2026 New Jersey Coastal & Climate Resilience Conference

Nature-Based Climate Solutions to Lower the Temperature

The Low-Cost Alternative to Mitigating Severe Weather Events

BRITTA FORSBERG & KAREN ARGENTI

Science, Municipal Leadership, and Community Action in Barnegat Bay Watershed

Barnegat Bay is the largest coastal lagoon in New Jersey, and the communities around it are increasingly facing the combined pressures of heat, flooding, and coastal storms. Today we're going to look at how nature-based solutions are already being used across this watershed to reduce risk and strengthen resilience.

SAVE BARNEGAT BAY

MATT VON DER HAYDEN

From Concept to Implementation: Stafford Township

Municipal leadership in climate resilience

How local governments are using nature-based solutions, data, and strategic investment to build climate resilience in the Barnegat Bay watershed.

Resilient Stafford Action Plan

A Roadmap to Climate Resilience

The Plan
Resilient Stafford: A Strategic Framework

Goals:
1. Preservation of Natural Resources
2. Resilient Infrastructure Design
3. Civic Empowerment and Preparedness
4. Economic Development Initiatives

Our goal is to align environmental protection with infrastructure investment.

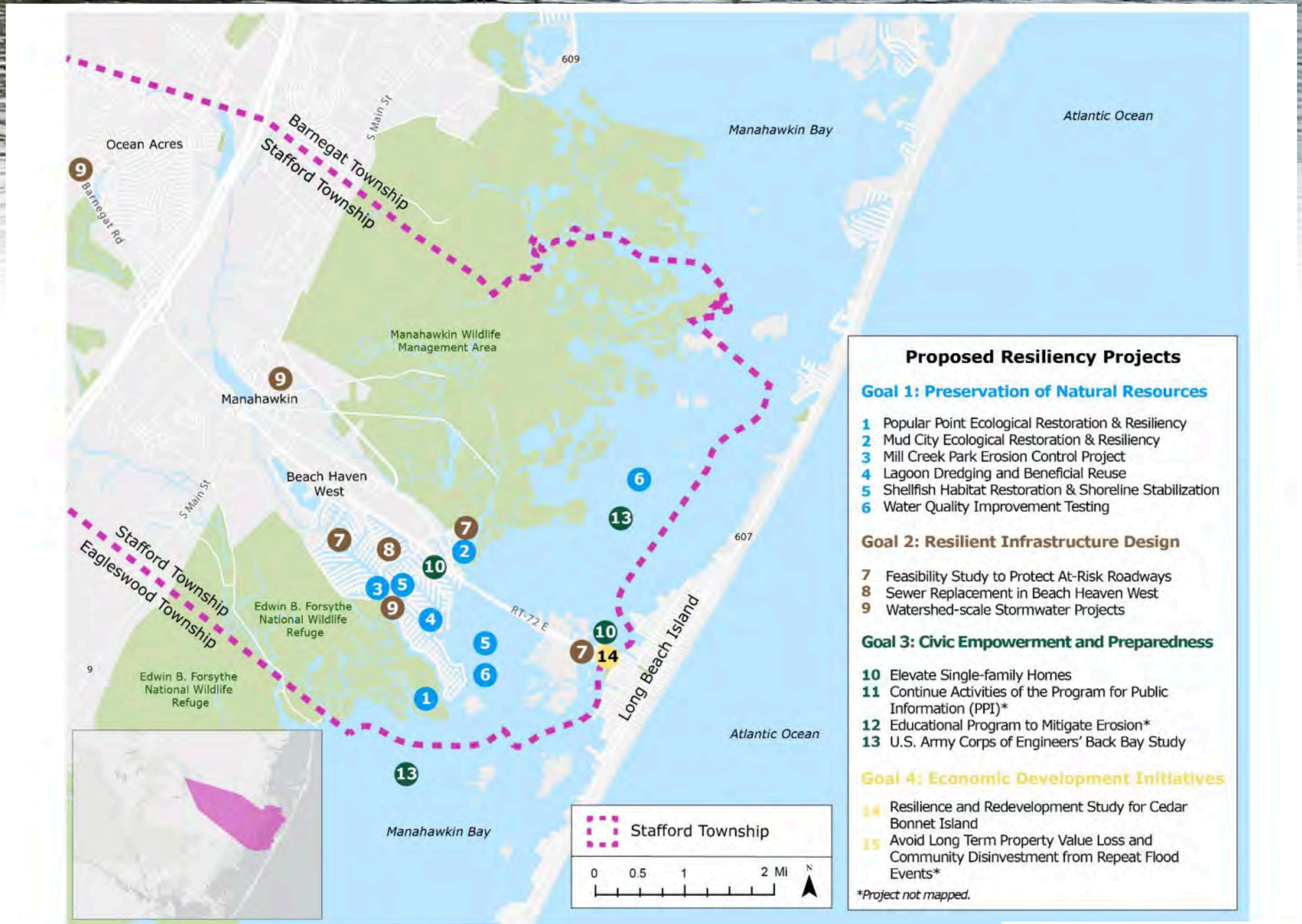


Figure 8: Resilience and Adaptation Actions Map

Resilient Stafford Action Plan
Section 6: Resilience and Adaptation Actions

RESILIENT NJ

Implementation in Action

NJIB » NEWS » STAFFORD TOWNSHIP BEACH HAVEN WEST SEWER REPLACEMENT PHASE VII

NJIB *December 16th, 2025*

STAFFORD TOWNSHIP BEACH HAVEN WEST SEWER REPLACEMENT PHASE VII

NJ I-Bank and NJDEP Helping to Improve New Jersey's Infrastructure, One Project at a Time

These projects improve water quality, and protect the bay.

The Local Challenge

- Growing coastal flooding risks
- Aging water & sewer infrastructure
- Pressure on Barnegat Bay ecosystem
- Need to balance growth and protection

Implementation in Action

Cleaning Up the Bay

Nature-Based Infrastructure at Work

Nature-based solutions reduce infrastructure pressure

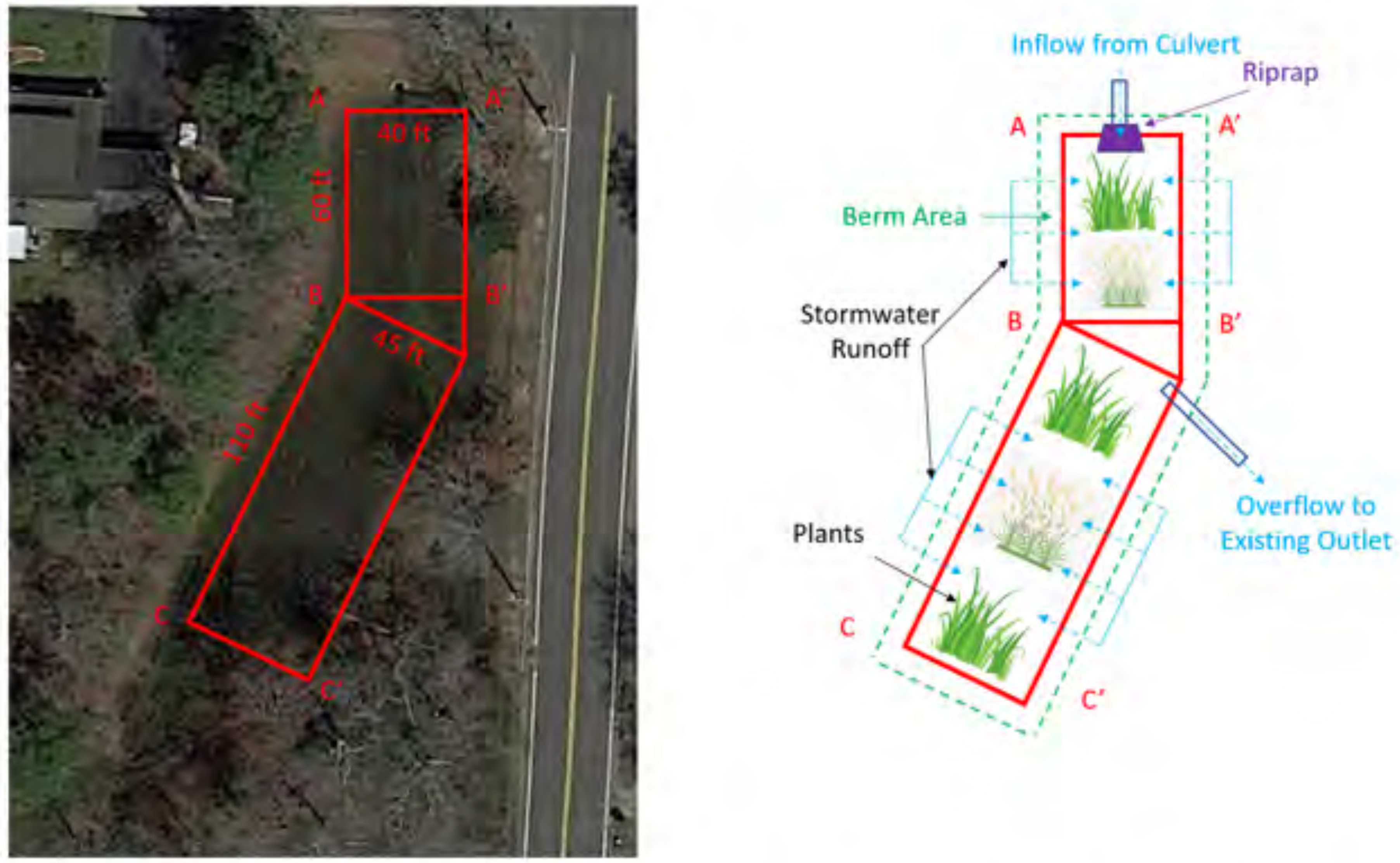
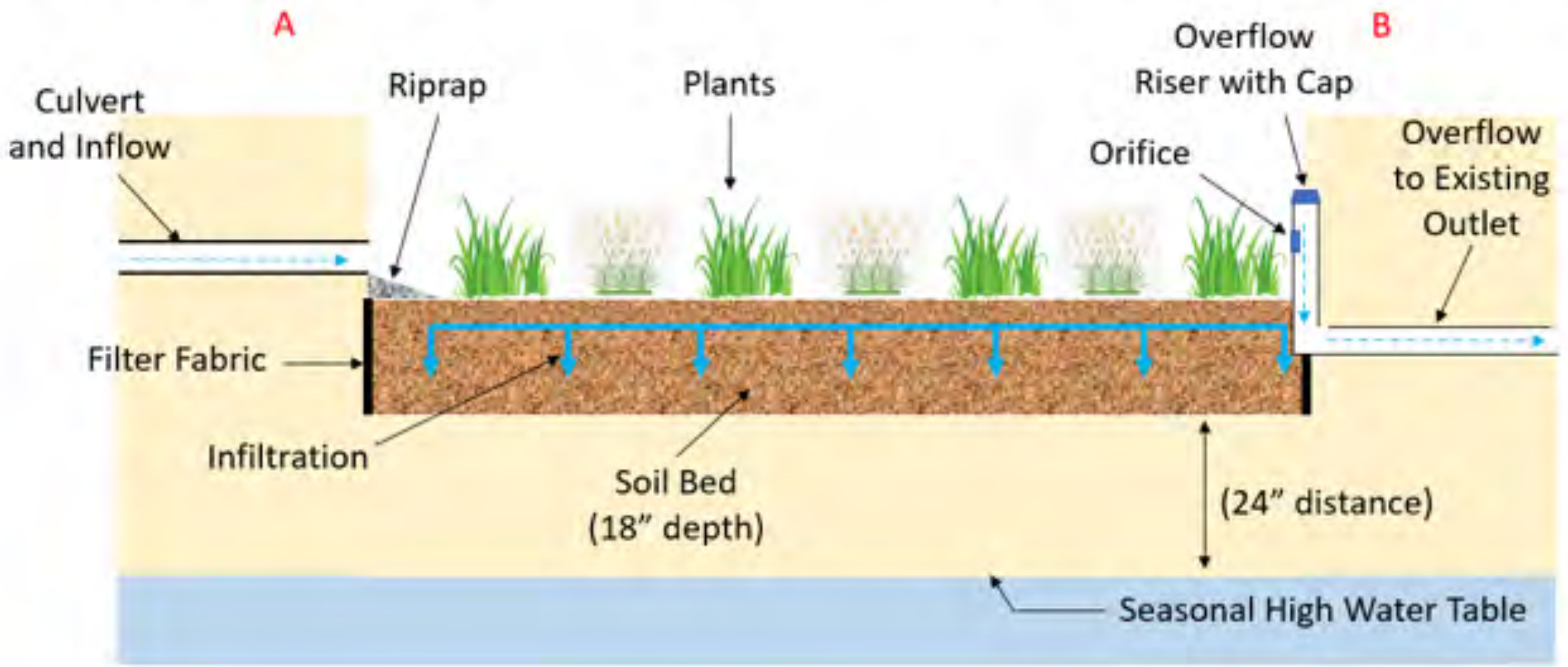


Figure 7. Design area and dimensions of the bioswale (left) and plan view of bioswale (right)



ARPA Funds – Ocean County Provided Bioswale & NJDEP/Mud City Study

Investing in Resilience

Strategic investment today avoids much larger costs tomorrow.

- $4,998,109 NJDEP resiliency grant
- Stormwater management improvements
- Long-term infrastructure planning
- Lower long-term municipal costs

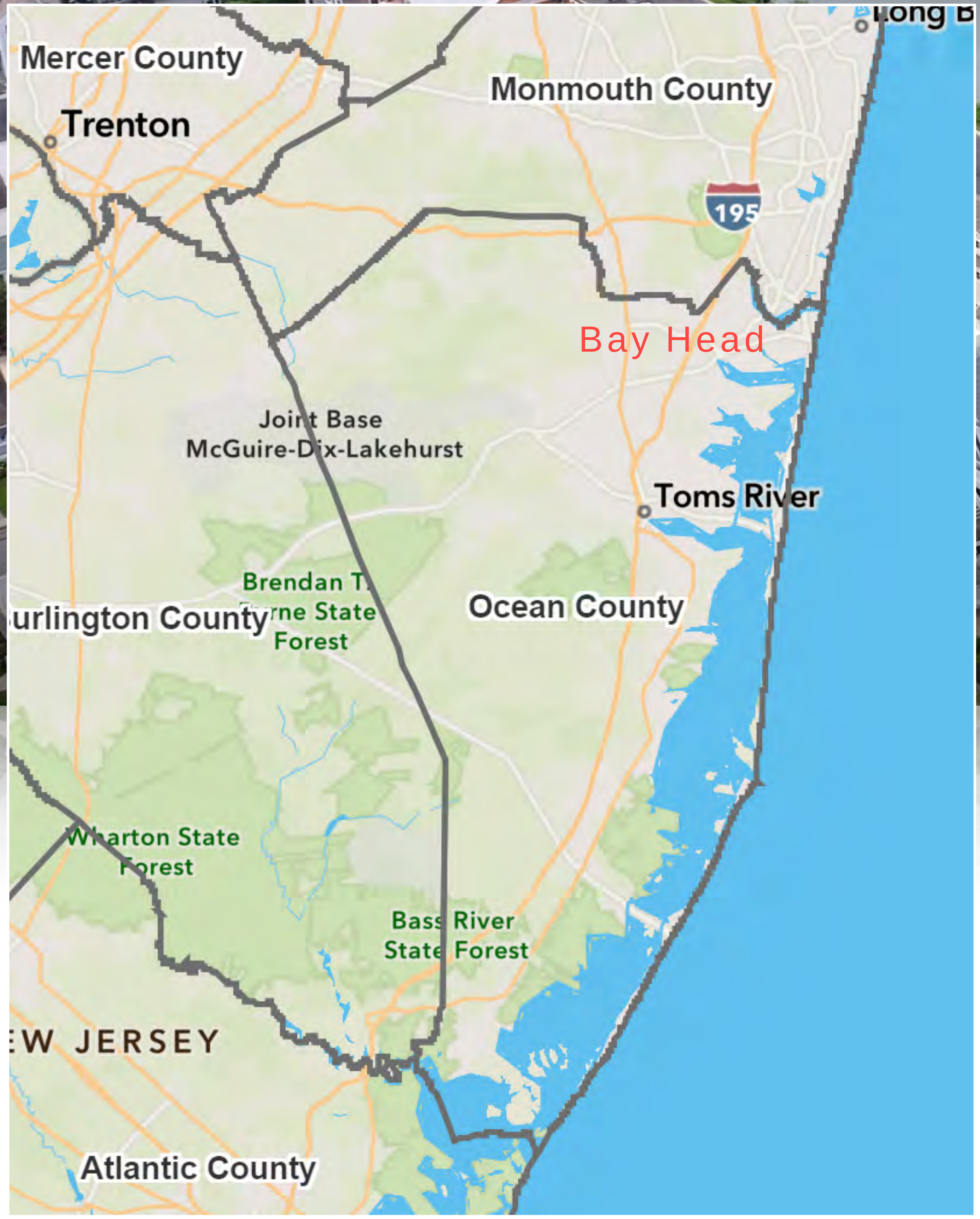
RICK MCGOEY

Borough of Bay Head
Data-Driven Coastal Management

Municipal leadership in climate resilience

Borough of Bay Head Climate Resilience Project
- Enhance Twilight Lake Ecosystem
- Promote & Enhance Natural Carbon Sink
- Utilize science & data driven analyses to mitigate flooding due to environmental changes.

BOROUGH OF BAY HEAD • NEW JERSEY •



Borough of Bay Head

- Bay Head is a coastal community located north of Barnegat Bay.
- Twilight Lake lies in the center of Bay Head and is a tidal waterbody hydraulically connected to Barnegat Bay.
- Twilight Lake is an environmentally sensitive ecosystem, home to salt marshes, wetlands, and sea grass, and is a source of recurrent and severe flooding.

Twilight Lake Ecosystem Project

- Completed a comprehensive 3-year Twilight Lake Watershed Improvement study to understand and enhance the sustainability of this ecosystem.
- Currently is in the middle of 3-year project of installing a system of improving the water quality of Twilight Lake. This involves installing a bio-char filter system.
- With the collected data and analysis, a detailed action plan will be developed to enhance the salt marshes, wetlands, and sea grass.

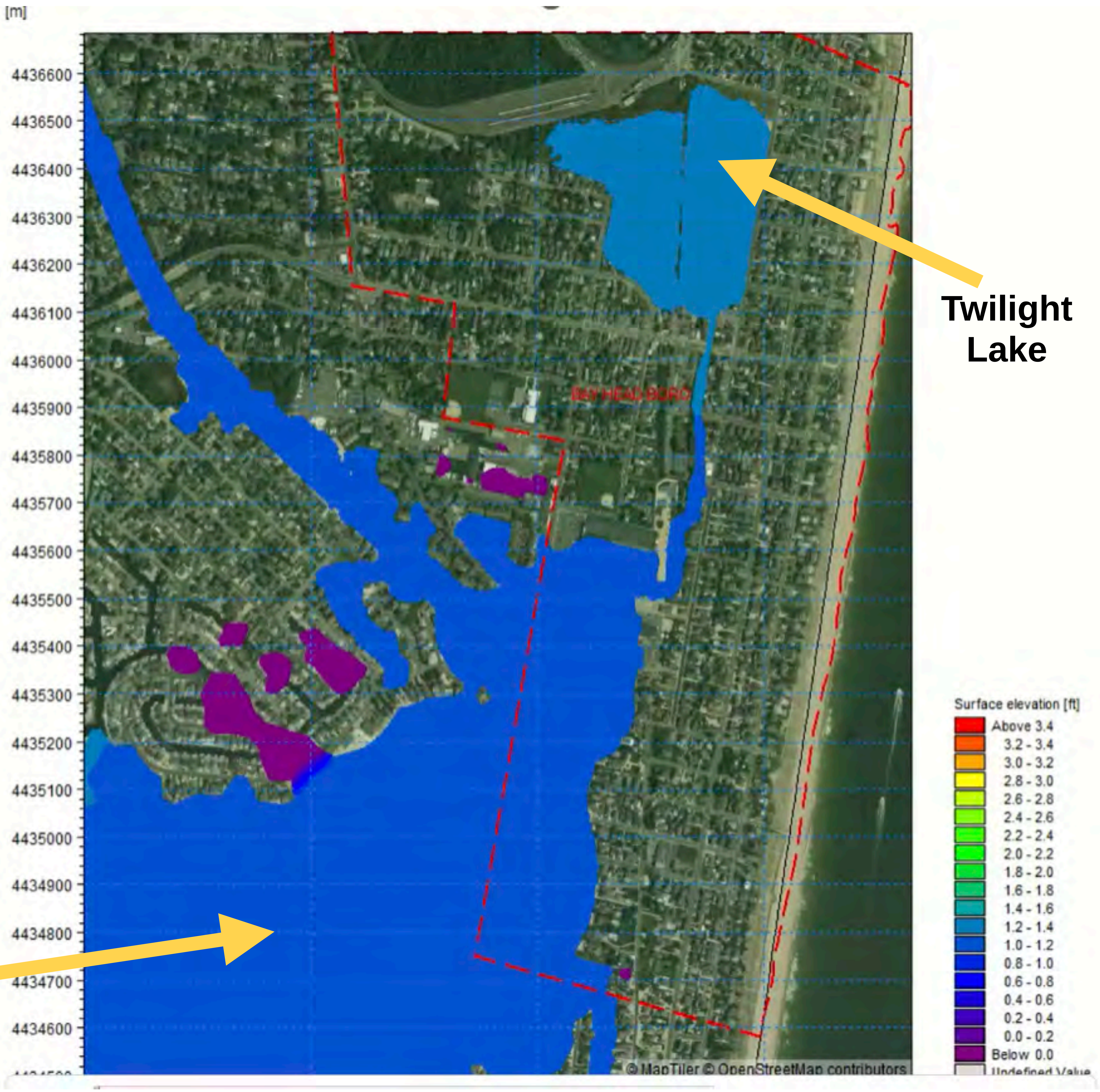
Data-Driven Flood Mitigation Planning

Monitoring & Analysis

- Water level gauges and weather station monitoring
- USGS water level gauge data integration
- Back-bay storm surge modeling across multiple event scenarios

Designing Resilience Solutions

- Twilight Lake living shoreline restoration
- Tidal flood control gate to reduce contamination and flooding
- Permeable roadway surfaces to improve stormwater infiltration
- Pump station to regulate Scow Ditch and Twilight Lake floodwaters

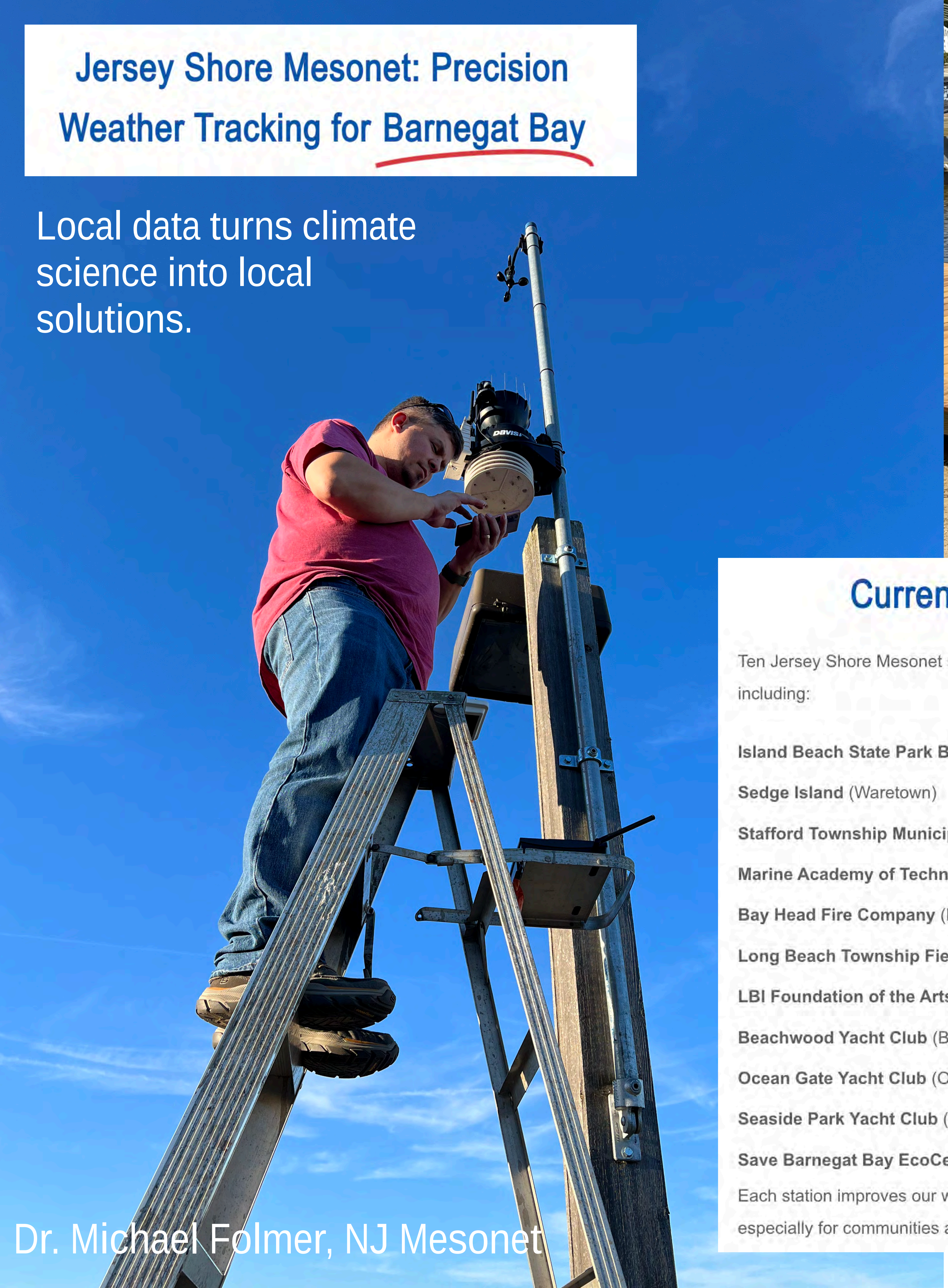


Twilight Lake

North Barnegat Bay

Jersey Shore Mesonet: Precision Weather Tracking for Barnegat Bay

Local data turns climate science into local solutions.



Dr. Michael Folmer, NJ Mesonet

Current Mesonet Stations

Ten Jersey Shore Mesonet stations currently contribute to this network, including:

Island Beach State Park Bathhouse #1 (Island Beach State Park)

Sedge Island (Waretown)

Stafford Township Municipal Complex (Manahawkin)

Marine Academy of Technology & Environmental Science (Manahawkin)

Bay Head Fire Company (Bay Head)

Long Beach Township Field Station (Holgate)

LBI Foundation of the Arts & Sciences (Long Beach Township)

Beachwood Yacht Club (Beachwood)

Ocean Gate Yacht Club (Ocean Gate)

Seaside Park Yacht Club (Seaside Park)

Save Barnegat Bay EcoCenter (Toms River)

Each station improves our weather forecasting accuracy for the Jersey Shore, especially for communities around Barnegat Bay.

Drexel University & Bay Head team

Science Informing Future Solutions

- Coastal systems are hyper-local
- Generic models aren't enough
- Local monitoring enables actionable decisions

BAY HEAD WEATHER AND FLOOD SUMMARY

2023 ANNUAL WEATHER RECAP

Temperature Sumary		Wind Summary		Precipitation Summary	
AVG. TEMP.	56.5°	AVG. WIND	6.2 mph	TOT. RAIN	41.8"
WARMEST	94.8° 07/27/2023	WIND GUST	64 mph 04/01/2023	MOST RAIN	2.7" 09/29/2023
COLDEST	8.6° 02/04/2023			TOT. SNOW	0.0"

2023 ANNUAL FLOOD RECAP

Flood Summary	Days	Avg Bay	Avg Rain	Avg Wind	Max Wind
NO FLOOD	315 days	1.03 ft	0.1"	6.0 mph	21.8 mph
NUISANCE	47 days	1.71 ft	0.3"	7.5 mph	26.4 mph
MAJOR	3 days	2.27 ft	1.5"	11.1 mph	38.0 mph

ANNUAL SEA LEVEL RISE RECAP

	2023	2022	Change
AVG MEAN TIDE	0.58 ft	0.32 ft	0.26 ▲ ft
AVG LOW TIDE	0.07 ft	-0.18 ft	0.24 ▲ ft
AVG HIGH TIDE	1.13 ft	0.86 ft	0.27 ▲ ft
MAX HIGH TIDE	2.87 ft	3.43 ft	0.56 ▼ ft
MIN LOW TIDE	-0.89 ft	-1.57 ft	0.68 ▲ ft

HIGH TIDE DAYS

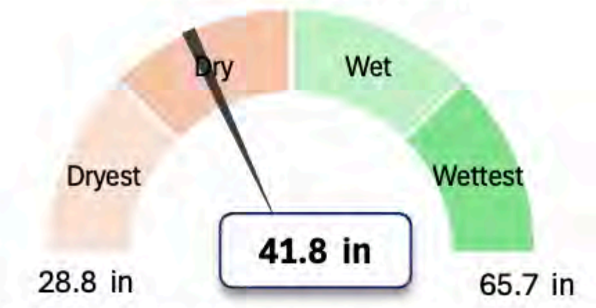
	Nuisance	Major	Total
2022	34 dys	3 dys	37
2023	93 dys	3 dys	96

HISTORICAL COMPARISONS - FROM 1895 TO 2023

Avg. Temperature Comparison

Avg. temp. of 56.5° was the 5th warmest year in the last 129 years.

Total Rain Comparison



Total rainfall of 41.8 inches was the 41st dryest year in the last 129 years.

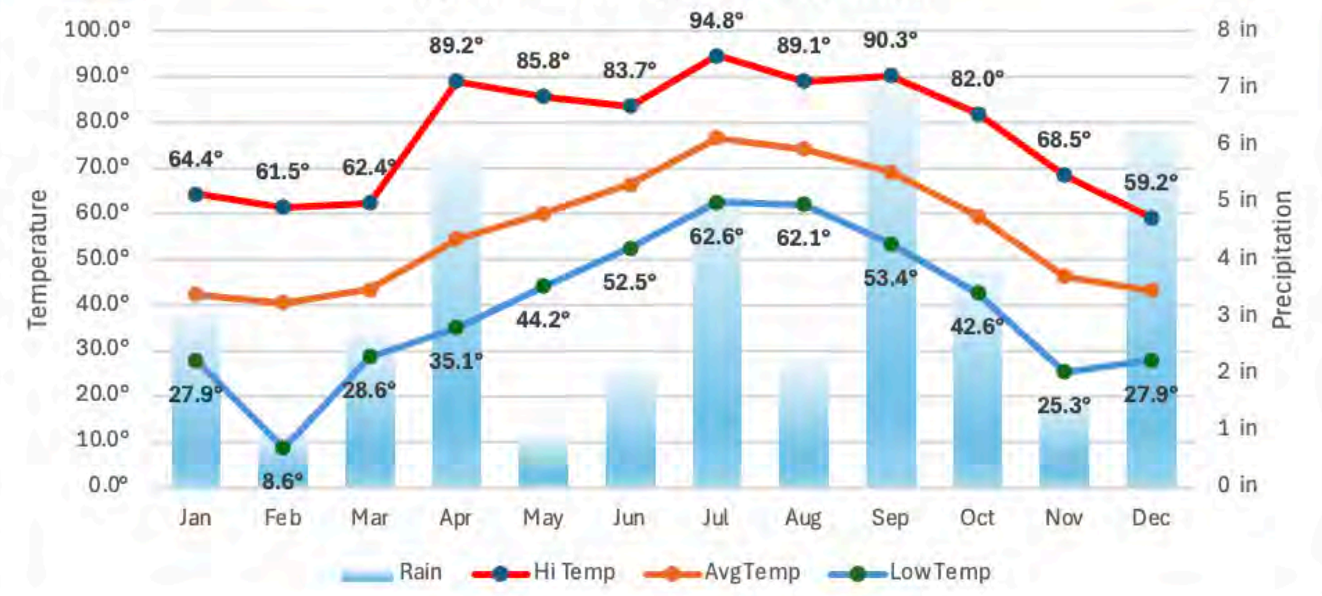
NORMAL TEMP	55.0°	NORMAL RAIN	45.2"
DEPARTURE	+1.4° Warmer	DEPARTURE	-3.4" Dryer

2023 MONTHLY COMPARISON

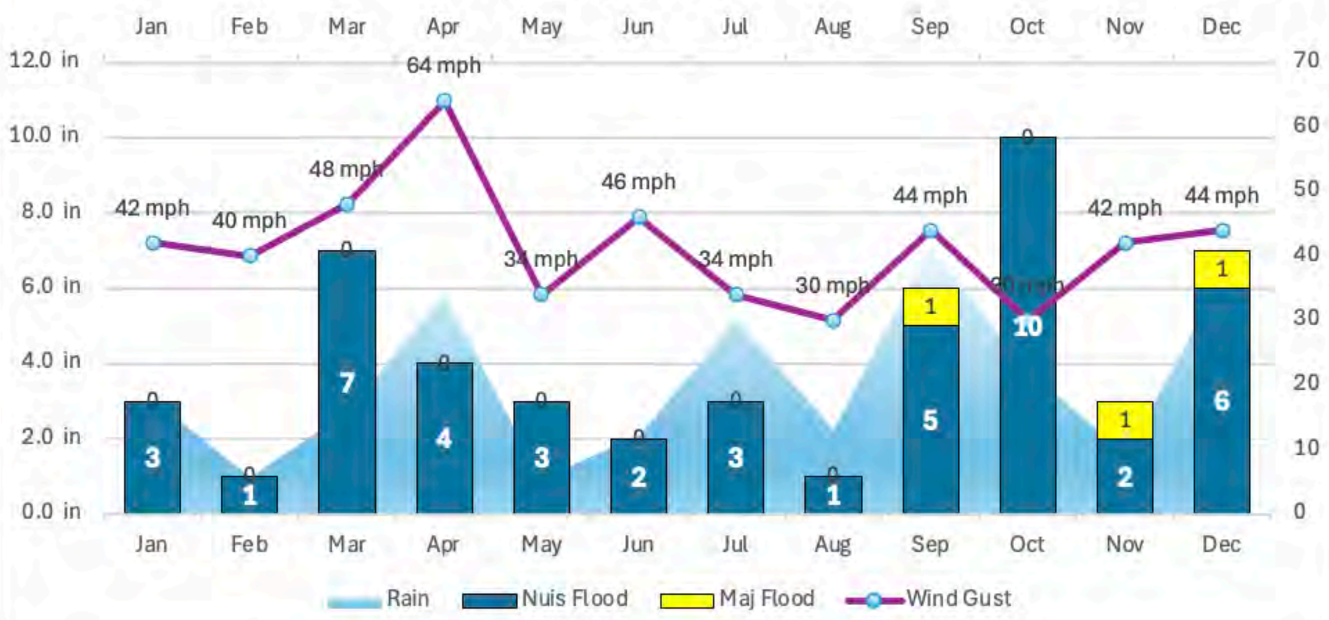
Month	Avg Temp	HiTemp	Low Temp	Avg Dew Pt	Rain	Snow	Flood Days	Avg Wind	Wind Gust
Jan	42.3°	64.4°	27.9°	34.0°	3.1 in	0.0 in	3	6.4 mph	42 mph
Feb	40.5°	61.5°	8.6°	29.8°	1.0 in	0.0 in	1	7.0 mph	40 mph
Mar	43.4°	62.4°	28.6°	31.6°	2.7 in	0.0 in	7	7.9 mph	48 mph
Apr	54.5°	89.2°	35.1°	42.9°	5.8 in	0.0 in	4	6.7 mph	64 mph
May	60.1°	85.8°	44.2°	48.3°	0.9 in	0.0 in	3	6.2 mph	34 mph
Jun	66.5°	83.7°	52.5°	58.8°	2.1 in	0.0 in	2	6.0 mph	46 mph
Jul	76.7°	94.8°	62.6°	70.2°	5.2 in	0.0 in	3	5.2 mph	34 mph
Aug	74.3°	89.1°	62.1°	65.6°	2.2 in	0.0 in	1	5.6 mph	30 mph
Sep	69.2°	90.3°	53.4°	62.4°	7.1 in	0.0 in	6	7.0 mph	44 mph
Oct	59.6°	82.0°	42.6°	52.4°	3.8 in	0.0 in	10	5.2 mph	30 mph
Nov	46.3°	68.5°	25.3°	36.0°	1.6 in	0.0 in	3	6.3 mph	42 mph
Dec	43.3°	59.2°	27.9°	30.2°	6.3 in	0.0 in	7	5.5 mph	44 mph
Annual	56.5°	94.8	8.6°	47.0°	41.8 in	0.0 in	50	6.2 mph	64 mph

2023 WEATHER RECAP & FLOOD ACTIVITY BY MONTH

Temperature Comparison by Month



Flood Activity by Month



2023 DAILY DETAIL - use "Select Month" to view Daily Detail for individual Month.

Select Month: November

Bay Level Flag: 1.4

Date	Avg Temp	Hi Temp	Low Temp	Norm Temp	Temp Diff	Avg Dew Pt	Snow	Flood Status	Bay Level	Rain	Moon %	Avg Wind	Wind Gust
November	46.3°	68.5°	25.3°	46.5°	-0.2° Cooler	36.0°	0 in	3 Events	1.18 ft	1.6 in	N.A.	6.3 mph	42 mph
11/01/2023	45.0°	51.1°	39.4°	51.0°	-6.0° Cooler	33.9°	0		1.40 ft	0.1 in	85% ↓	8.7 mph	29 mph
11/02/2023	41.4°	50.2°	32.2°	51.0°	-9.6° Cooler	28.1°	0		1.43 ft	0.0 in	77% ↓	5.0 mph	14 mph
11/03/2023	46.5°	55.2°	35.1°	50.0°	-3.5° Cooler	34.8°	0		1.20 ft	0.0 in	68% ↓	4.8 mph	20 mph
11/04/2023	50.9°	62.4°	40.3°	50.0°	+0.9° Warmer	42.1°	0		0.88 ft	0.0 in	59% ↓	2.8 mph	13 mph
11/05/2023	52.6°	67.3°	42.4°	50.0°	+2.6° Warmer	43.6°	0		1.14 ft	0.0 in	49% ↓	2.5 mph	12 mph
11/06/2023	52.2°	56.8°	46.2°	49.0°	+3.2° Warmer	44.4°	0		1.34 ft	0.0 in	40% ↓	5.4 mph	20 mph
11/07/2023	59.5°	65.3°	54.3°	49.0°	+10.5° Warmer	51.0°	0		1.42 ft	0.0 in	31% ↓	6.3 mph	21 mph
11/08/2023	48.4°	54.7°	42.4°	49.0°	-0.6° Cooler	33.4°	0		1.03 ft	0.0 in	23% ↓	4.5 mph	20 mph
11/09/2023	57.5°	68.5°	45.0°	48.0°	+9.5° Warmer	49.0°	0		1.31 ft	0.0 in	15% ↓	5.2 mph	23 mph
11/10/2023	47.5°	53.4°	41.4°	48.0°	-0.5° Cooler	41.9°	0		1.21 ft	0.2 in	9% ↓	5.2 mph	20 mph
11/11/2023	46.9°	56.5°	37.6°	48.0°	-1.1° Cooler	34.9°	0		0.74 ft	0.0 in	4% ↓	6.2 mph	20 mph
11/12/2023	40.8°	44.8°	36.0°	47.0°	-6.2° Cooler	31.4°	0		0.76 ft	0.0 in	1% ↓	4.7 mph	15 mph
11/13/2023	42.1°	49.3°	33.3°	47.0°	-4.9° Cooler	32.7°	0		1.12 ft	0.0 in	1% ↑	4.5 mph	20 mph
11/14/2023	45.9°	54.1°	37.9°	47.0°	-1.1° Cooler	33.5°	0		0.97 ft	0.0 in	2% ↑	7.3 mph	31 mph
11/15/2023	44.8°	52.0°	35.2°	47.0°	-2.2° Cooler	36.6°	0		1.14 ft	0.0 in	6% ↑	4.0 mph	17 mph
11/16/2023	50.6°	63.0°	41.4°	46.0°	+4.6° Warmer	44.1°	0		0.90 ft	0.0 in	11% ↑	4.5 mph	17 mph
11/17/2023	55.2°	65.1°	45.3°	46.0°	+9.2° Warmer	51.2°	0		1.07 ft	0.0 in	19% ↑	4.8 mph	21 mph
11/18/2023	51.6°	58.1°	40.3°	46.0°	+5.6° Warmer	39.6°	0		1.12 ft	0.0 in	29% ↑	7.7 mph	29 mph
11/19/2023	45.2°	56.1°	34.0°	45.0°	+0.2° Warmer	31.2°	0		1.38 ft	0.0 in	40% ↑	5.4 mph	21 mph
11/20/2023	42.0°	45.5°	34.9°	45.0°	-3.0° Cooler	25.6°	0		0.68 ft	0.0 in	51% ↑	6.8 mph	22 mph
11/21/2023	47.6°	51.6°	44.2°	45.0°	+2.6° Warmer	38.6°	0		1.36 ft	0.3 in	62% ↑	13.4 mph	40 mph
11/22/2023	53.6°	58.8°	50.2°	45.0°	+8.6° Warmer	50.5°	0	MAJOR	2.49 ft	1.0 in	73% ↑	8.3 mph	42 mph
11/23/2023	47.9°	53.1°	40.6°	44.0°	+3.9° Warmer	37.0°	0	NUISANCE	1.35 ft	0.0 in	83% ↑	8.1 mph	30 mph
11/24/2023	42.7°	51.6°	33.4°	44.0°	-1.3° Cooler	30.4°	0		1.34 ft	0.0 in	90% ↑	6.7 mph	30 mph
11/25/2023	34.4°	39.7°	29.3°	44.0°	-9.6° Cooler	22.4°	0		0.89 ft	0.0 in	96% ↑	4.2 mph	17 mph
11/26/2023	46.3°	56.1°	31.8°	43.0°	+3.3° Warmer	41.5°	0	NUISANCE	1.74 ft	0.1 in	100% ↑	8.2 mph	33 mph
11/27/2023	44.5°	54.7°	34.9°	43.0°	+1.5° Warmer	34.0°	0		1.77 ft	0.0 in	100%	9.9 mph	32 mph
11/28/2023	33.3°	38.5°	28.9°	43.0°	-9.7° Cooler	17.7°	0		1.16 ft	0.0 in	99% ↓	9.6 mph	32 mph
11/29/2023	31.6°	37.6°	25.3°	43.0°	-11.4° Cooler	14.8°	0		0.31 ft	0.0 in	95% ↓	8.0 mph	23 mph
11/30/2023	40.8°	52.0°	31.6°	42.0°	-1.2° Cooler	28.6°	0		0.69 ft	0.0 in	90% ↓	6.0 mph	22 mph

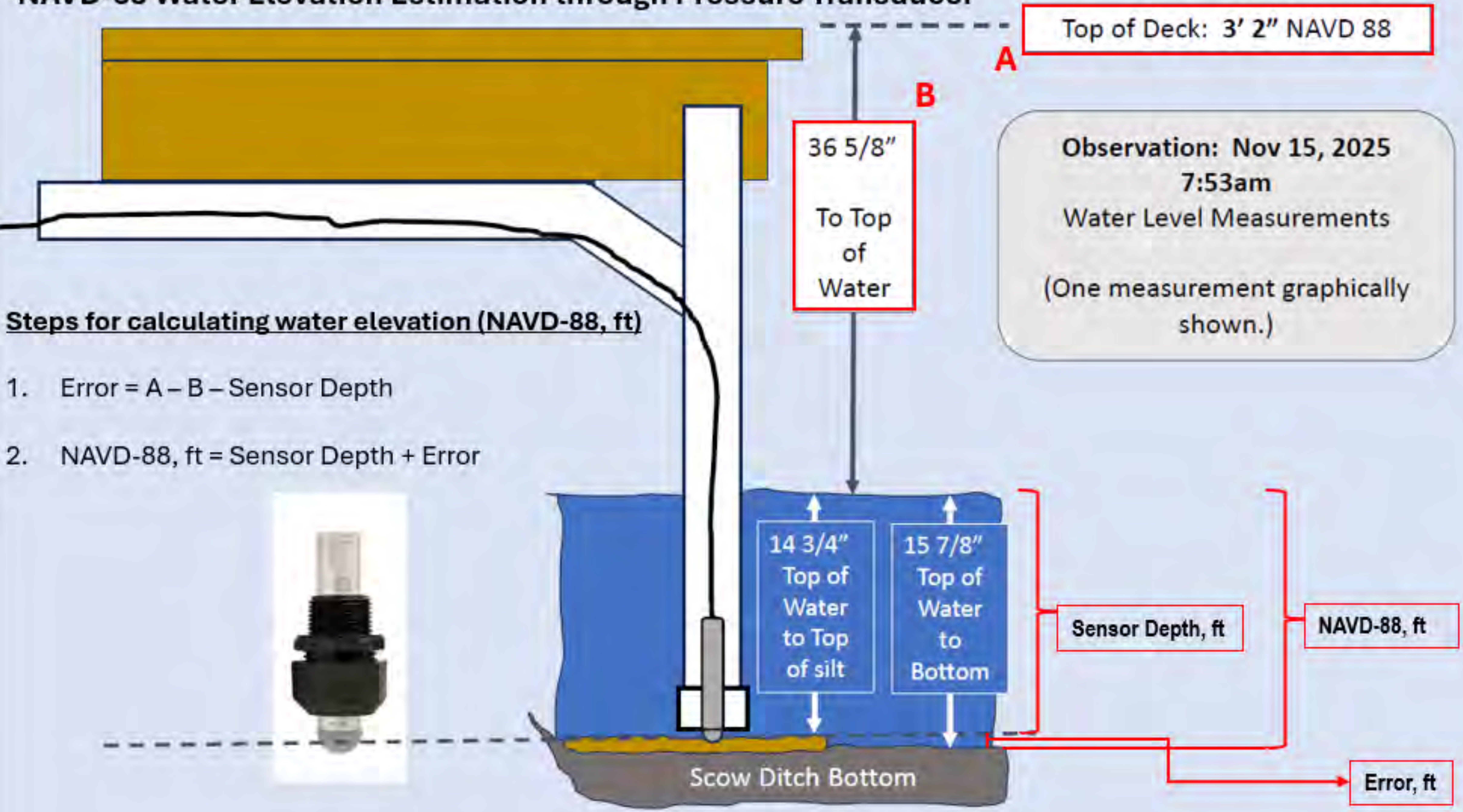
DR. MATINA SHAKYA

Science Supporting Climate-Resilient Communities

How research partnerships help design the next generation of nature-based solutions

DREXEL UNIVERSITY College of Engineering

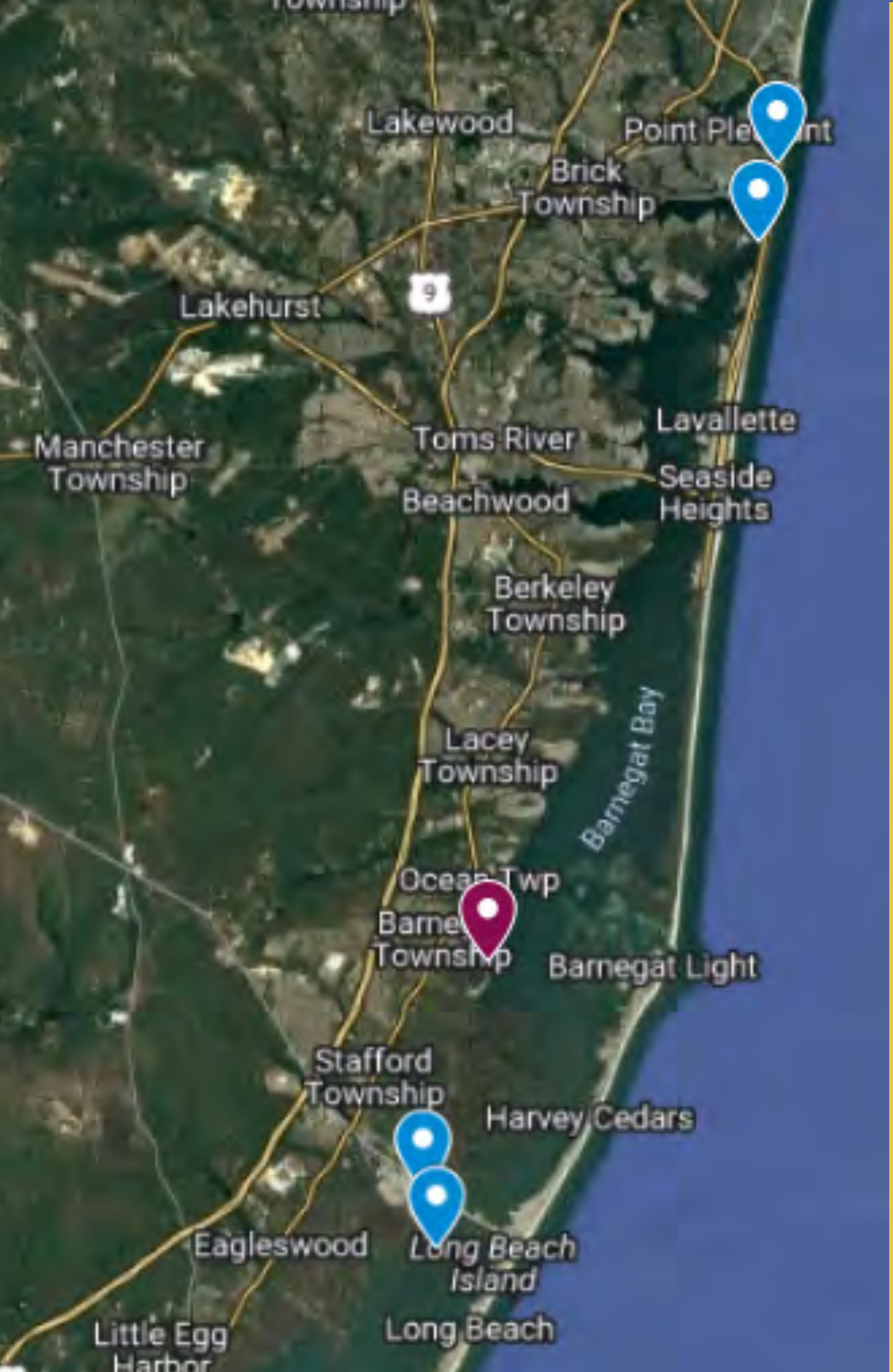
NAVD-88 Water Elevation Estimation through Pressure Transducer



<u>Steps for calculating water elevation (NAVD-88, ft)</u>

1. Error = A – B – Sensor Depth

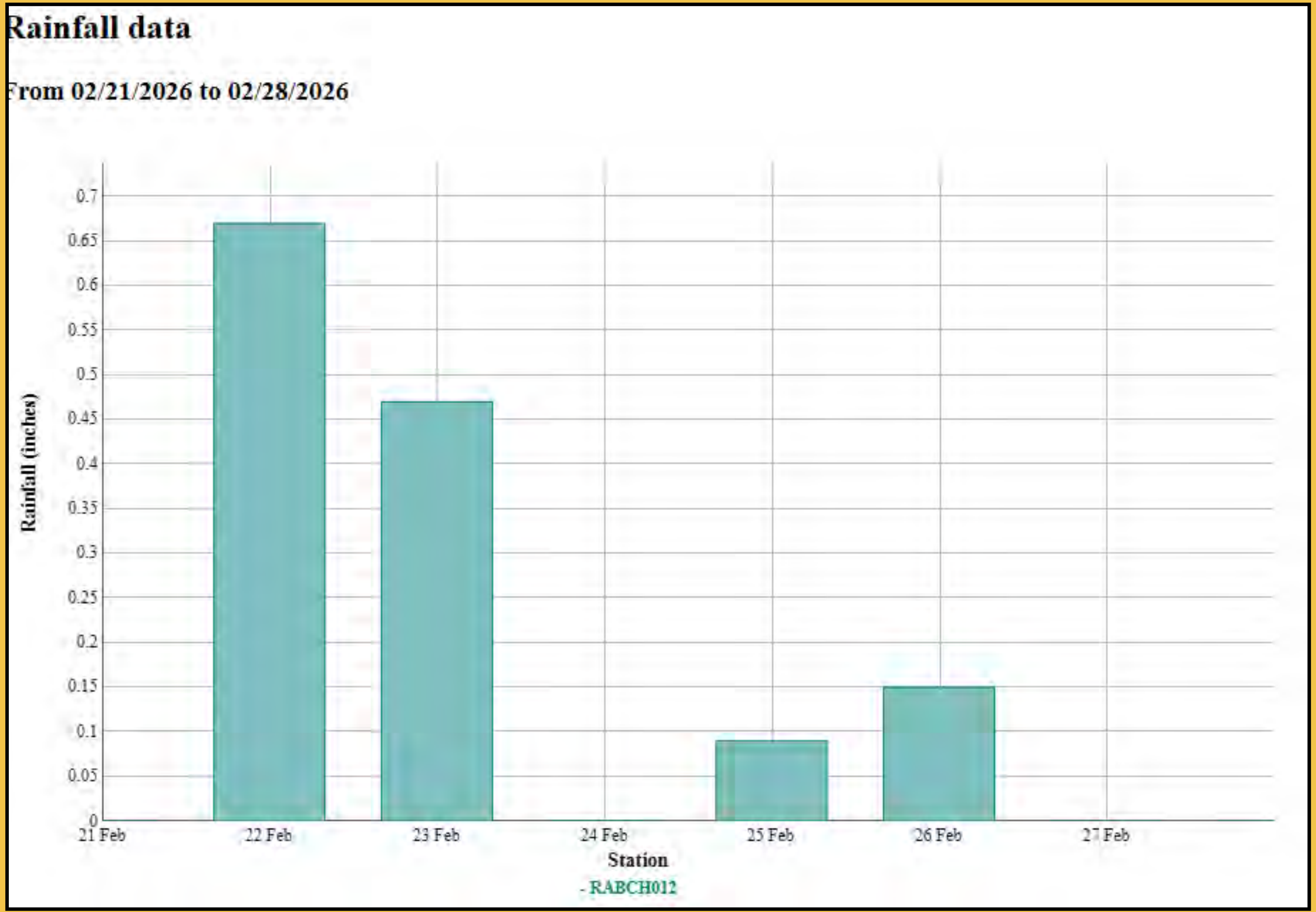
2. NAVD-88, ft = Sensor Depth + Error

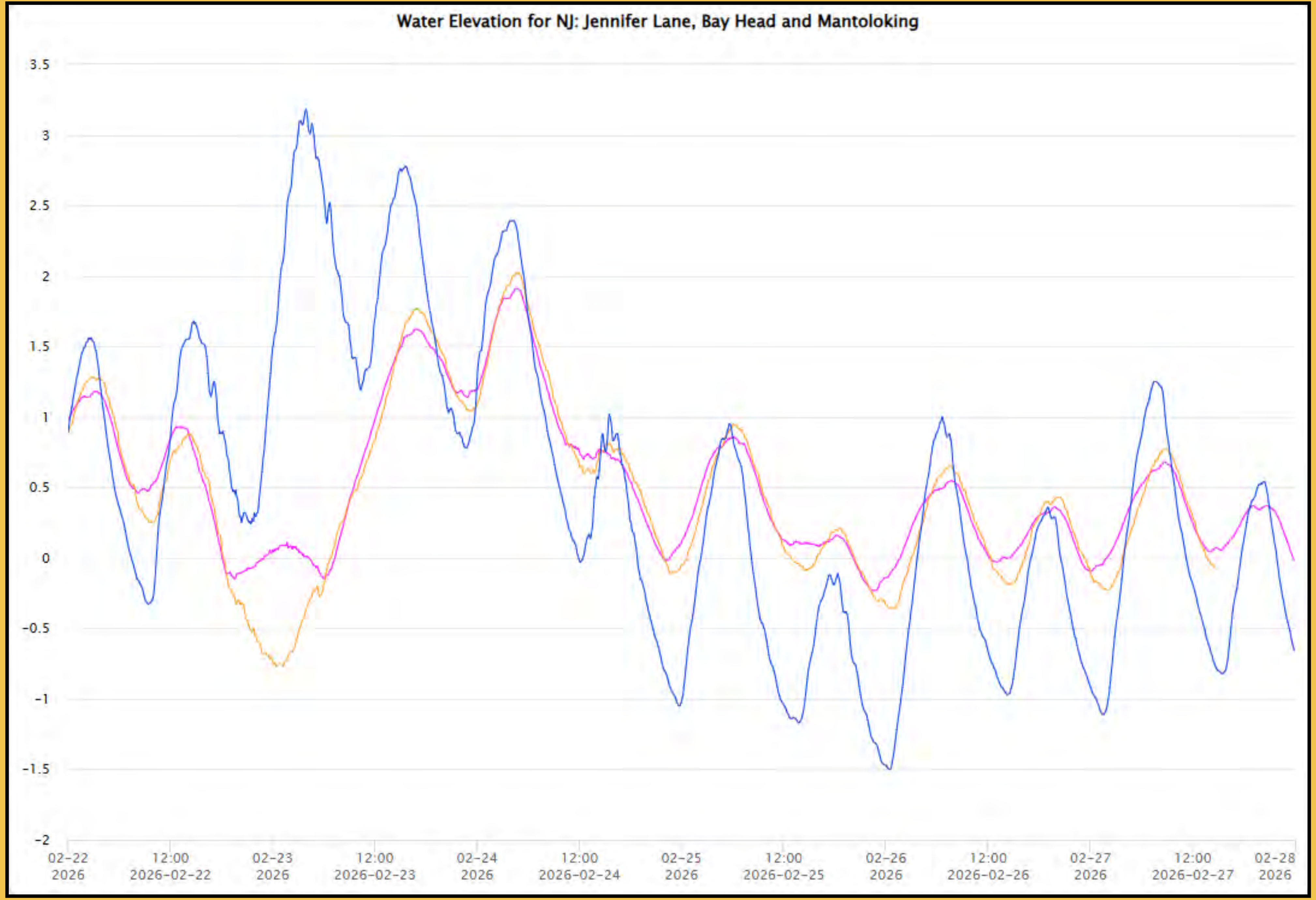


Monitoring Station at Barnegat Bay

Recording Real Time

Tidal Data





Thank you!

Continue the Conversation

Scan the QR code to connect with our panelists and learn more about climate resilience projects in the Barnegat Bay watershed.