



U.S. ARMY®



The Placement and Fate of Subaqueous Berms for Marsh Edge Protection and Intertidal Flats Enhancement

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2022 Annual SMIL Working Group Meeting
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US Army Corps
of Engineers®



US Army Corps of Engineers (USCAE) Sediment Mission Areas

Navigation



Flood Risk Management



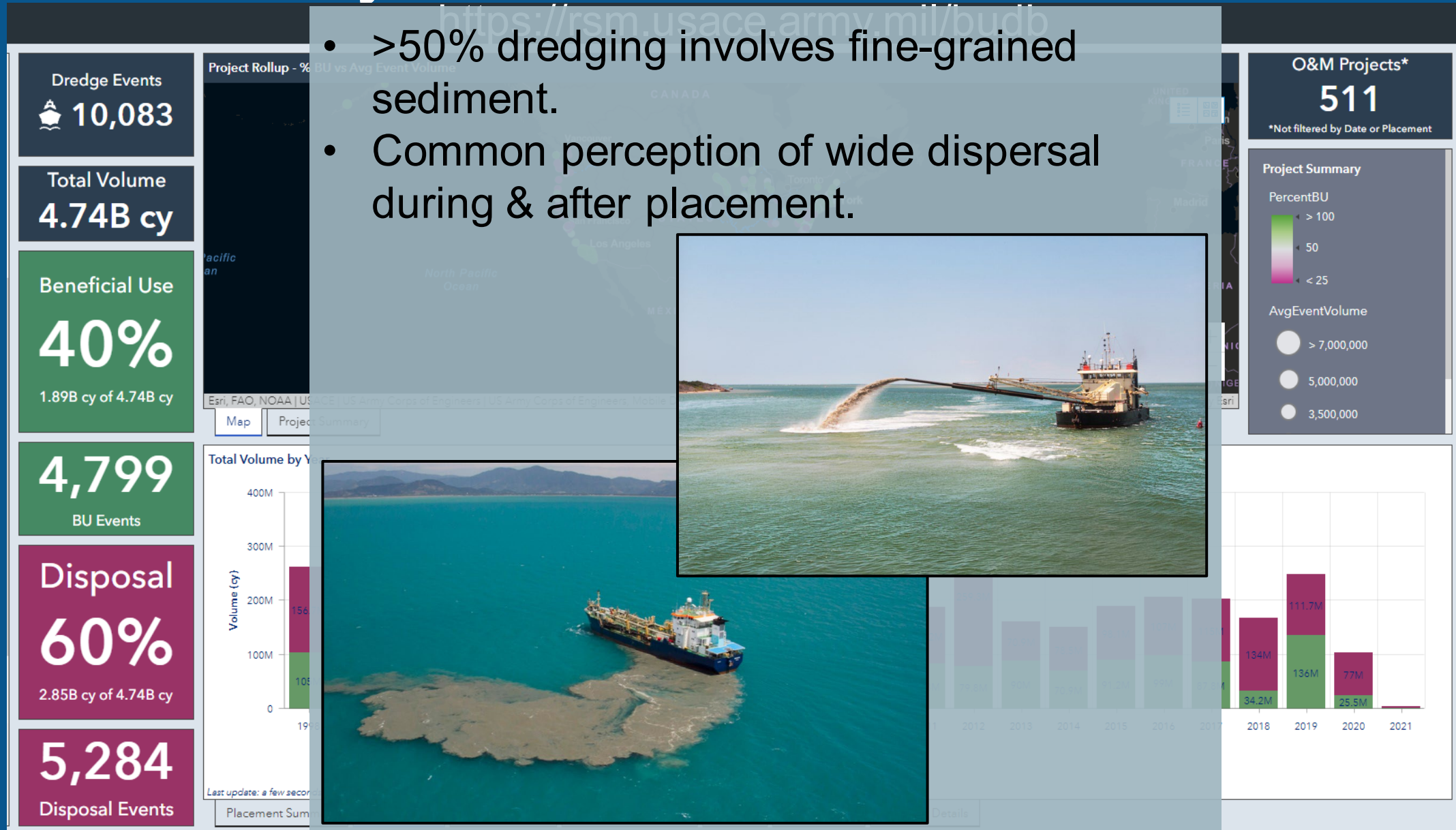
Dredging



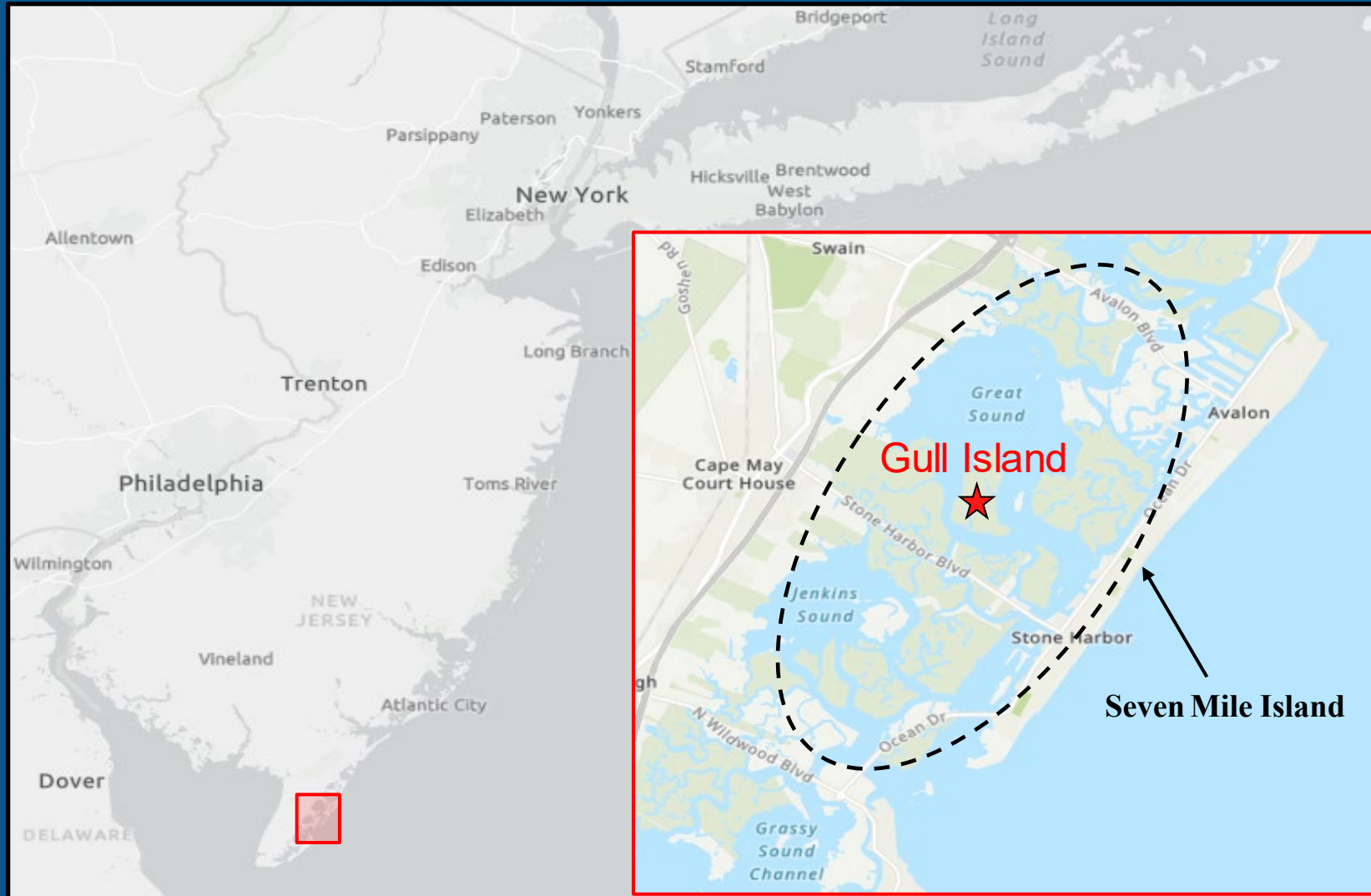
Environmental

2030: Beneficially Use 70%

- >50% dredging involves fine-grained sediment.
- Common perception of wide dispersal during & after placement.



Seven Mile Island Innovation Laboratory



Established 2019:
USACE-Philadelphia District, State of New Jersey, The Wetlands Institute

Encompassing 24 mi², and 15,000 acres of Back Bay Tidal Marshes, Shallow Bays, and Inlets.

Goal: To advance and improve dredging, beneficial use, and marsh restoration techniques.

Bathymetry Southern Gull Island August 2020

Aug2020_ft
(MLLW)

VALUE

	-2.714 - -1
	-0.999 - 0
	0.001 - 1
	1.001 - 2
	2.001 - 3
	3.001 - 4
	4.001 - 5
	5.001 - 6
	6.001 - 7
	7.001 - 8
	8.001 - 9
	9.001 - 10
	10.001 - 11
	11.001 - 12
	12.001 - 13



Loss of critical
bird habitats in
the marshes and
tidal flats of Gull
Island

May 2020

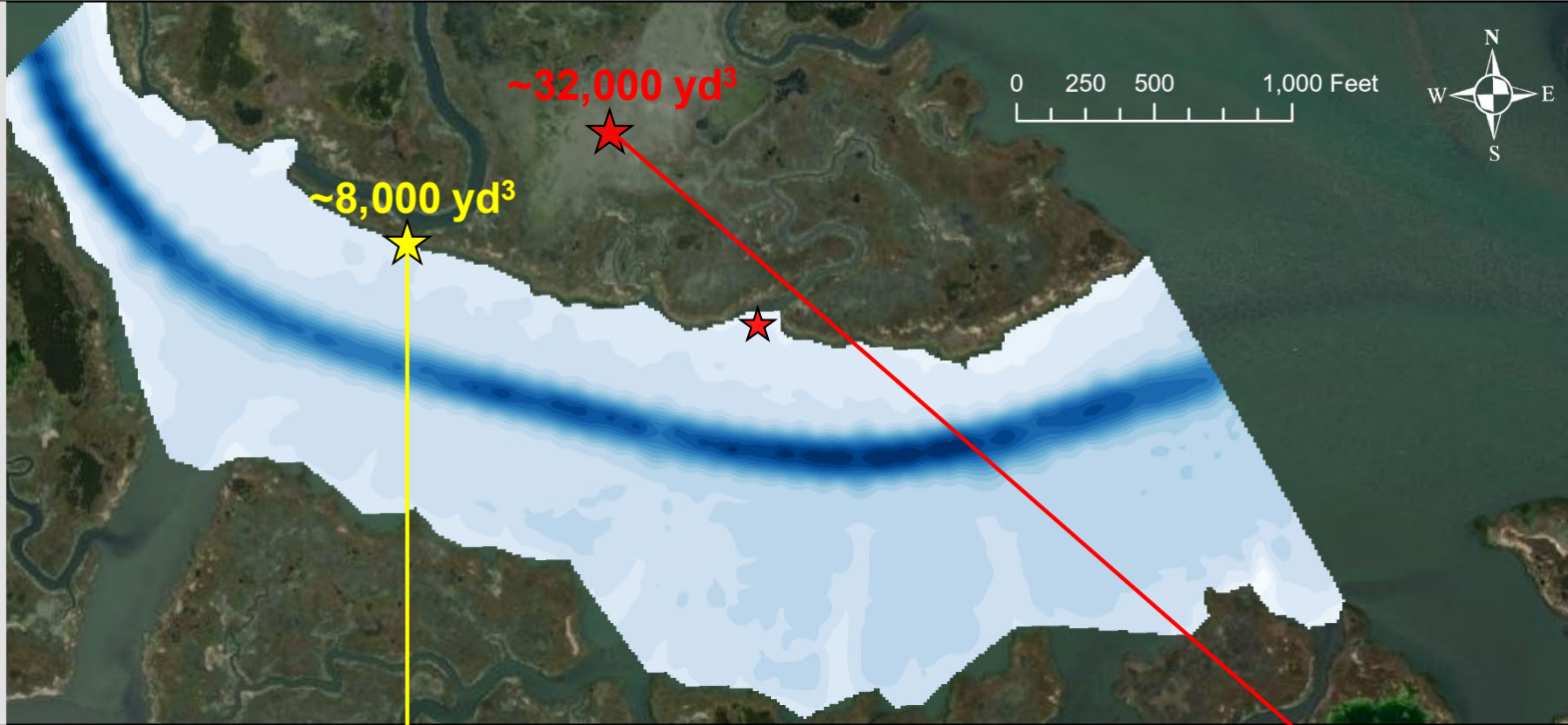


Placement in September 2020

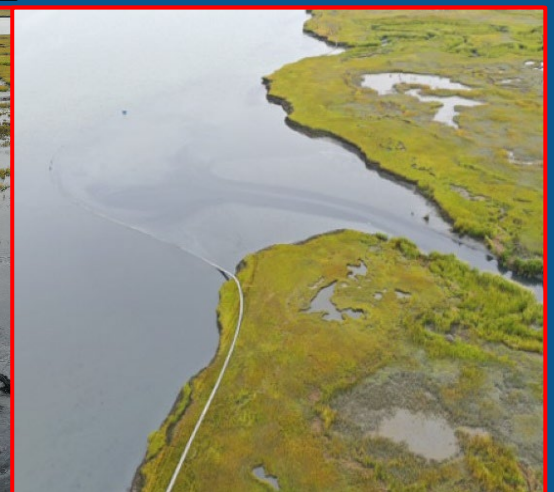
Aug2020_ft
(MLLW)

VALUE

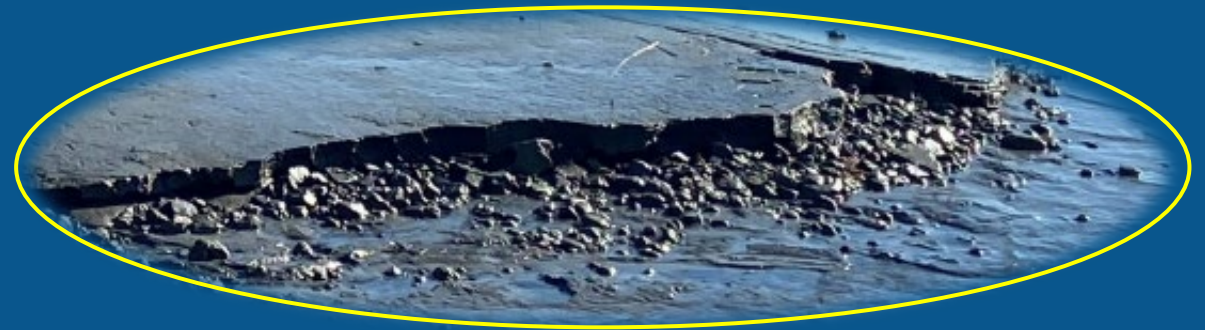
	-2.714 - -1
	-0.999 - 0
	0.001 - 1
	1.001 - 2
	2.001 - 3
	3.001 - 4
	4.001 - 5
	5.001 - 6
	6.001 - 7
	7.001 - 8
	8.001 - 9
	9.001 - 10
	10.001 - 11
	11.001 - 12
	12.001 - 13



~40,000 yd³ of fine
sand and mud



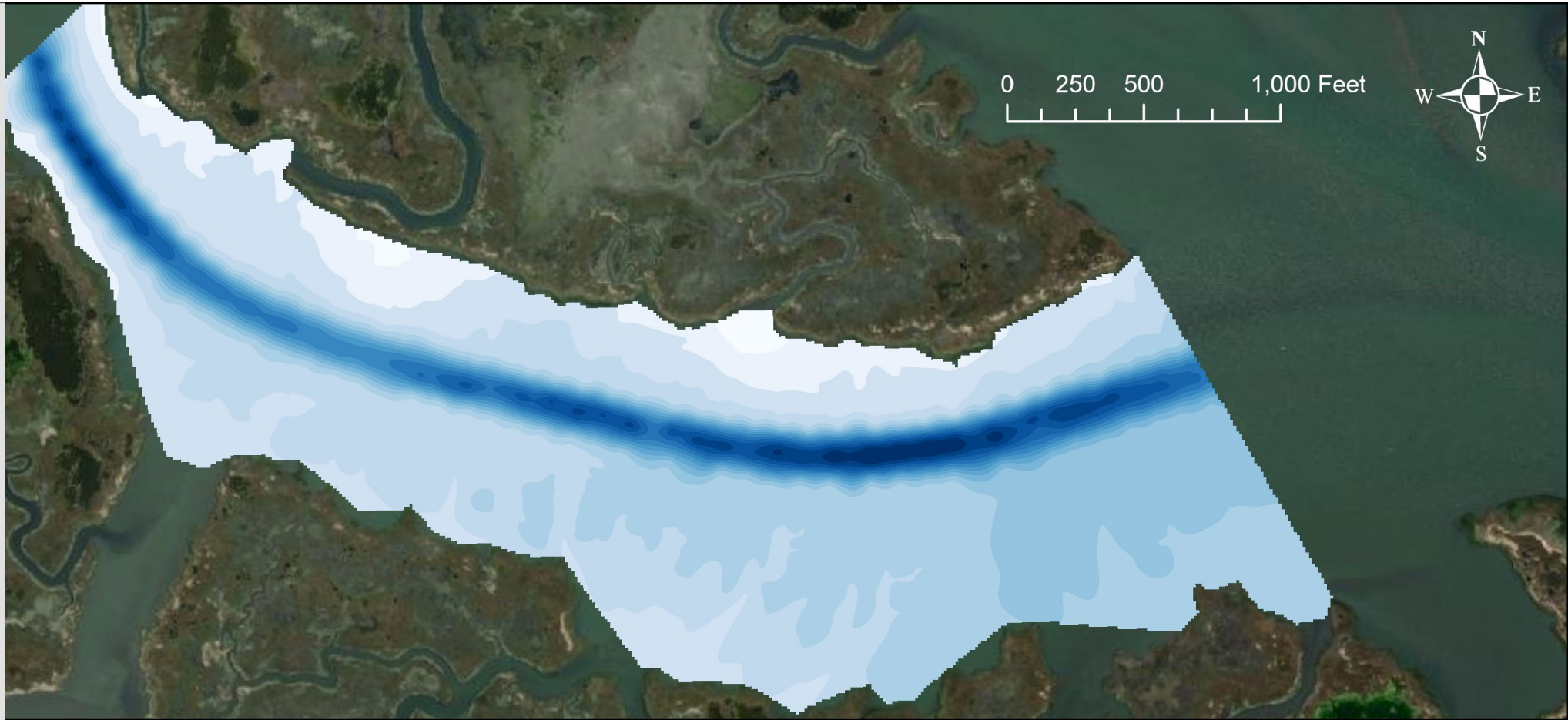
Features Along Southern Edge of Gull Island-1 Month Post-Placement



Bathymetry Southern Gull Island March 2021

Mar2021_ft
(MLLW)

VALUE

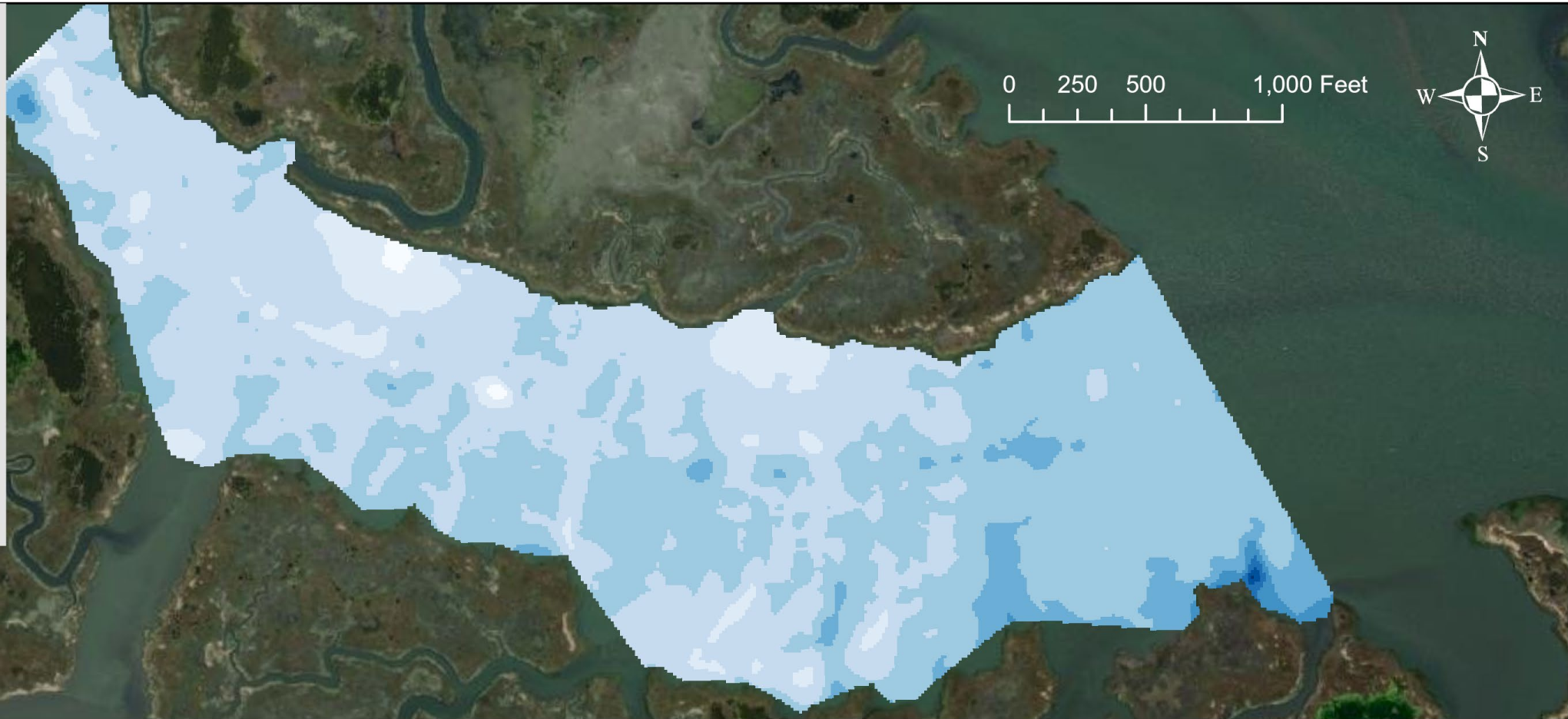


Approximately 6 Months After Placement

Bathymetry Change Aug 2020 to Mar 2021

Mar2021 to
Aug2020 Change
(ft)

Value



Approximately 6 months after placement

Bathymetry Change Aug 2020 to Mar 2021

Mar2021 to
Aug2020 Change
(ft)

Value

-2.628 - -2

-1.999 - -1

-0.999 - 0

0.001 - 1

1.001 - 2

2.001 - 3

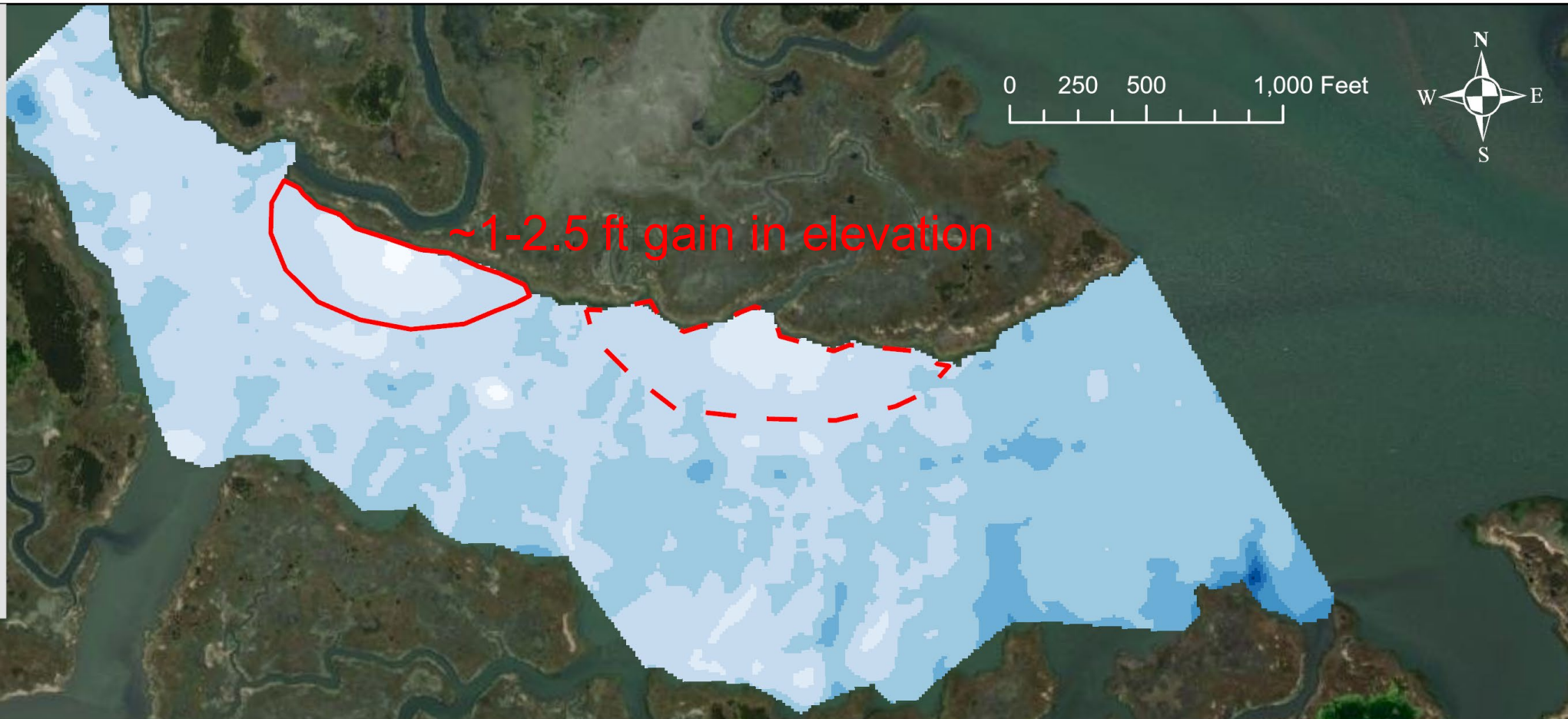
3.001 - 4

4.001 - 5

5.001 - 6

Direct Placement

Indirect Placement

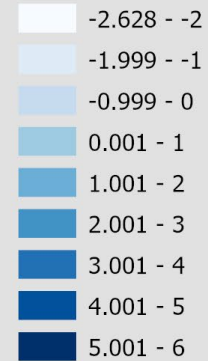


Approximately 6 months after placement

Bathymetry Change Aug 2020 to Mar 2021

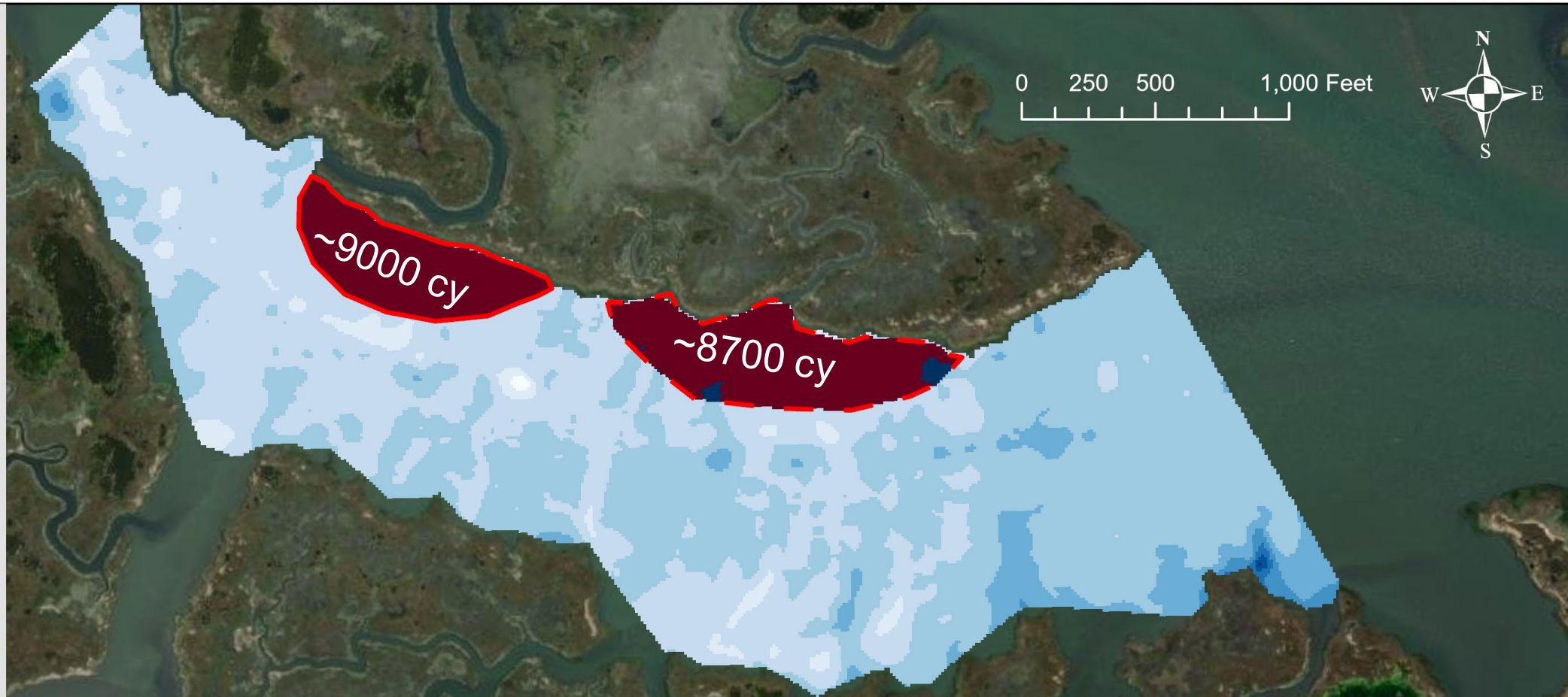
Mar2021 to
Aug2020 Change
(ft)

Value



 Direct Placement
 Indirect Placement

VOLUME



Approximately 6 Months After Placement

Bathymetry Change Aug 2020 to Feb 2022

Feb2022 to
Aug2020 Change
(ft)

Value



Direct Placement
Indirect Placement



Approximately 16 Months After Placement

Bathymetry Change Aug 2020 to Feb 2022

Feb2022 to
Aug2020 Change
(ft)

Value

-1.744 - -1

-0.999 - 0

0.001 - 1

1.001 - 2


2.001 - 3


3.001 - 4

4.001 - 5

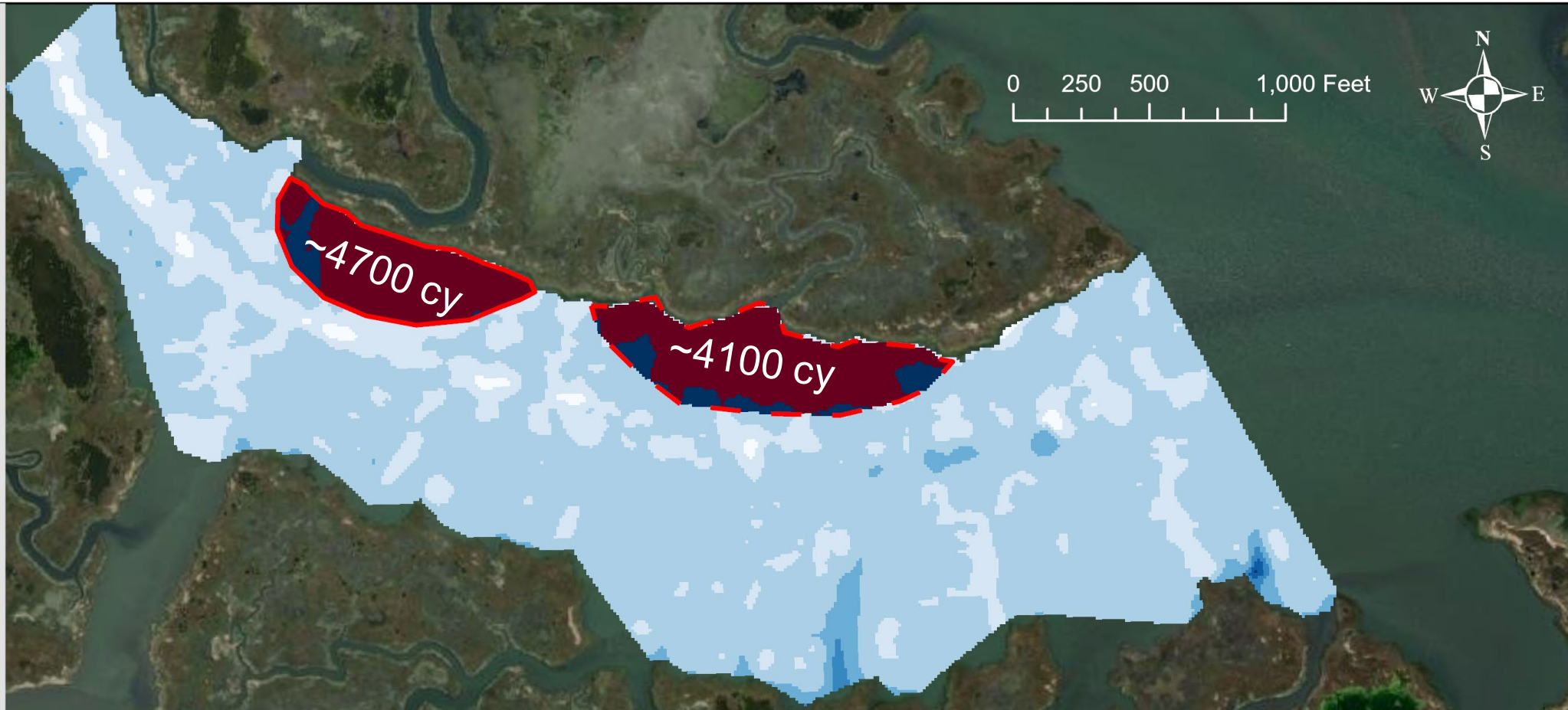
 Direct Placement

 Indirect Placement

 Net Gain

 Unchanged

 Net Loss



Features still present but show
~50% reduction in volume from March 2021 to Feb 2022

Deployed Wave Pressure Sensors

▲ Sensors

0 250 500 1,000 Feet

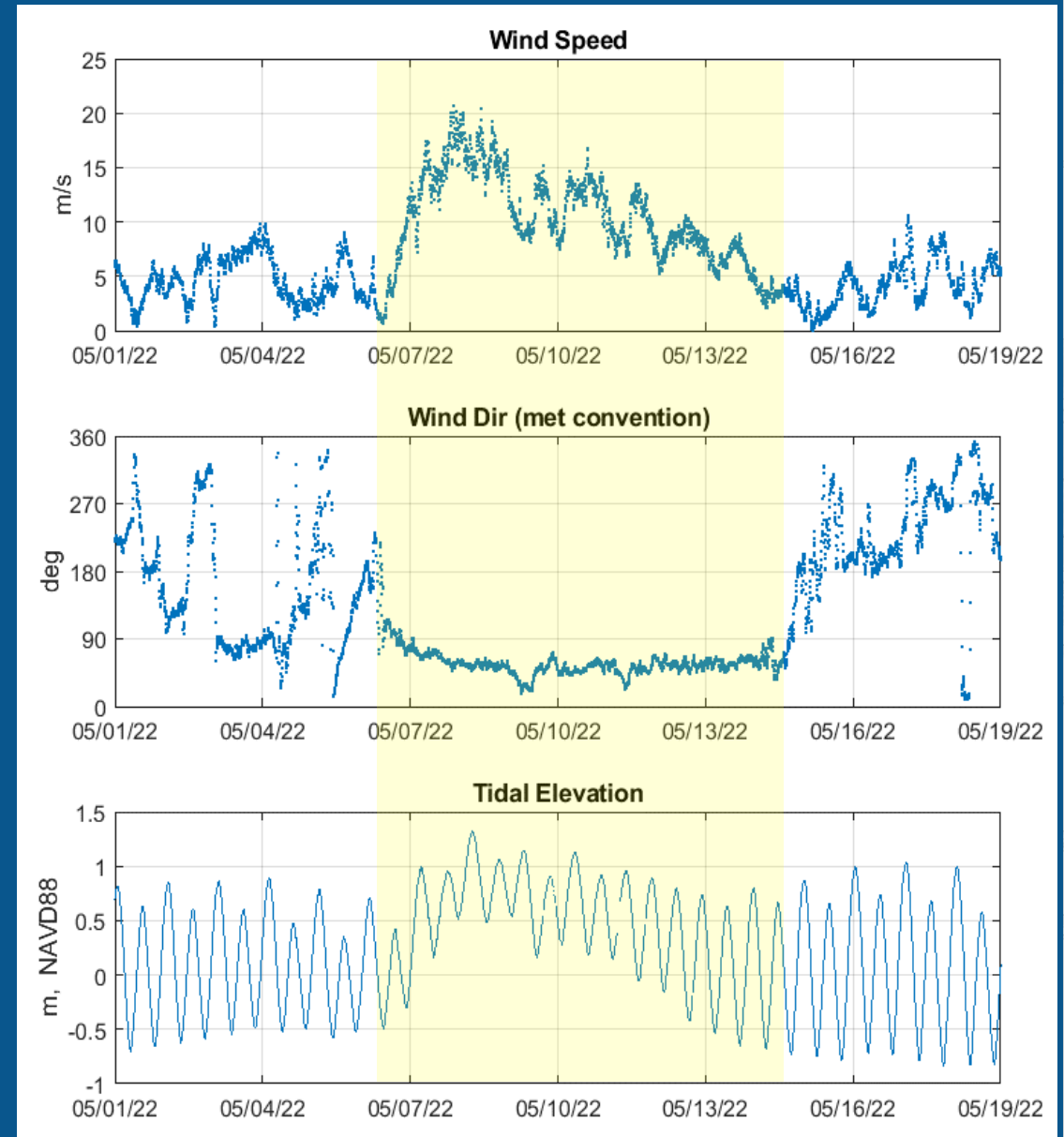


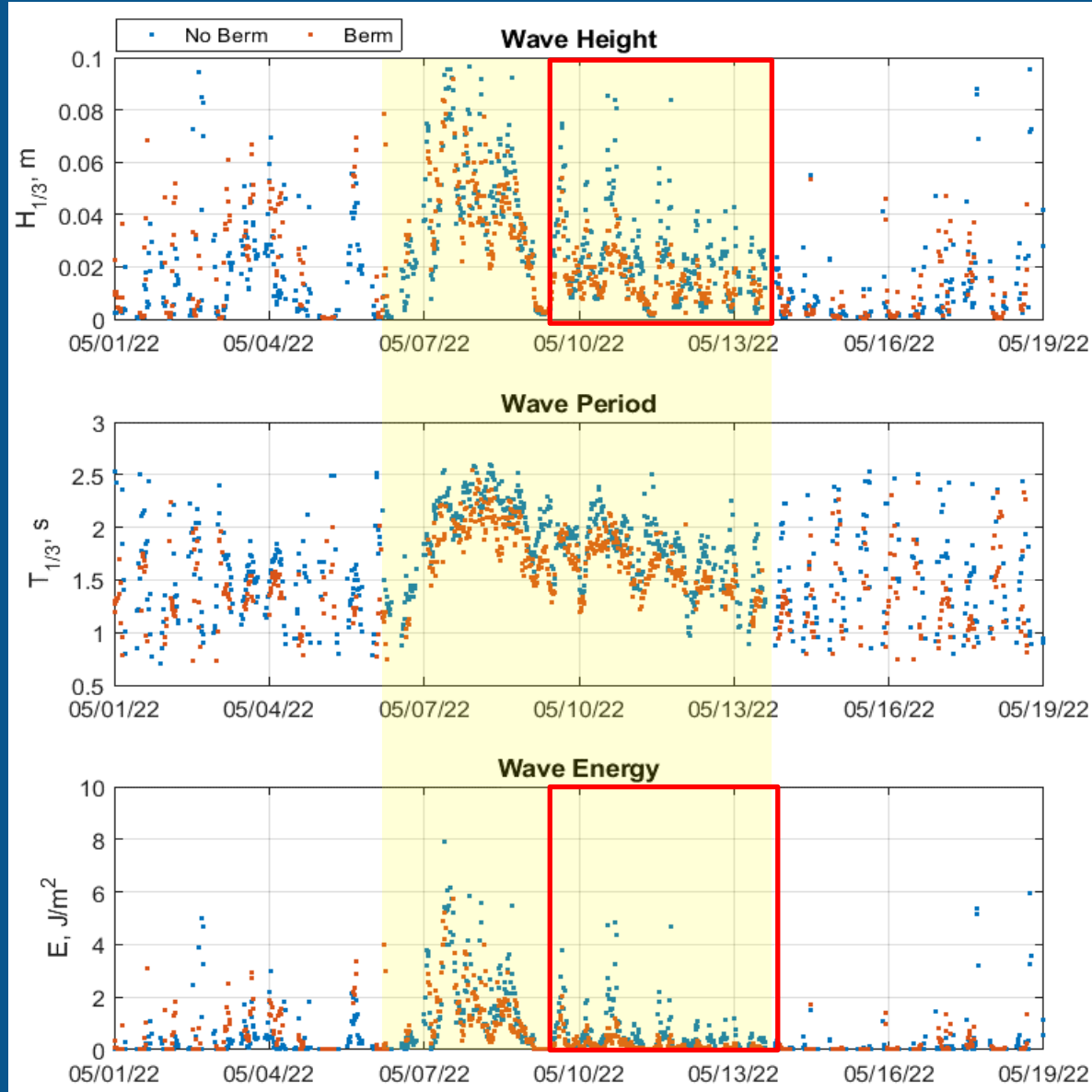
UNCLASSIFIED

Berm Impacts on Wave Energy

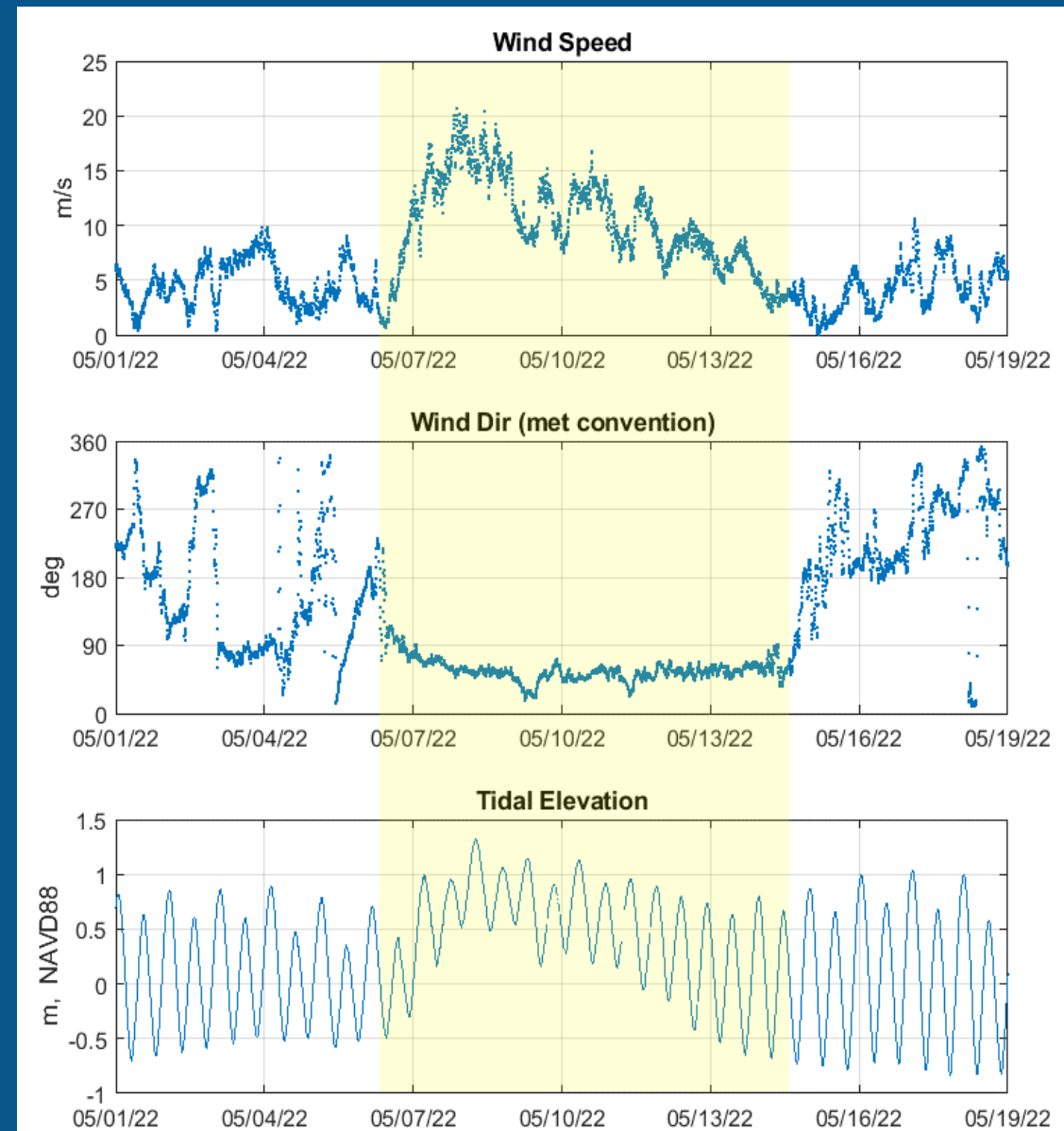
Preliminary analysis of May 2022 Event:

- Sustained, Strong Winds from the NE pushing water up onto marsh.
- Marsh inundated for days.





Preliminary analysis suggests berms slightly reduce wave height and energy at marsh edge, particularly during tail end of event.



Initial Findings

- Dredge material placement of muddy sediment at Gull Island successfully created two depositional features along the marsh edge.
- Placed material showed evidence of cohesion and stability 16 months after placement without any containment/confinement.
- Reduction in feature volume due to a combination of erosion, consolidation, and compaction.
- Initial analysis indicates that the berm features can reduce wave energy at the marsh edge.

Future Work

Sediment Cores

+ Berm cores

Feb2022 to
Aug2020 Change
(ft)

Value

