Terminology
- Shoreline Stabilization Options
- Living Shoreline Designs
- Natural Resilience
- Room for Growth

# Living Shoreline Defined

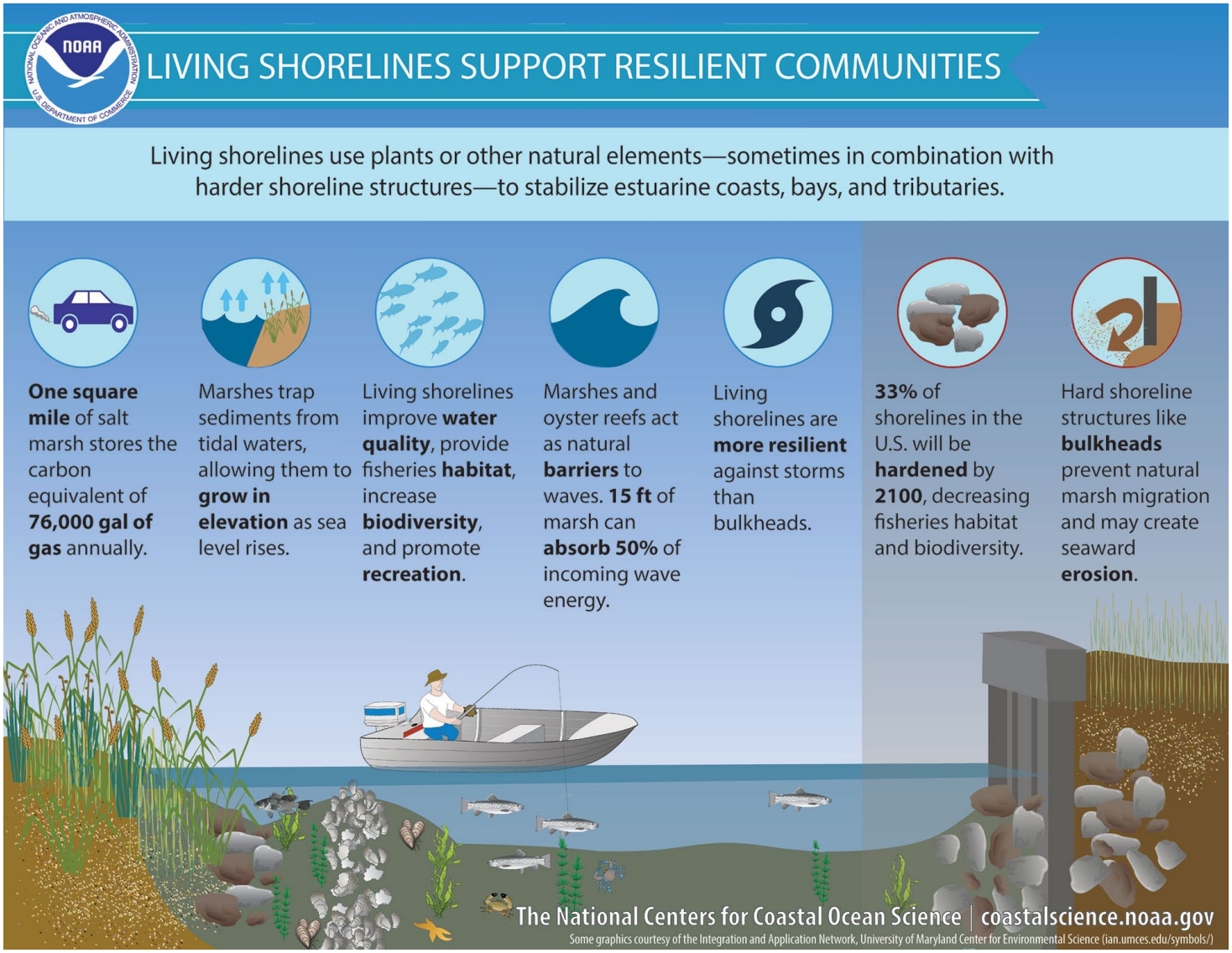
- Shoreline protection
- Allows natural coastal processes
- Strategic placement of :
  - Plants
  - Stone
  - Fill
  - Other structural organic materials:
    - Biologs
    - Oyster reefs



# Living Shoreline Defined

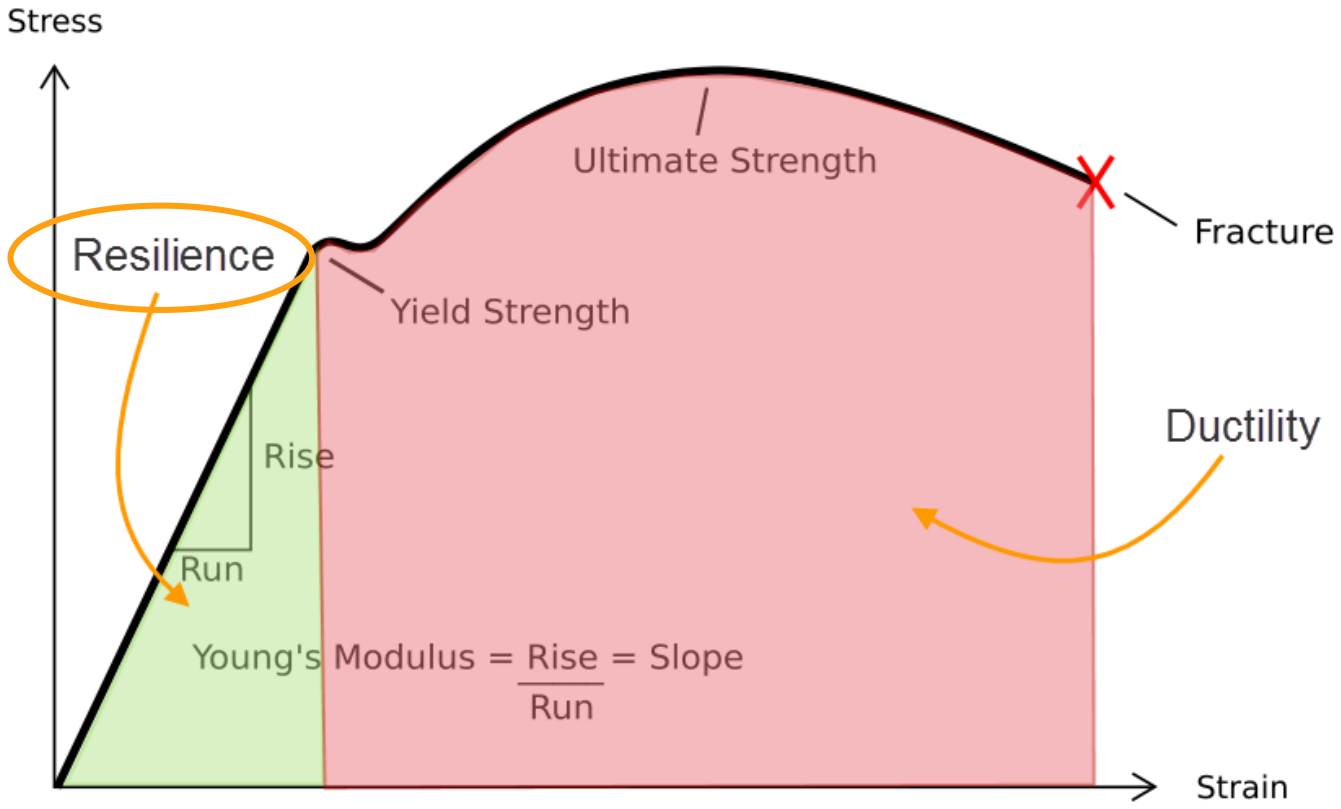
- Absorbs wave energy
- Reduces erosion
- Filters water, traps pollutants and sediment
- Provides habitat for plants, fish, and wildlife
- Creates aesthetic and recreational value
- Resilient to changing environments, including SLR

# Living Shoreline Defined

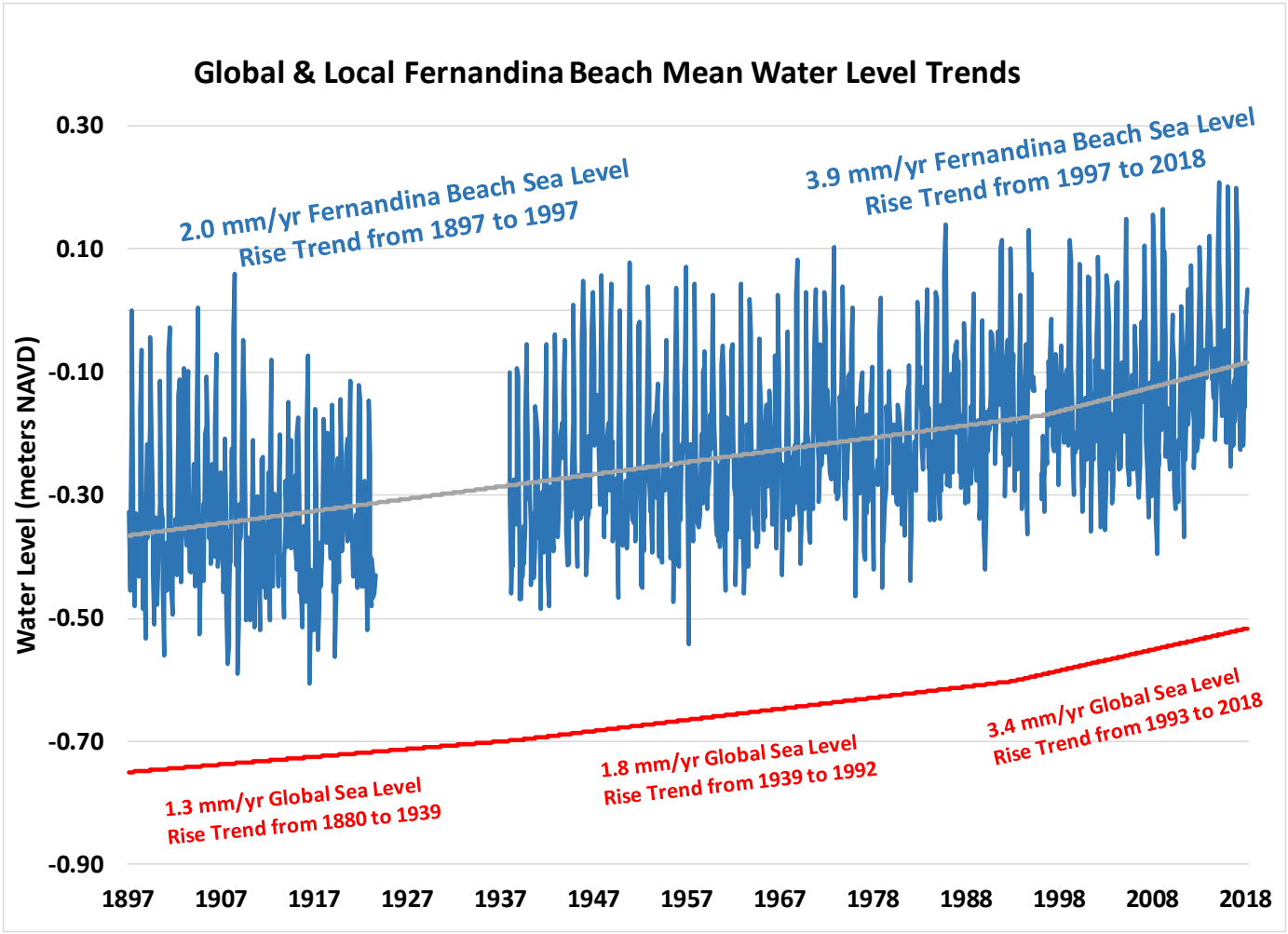


# Resilience Defined

- Ability to bounce back quickly from adversity
- Recover without changing into something different



# Sea Level Rise Defined



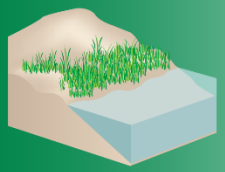

Sources: Data adapted from NOAA (2018), Fourth National Climate Assessment (2018)

# Shoreline Stabilization Options

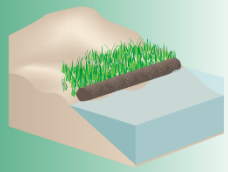
## HOW GREEN OR GRAY SHOULD YOUR SHORELINE SOLUTION BE?

**GREEN - SOFTER TECHNIQUES** → **GRAY - HARDER TECHNIQUES**

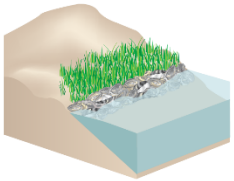
### *Living Shorelines*



**VEGETATION ONLY -** Provides a buffer to upland areas and breaks small waves. Suitable for low wave energy environments.

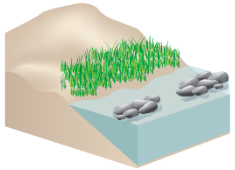


**EDGING -** Added structure holds the toe of existing or vegetated slope in place. Suitable for most areas except high wave energy environments.

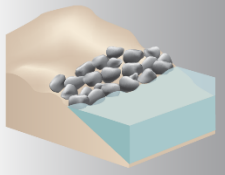


**SILLS -** Parallel to vegetated shoreline, reduces wave energy, and prevents erosion. Suitable for most areas except high wave energy environments.

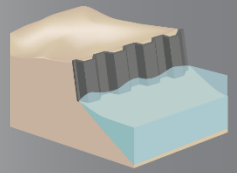
### *Coastal Structures*



**BREAKWATER -** (vegetation optional) - Offshore structures intended to break waves, reducing the force of wave action, and encourage sediment accretion. Suitable for most areas.



**REVETMENT -** Lays over the slope of the shoreline and protects it from erosion and waves. Suitable for sites with existing hardened shoreline structures.



**BULKHEAD -** Vertical wall parallel to the shoreline intended to hold soil in place. Suitable for high energy settings and sites with existing hard shoreline structures.

Sources: NOAA Guidance for Considering the Use of Living Shorelines (2015) adapted from SAGE (2015)

# Shoreline Stabilization Options

## LIVING SHORELINE

### BEACH NOURISHMENT ONLY

Photo Credit: USACE New York District Public Affairs

Large volume of sand added from outside source to an eroding beach. Widens the beach and moves the shoreline seaward.

**Suitable For**

Low-lying oceanfront areas with existing sources of sand and sediment.

**Material Options**

- Sand

**Benefits**

- Expands usable beach area
- Lower environmental impact than hard structures
- Flexible strategy
- Redesigned with relative ease
- Provides habitat and ecosystem services

### BEACH NOURISHMENT & VEGETATION ON DUNE

Helps anchor sand and provide a buffer to protect inland area from waves, flooding and erosion.

**Suitable For**

Low-lying oceanfront areas with existing sources of sand and sediment.

**Material Options**

Sand with vegetation
Can also strengthen dunes with:

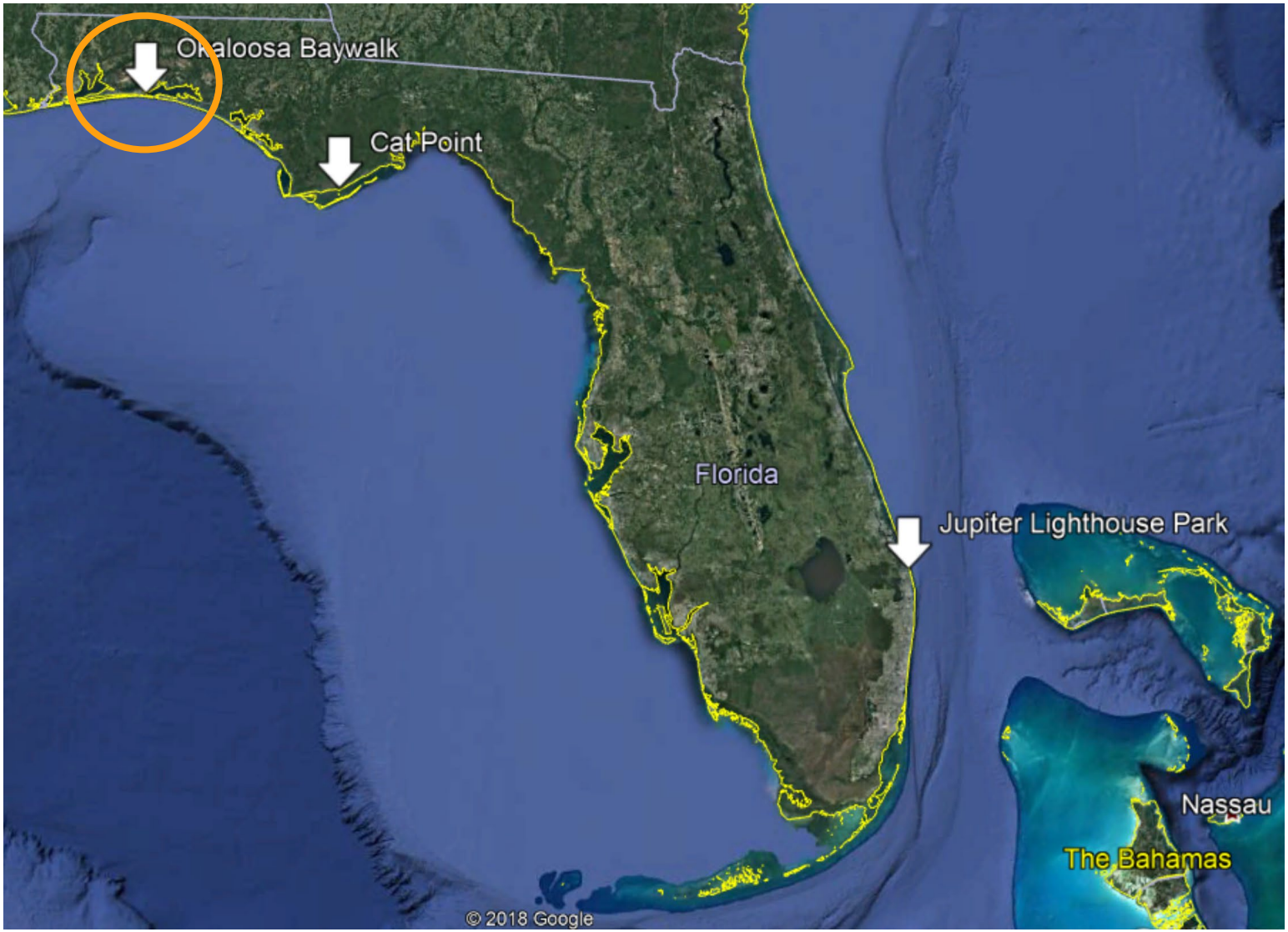
- Geotextile tubes
- Rocky core

**Benefits**

- Expands usable beach area
- Lower environmental impact
- Flexible strategy
- Redesigned with relative ease

Sources: Natural and Structural Measures for Shoreline Stabilization, SAGE (2015)

# Living Shoreline Design – Okaloosa Baywalk



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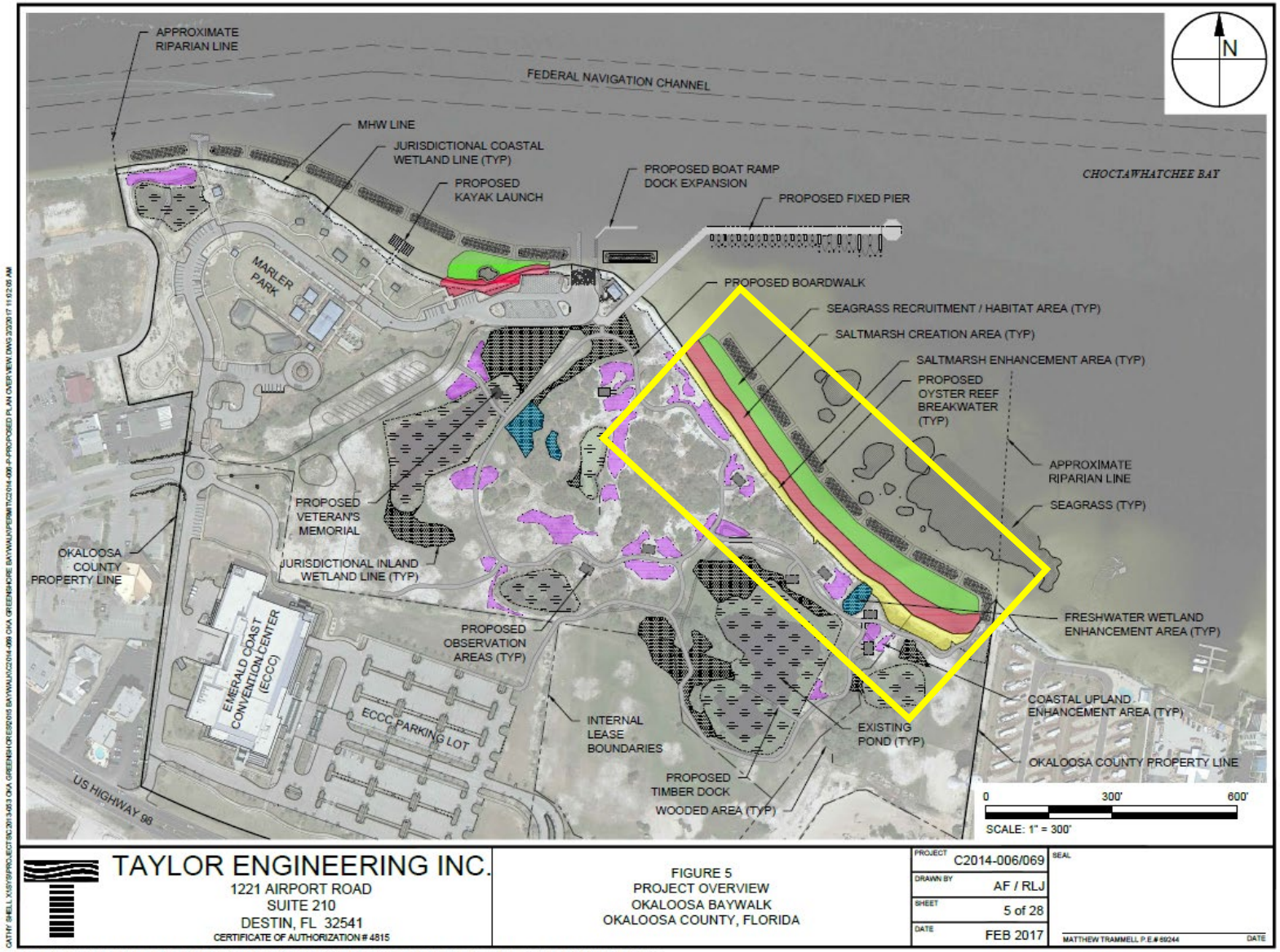

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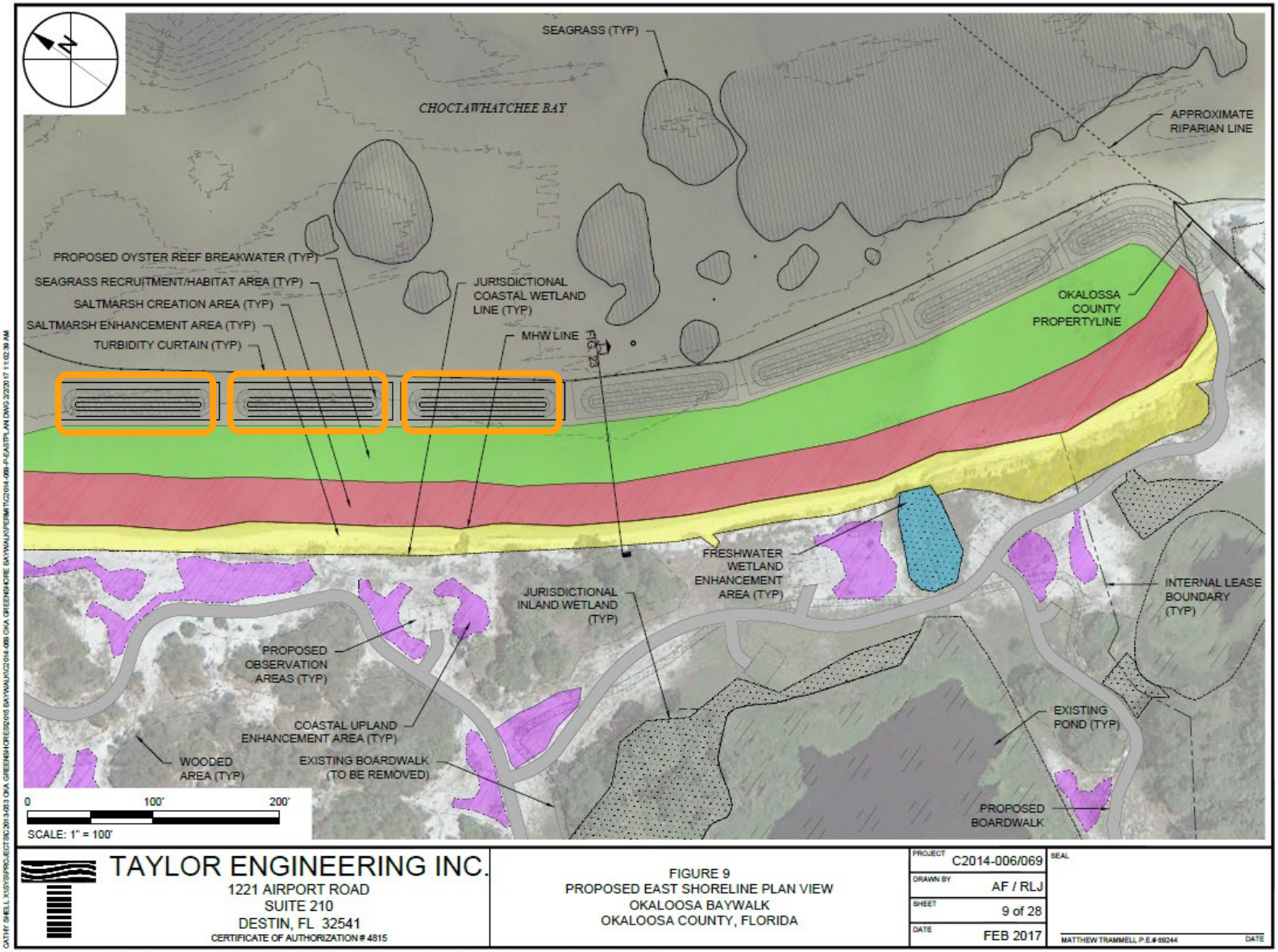


PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

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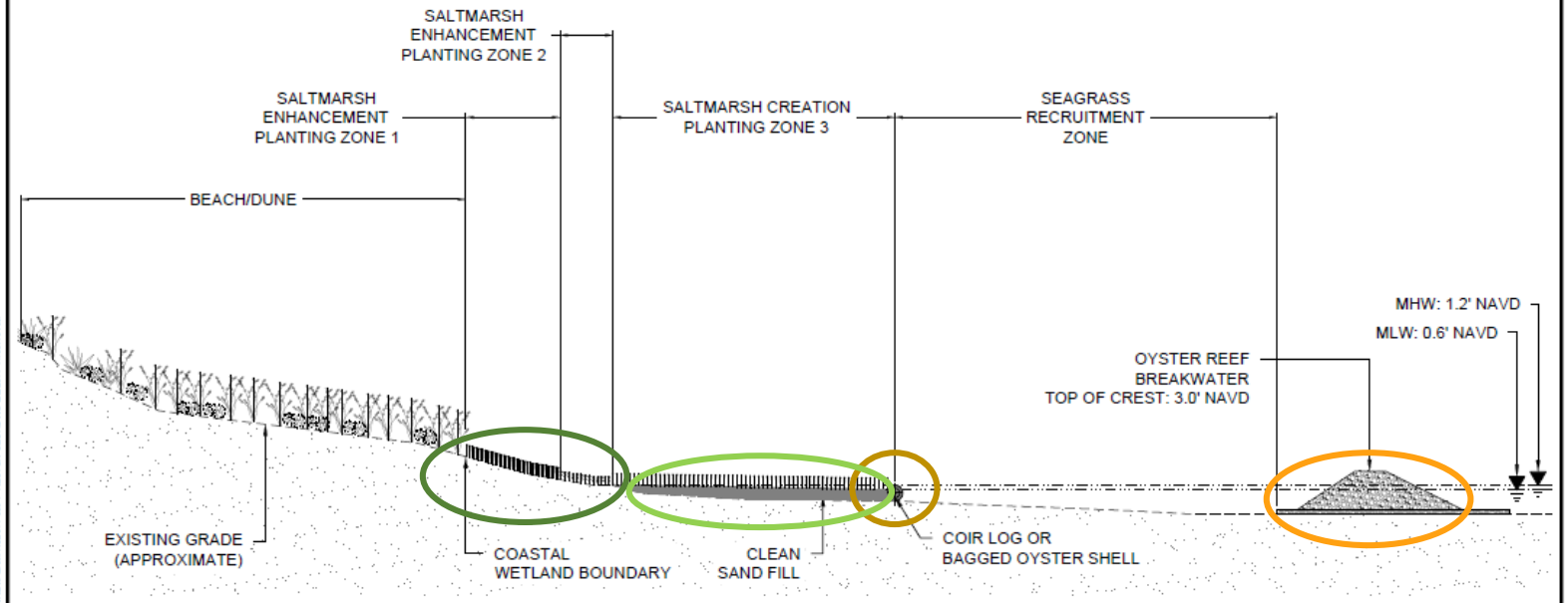



| PLANTING SCHEDULE | | | | |
|---|---|---|---|---|
| ZONE | COMMON NAME | SCIENTIFIC NAME | SIZE | DENSITY |
| 1 | MARSH-HAY CORDGRASS | *Spartina patens* | 2" LINER | 12" ON CENTER |
| 2 | BLACK NEEDLERUSH | *Juncus roemerianus* | 2" LINER | 12" ON CENTER |
| 3 | SMOOTH CORDGRASS | *Spartina alterniflora* | 2" LINER | 12" ON CENTER |

FIG. 9 J-J — LIVING SHORELINE TYPICAL CROSS SECTION
NOT TO SCALE

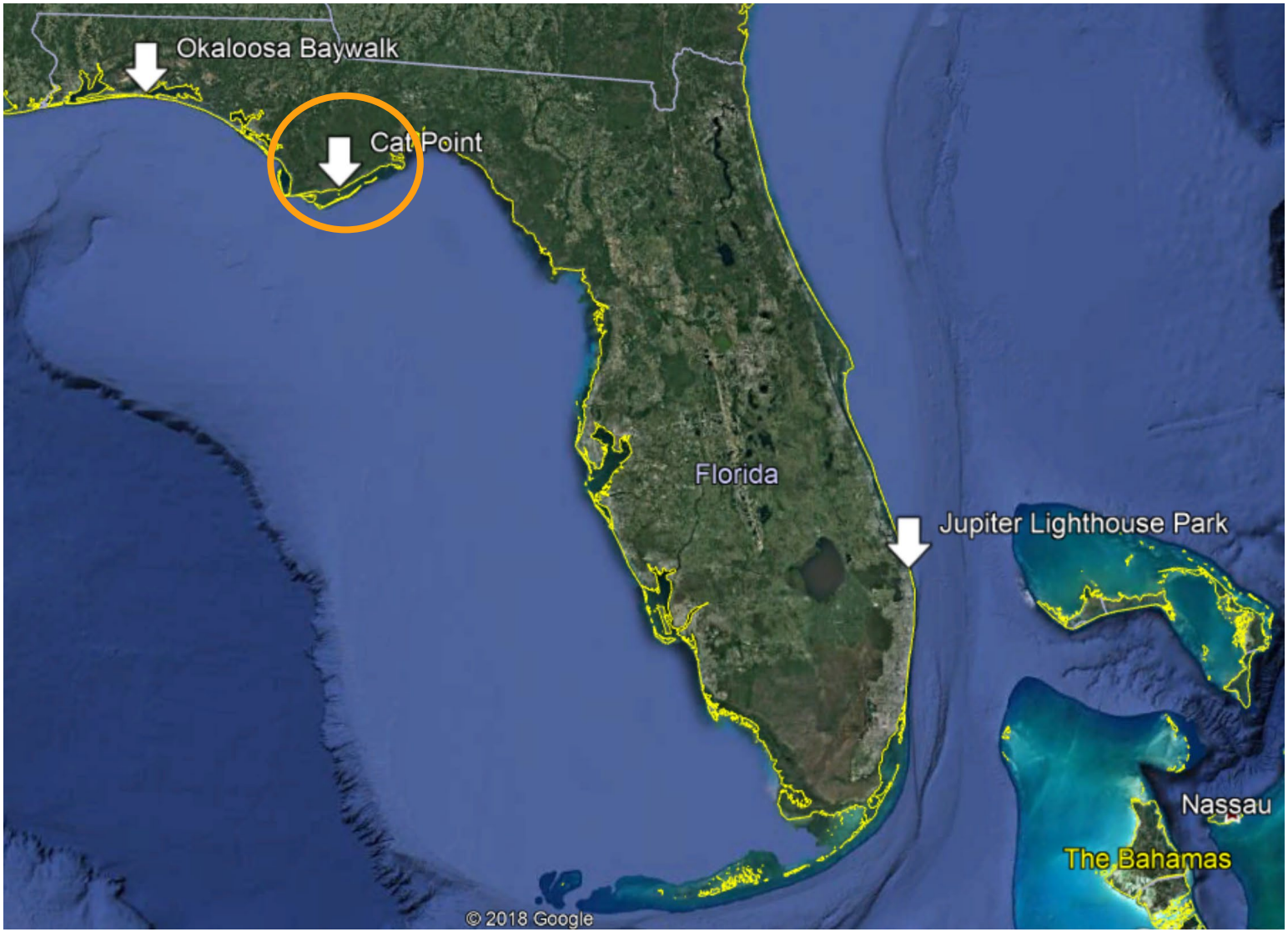
TAYLOR ENGINEERING INC.
1221 AIRPORT ROAD
SUITE 210
DESTIN, FL 32541
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 23
LIVING SHORELINE TYPICAL CROSS SECTION
OKALOOSA BAYWALK
OKALOOSA COUNTY, FLORIDA

PROJECT C2014-006/069
DRAWN BY AF / RLJ
SHEET 23 of 28
DATE FEB 2017
SEAL
MATTHEW TRAMMELL, P.E. # 69244 DATE

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

# Living Shoreline Design – Cat Point



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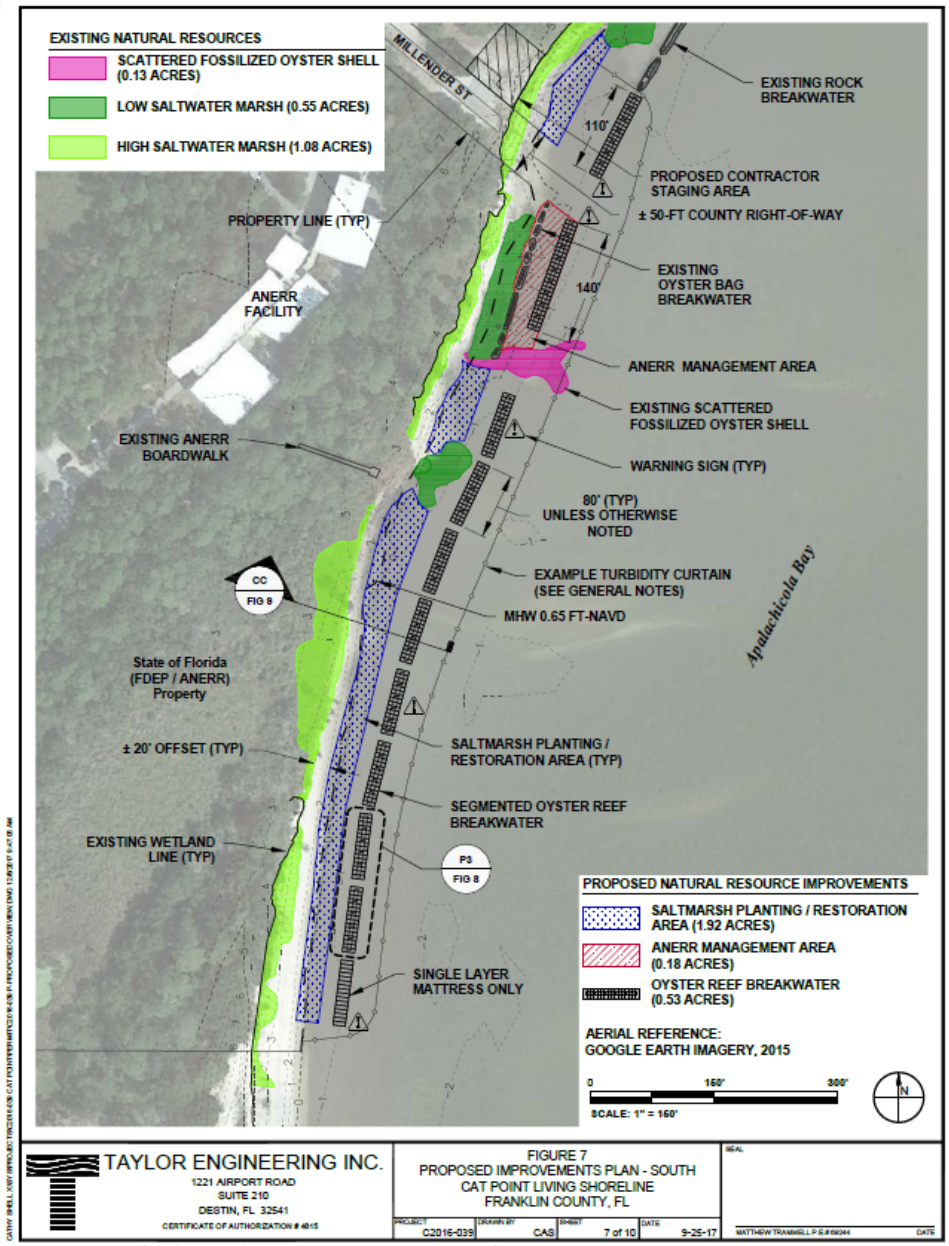

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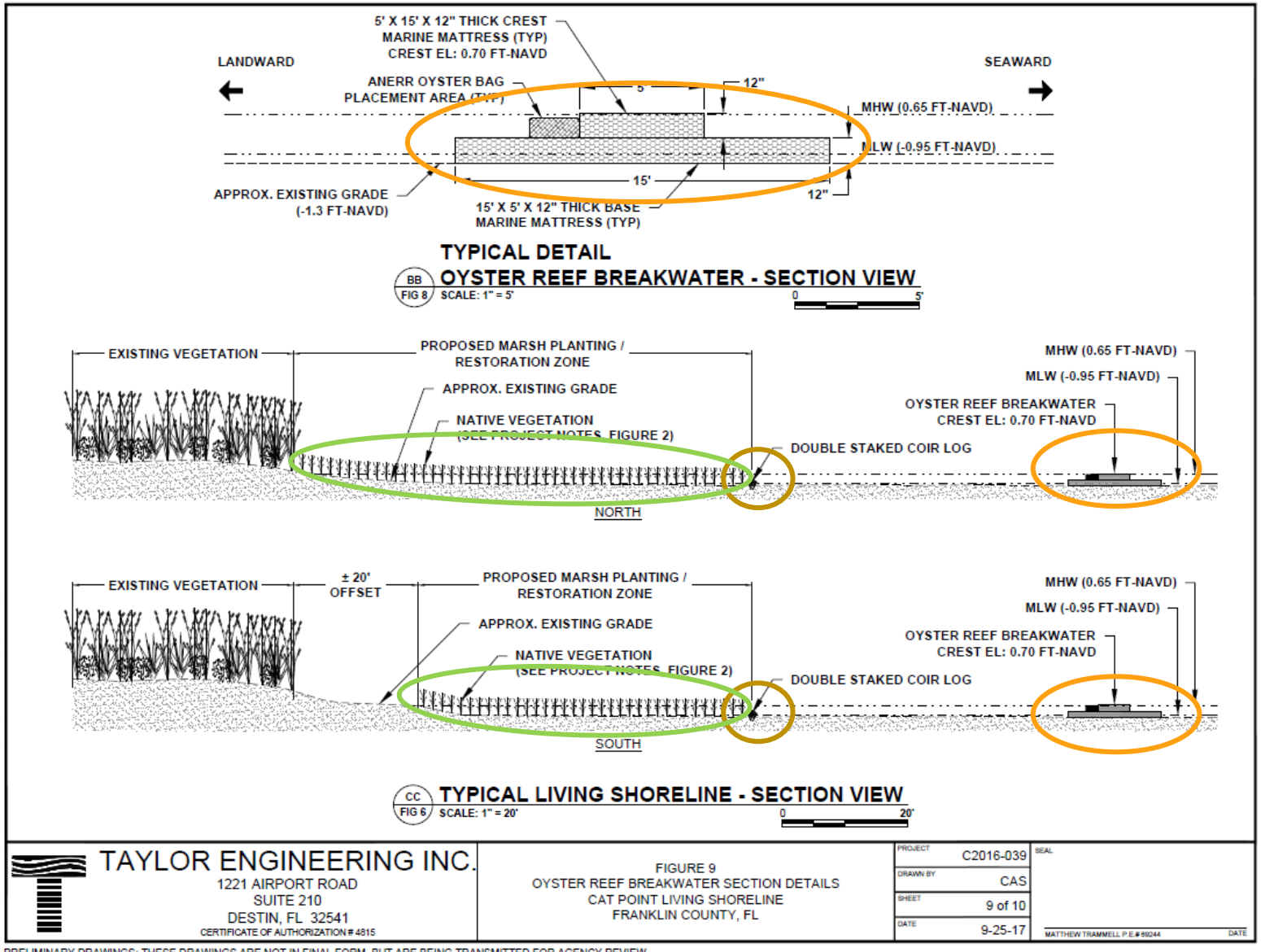
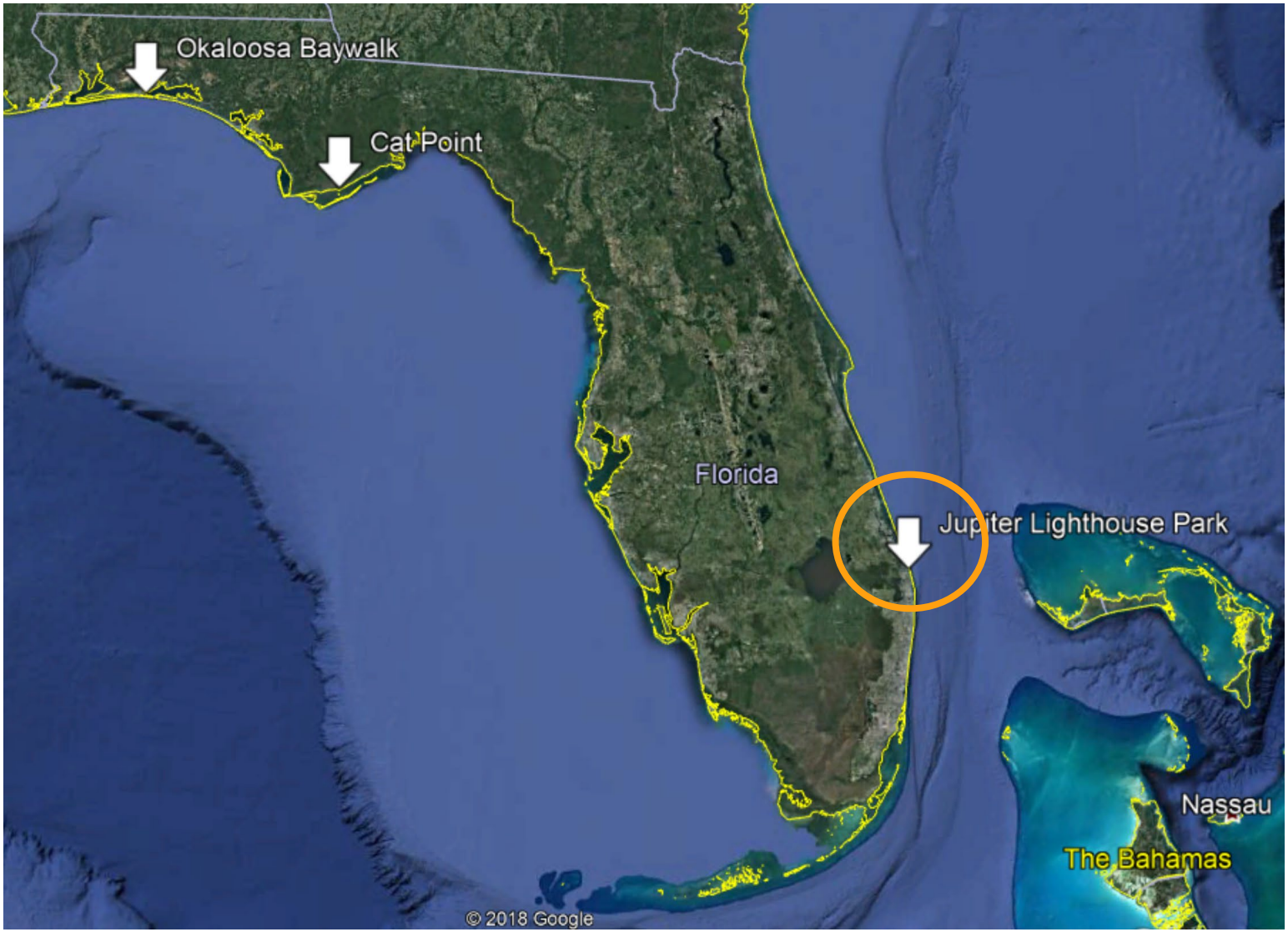
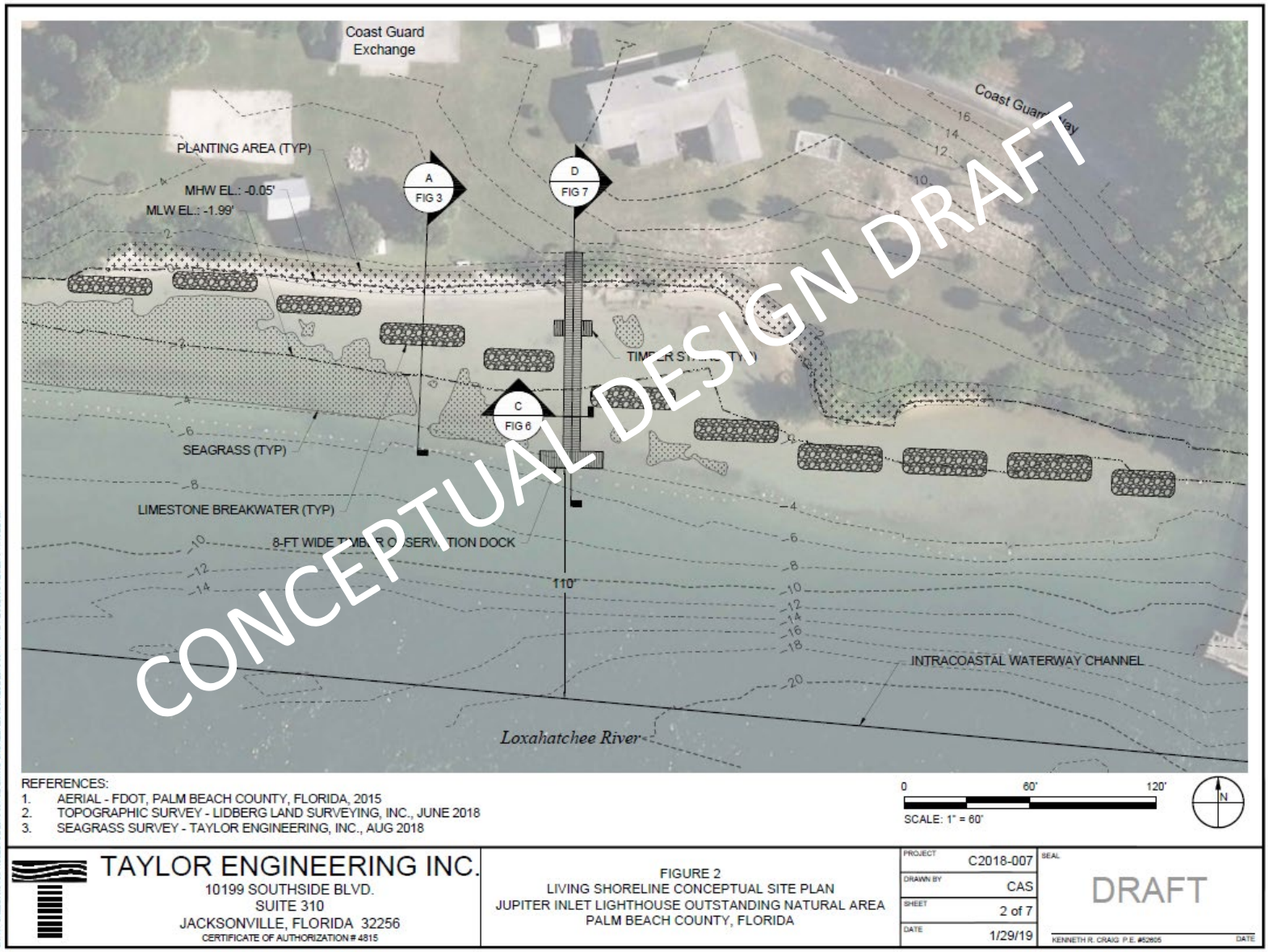


# Living Shoreline Design – Jupiter Lighthouse



# Living Shoreline Design – Jupiter Lighthouse



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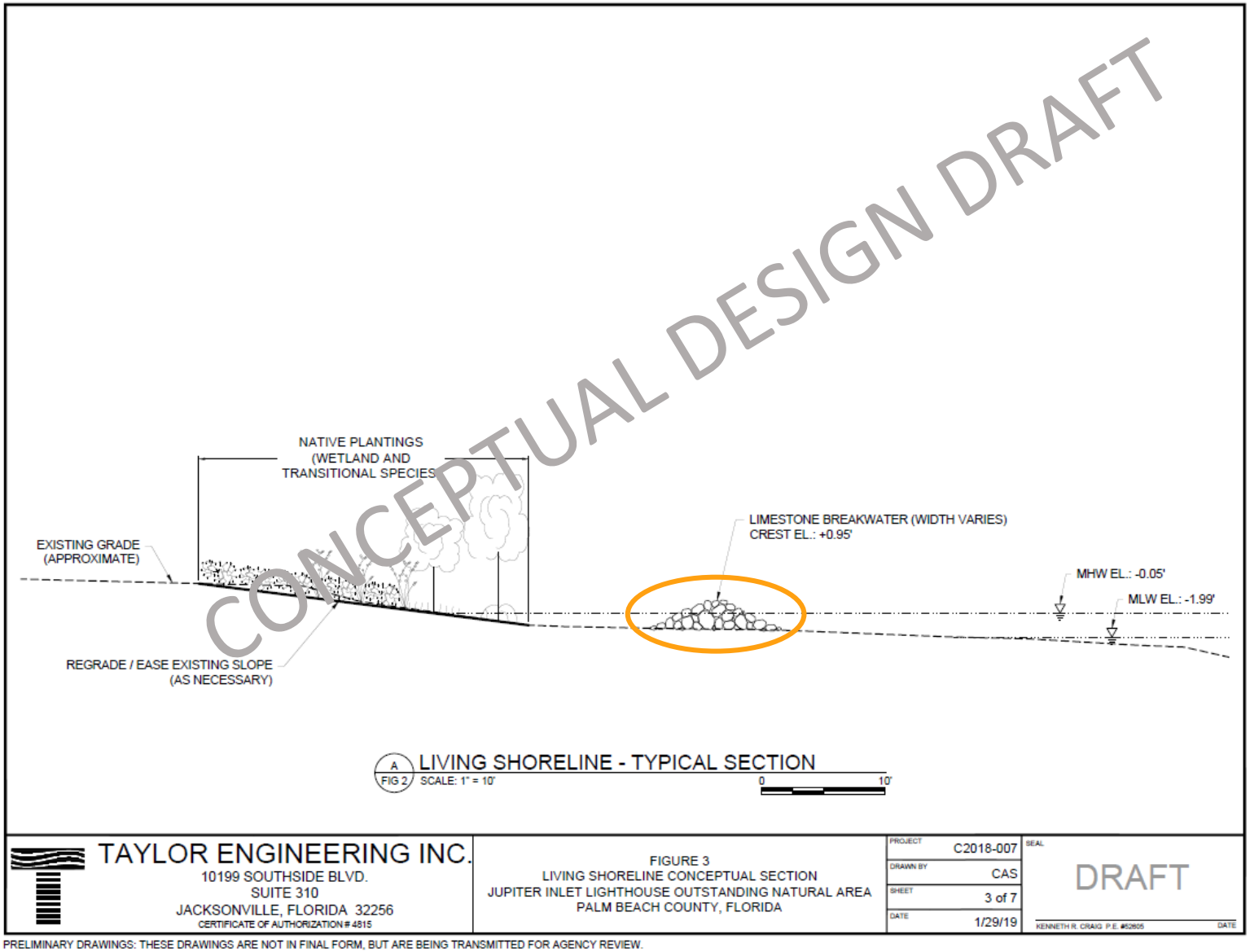


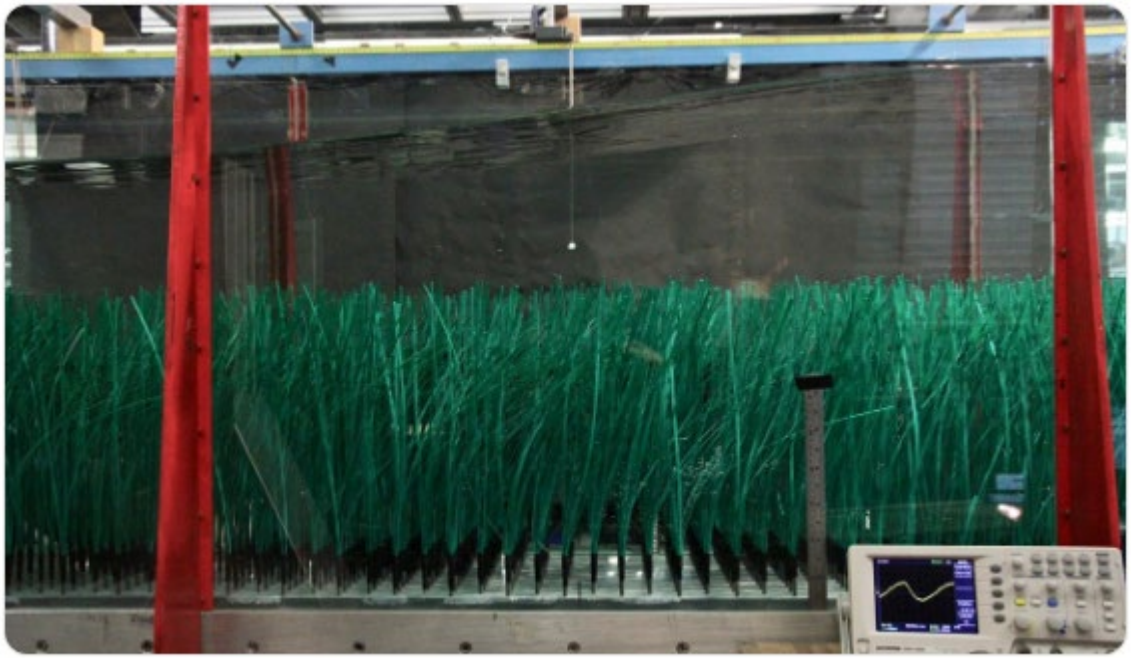
# Natural Resilience of Living Shorelines

- Can keep up with current sea level rise trend
  - Wetlands can increase upward 12 mm/yr
  - Mangroves can migrate landward faster than SLR
  - Oyster reefs can grow vertically up to 60 mm/yr
  - Beaches with nourishment can keep pace with SLR

Sources: Morris et al (2002), Das and Vincent (2009), Gilman et al (2007), Rodriguez et al (2014), Ridge et al (2017), Houston (2017)

# Room for Growth

- Quantifiable metrics of success
  - Reduction of wave energy
  - Decreased erosion
  - Improved water quality
- Field data for calibrating models
- Costs of constructing and maintaining



Source: Robert Houseago (2018)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