



14 June 2016



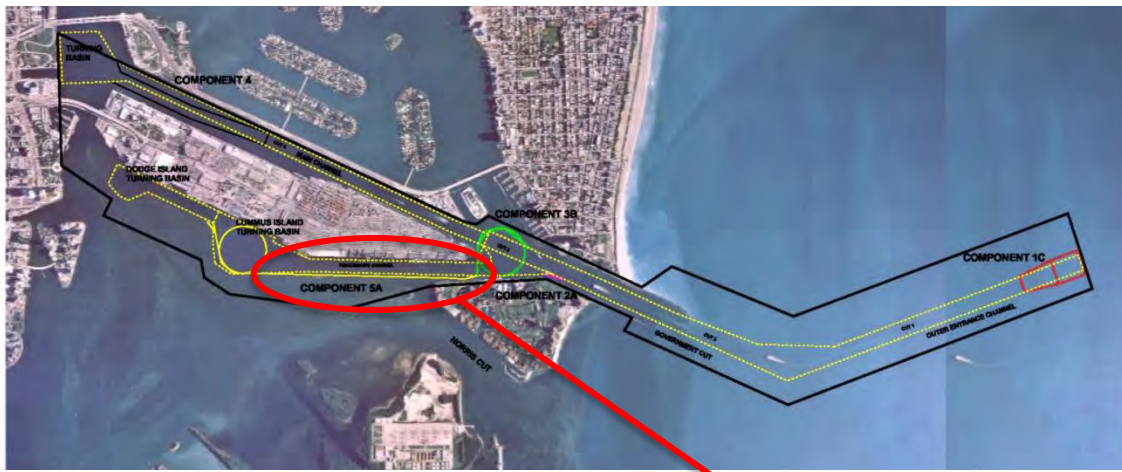
The Value of
Navigation-Dredged
Material to
Ecosystem
Restoration and
Coastal Resiliency

- T. Jordan-Sellers, Senior Biologist, U.S. Army Corps of Engineers, Jacksonville District, Environmental Branch*
- E.P. Summa, Chief, Planning Division, U.S. Army Corps of Engineers, Jacksonville District*
- B. Hope, Environmental Manager, PortMiami*
- C.J. Kruempel, Director of Coastal Services, Tetra Tech, Inc.*
- D. Nelson, Project Engineer, Great Lakes Dredge and Dock*
- A. McCarthy, Senior Scientist / Project Manager, CSA Ocean Sciences Inc.**
- M.S. Fonseca, Ph.D., Vice President, Science, CSA Ocean Sciences Inc.*
- S.R. Conger, Engineering Technical Lead, U.S. Army Corps of Engineers, Jacksonville District*
- C. Pomfret, Senior Project Manager, Great Lakes Dredge and Dock, LLC.*

WODCON XXI
Miami, Florida



- 1990: Congress recommended navigational improvements to Miami Harbor
 - Authorized a Project Feasibility Study
- 2004: USACE issued Final Environmental Impact Assessment



- 0.2 acres of direct impacts to seagrass beds



- 7.7 acres indirect from side slope sloughing

SEAGRASS MITIGATION REQUIREMENTS

- Seagrass habitat important to south Florida
- Biscayne Bay
 - Critical habitat for Florida manatee and Johnson's seagrass
 - Aquatic Preserve (OFW)
 - Important nursery habitat
- Compensatory mitigation required for unavoidable impacts
- Identify the best alternative to offset seagrass habitat loss



PREVIOUS DREDGE HOLE PROJECT

- Up to 40% of northern Biscayne Bay historically dredged
- 1994: Miami-Dade DERM conducted inventory of potential fill sites
- 1993-1995: Pilot project to fill 2.6 acre with PortMiami expansion dredged material
 - Partially successful
 - Did not cap with fine grained sands due to insufficient funds, leaving “coarse and rocky” material
 - Rock groins may have prevented natural infilling and colonization
 - 12,597 planting units; Max survival of transplants ~60%
- No large-scale dredge hole fill efforts until 2013

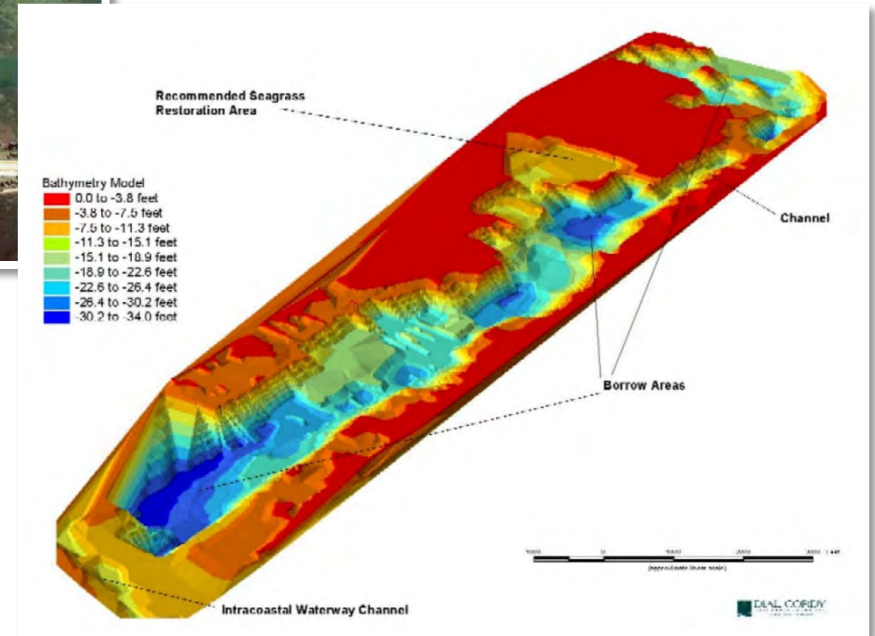


IDENTIFYING IDEAL MITIGATION SITE

- 1994 inventory: Size and physical characteristics of potential fill areas
- Area north of Julia Tuttle Causeway defined as suitable for filling
- >100 + acres in size

TABLE 2.1
PHYSICAL CHARACTERISTICS OF
POTENTIAL FILLING AREAS IN NORTH BISCAYNE BAY

FILL AREA	WATER DEPTH (ft)	SURFACE AREA (acres)	BOTTOM MATERIAL	AMBIENT DEPTH (ft)	MAXIMUM CURRENT VELOCITY (ft/sec)	SUSPENDED SOLIDS (mg/l)	ESTIMATED FILL REQ.	FILL TYPE	POTENTIAL ENVIRONMENTAL BENEFIT
II-A	7.0	10	Sandy	2.0-5.0	0.2	10	46,000cy	Dredge Spoil	Seagrass Growth
II-B	7.0-8.0	46	Sandy	4.0-6.0	0.2	10	300,000cy	Dredge Spoil	Seagrass Growth
II-C	8.0	3	Muddy	6.0	0.2	8	3,000cy	Coarse Sand	Mud cap
III-A	13.0-17.0	16	Muddy	3.0-5.0	0.3	5	290,000cy	Const. Debris	Artific. Reef
III-B	16.0-24.0	16	Muddy	5.0-6.0	0.3	6	360,000cy	Const. Debris	Artific. Reef
III-C	4.0-7.0	4	Muddy	2.0-3.0	0.3	7	19,000cy	Dredge Spoil	Seagrass Growth
	1.0-6.0	1	Muddy	1.0-5.0	1.0	13	31,000cy	Dredge Spoil	Seagrass Growth
	1.0-8.0	31	Sandy	4.0-6.0	1.0	6	150,000cy	Dredge Spoil	Seagrass Growth



- 2002-2003 surveys confirm JT dredge hole most appropriate size
 - Draft EIS proposed 24 acres with no seagrass transplantation

HISTORY OF JULIA TUTTLE HOLE

- The “Julia Tuttle” hole (circa 1959) was dredged for material for the Julia Tuttle Causeway from Miami to Miami Beach
- Hole was large (>100 acres) and deep (up to 24 ft)
- Causeway effectively created barrier to water movement
- Low sediment inflow in the bay
- Unlikely to naturally fill over time and be able to support seagrass



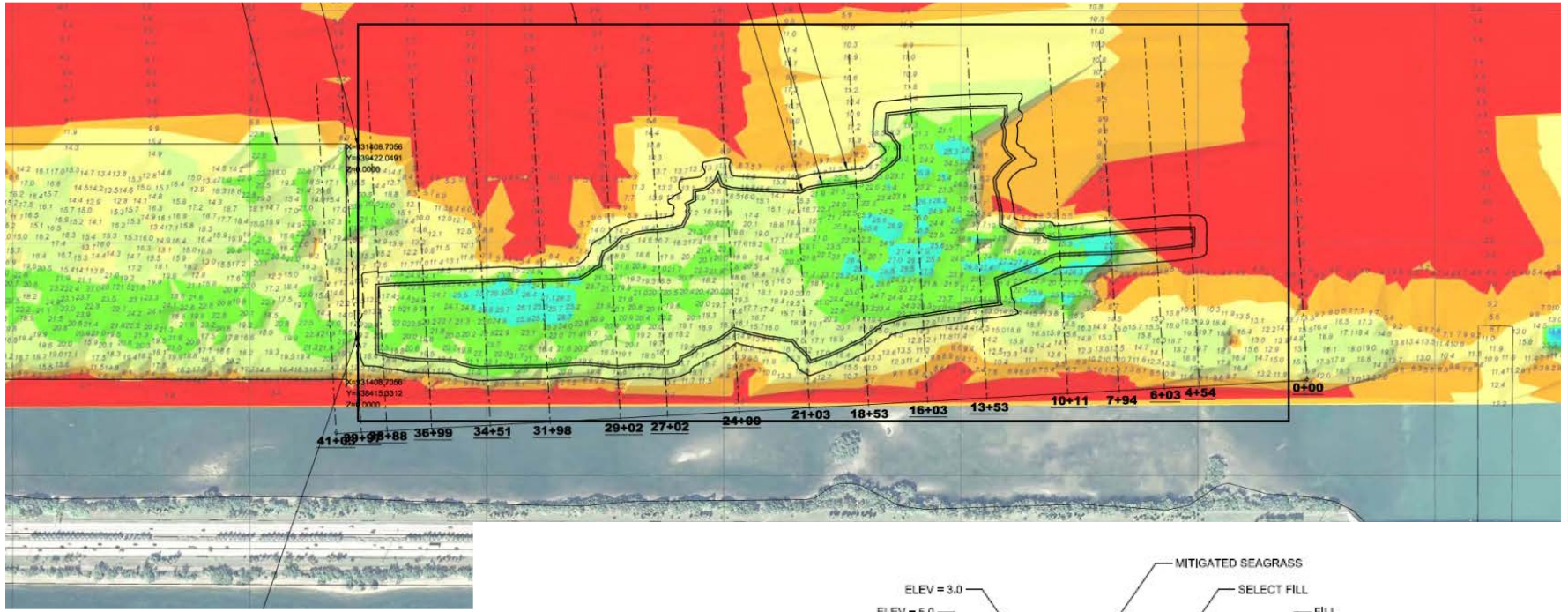
Photo credit: <http://miamiarchives.blogspot.com/2013/07/julia-tuttle-causeway-opens-dec-12-1959.html>

- 2004 NEPA process complete (EIS)
- 2006 Record of Decision (ROD)
- 2012 Final Florida Department of Environmental Protection (FDEP) permits, including federal and state consistency determinations
- Functional analysis conducted (UMAM)
 - Final Mitigation
 - 16.6 acres filled with dredged and quarried material
 - 7.15 acres planted with locally sourced seagrass
- Turbidity a concern
 - Dredged material $\leq 15\%$ silts and clays
 - Quarried material (upland source) $\leq 5\%$ silts and clays
 - Compliance levels: 9 NTUs* above background
- 2012 Development of plans and specifications



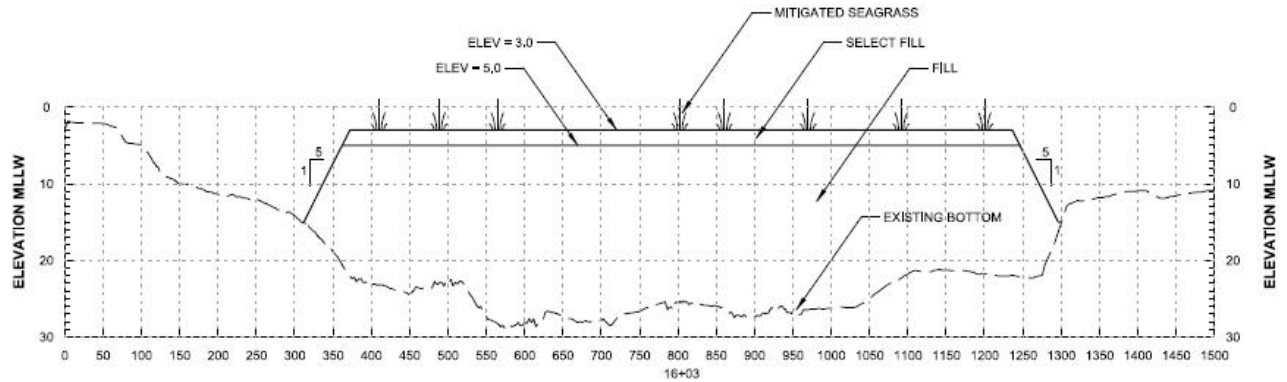
CONTRACT SPECIFICATIONS

31-acres available for 16.6-acres mitigation



Base fill elevation:
- 6 ft MLLW

Select fill elevation:
- 4 ft MLLW

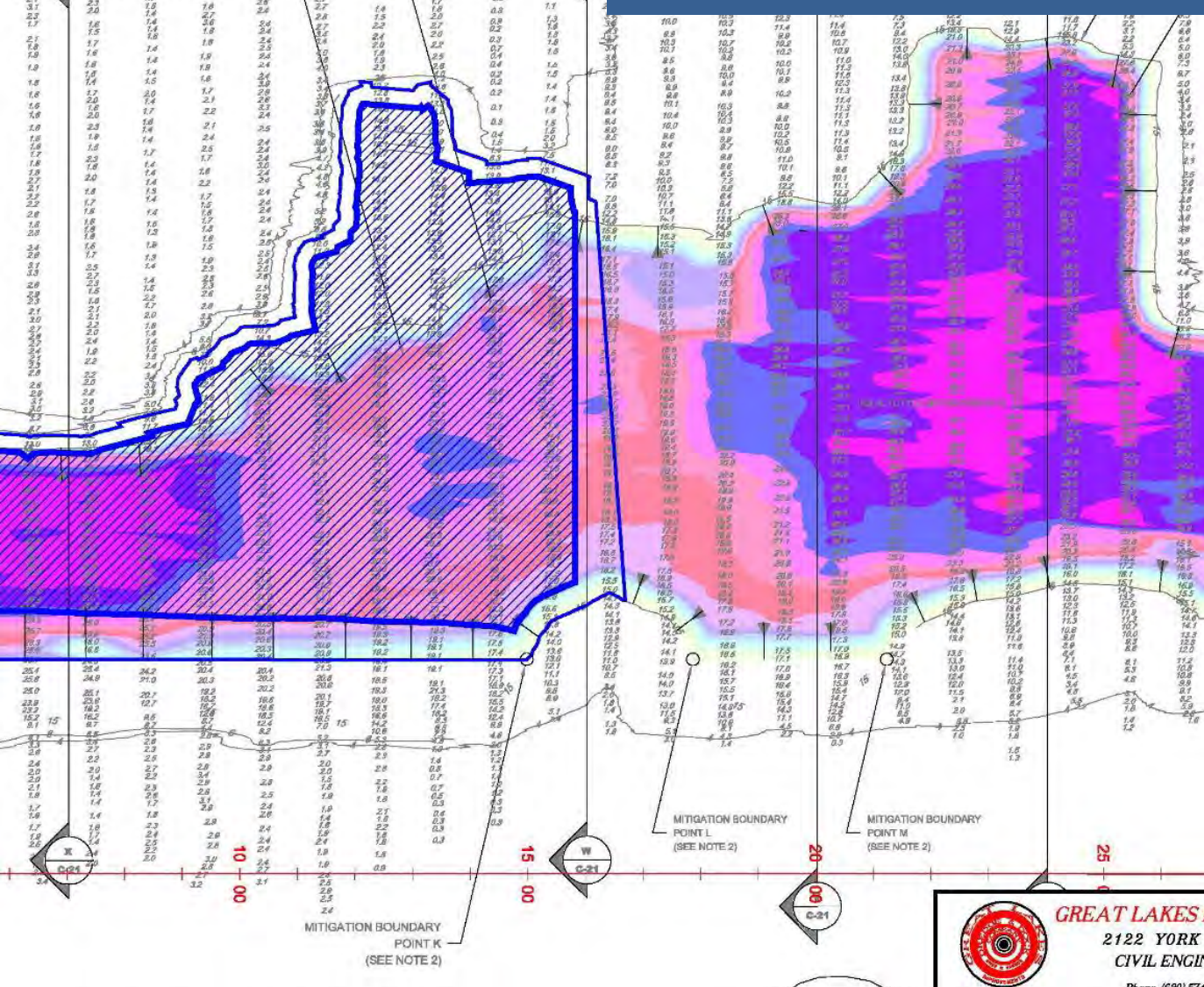


TYPICAL CROSS SECTION
JULIA TUTTLE MITIGATION AREA

ALTERNATIVE FILL

CONTRACT SPECIFICATIONS

- Flexibility in final site design to optimize site utilization
- GLDD awarded contract; developed alternative fill plan



GRAPHIC SCALE

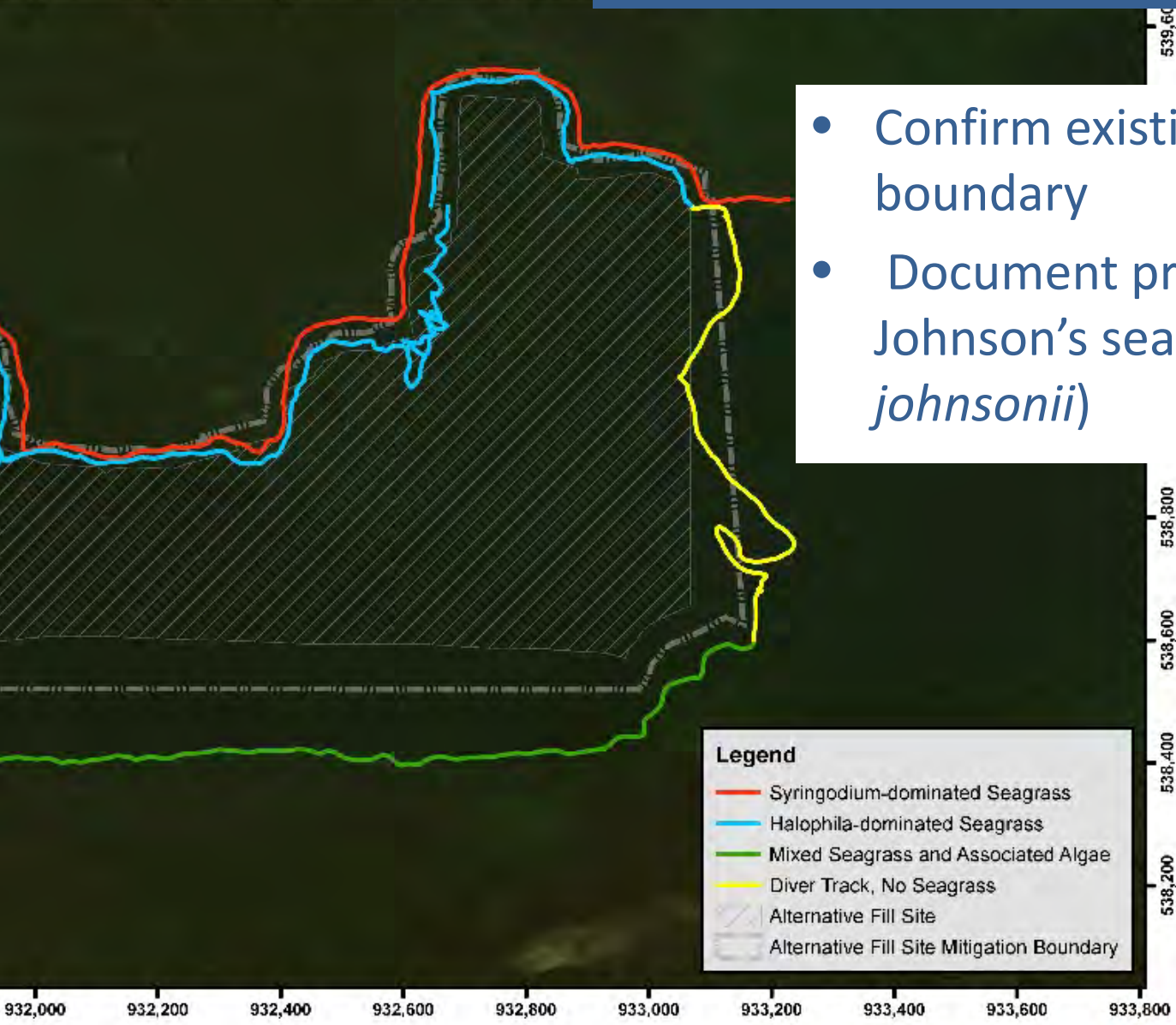


(IN FEET)
1 inch = 200 ft.

	GREAT LAKES 1 2122 YORK CIVIL ENGIN Phone: (630) 574-	
	PROJECT Miami H	
TITLE/SURVEY TITLE		JULIA
DRAWING DATE: JANUARY 3, 2013	GI DD JOB NO.	
FILE NAME: 2330 3216 TUTTLE PLANNING 0102261 Long	USAGE JOB NO.	
DRAWN BY: CT	APPROVED BY:	

CONTRACT SPECIFICATIONS

932,000 932,200 932,400 932,600 932,800



- Confirm existing seagrass boundary
- Document presence of Johnson's seagrass (*Halophila johnsonii*)

Legend

- Syringodium-dominated Seagrass
- Halophila-dominated Seagrass
- Mixed Seagrass and Associated Algae
- Diver Track, No Seagrass
- ▨ Alternative Fill Site
- Alternative Fill Site Mitigation Boundary

932,000 932,200 932,400 932,600 932,800 933,000 933,200 933,400 933,600 933,800

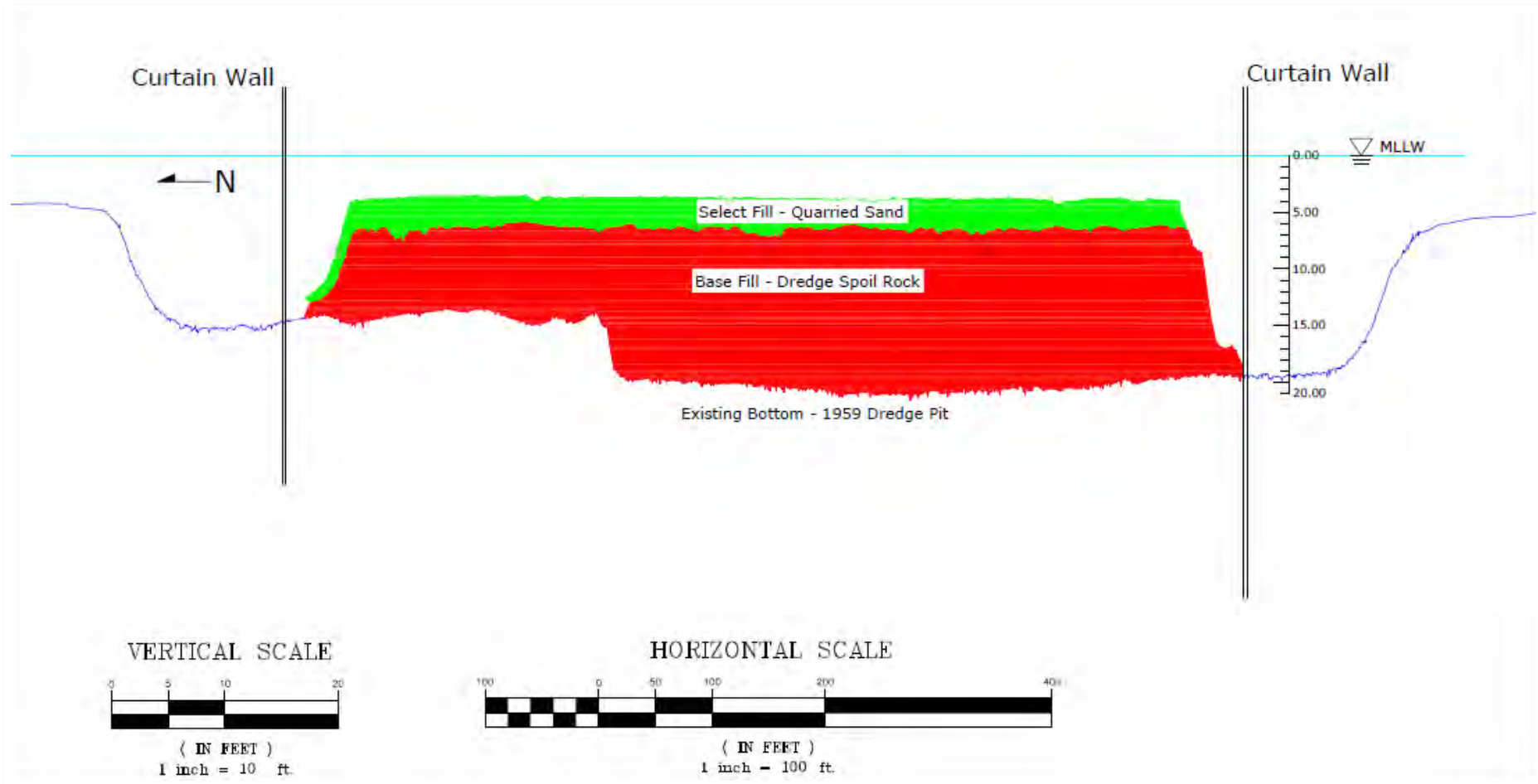
250 500 1,000 Feet

Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901 Feet



SITE DESIGN

- Base fill (-6 ft MLLW) \leq 15% silts and fines but NO upper limit
- Broken limestone rock (dredge spoil) chosen for low turbidity potential



SITE CONSTRUCTION - CURTAINS

- More curtains than GLDD deployed at one time— 7,350 linear feet encompassing 34.5 acres
- Weighted with chains (2.4 lb/ft)
- Anchoring not feasible
- Drive vertical steel pilings –into 12 to 26 ft. water depths
- 74 steel pilings; ~100 ft apart
- Rigorous maintenance and curtain replacement: Replaced certain segments 1-2 times; total 13,900 linear feet

BASE FILL TRANSPORT

- 1,192 split hull scow loads
- <1,000 CY/scow load due to depth
- ~5.0 mi one-way trip
- Cross under three IWW bridges



BASE FILL PLACEMENT



- 560,000 CY of navigation dredged material
- Beneficial reuse – no ODMDS (~600 ft)
- Daily bathymetric surveys
- Created 16.99 acres seagrass habitat



BASE FILL COMPLETE

-6 ft MLLW – USACE approved December 17, 2014



SELECT FILL TRANSFER

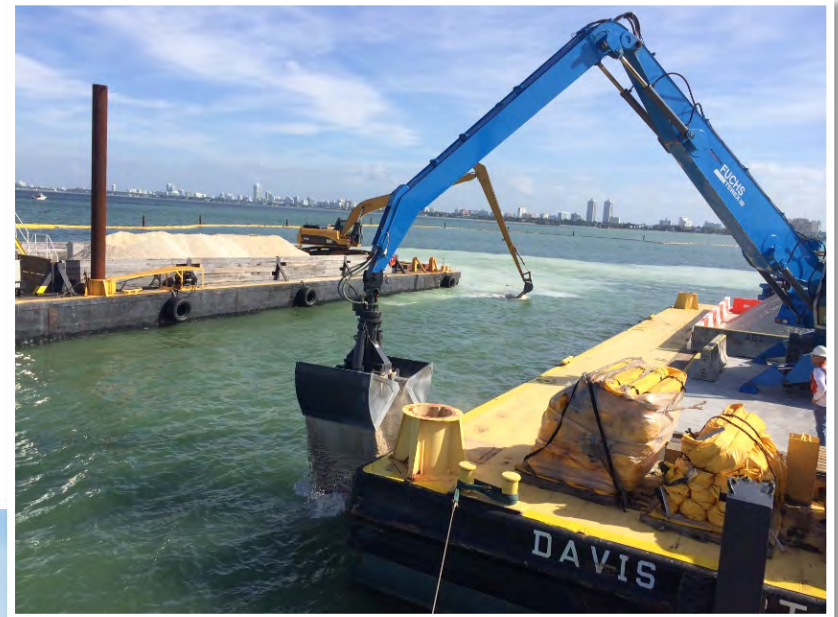


- Dredged material non-compliant for select fill (>5% silts and clays)
- Sourced from local quarry
- 114,425 tons; 5,500 dump trucks
- Stockpiled at staging area
- Transferred to barges using sand shooter
- 3.5-mi transit; no bridges



SELECT FILL PLACEMENT

- 285 barge loads
- 85,000 CY select fill
- 180 days active filling
- -4 ft MLLW USACE approved 3 August 2015



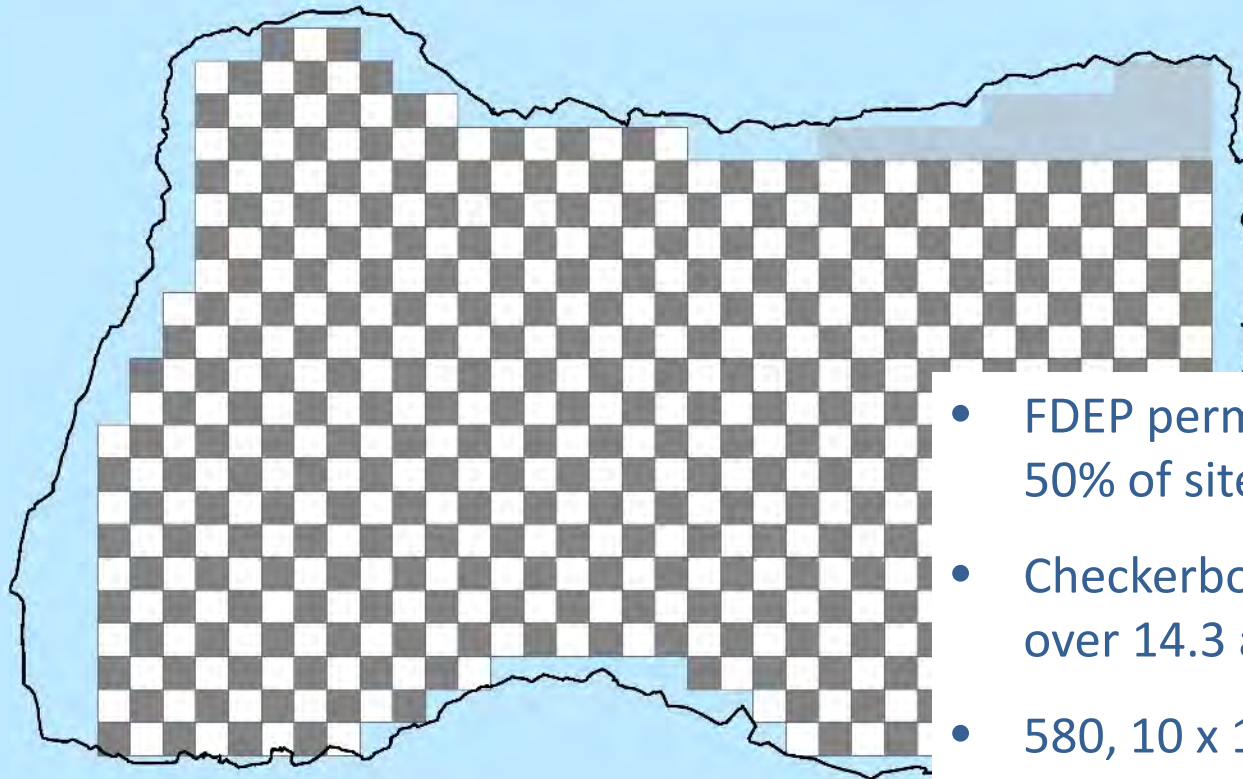
SEAGRASS PLANTING DESIGN

80°9'35"W

80°9'30"W

80°9'25"W

80°9'20"W



Legend

— 4.5 Foot Depth Line

Great Lakes Seagrass Mitigation 10x10 m Plots

■ Planted

□ Non-Planted

- FDEP permit required 50% of site be planted
- Checkerboard pattern over 14.3 acres
- 580, 10 x 10 m plots
- 290 planted plots
- 100 planting units (PU) plot per plot
- 29,000 PUs total

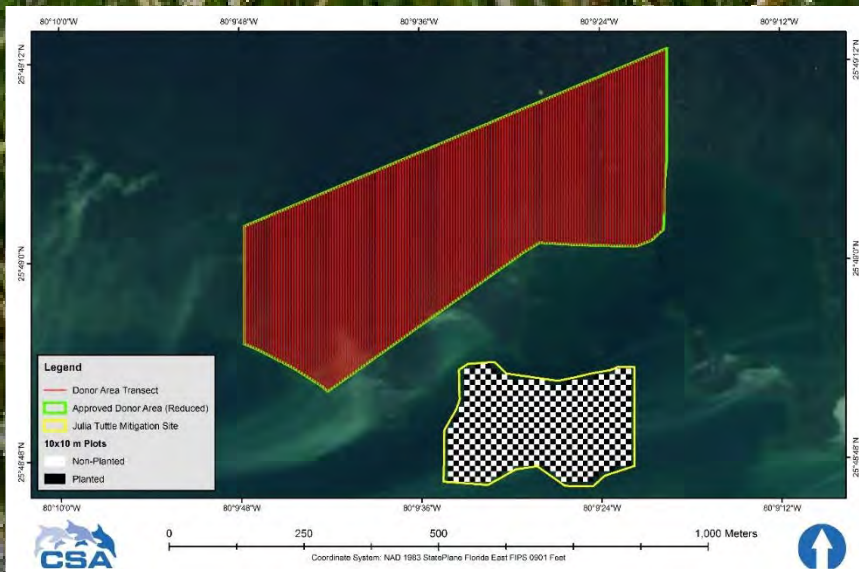
80°9'35"W

80°9'30"W

80°9'25"W

DONOR SITE SELECTION

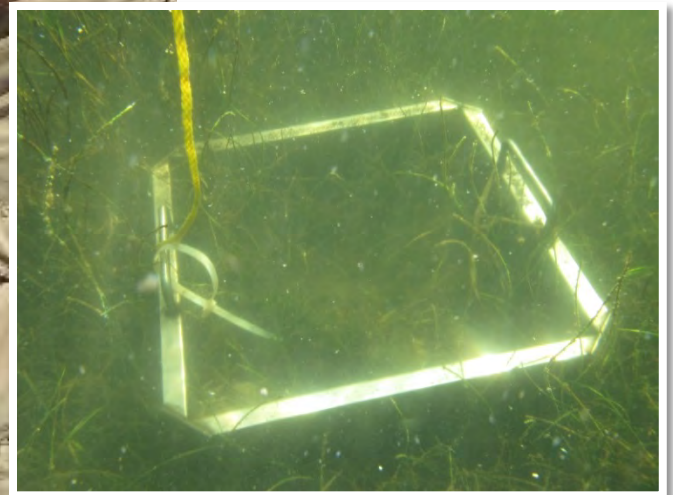
- FDEP required approval of harvest (donor) area
- Donor area must be “proximal” and adjacent to the JTMS
- Joint survey – FDEP, USACE, and CSA
- Target species, *Syringodium filiforme* (manatee grass)
- Searched for high density aerial and sediment runners (growing tips)
- Area of ~273,000 m² selected



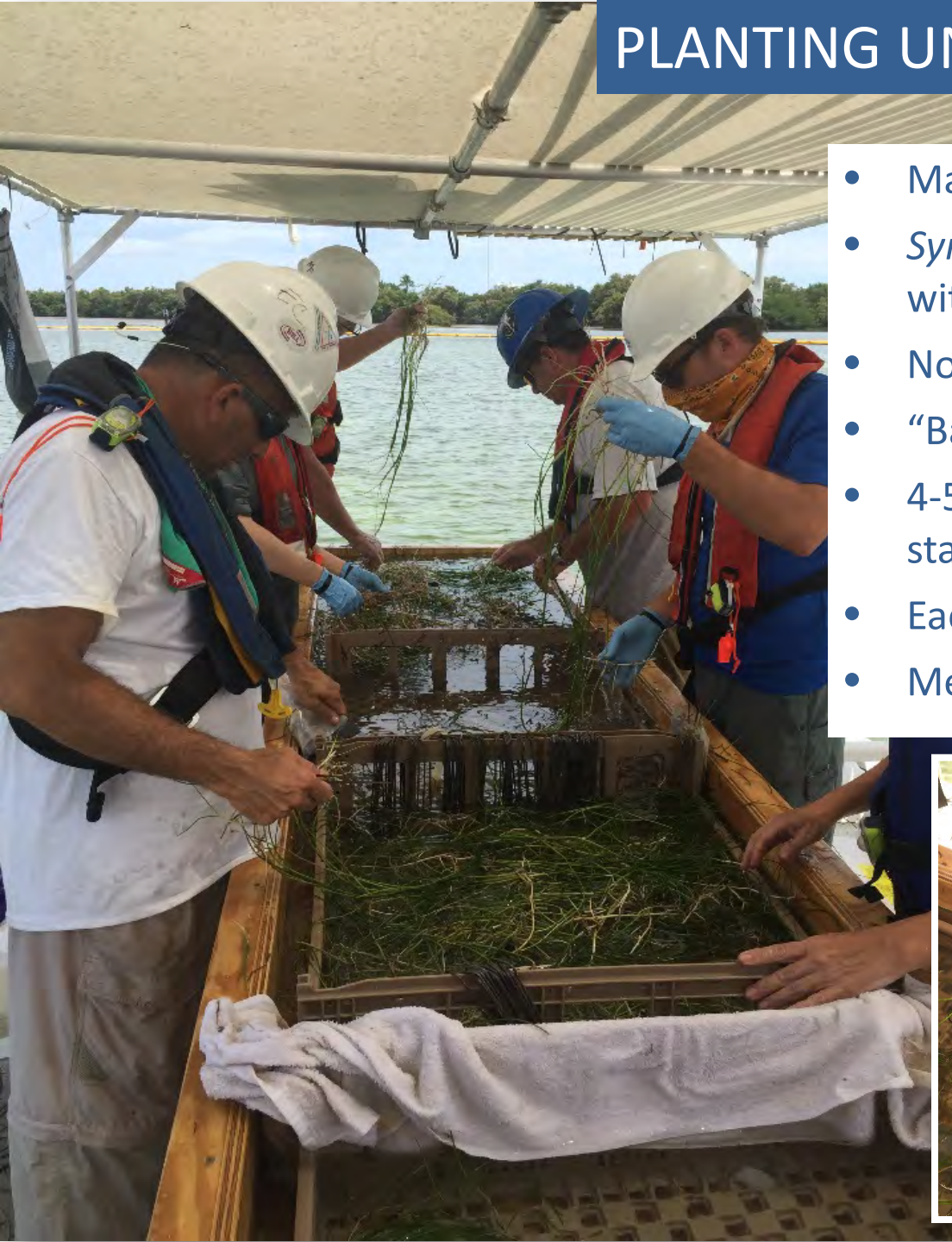
SEAGRASS HARVESTING



- 30 days following approval of site
- 0.25 m² harvest plots
- Every 2 m along 100 m transects
- “Cookie cutters” used
- Stored *in situ* in large mesh bags



PLANTING UNIT (PU) FABRICATION



- Material sorted in flow-through table
- *Syringodium filiforme* (manatee grass) with growing tips
- Non-target seagrass discarded
- “Bare-root” staple method
- 4-5 growing tips (rhizome apicals) + staple = 1 PU
- Each tray held 100 PUs
- Mean = 4.1 growing tips (apicals) PU⁻¹

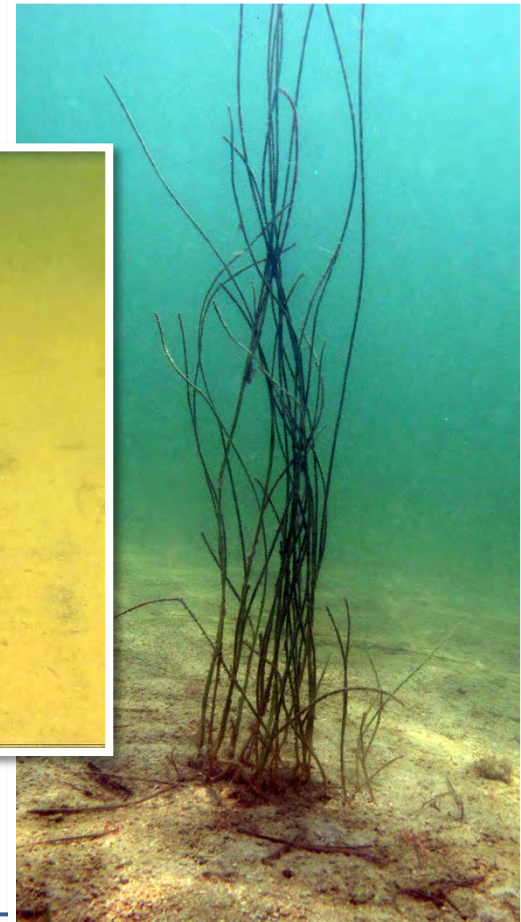


SEAGRASS PLANTING



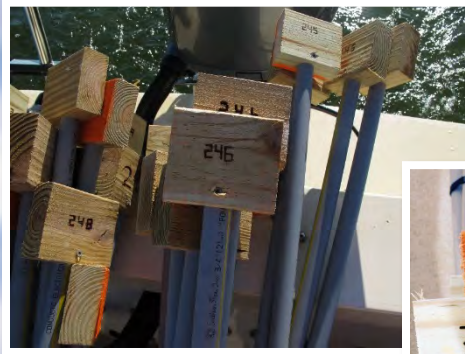
Divers inserted 1 PU m^{-2}
just beneath the
sediment surface

Plots visibly partitioned



Manatees observed eating PUs

BIRD STAKE INSTALLATION

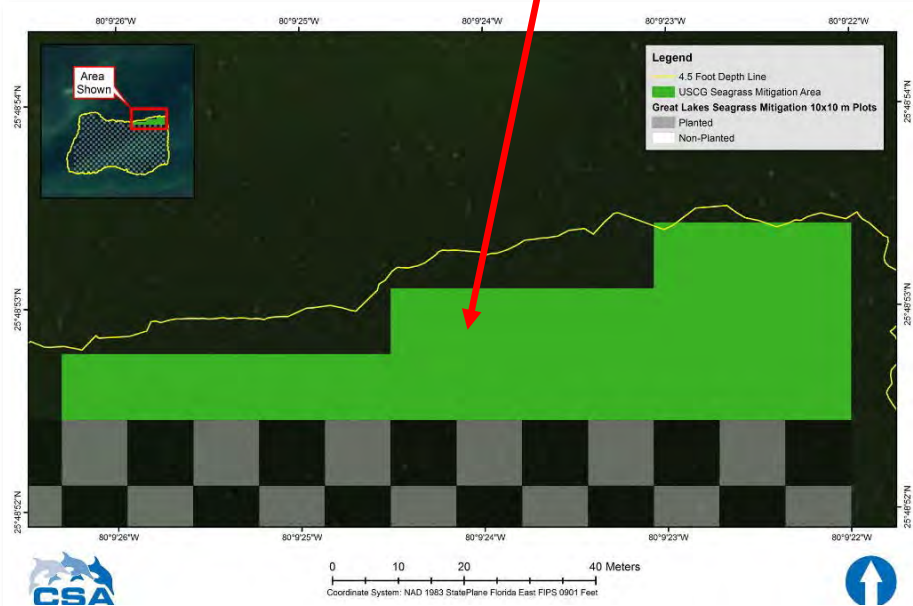
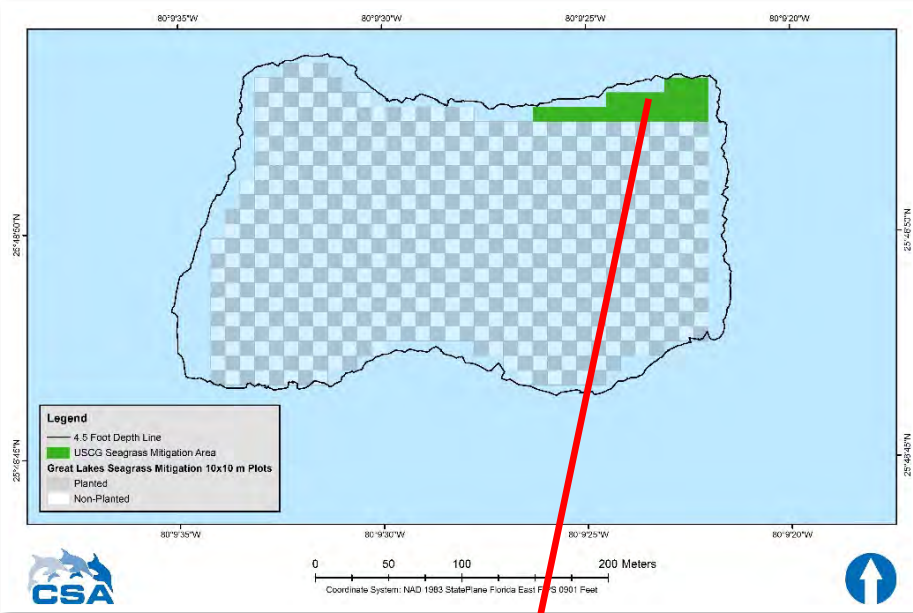


- Bird roosting stakes installed to fertilize seagrass and encourage growth
- Each bird stake marked by plot number (1-290) burned into the face
- 1,160 stakes (4 per plot) interior of plot
- 45 days for planting and bird stake installation



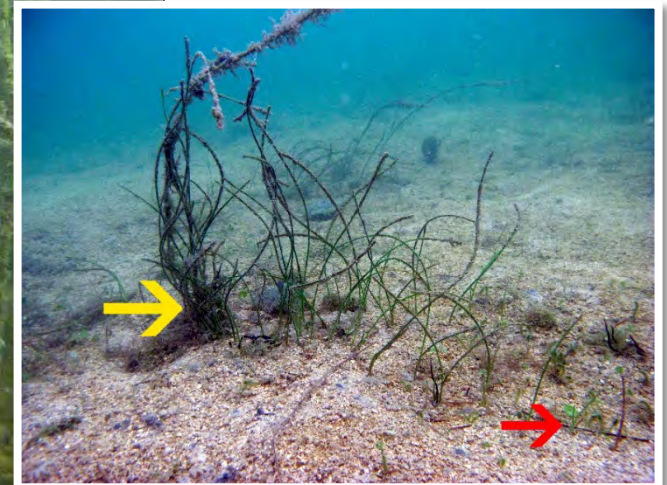
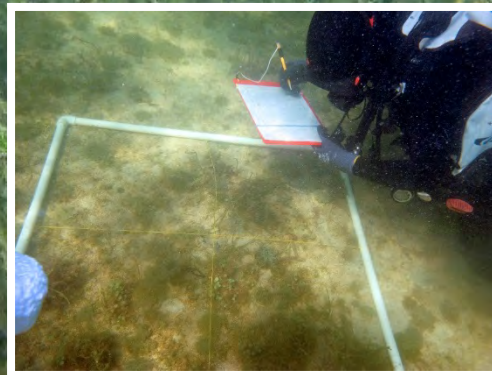
USCG MITIGATION

- Mitigation for Dredging at U.S. Coast Guard Base Miami Beach
- Opportunity to increase seagrass habitat restoration at JTMS
- 0.54 acres, conterminous 10 m x 10 m plots planted (no checkerboard)



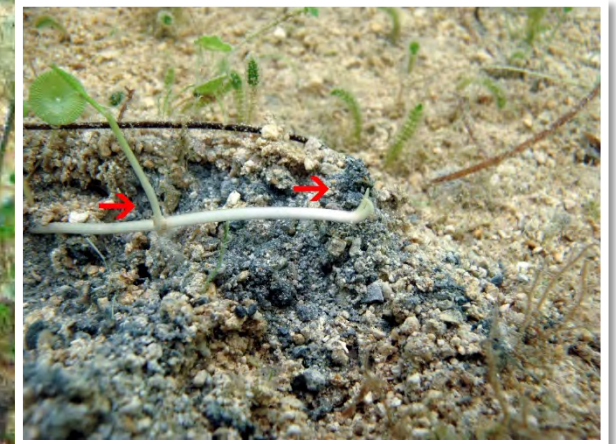
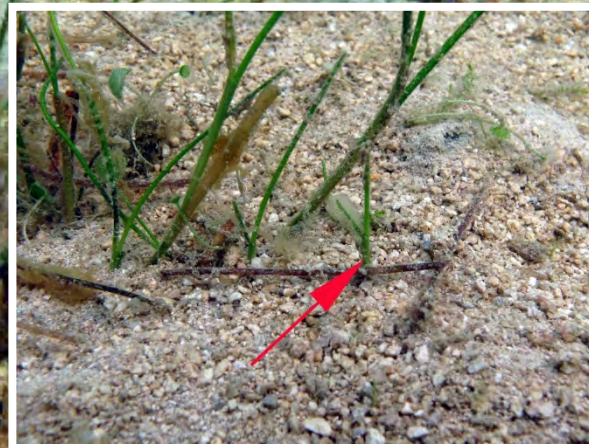
MONITORING

- Survivability survey (~30 days following completion)
- Miami Harbor mitigation: 5 Y by Miami-Dade County consultants
- USCG mitigation: 5 Y by CSA



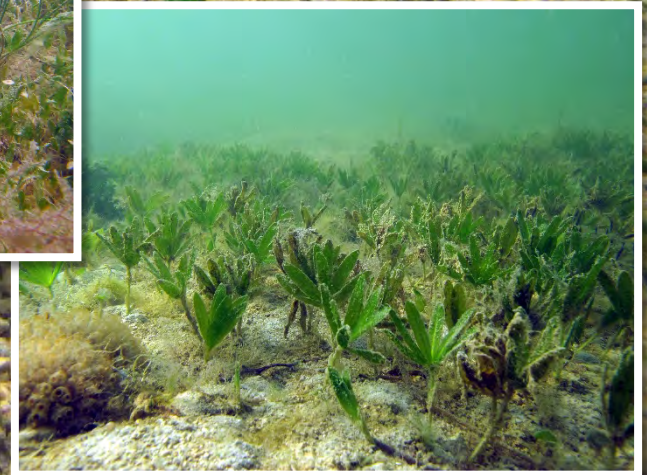
INITIAL RESULTS ~30 DAYS

- Miami Harbor PUs – 97.6% survival
 - Above and below ground growth
- USCG PUs – 98.2% survival
- Baseline USCG data
 - Mitigation Site: 1% Total Seagrass;
 - Reference Site: 55.0% Total Seagrass



NATURAL COLONIZATION

- Volunteer seagrass – 5 species
 - *Halodule wrightii*
 - *Syringodium filiforme*
 - *Halophila decipiens*
 - *Halophila engelmannii*
 - *Thalassia testudium*
- Macroalgae - multiple species



NEXT STEPS

- Document natural colonization by volunteer (non-planted) seagrass
- Quantify recovery trajectory for comparison with literature
- Compare seagrass cover and density with reference area
- Assess overcompensation response
- Seasonality of aerial runners



QUESTIONS?

Thank you to all the team members that helped make this project a success!

