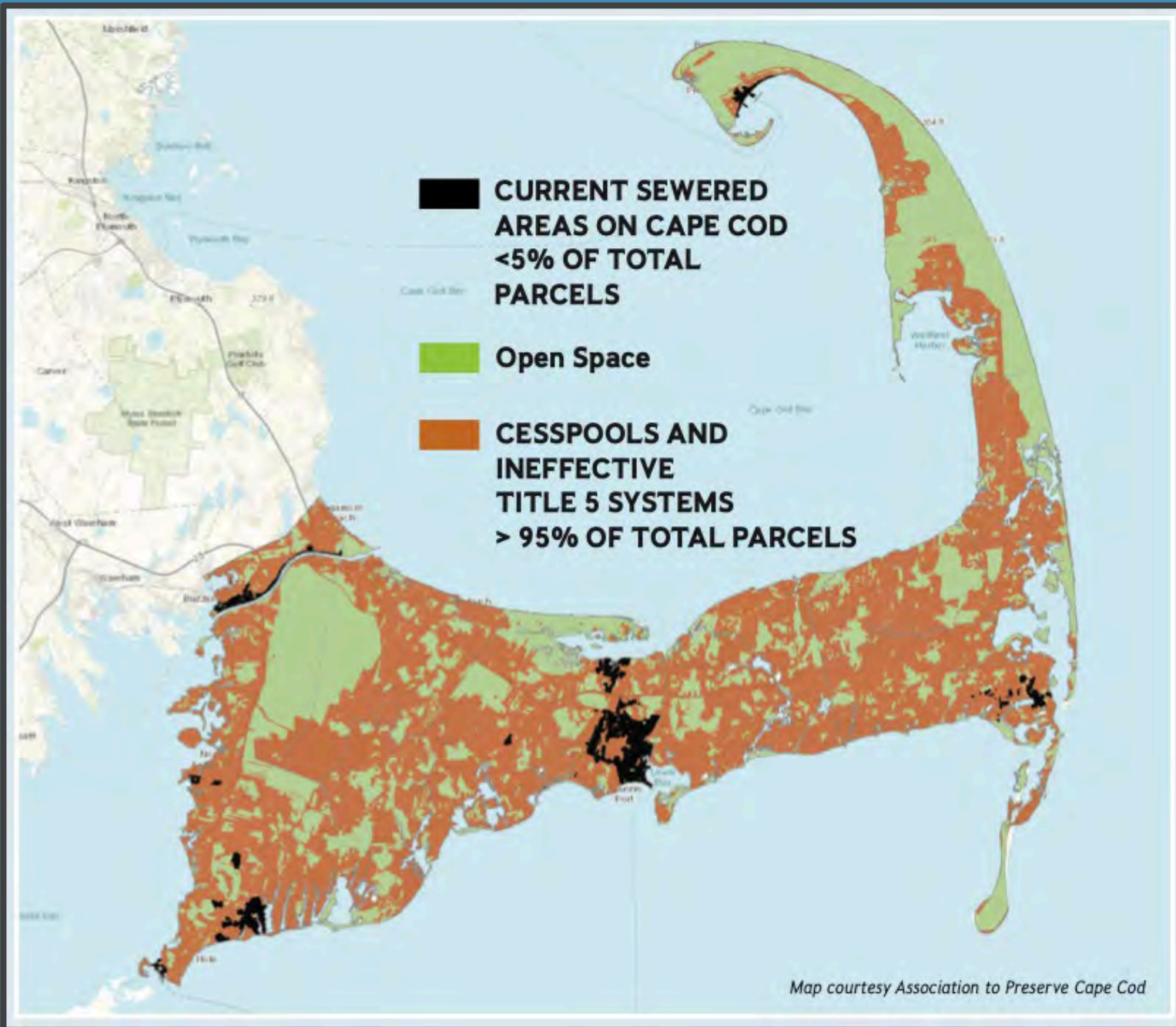




**Shubael Pond Project
Lessons Learned
June 18, 2024
Zenas “Zee” Crocker**



**Source Reduction
is Key to
Clean Water on
Cape Cod**

**Restore and preserve clean water
throughout Barnstable**
Educate, Monitor, Mitigate and Advocate

I/A Septic System Project

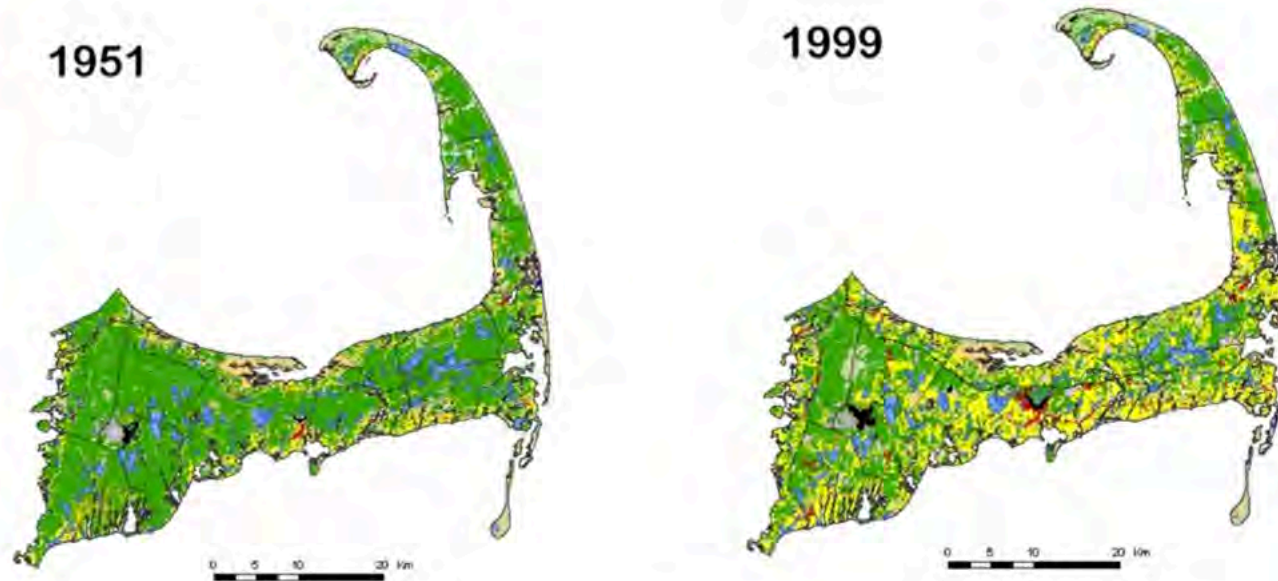


Cranberry Bog Restoration Project



HISTORY LESSON

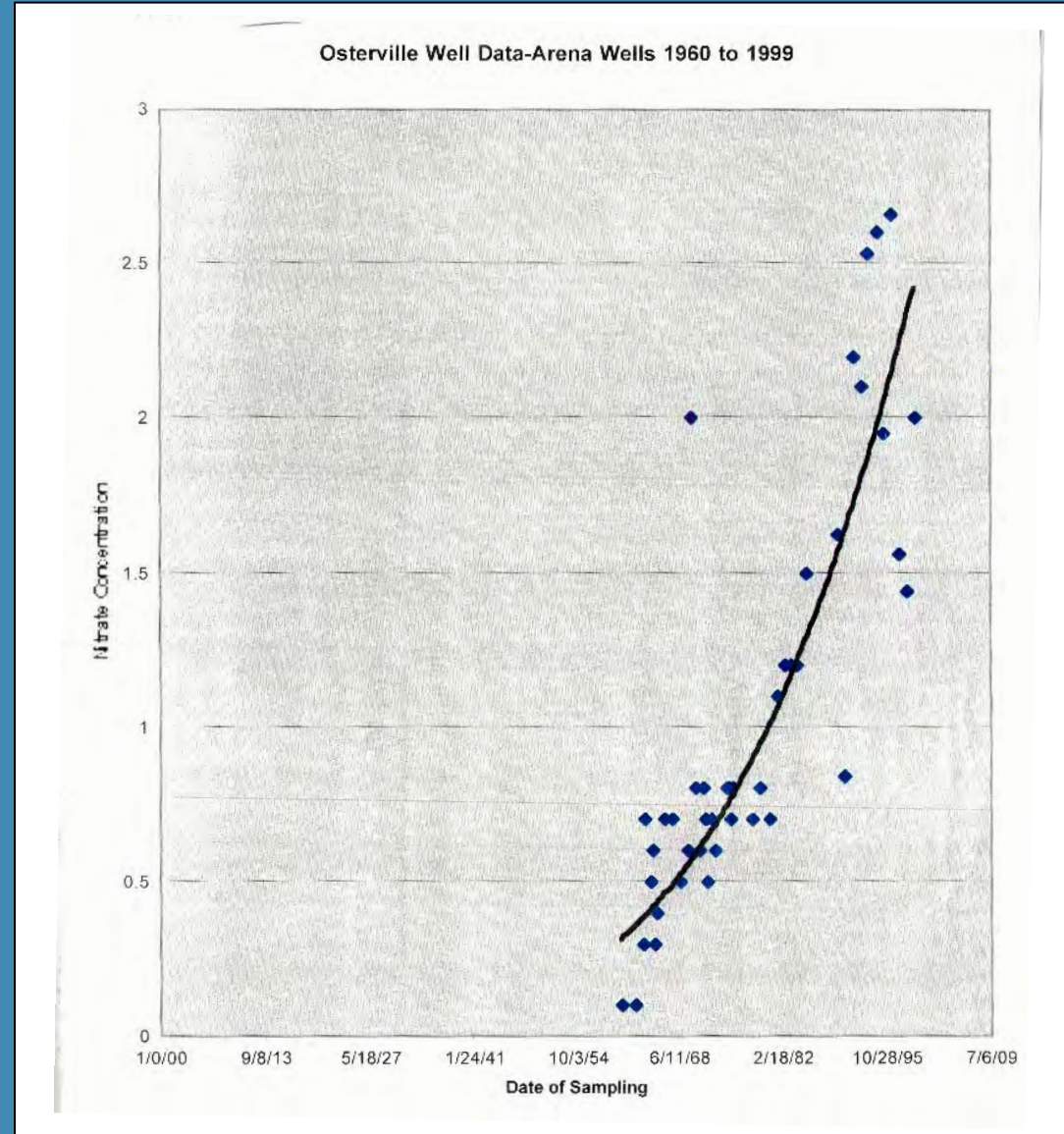
1951 VS 1999 LAND COVER OF CAPE COD

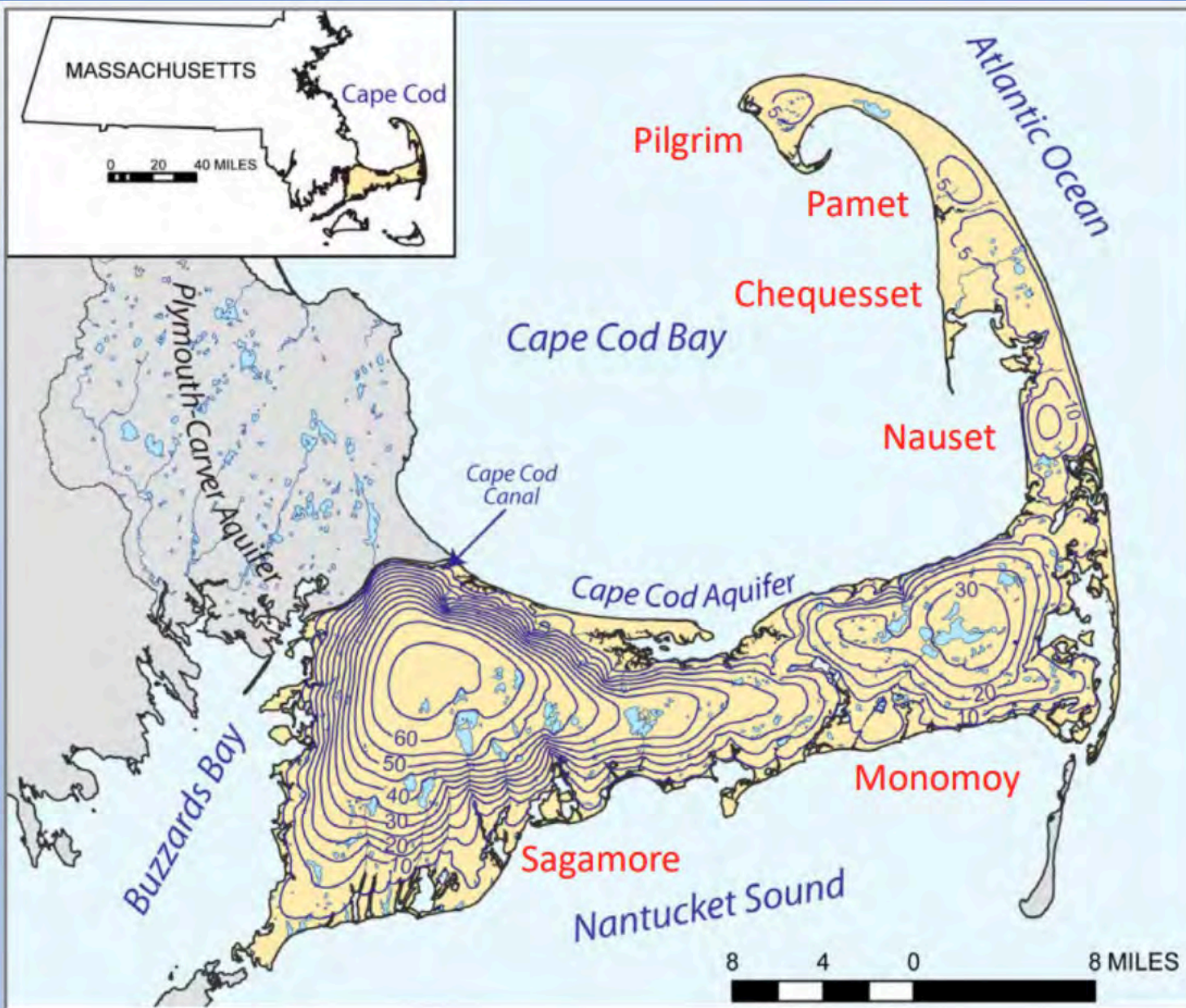


Source: Woods Hole Research Center

- Residential and commercial development has grown immensely
- Significant stress on our sole source aquifer and water supply
- Increased nutrient overload, primarily nitrogen and phosphorus

1960 TO 1999





The Nature Conservancy



USGS
science for a changing world



Wastewater
Treatment
Technologies

OUR PARTNERS

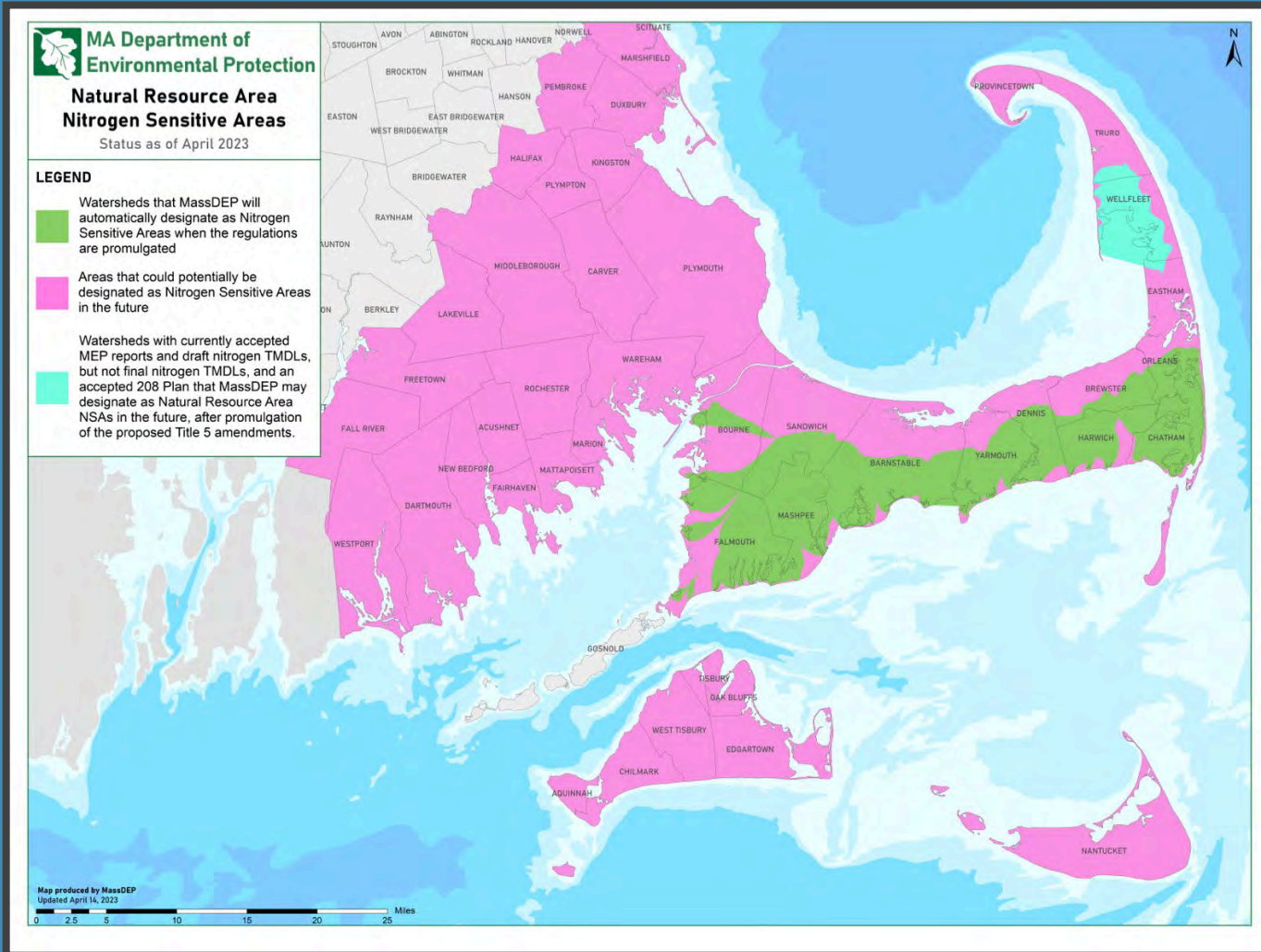


CAPE COD
COMMISSION



School for Marine Science & Technology
UMass Dartmouth

CHANGES TO MA DEP TITLE 5 REGULATIONS

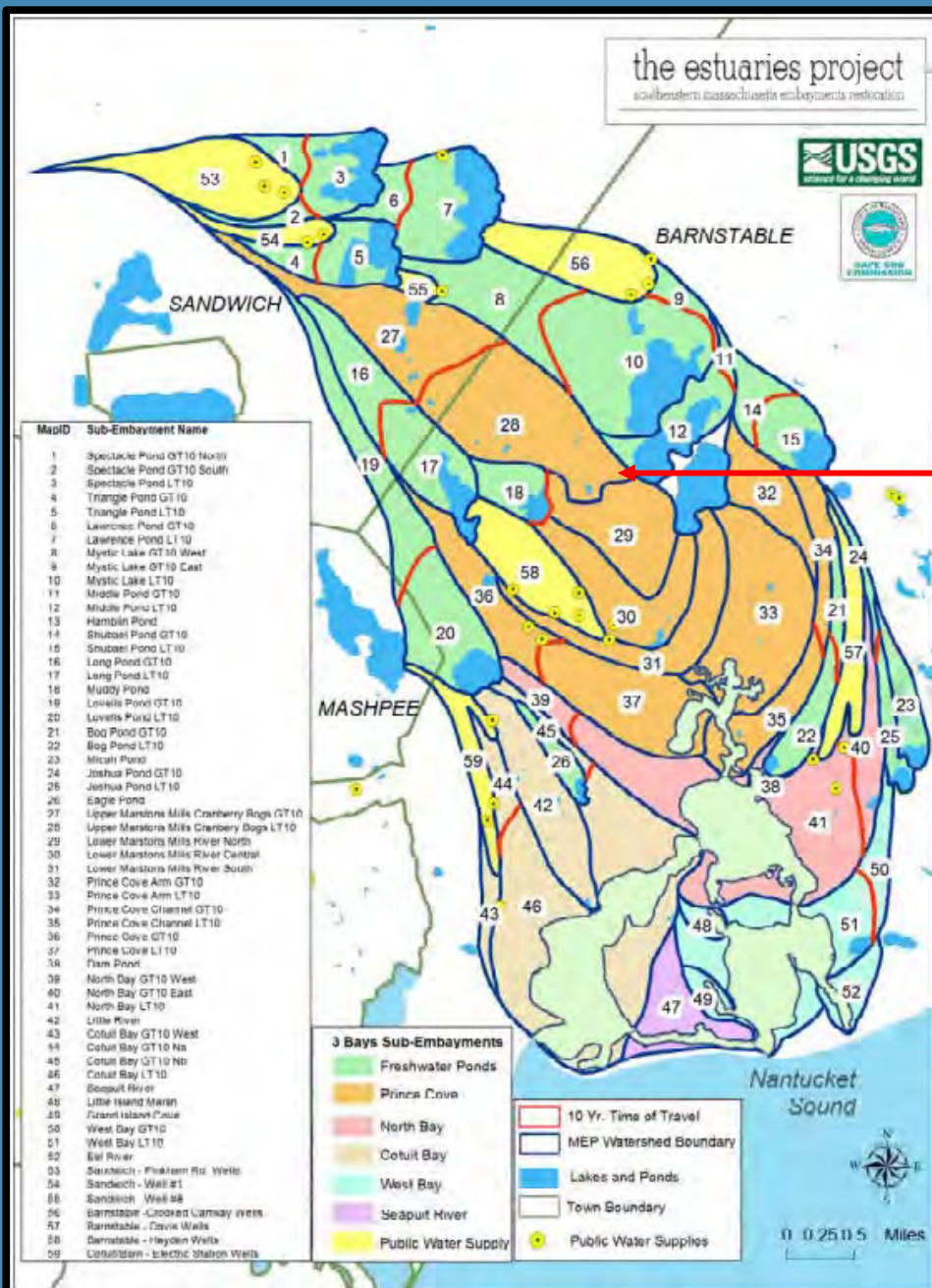


Key Highlights

- Designated Nitrogen Sensitive Areas (NSAs) on Cape Cod and Southeast MA
- Two choices for Towns
 - Implement a Watershed Permit within 20 years (town responsibility) **OR**
 - Mandatory upgrades of current septic systems to I/A septic systems within 5 years (homeowner responsibility)



the estuaries project
southeastern massachusetts estuaries restoration



Howes B., S. W. Kelley, J. S. Ramsey, R. Samimy, D. Schlezinger, E. Eichner (2005). Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Three Bays, Barnstable, Massachusetts. Massachusetts Estuaries Project, Massachusetts Department of Environmental Protection. Boston, MA.

DESIGNING FOR THE FUTURE

*All models are wrong
but some are useful*



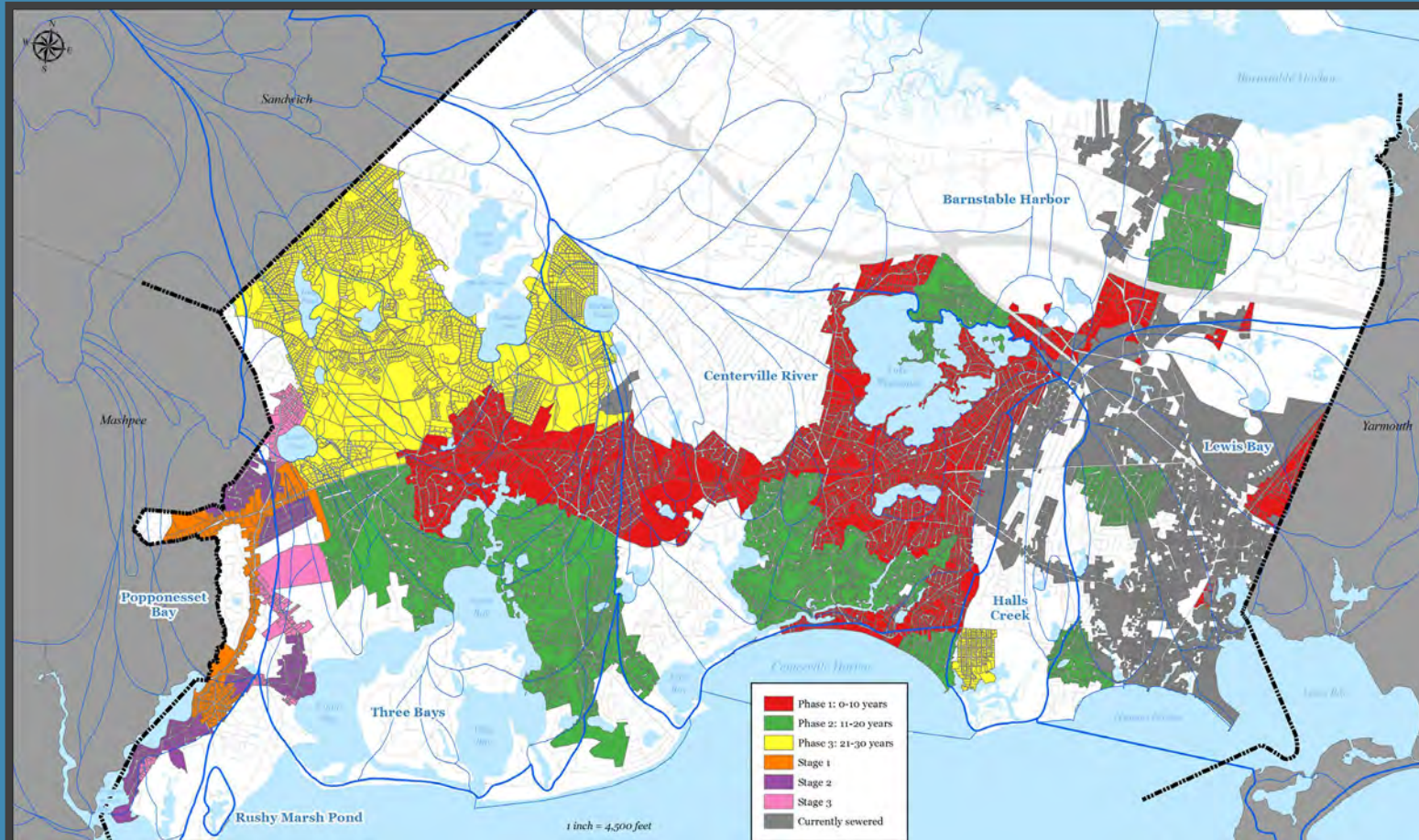
George E.P. Box
British Statistician

*Taking a model literally is not
taking a model seriously*



Peter Diamond
Economist

BARNSTABLE COMPREHENSIVE WASTEWATER MANAGEMENT PLAN (CWMP)



- \$1.46 Billion, 30 year plan
- 26,965 parcels in Barnstable
- 3,100 currently served by sewer; 100+ I/A septic systems with 85% reducing nitrogen
- 11,823 part of CWMP

**ONLY 55%
OF THE TOWN
WILL BE SERVED**

THE WALL STREET JOURNAL.

DOW JONES | News Corp *****

FRIDAY, MARCH 22, 2024 - VOL. CCLXXXIII NO. 68

WSJ.com

★★★★ \$5.00

DJIA 39781.37 ▲ 269.24 0.7%

NASDAQ 16401.84 ▲ 0.2%

STOXX 600 509.77 ▲ 0.9%

10-YR. TREAS. yield 4.270%

OIL \$81.07 ▼ \$0.20

GOLD \$2,182.40 ▲ \$24.50

EURO \$1.0862

YEN 151.63

HOMEOWNEROUS | KRIS FRIESWICK

Why Your Septic System Will Not Be Ignored



“Bet you didn’t know you had a big old hunk of Moses-approved engineering history buried next to your rhododendron.”

Proper waste management is so crucial that instructions on it can be found as far back as the

Old Testament: Book of Deuteronomy Chapter 23: Verses 12-13

“Designate a place outside the camp where you can go to relieve yourself,” it commands. “As part of your equipment have something to dig with, and when you relieve yourself, dig a hole and cover up your excrement.”



Tisbury Tightens Septic Regulations

Louisa Hufstader *Tuesday, October 3, 2023 - 10:06am*

New Wastewater Rules Arrive in Tisbury as Part of Islandwide Plan

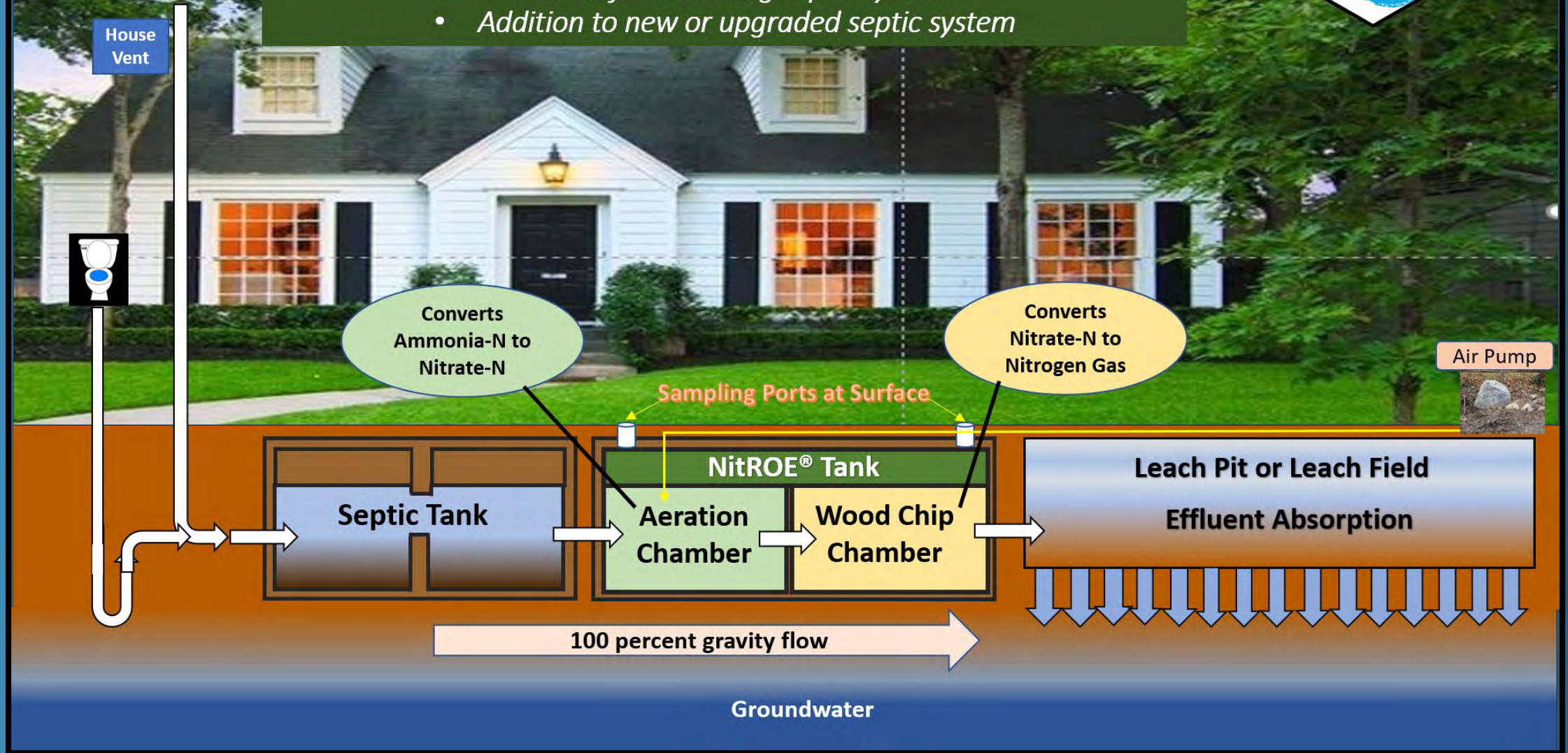
Thomas Humphrey *Thursday, January 4, 2024 - 4:45pm*

- **Installation of enhanced, nitrogen removing septic system that removes at least 95% of nitrogen**
 - **House sales/real estate transfers**
 - **Upgrades, repairs, replacements — whether or not system has failed**
 - **New construction**
 - **Expansions/Additions (e.g., bedrooms)**
- **Considering another amendment to require upgrades for systems too close to the water (within 1,000 feet)**

NitROE® WWTS Tank Supplement



- *Retrofit to existing septic system*
- *Addition to new or upgraded septic system*



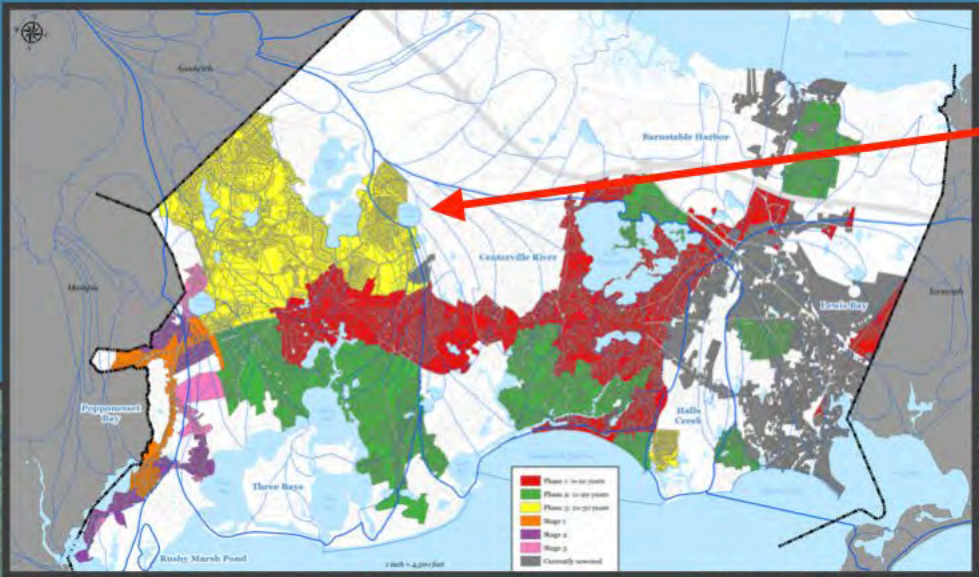
KleanTu NitROE I/A Septic System

Desirable Characteristics

- Best in Class Performance
- Low cost/cost competitive to municipal sewer
- Modular structure allowing integration into existing Title 5 system
- Low maintenance
- Real time monitoring
- Ability to operate in absence of power



Shubael Pond Marstons Mills



July 2020



350 homes around the pond

Sand Shores Neighborhood - Shubael Pond



- Southwest corner of the neighborhood
- Red = 14 Target Homes
- Blue = Alternate Homes
- Horsely Witten Group has completed all survey work and septic system inspections
- April Board of Health meeting

Sand Shores Neighborhood - Shubael Pond



0 250 500 1,000 Feet

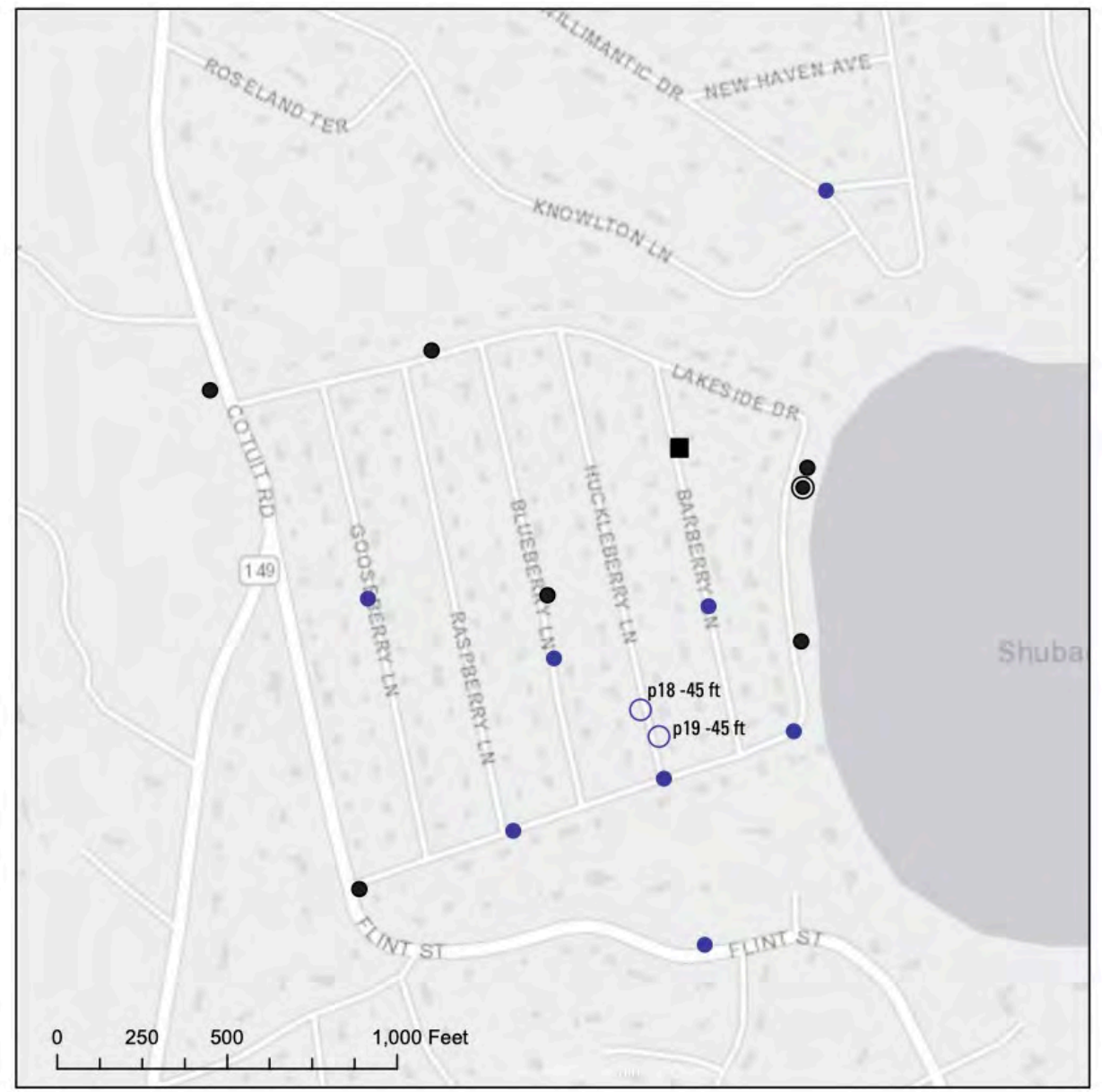
○ water table wells

Hydraulic Gradient Vectors

← 11/12/2020	← 0.0015
← 12/16/2020	← 0.002
← 2/23/2021	

- 35+ water table wells drilled in the Sand Shores neighborhood
- Managed and funded by the USGS and U.S. EPA Region 1
- Groundwater samples collected quarterly

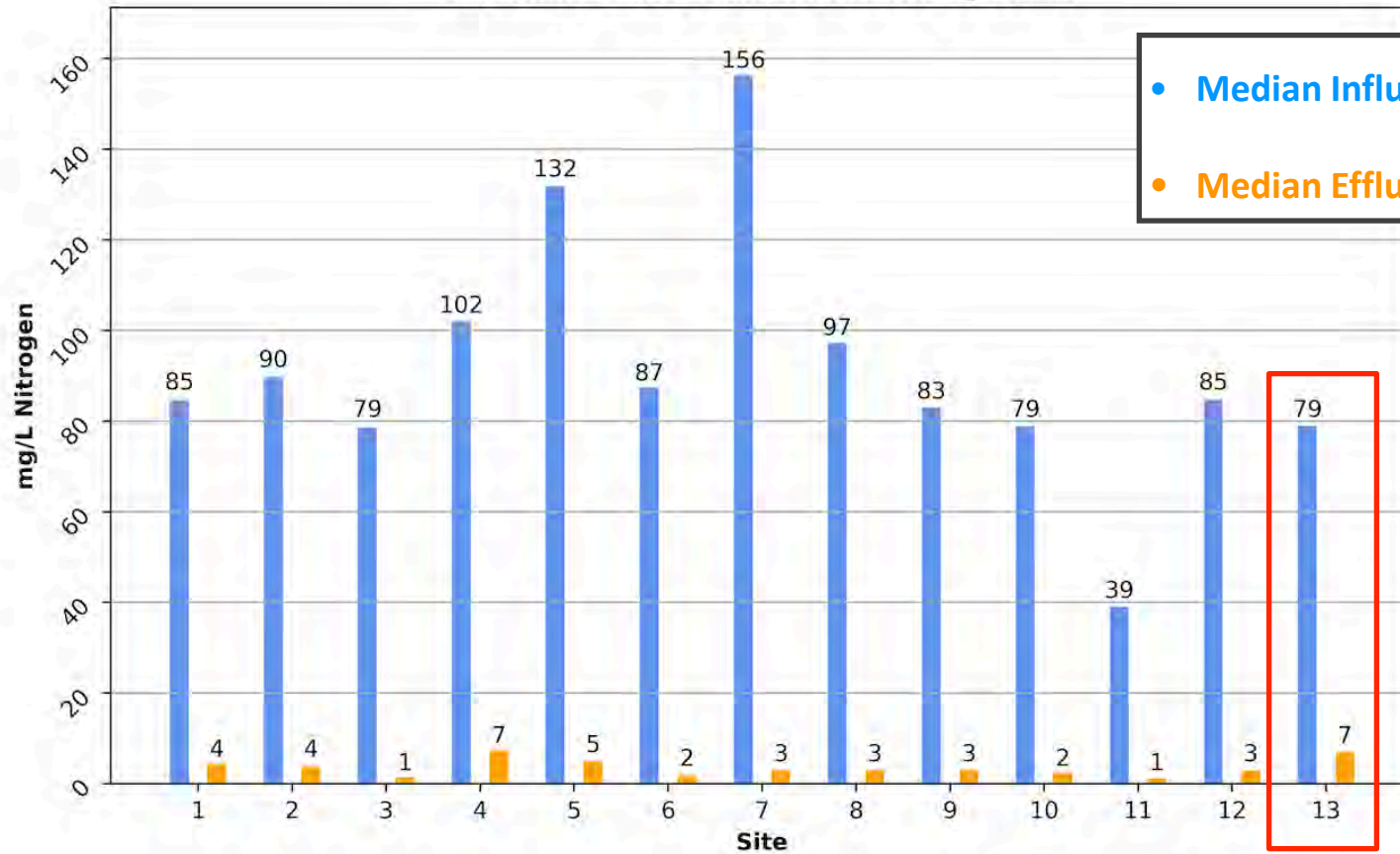
Sand Shores Neighborhood Latest Sampling Wells



- Existing well cluster
- Phase 1 completed water-table well
- Phase 1 completed multilevel well
- Phase 2 completed water-table well
- Phase 3 proposed multilevel well
site name and proposed max depth in feet

SHUBAEL POND I/A SEPTIC SYSTEM PROJECT PERFORMANCE DATA 12/10/21 - 01/24/24 (MEDIAN)

13 Homes with KleanTu NitROE Systems

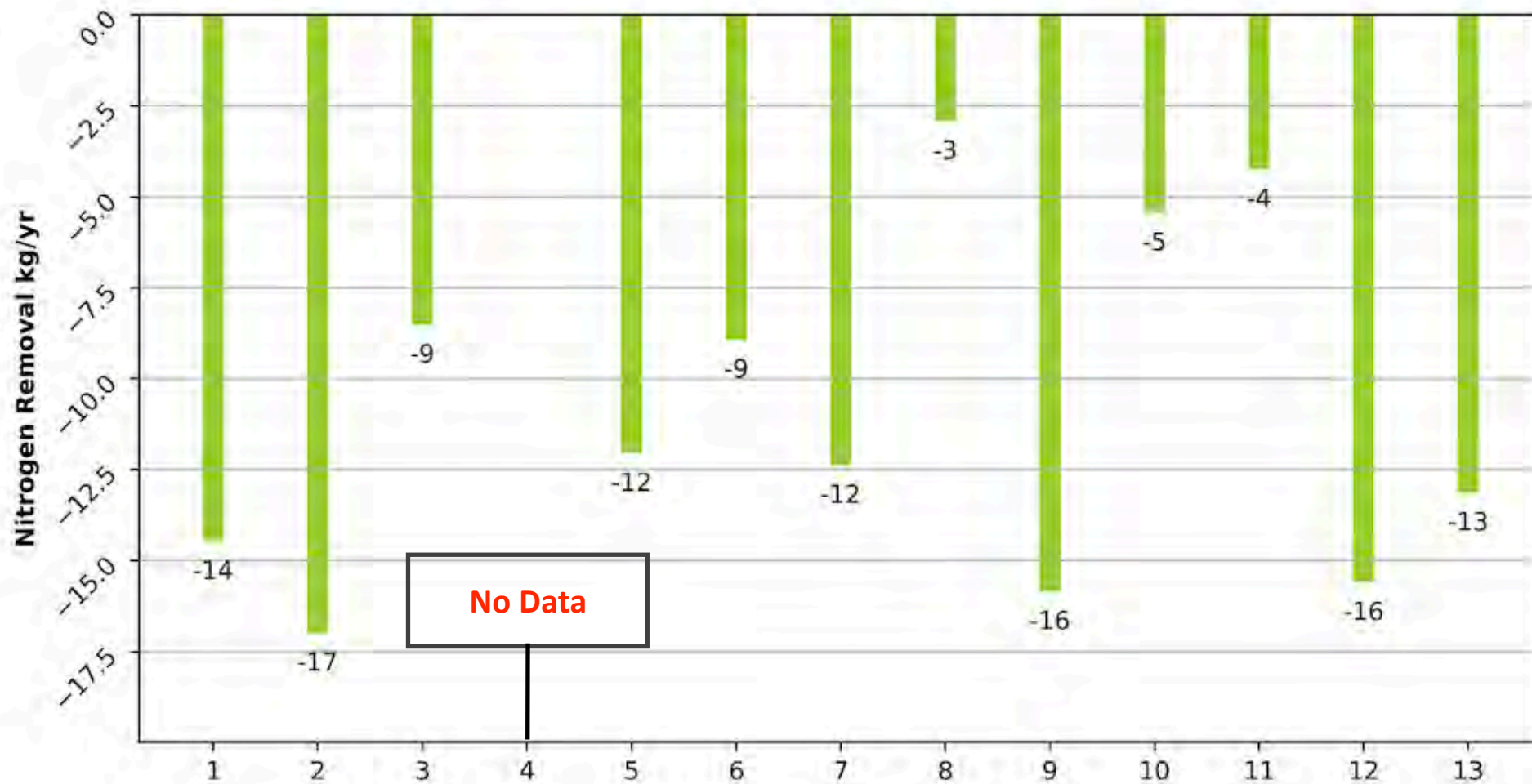


- Median Influent: 87.4 mg/L
- Median Effluent: 2.9 mg/L

Installed Sept 2023

Influent (mg/L) Effluent (mg/L)

SHUBAEL POND I/A SEPTIC SYSTEM PROJECT NITROGEN REMOVAL KG/YEAR



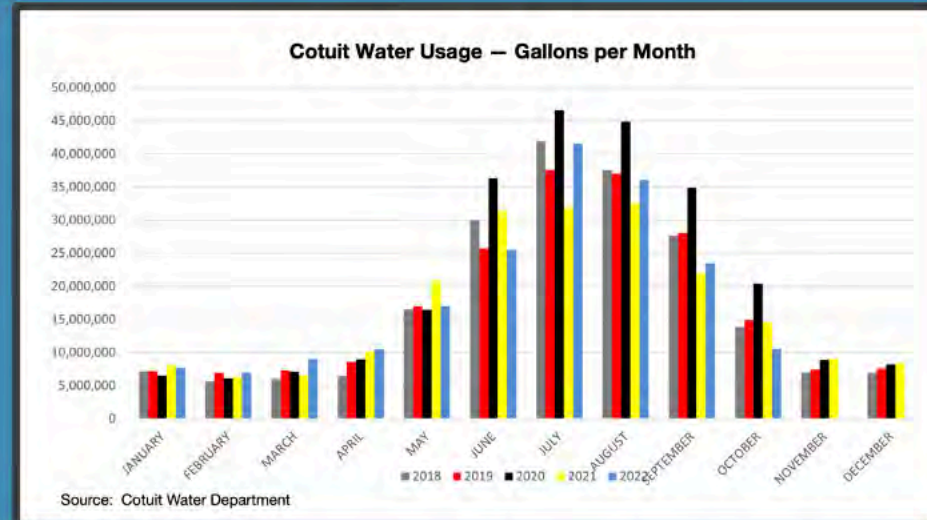
Forecasted Nitrogen Removal Based on Household Water Usage (kg/yr)



- 106 single family homes within 400 feet from the shores of Cotuit Bay
- Discharge more than 47,000 gallons of wastewater per day; approximately 12 million gallons per year ⁽¹⁾

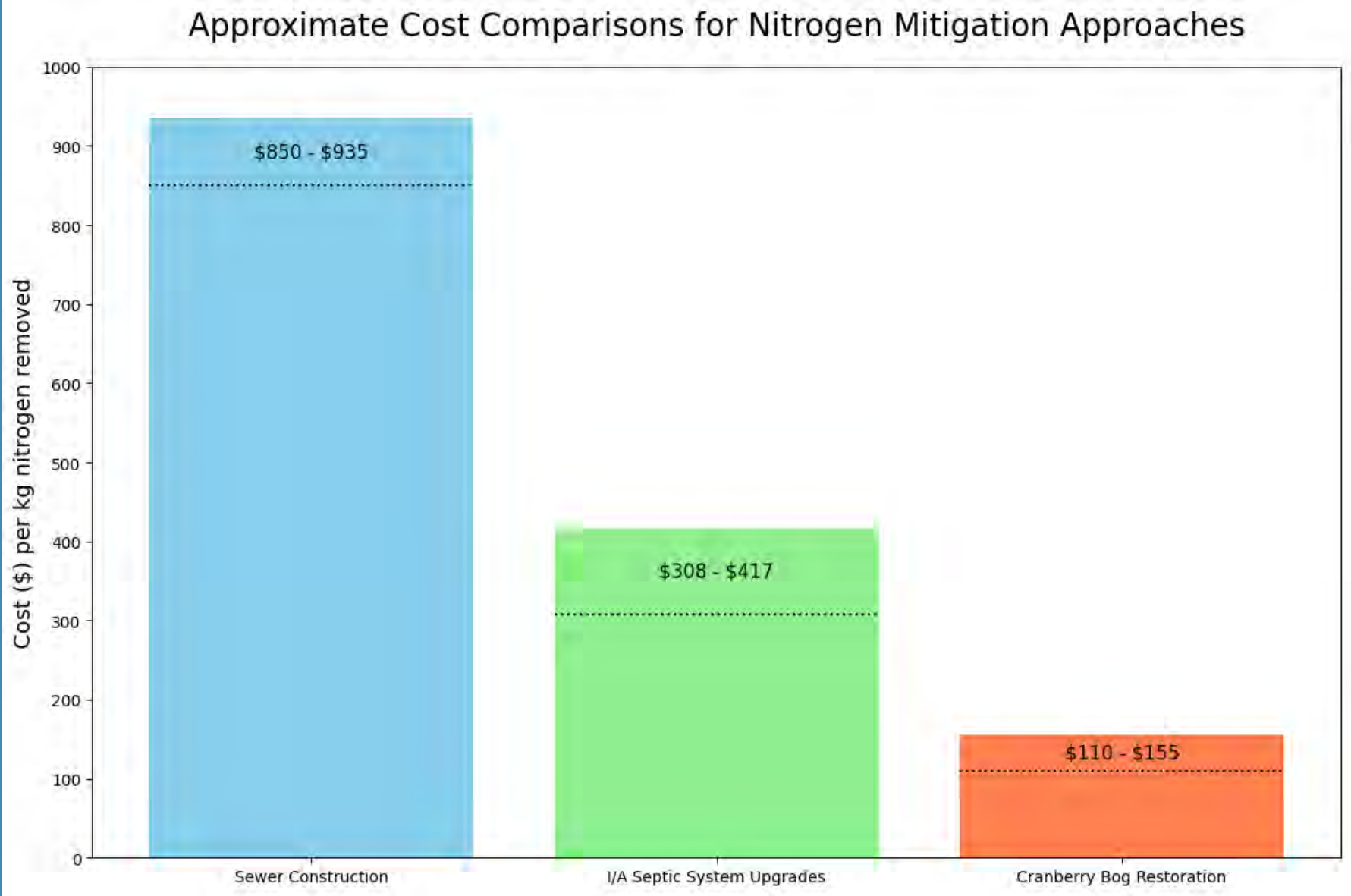
4,500 pounds (2.5 tons) of nitrogen going into Cotuit Bay annually

- I/As performing at 4 mg/L **could eliminate 3,600 pounds**

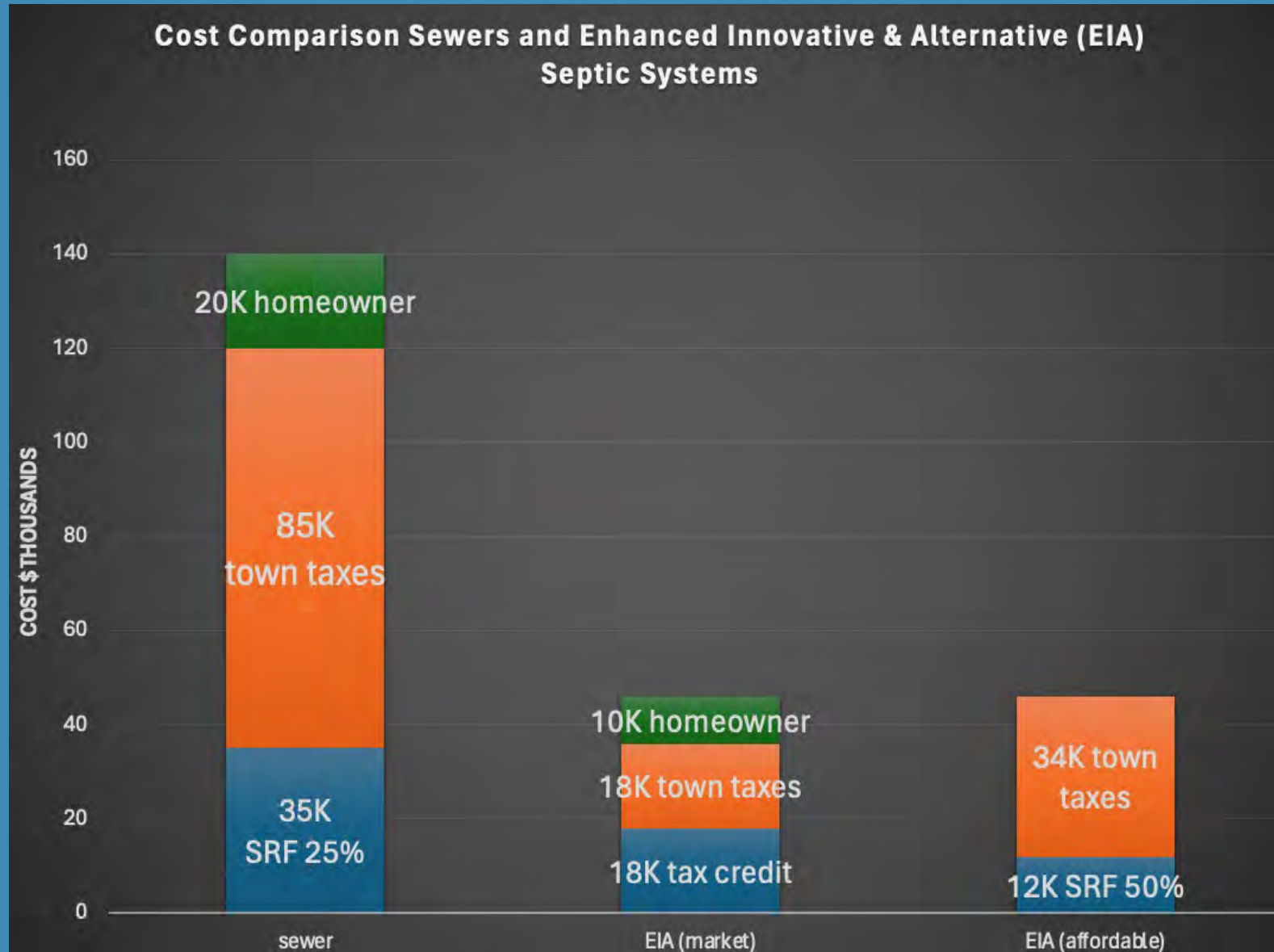


(1) Source: Cape Cod Commission's Watershed MVP software and Cotuit Water Department

COST COMPARISON FOR NITROGEN MITIGATION

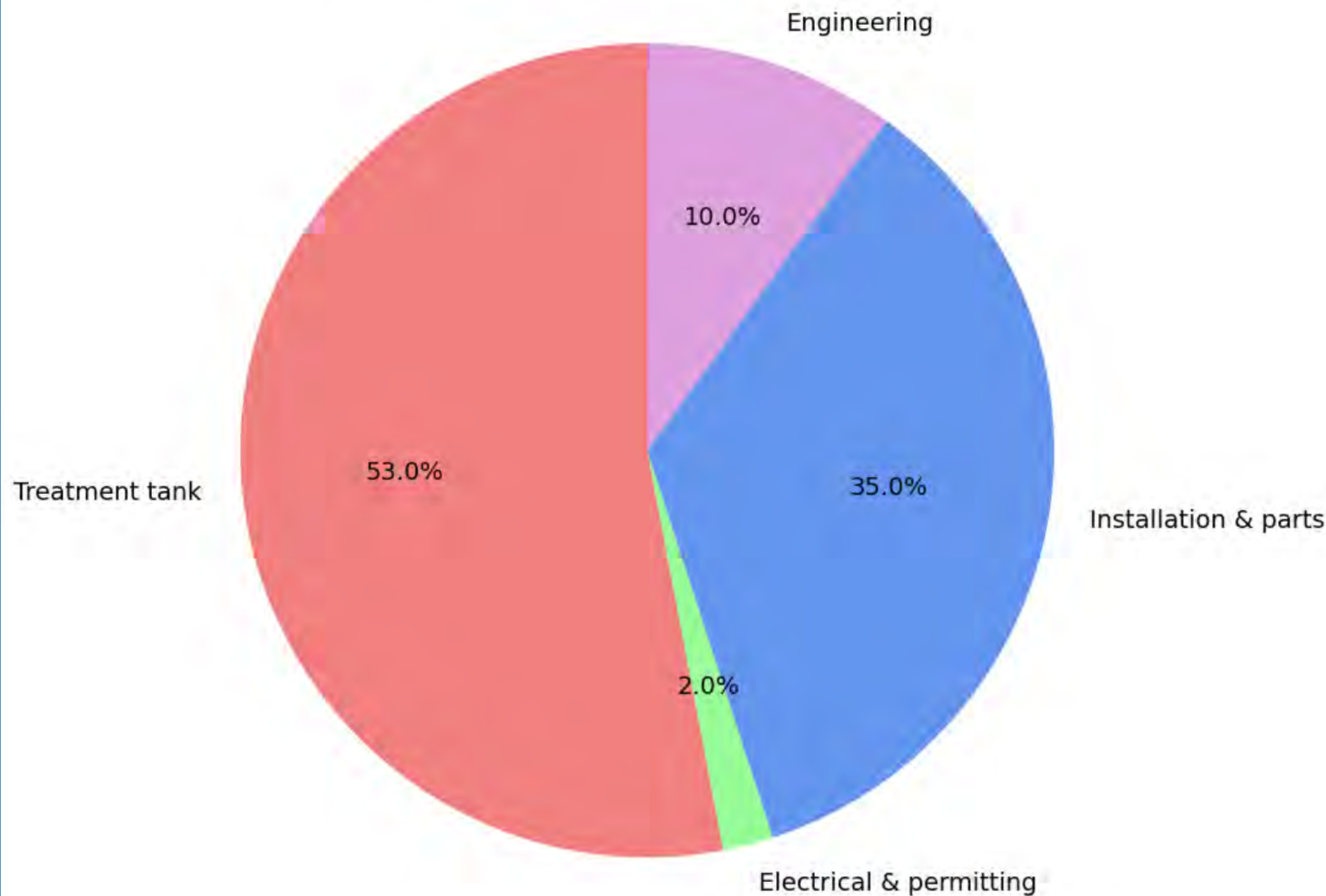


FUNDING SCENARIOS



ALTERNATIVE SEPTIC COST BREAKDOWN

Average Capital Costs For EIA



ENHANCED INNOVATIVE & ALTERNATIVE (EIA) SEPTIC SYSTEMS ACTUAL (AS-BUILT) COSTS (INCLUDING ENGINEERING DESIGN FEES)

		Number	Construction Cost	Engineering Design	Total Cost Per System	Updated Cost Estimates 2023 (add \$10,000)
Retrofit of Existing Title 5 System						
	Buzzards Bay Coalition	4	\$24,891	\$3,000	\$27,891	
	Barnstable Clean Water Coalition	4	\$19,852	\$6,351	\$26,203	
	Average		\$22,372	\$4,676	\$27,047	\$37,047
Partial Upgrade (replace septic tank or leachfield)						
	Barnstable Clean Water Coalition	2	\$27,981	\$6,351	\$34,332	\$44,332
Full Upgrades (including both septic tank and leachfield)						
	Buzzards Bay Coalition	4	\$35,535	\$3,000	\$38,535	
	Barnstable Clean Water Coalition	2	\$32,808	\$6,351	\$39,159	
	Average		\$34,172	\$4,676	\$38,847	\$48,847
OVERALL AVERAGE COSTS					\$33,409	\$43,409

References: Buzzards Bay Coalition, Designing a Municipal Model for Mandating, Funding, and Managing I&A Septic Systems, June 2020
Barnstable Clean Water Coalition, Schubael's Pond Study, 2022

WARMING WATERS + NUTRIENTS=





COOLPIX W300, 4.3mm, f/4.1, 1/800s





BCLEANWATER.ORG



Issue 25, Fall 2023
COALITION
Quarterly
DOUBLE ISSUE

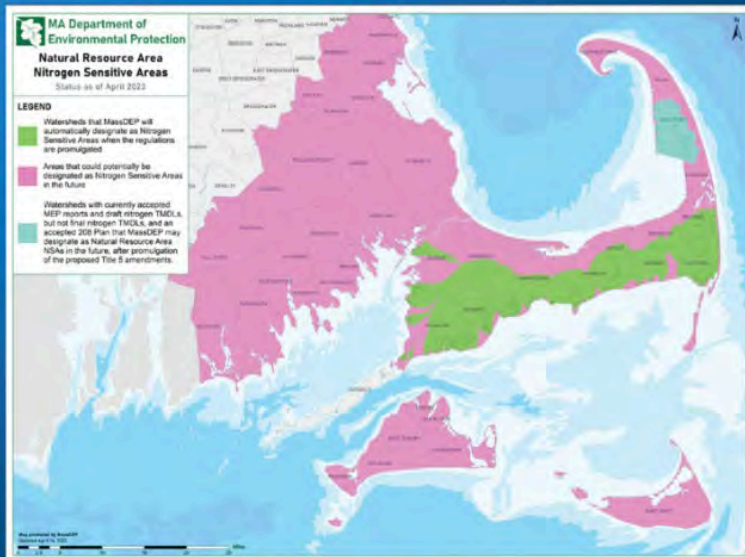
Rules, Regulations, and Resources

The Enterprise
FALMOUTH • BOURNE • MASHPEE • SANDWICH

Health Board Passes New Septic Regulations

VINEYARD  GAZETTE

New Wastewater Rules Arrive in Tisbury



BCleanWater.org

Step-by-Step Instructions for Installing An I/A System

1. Find out if you live in a Nitrogen Sensitive Area (NSA) and if your town is applying for a Watershed Permit (WP). Please refer to the NSA map on this issue's cover page.

- If you live in an NSA and your town is not applying for a WP, you will most likely need to install an I/A system.

- If you live in an NSA and your town is applying for a WP, you should discuss with your town's Board of Health if you should install an I/A system.

- If you live in Barnstable, visit the town's website (Administrative Dept->Assessing Division>Property Look Up) to determine if your property is scheduled to be connected to the town's sewer system.

2. Explore your financing options. The state, Barnstable County and a few Cape Cod towns have several options to help you. See page 6 for specific programs.

3. Select a local engineer. Choose a firm that specializes in civil engineering, land surveying, environmental permitting and understands the soil conditions of Cape Cod. They will design a system plan specific to your site and will secure approvals and construction permits with your local Board of Health and Conservation Commission (if you live near wetlands).

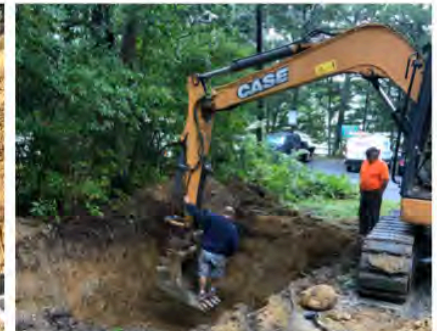
4. Working with your engineering firm, select an I/A system manufacturer and installer that offers an I/A system technology (BACT) that meets your goals and budget.

5. Once permits have been secured by your engineer, hire an excavator that will install your system and notify your town of the installation. It is important that the excavator is trained to install the I/A system you have selected.

6. Set up a system maintenance contract with a service provider.

7. Follow the US EPA's Septic Smart tips to ensure the proper function and longevity of your septic system.

Check out the Resources page on the BCWC website for more information.



THANK YOU