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Submarine Groundwater Discharge to Great South Bay

U.S. Department of the Interior
U.S. Geological Survey

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Project Science Team

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Special thanks to other members of the project team:

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- Irene Abbene, *USGS, NY Water Science Center*
- Michael Slattery, *Marine Sciences Research Center, Stony Brook University, NY*

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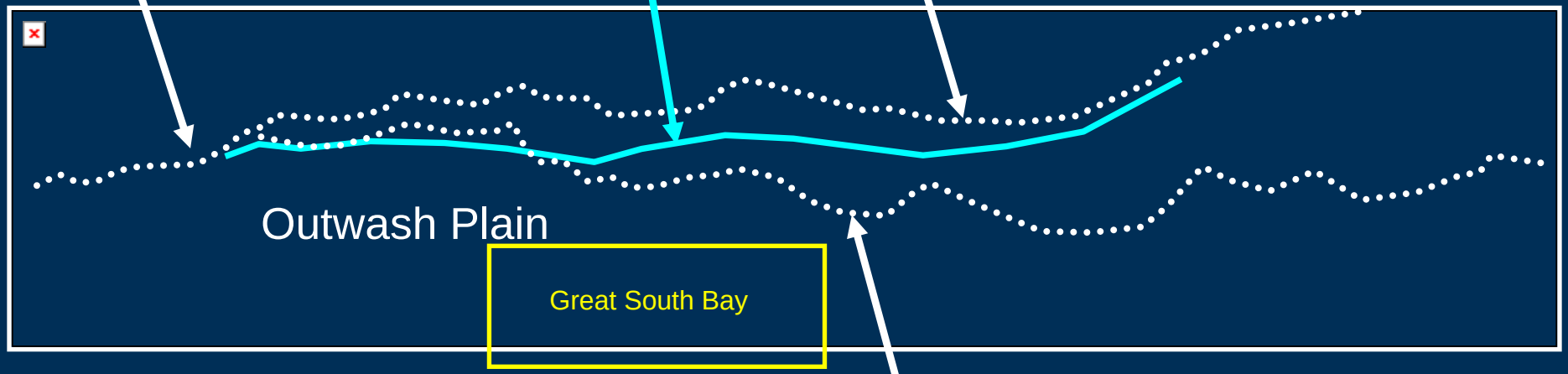
Regional Groundwater Divide

Harbor Hill Moraine

Roanoke Point Moraine



Ronkonkoma Moraine

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Source of base image: http://www.geo.sunysb.edu/reports/dem_2/

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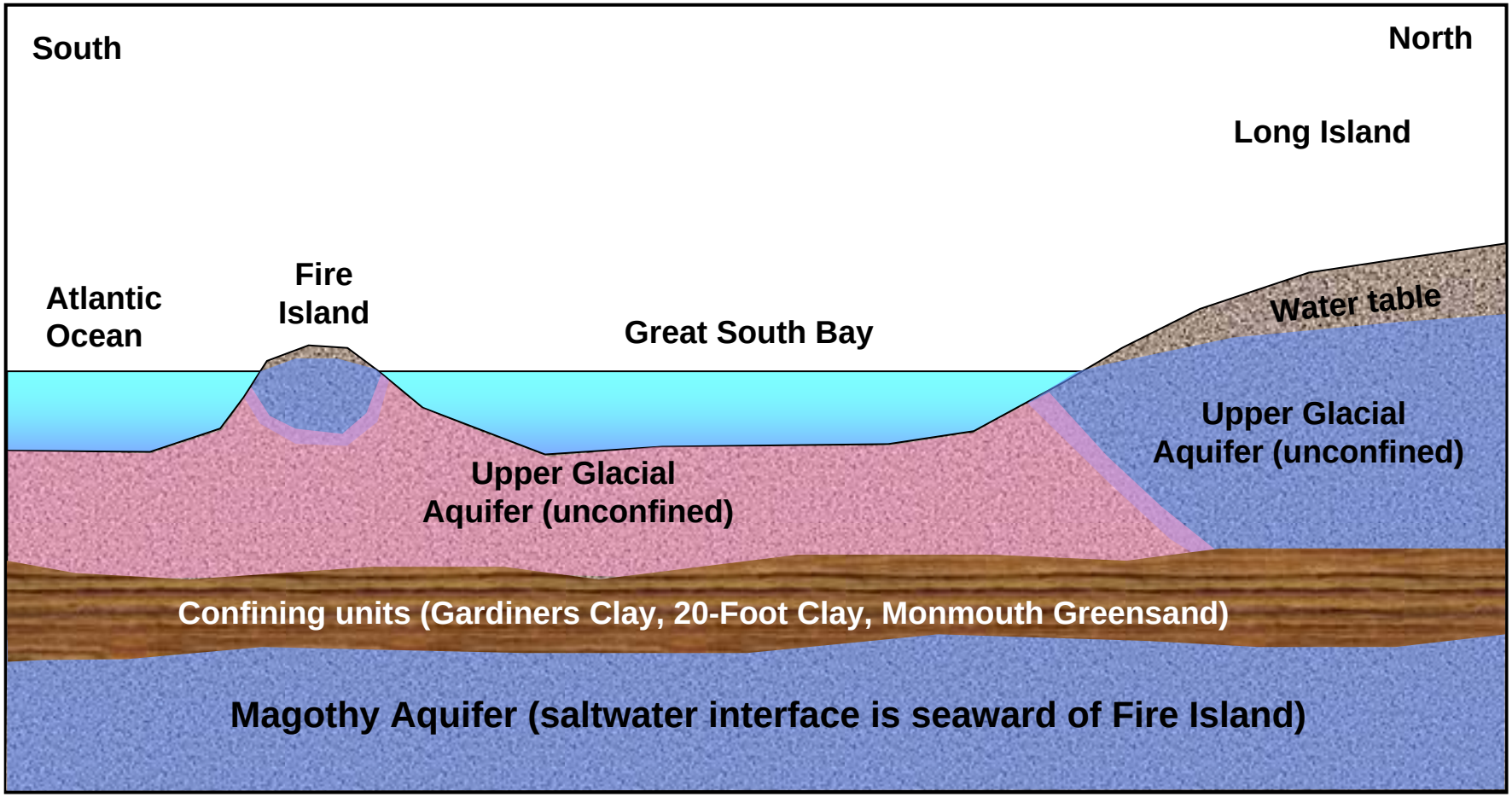

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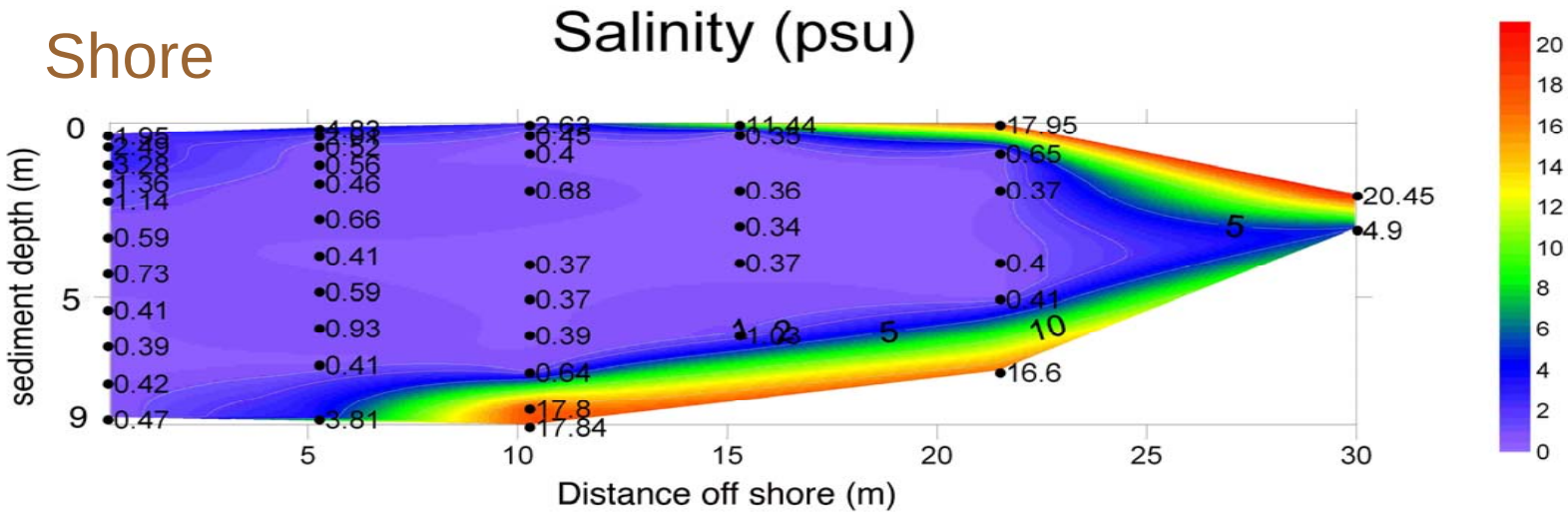
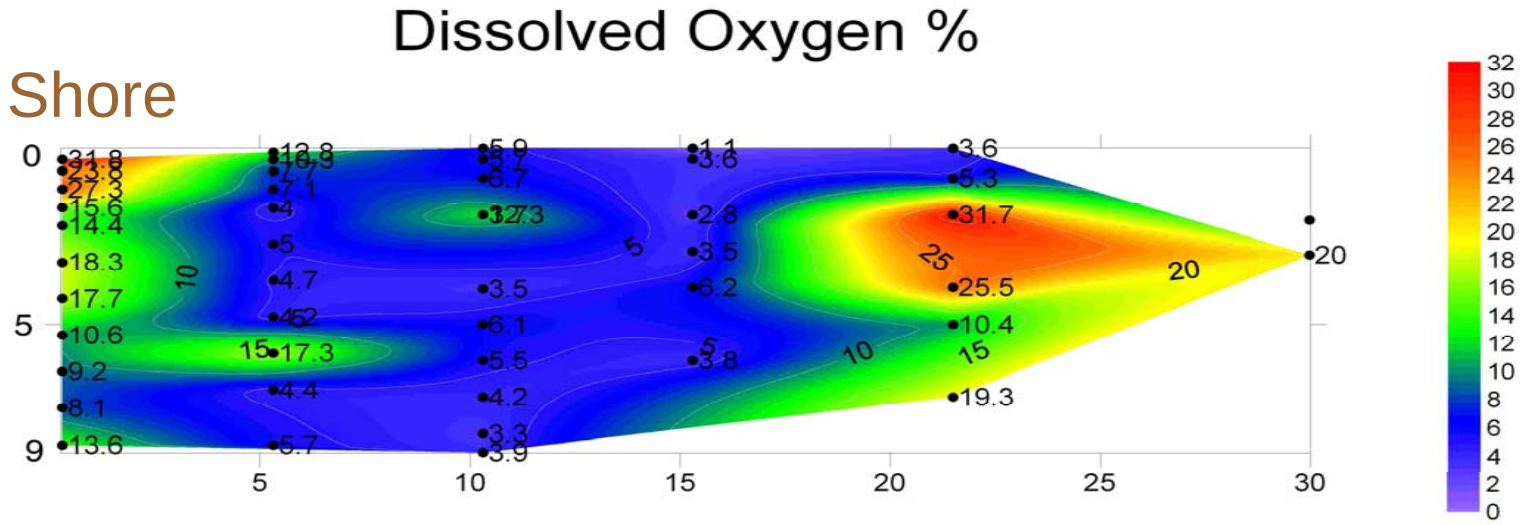
Patchogue Site





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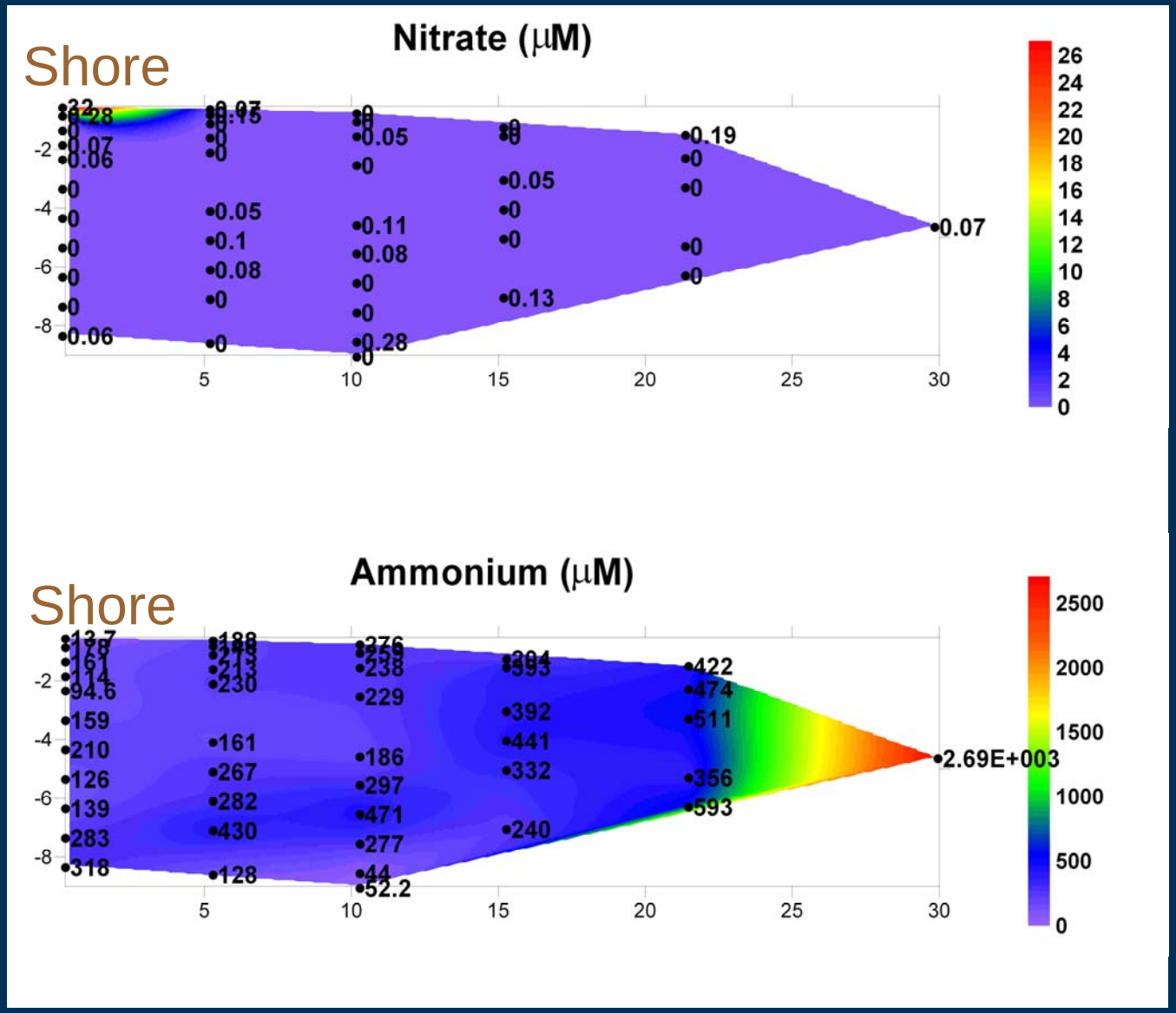

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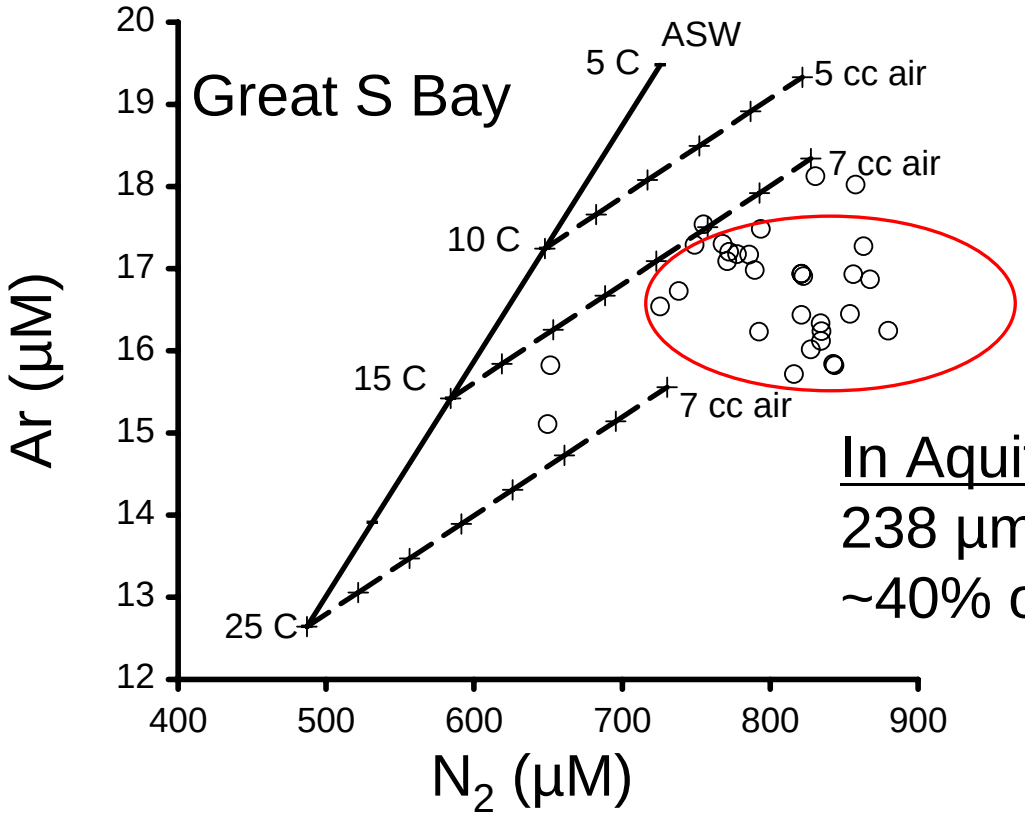

In Aquifer Denitrification

238 µmol/L DIN

~40% of N loaded to aq.

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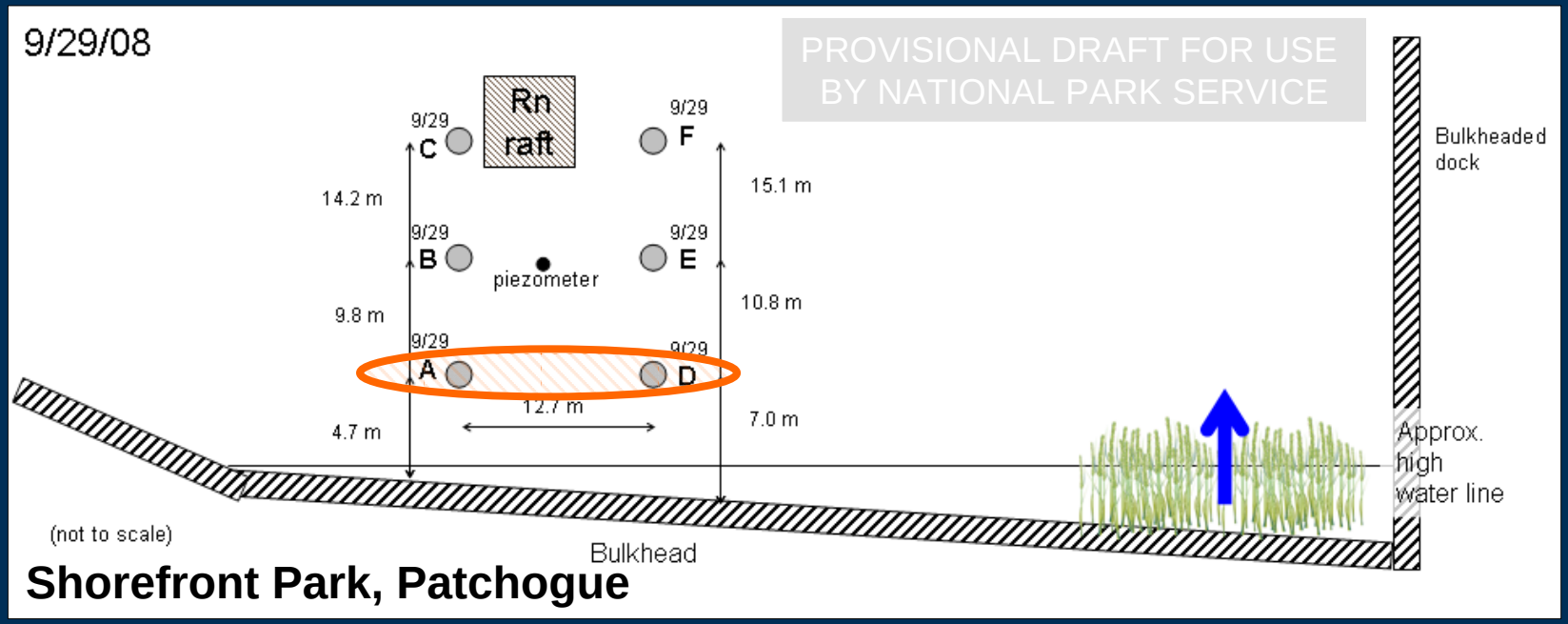
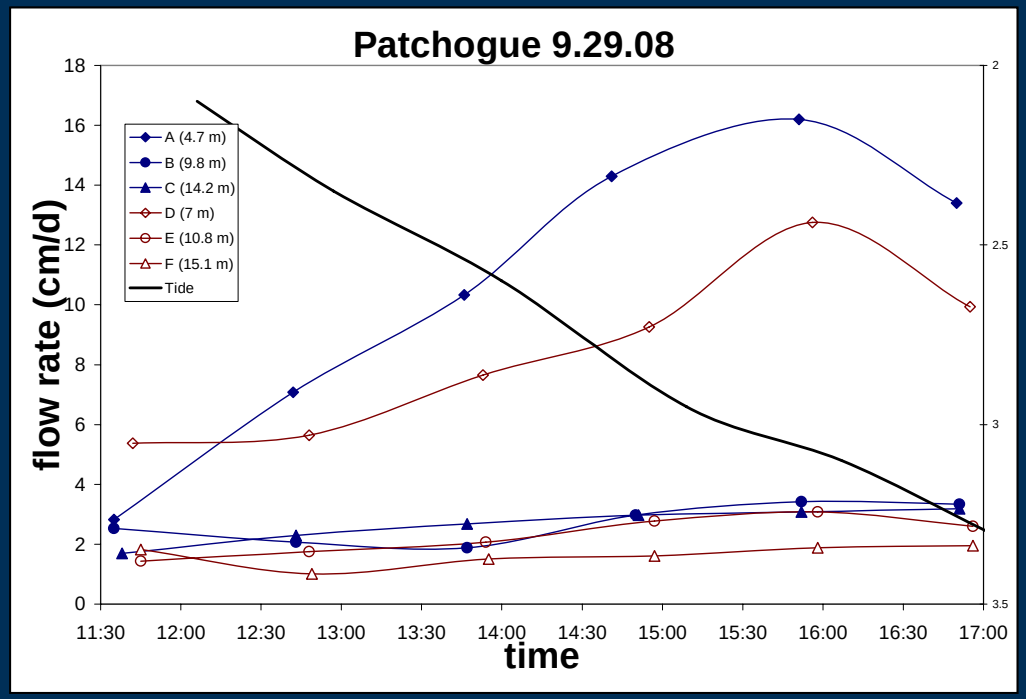
Image source: http://toxics.usgs.gov/photo_gallery/capecod.html


9/29/08
PROVISIONAL DRAFT FOR USE BY NATIONAL PARK SERVICE
Rn raft
9/29 C
9/29 F
14.2 m
15.1 m
9/29 B
9/29 E
piezometer
9.8 m
10.8 m
9/29 A
9/29 D
12.7 m
4.7 m
7.0 m
Bulkheaded dock
Approx. high water line
(not to scale)
Bulkhead
Shorefront Park, Patchogue


Patchogue 9.29.08
flow rate (cm/d)
time
A (4.7 m)
B (9.8 m)
C (14.2 m)
D (7 m)
E (10.8 m)
F (15.1 m)
Tide
0
2
4
6
8
10
12
14
16
18
2
2.5
3
3.5
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00

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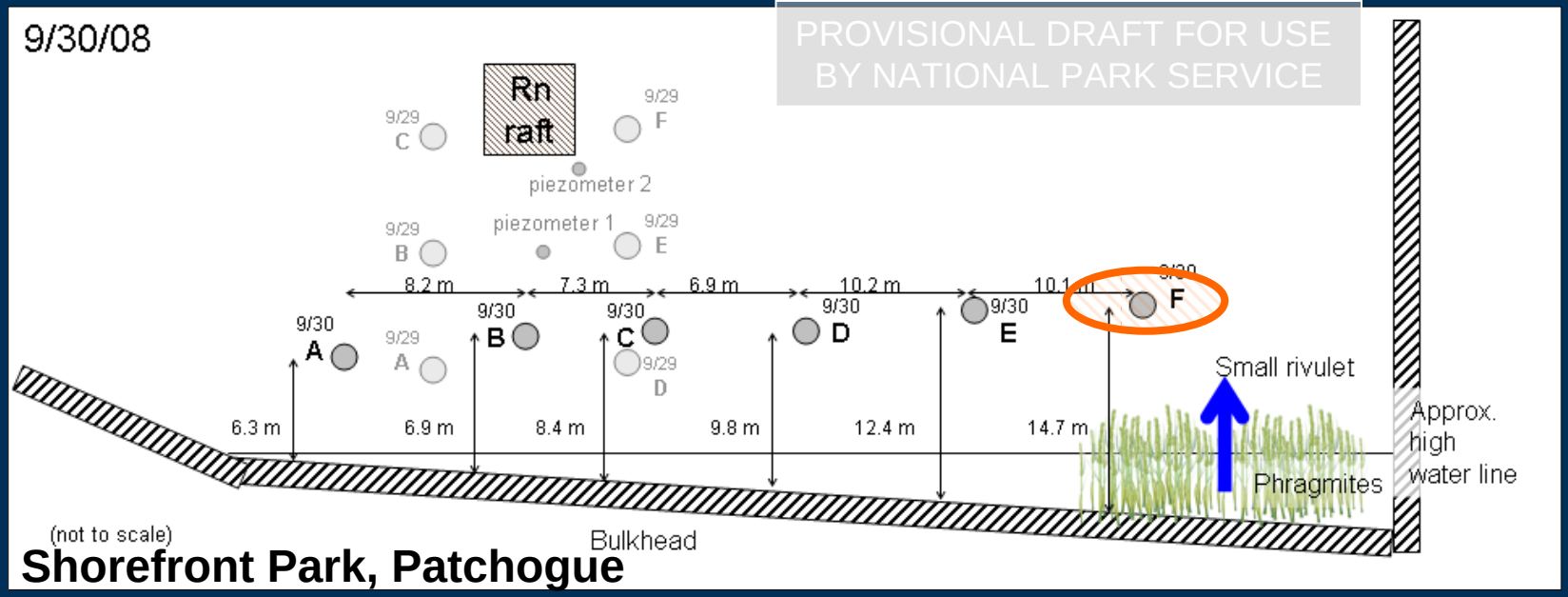
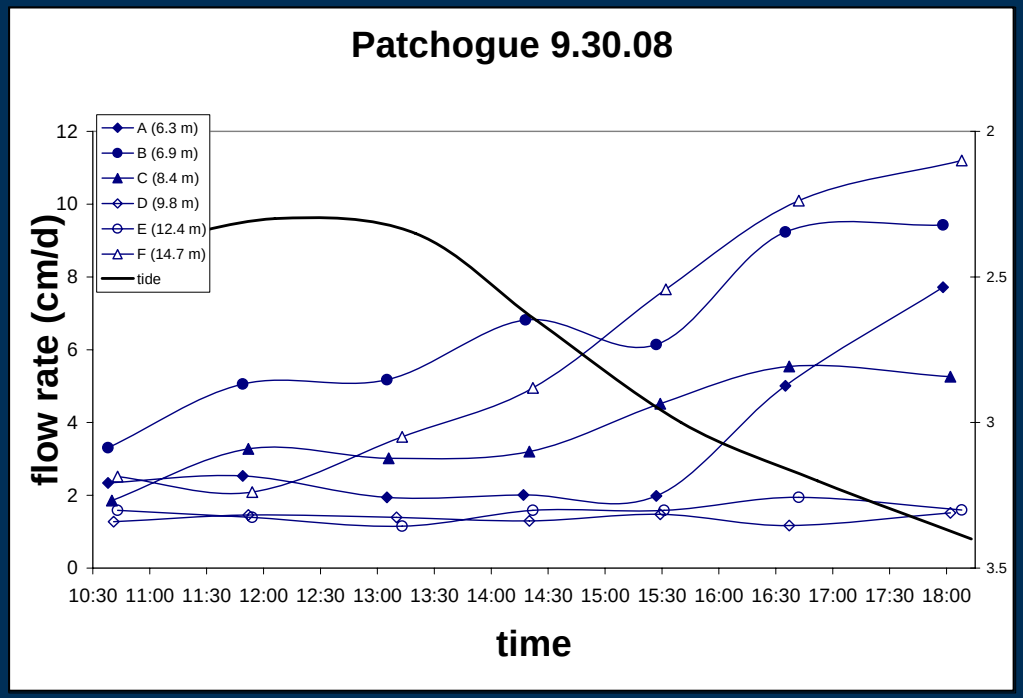


Shorefront Park, Patchogue



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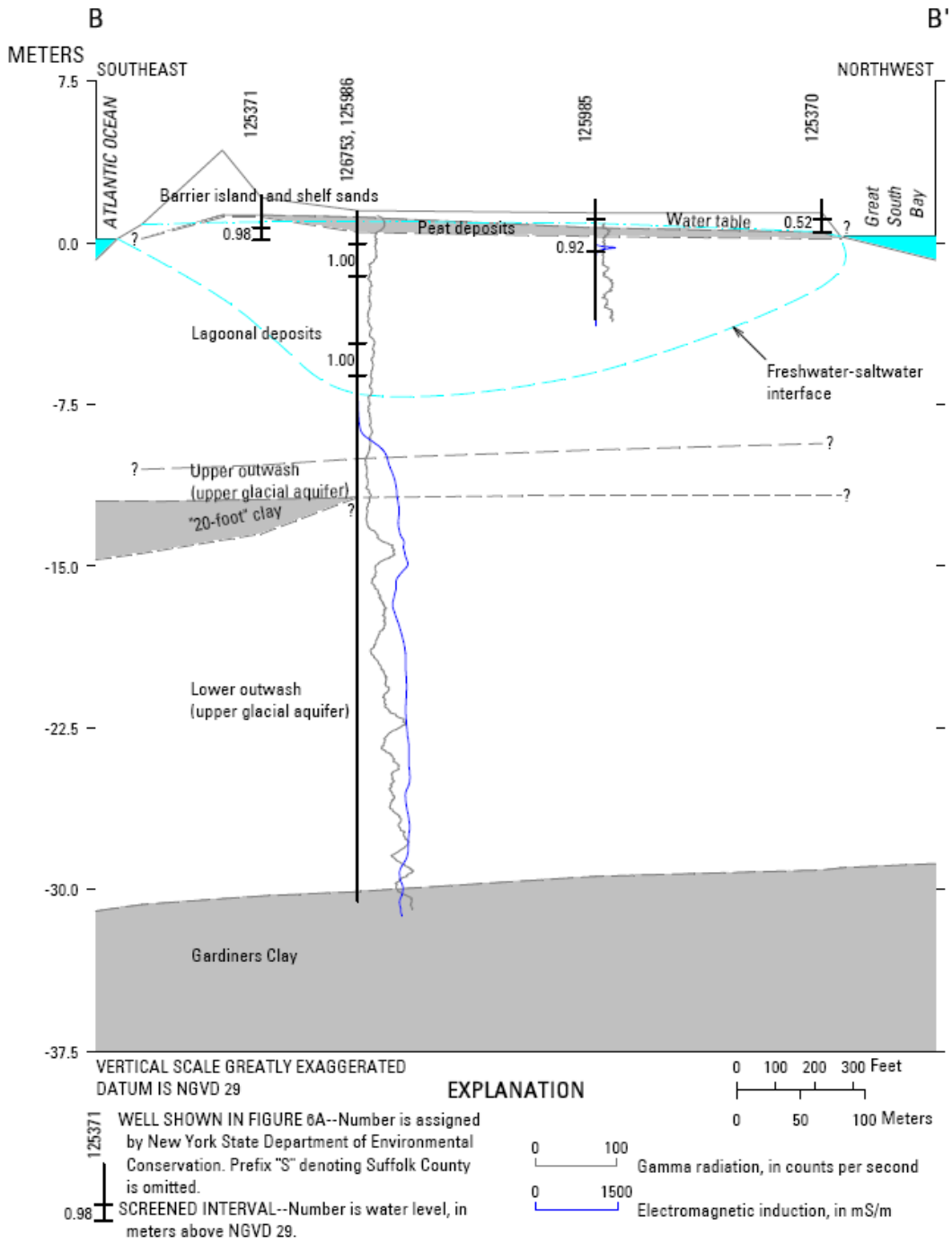

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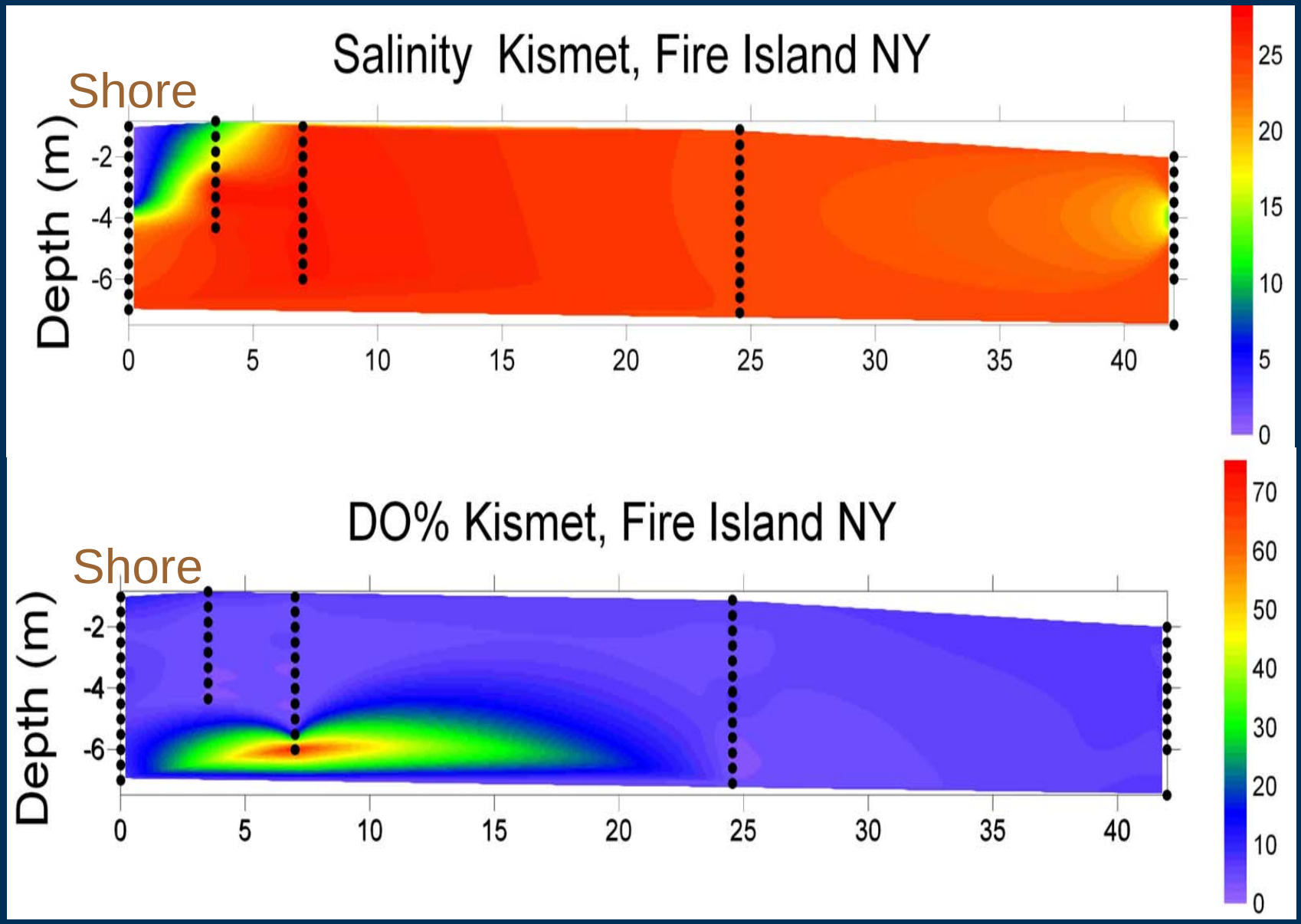

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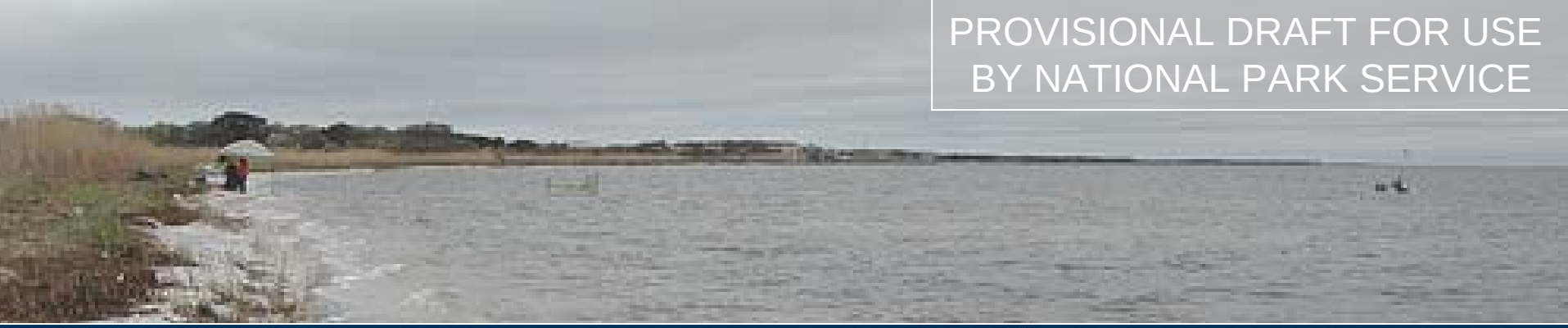

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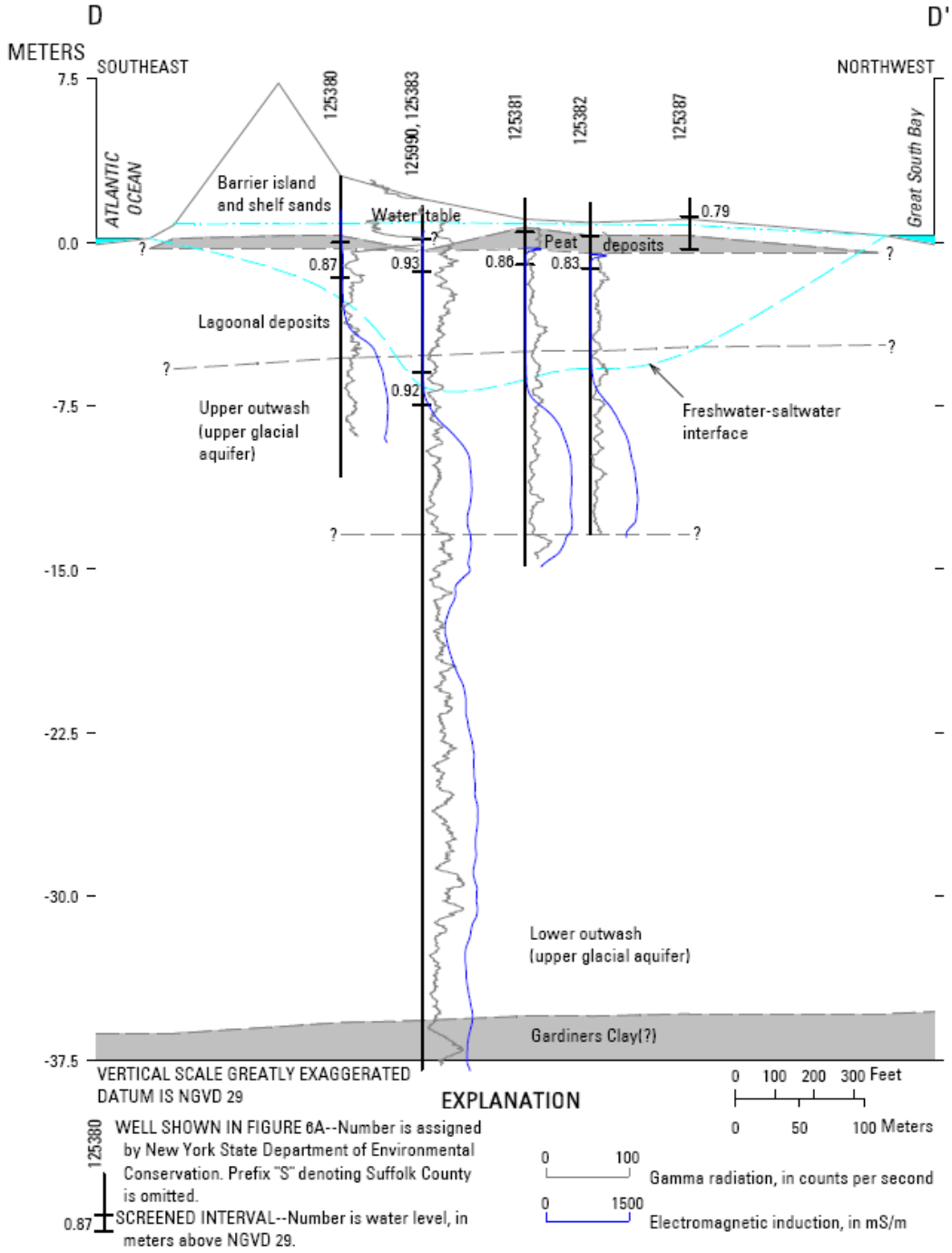

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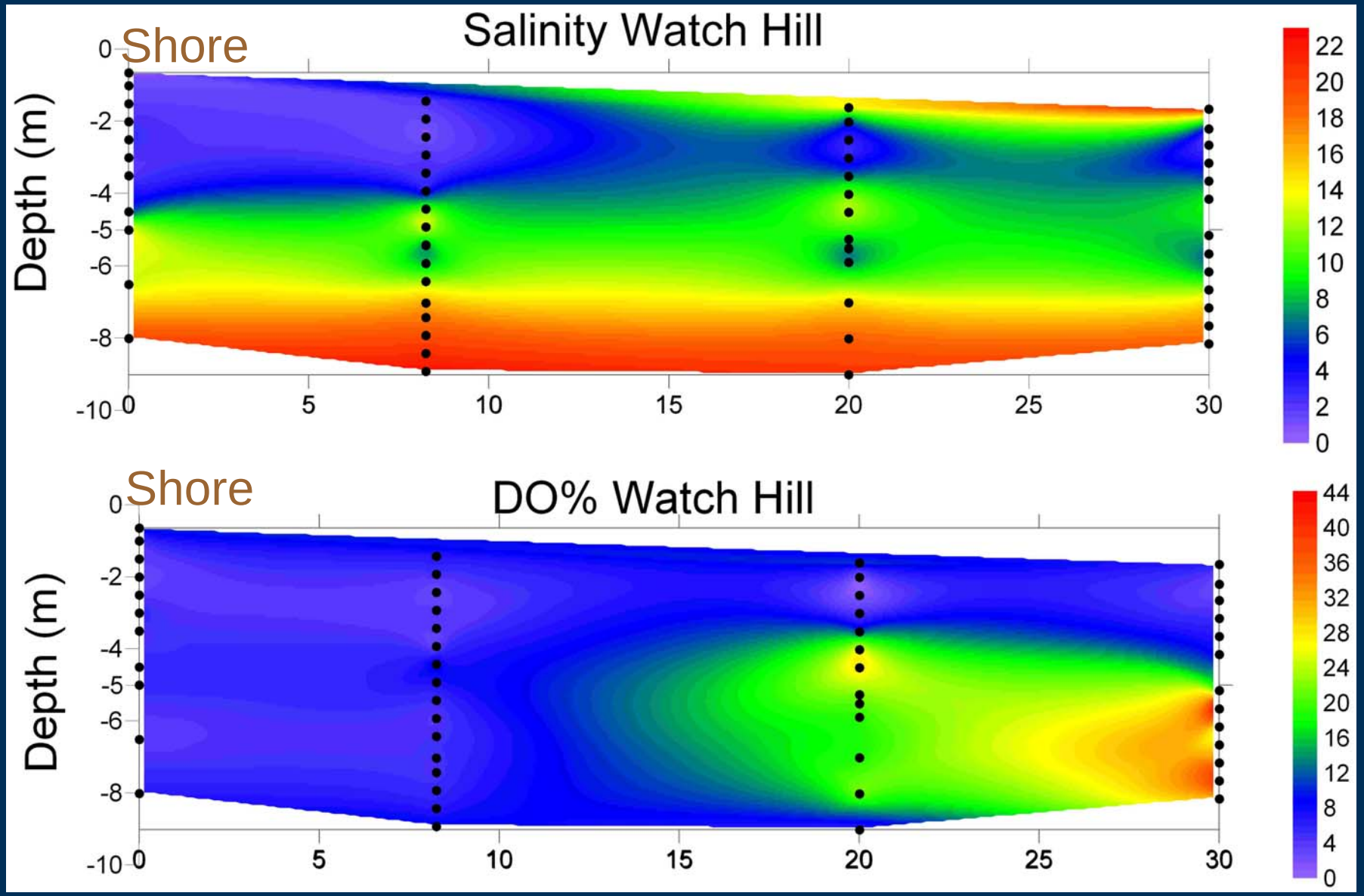

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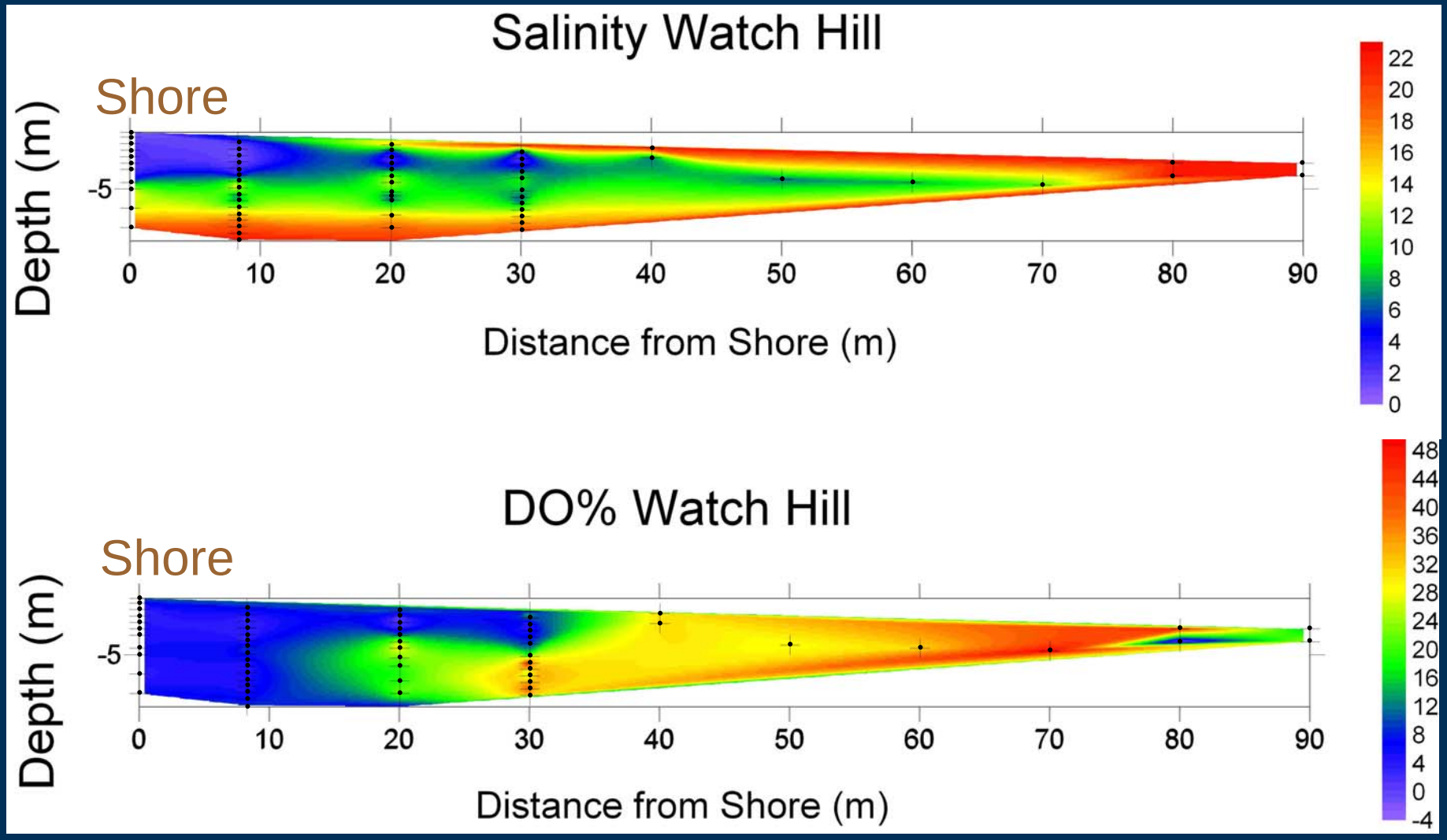

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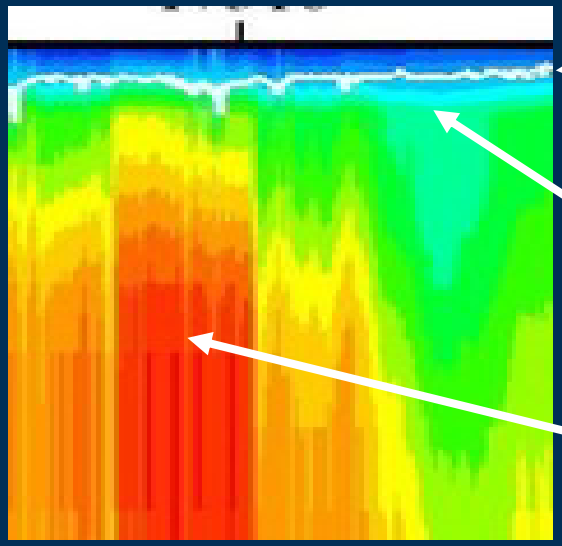
Key to Viewing Resistivity Profiles



White line = seafloor

Blue = low resistivity = salty

Red = high resistivity = fresh

Note: scales differ in images

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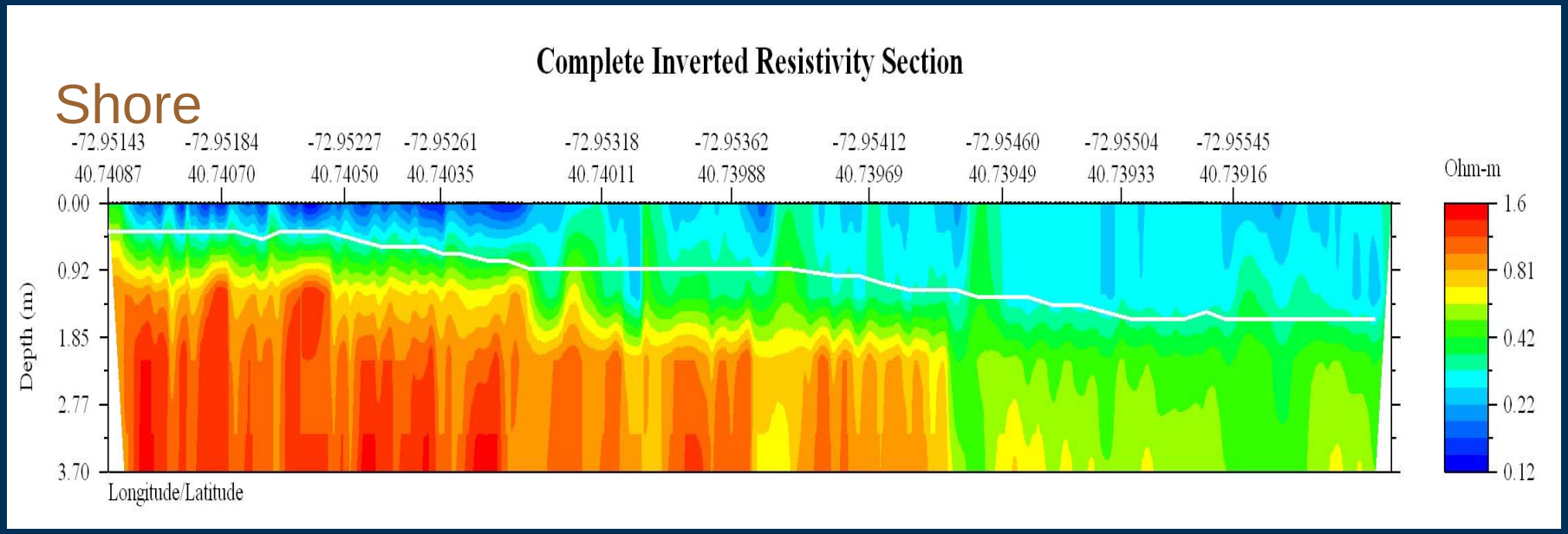

~1,000 feet

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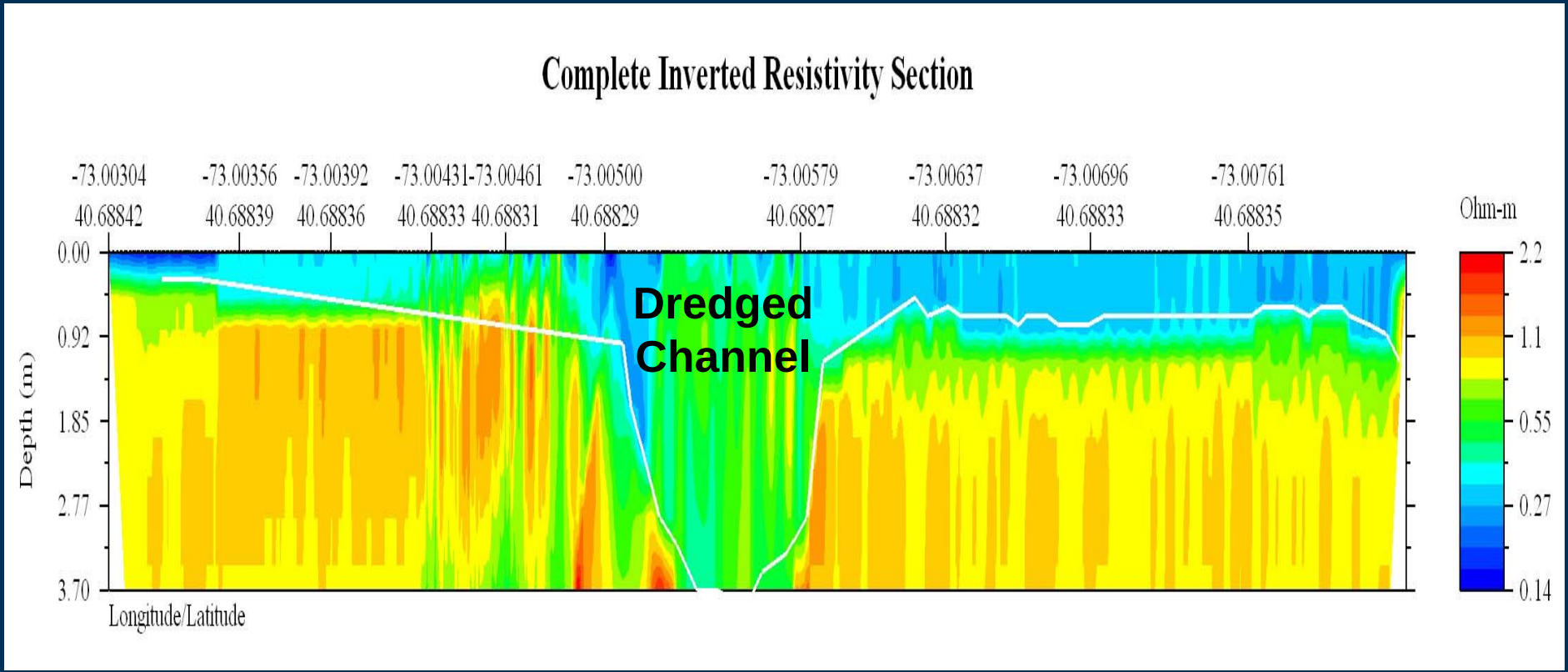

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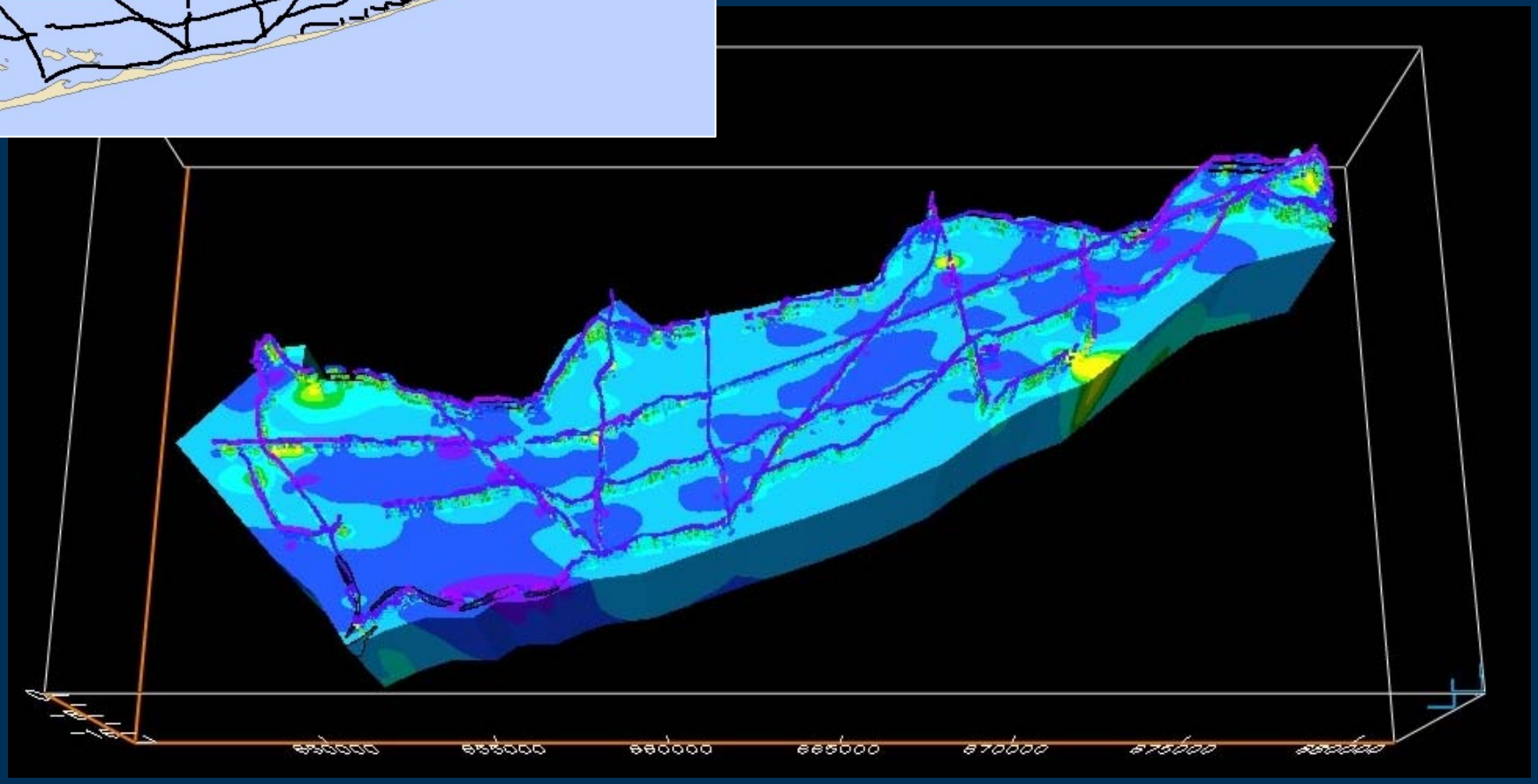
Horizontal resistivity slice at ~20 feet below sea level



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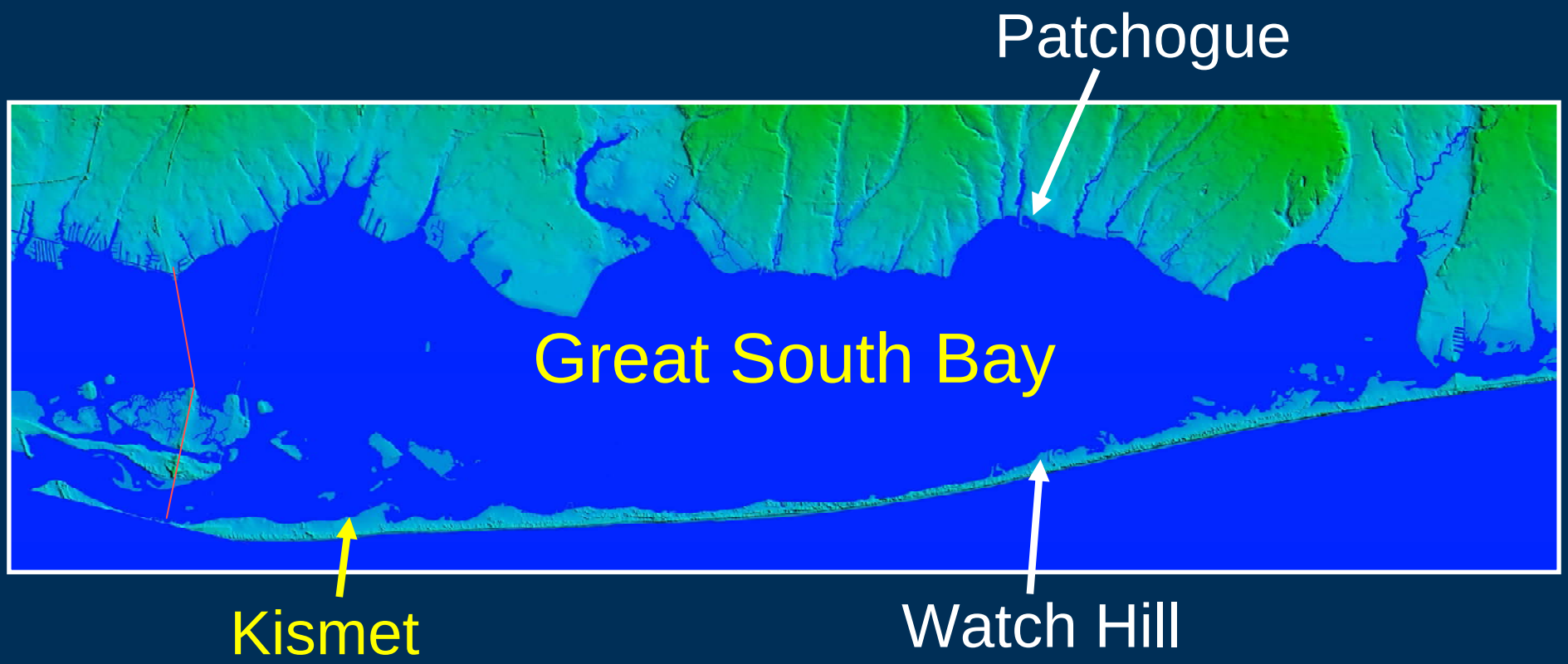

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West end of island located near current lighthouse in 1825

Kismet site

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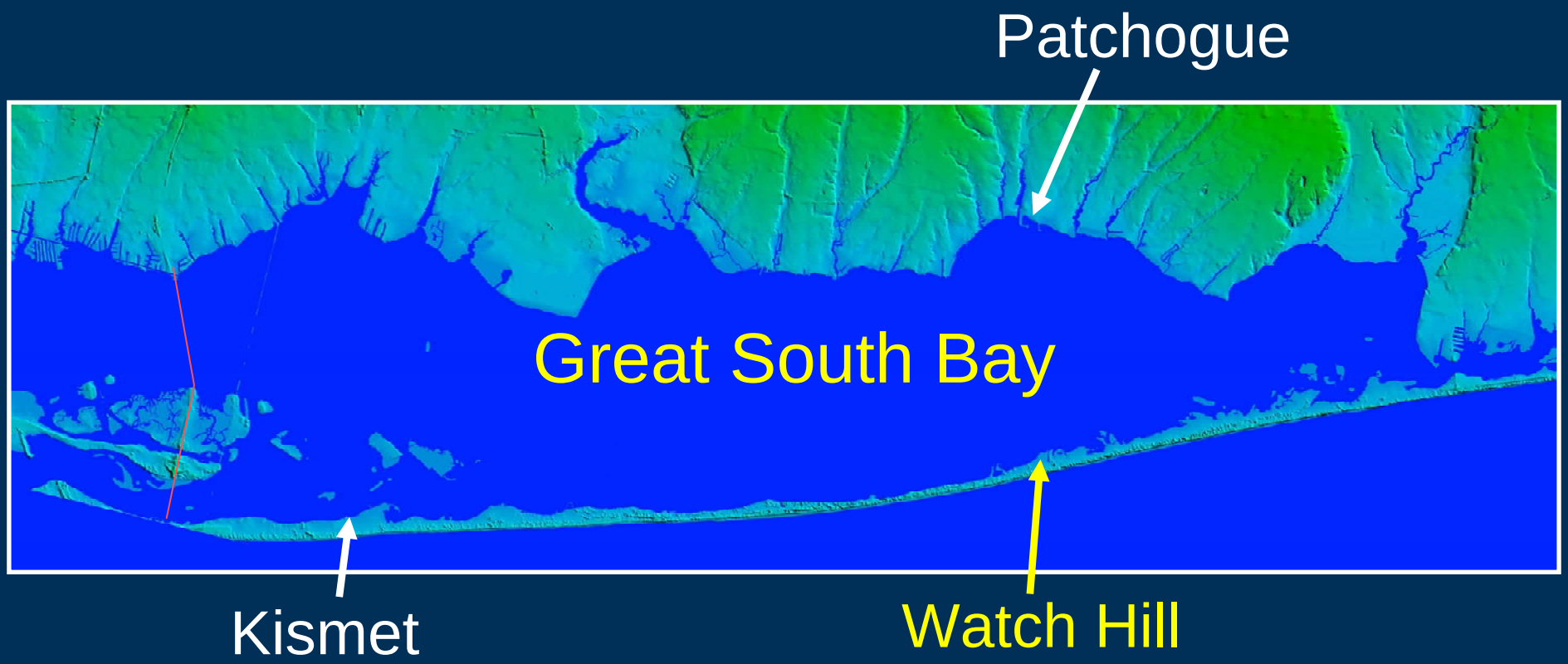

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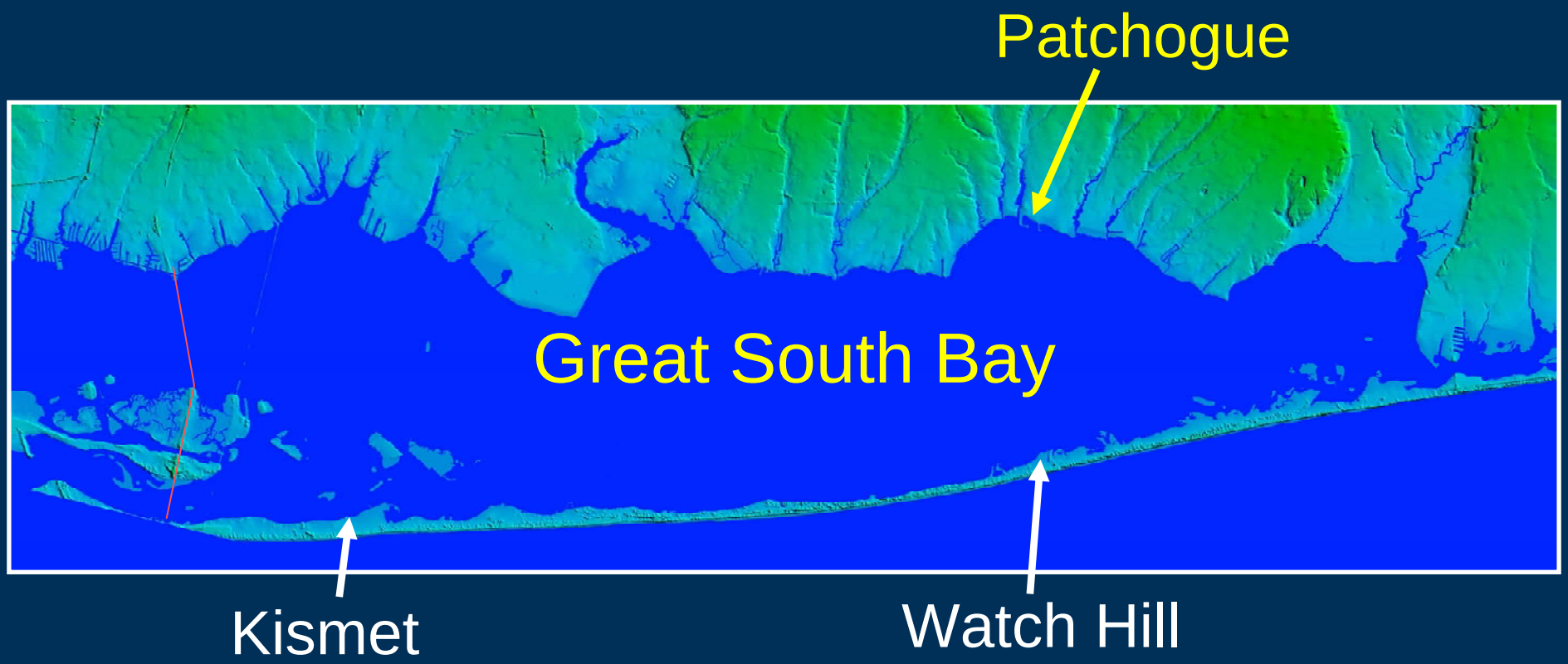

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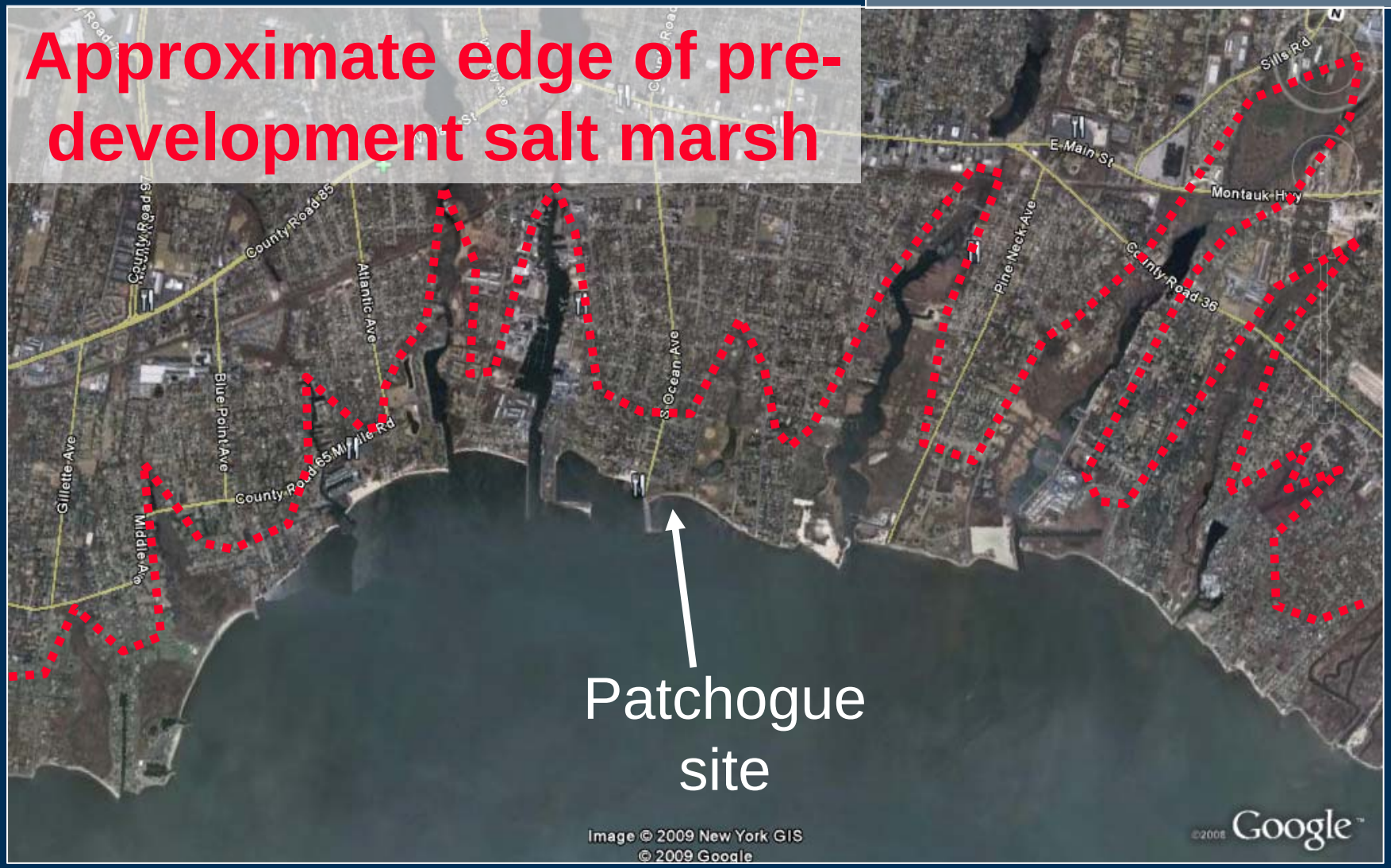
Approximate edge of pre-development salt marsh



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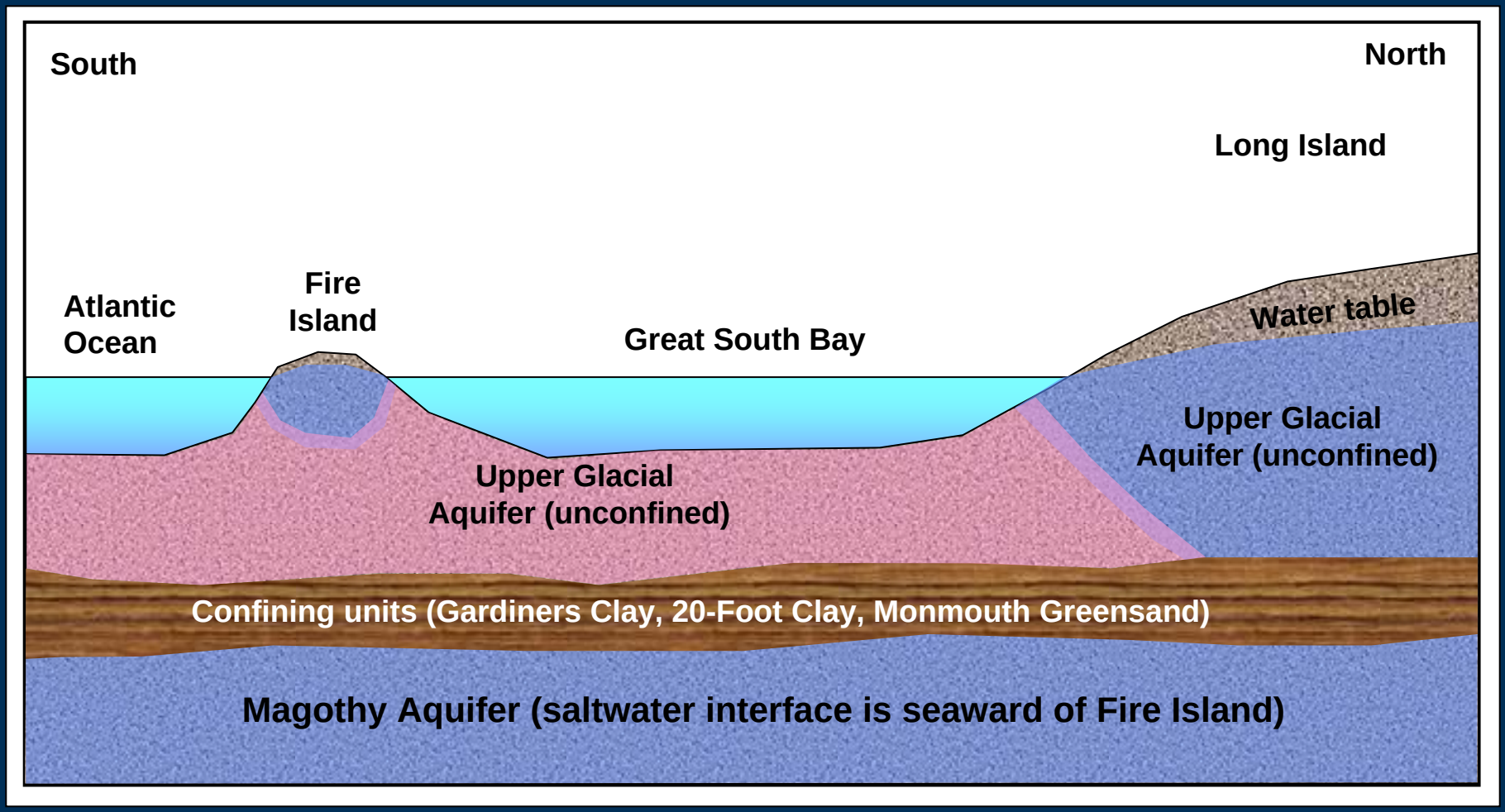

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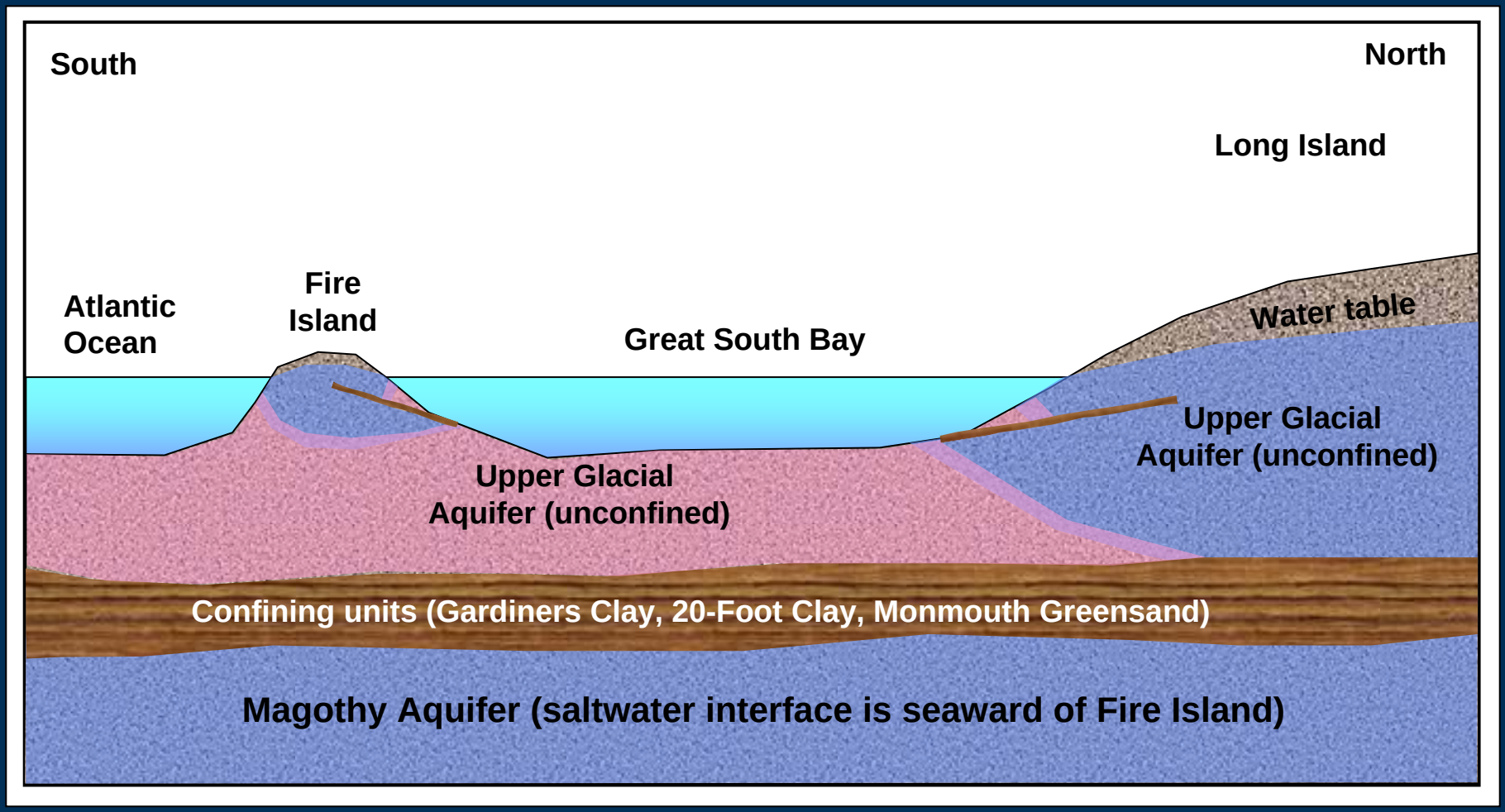

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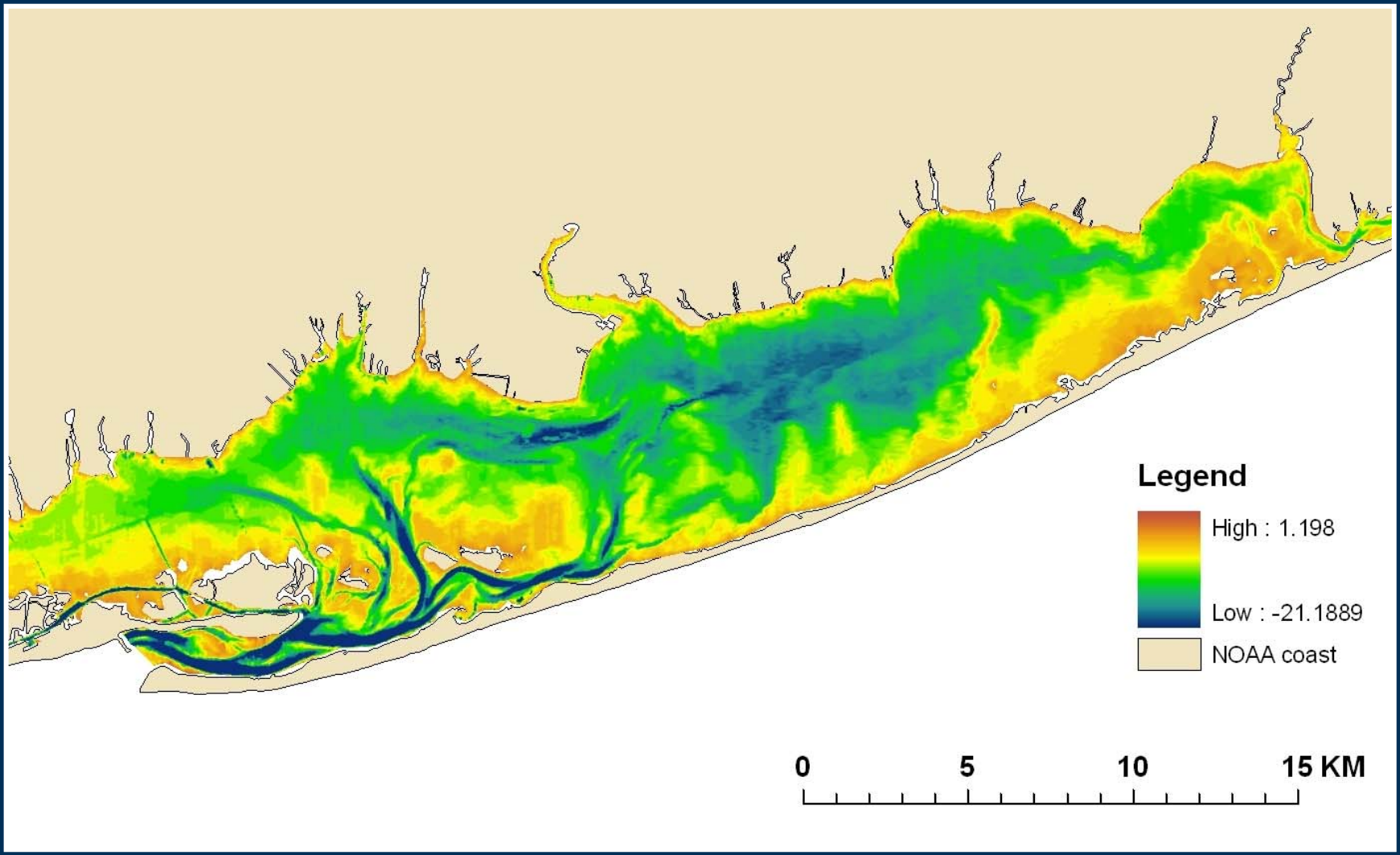

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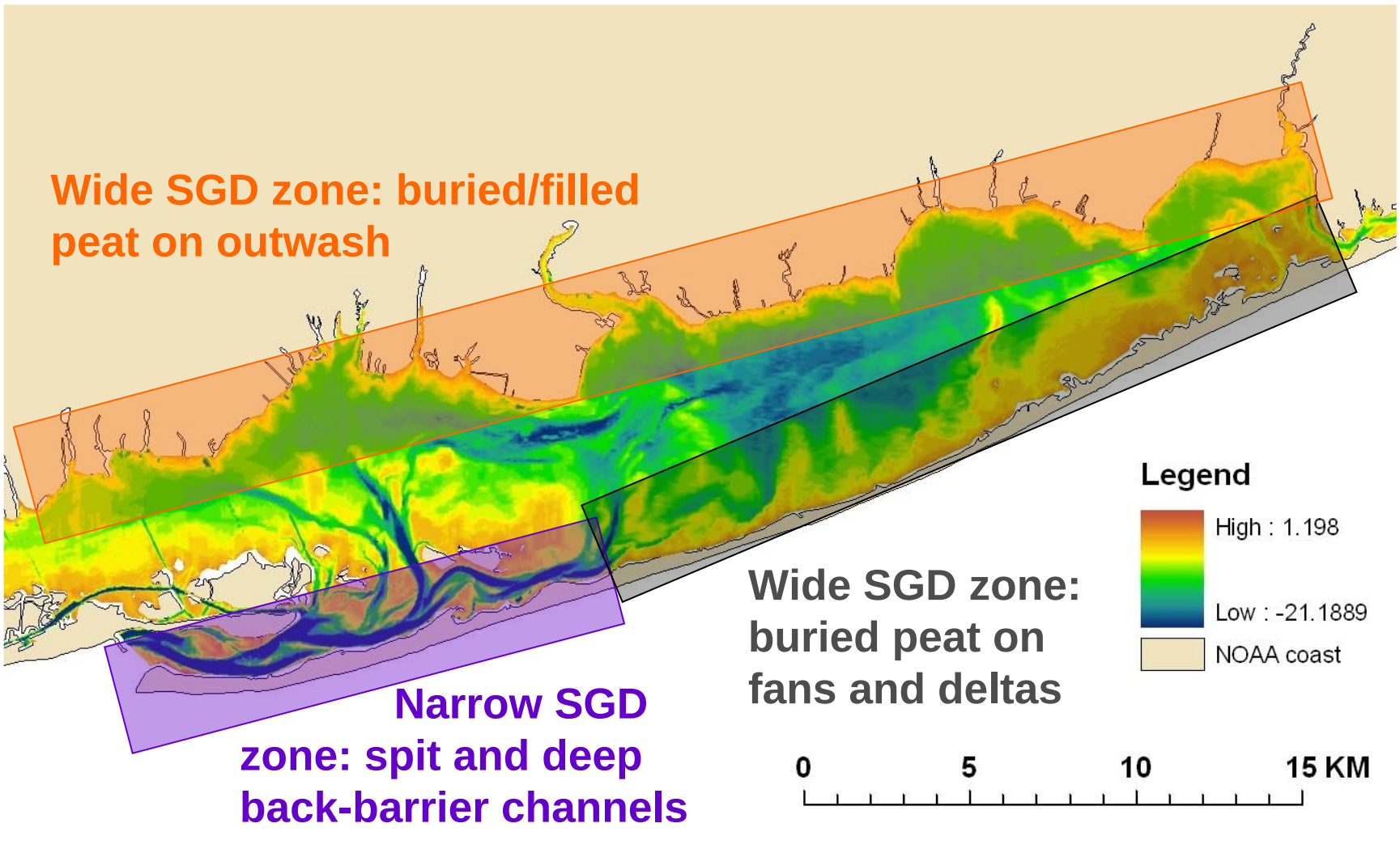

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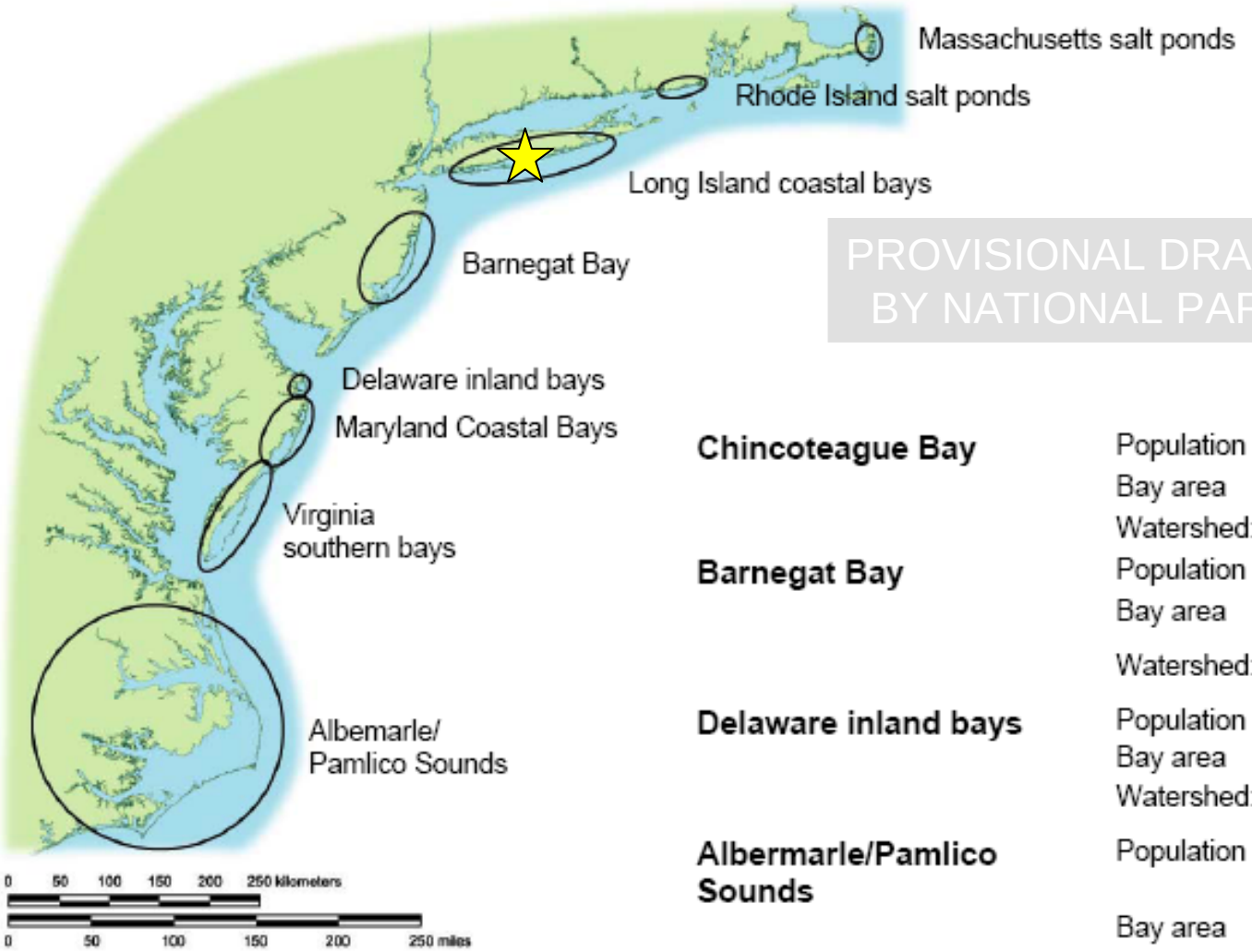
Coastal lagoons common along East Coast



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Chincoteague Bay	Population	20,000
	Bay area	509 km²
	Watershed:bay	1:1
Barnegat Bay	Population	450,000
	Bay area	ca 64,000 acres
	Watershed:bay	14:1
Delaware inland bays	Population	143,000
	Bay area	192,000 acres
	Watershed:bay	10:1
Albermarle/Pamlico Sounds	Population	2,200,000
	Bay area	1,500,000 acres
	Watershed:bay	13:1

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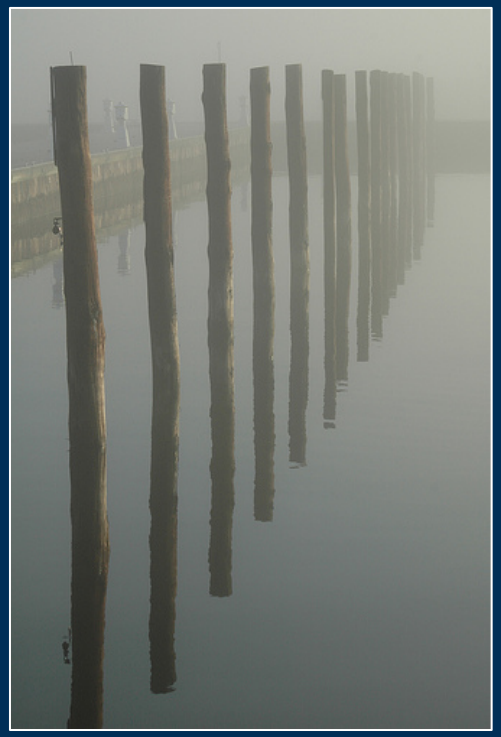
Summary

- SGD zone 25 to >200 feet wide
- Geological control by buried peats (where present) dominates; may be possible to predict peat locations based on shoreline type
- Shallow groundwater under the bay is generally low in oxygen and nitrate, and high in ammonium and methane due to recharge through buried onshore peats and wetlands



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Management Implications

- Wider SGD zones associated with buried peat can enhance nitrogen removal via denitrification
- Integrity of buried peat should be protected (e.g., limit dredging and shoreline modification) to maximize the benefits of natural remediation
- Areas of Great South Bay off western Fire Island without offshore peats are better flushed, so the narrow SGD zone and lack of peat are less significant

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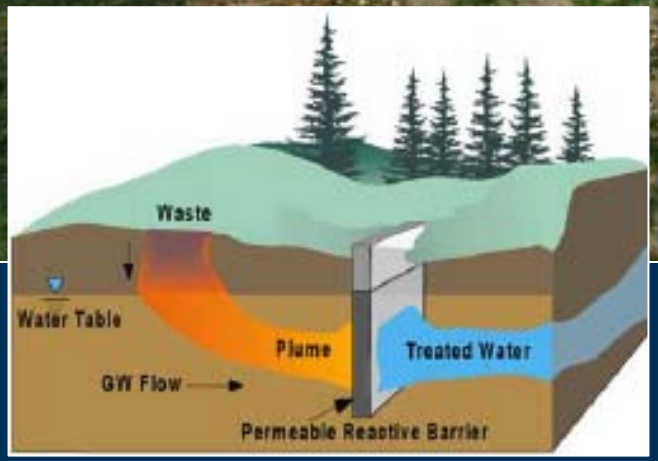

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