

Nitrogen reducing innovative and alternative septic systems installed in Falmouth:

Standards, performance and costs 2015-2020

MaDEP requirements to get to General Use

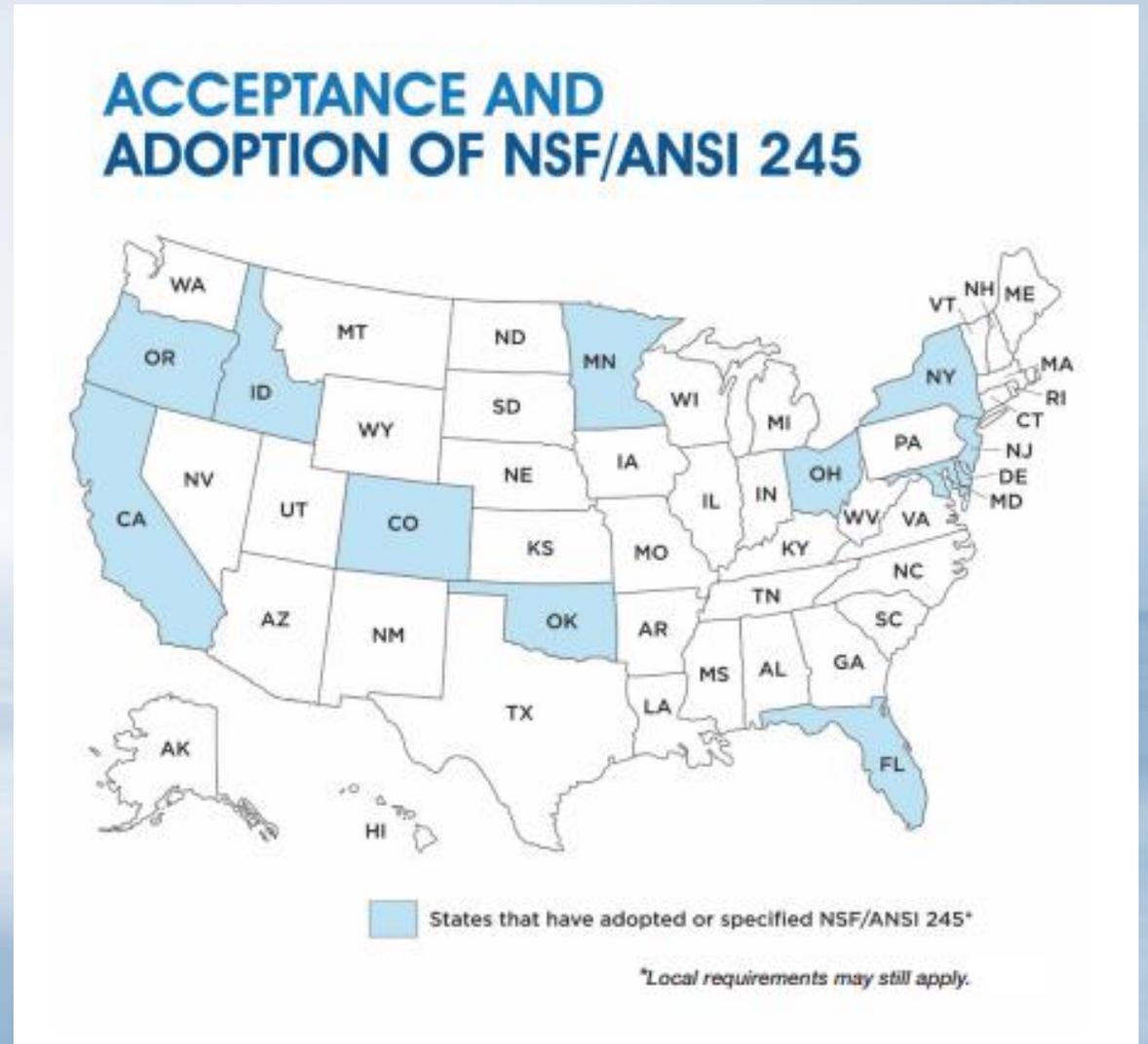
- MaDEP requires up to 15 installations (Pilot)...
- then additional installations to reach 50 (Provisional) with 3 years of quarterly monitoring & evaluation...
...before considering granting General Use approval.

Virginia requirements to get to General Use

- 20 systems installed and monitored
- Influent and effluent sampled quarterly for one year
- System must provide a 50% reduction of TN as compared to a conventional gravity drainfield system through:
 - (a) NSF Standard 245 compliance, or
 - (b) Demonstrated performance:
 - Effluent to soil treatment area ≤ 20 mg N/L
 - Mass loading of ≤ 4.5 lbs N / person per year

12 other states' requirements to get to General Use

This standard is for systems treating up to 1,500 gallons per day. Products certified to this standard must achieve total nitrogen reduction of 50 percent or more spanning six months of testing.



Systems approved by MaDEP for General Use with nitrogen reduction credit in Massachusetts

Recirculating sand filters (RSF)

Ruck

MicroFAST

Advantex

SeptiTech

Singulair

Tracking of I/A systems installed in Falmouth
(by the Barnstable County Septic Management Program)

303

Installations in Falmouth

269

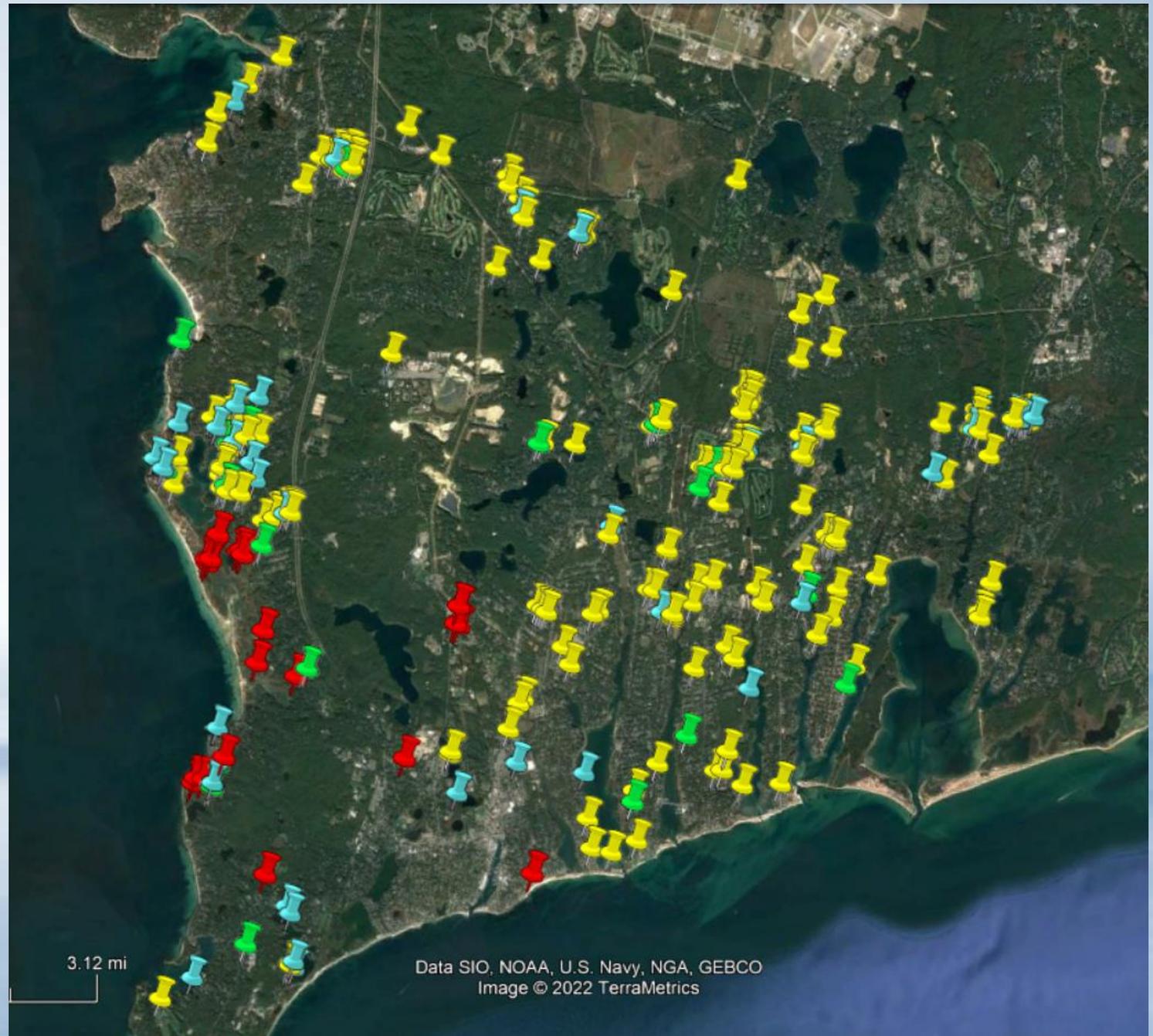
Active installations in Falmouth

177

Active installations in Falmouth with any monitoring data in the past five years

Location of active I/A systems in Falmouth

- Outside MEP watersheds
- Less than 19 mg N/L
- Less than 12 mg N/L
- More than 19 mg N/L or no recent data



Type and number of I/A systems installed in Falmouth

Systems with reported data and approval category

<u>Pilot</u>	<u>Provisional</u>	<u>General Use</u>	<u>Other</u>
OMNI RSF (19)	Bioclere (9)	MicroFAST (85)	Eliminite (6)
	NitROE (3)	RUCK (14)	GW discharge (1)
	Waterloo (1)	Singulair (23)	
	Amphidrome (1)	HOOT (10)	
		RSF (3)	
		Perc-Rite Drip (2)	

Performance of I/A systems installed in Falmouth

Number and % of installations that perform on average ≤ 19 mg N/L

57

(of 177 with data)

3 NitROE (100% performed ≤ 19 mg N/L)

12 RUCK (86% performed ≤ 19 mg N/L)

2 RSF (67% performed ≤ 19 mg N/L)

6 Hoot (60% performed ≤ 19 mg N/L)

7 Omni RSF (37% performed ≤ 19 mg N/L)

2 Eliminite (33% performed ≤ 19 mg N/L)

3 Bioclere (33% performed ≤ 19 mg N/L)

19 FAST (22% performed ≤ 19 mg N/L)

3 Singulair (13% performed ≤ 19 mg N/L)

Performance of I/A systems installed in Falmouth

Number and % of installations that perform on average ≤ 12 mg N/L

23

(of 177 with data)

2 NitROE (67% performed ≤ 12 mg N/L)

2 Hoot (20% performed ≤ 12 mg N/L)

2 RSF (67% performed ≤ 12 mg N/L)

9 FAST (11% performed ≤ 12 mg N/L)

8 RUCK (57% performed ≤ 12 mg N/L)

1 Bioclere (11% performed ≤ 12 mg N/L)

Performance of I/A systems installed in Falmouth

Number and % of installations that perform on average ≤ 6 mg N/L

4

(of 177 with data)

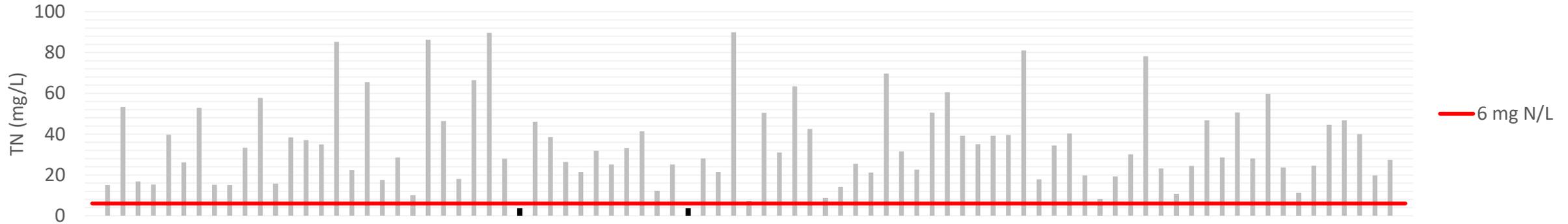
1 NitROE (33% performed ≤ 6 mg N/L)

1 RUCK (7% performed ≤ 6 mg N/L)

2 FAST (2% performed ≤ 6 mg N/L)

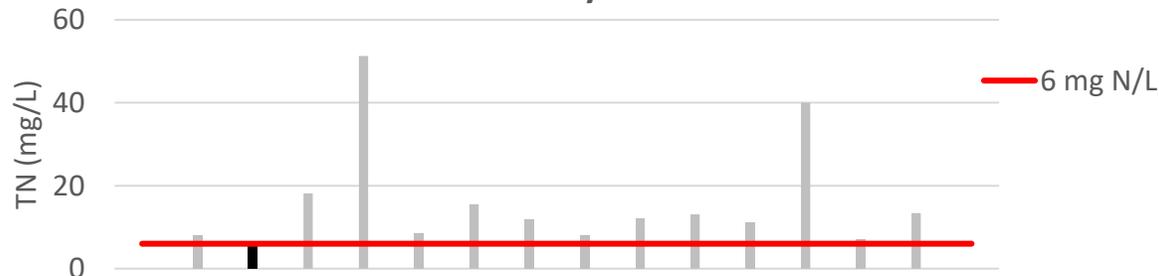
Performance of I/A systems installed in Falmouth

Falmouth's FAST Systems: Average Total Nitrogen data reported to Barnstable County from 2015 - 2020



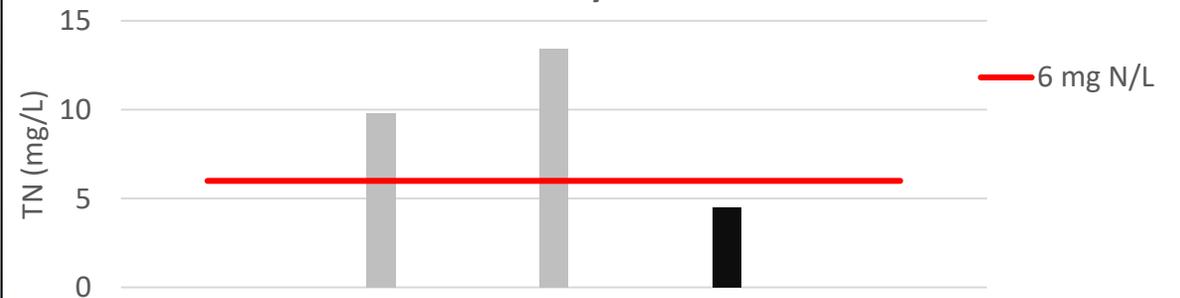
2 FAST systems (2%) performed ≤ 6 mg N/L

Falmouth's RUCK Systems: Average TN data reported to Barnstable County from 2015 - 2020



1 RUCK (7%) performed ≤ 6 mg N/L

Falmouth's NitROE Systems: Average TN data reported to Barnstable County from 2015 - 2020



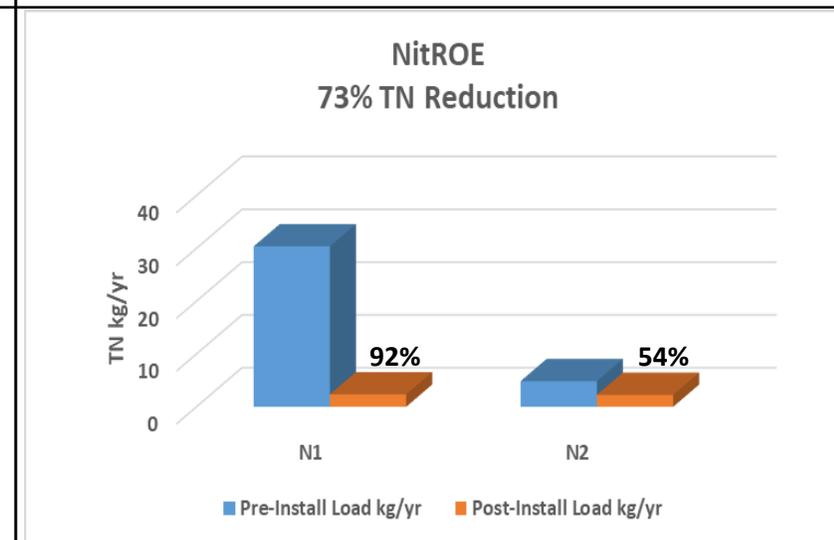
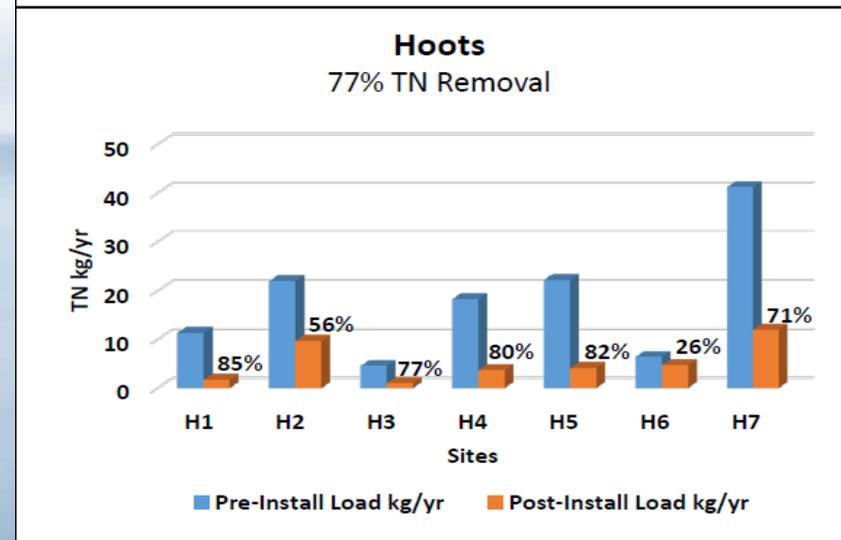
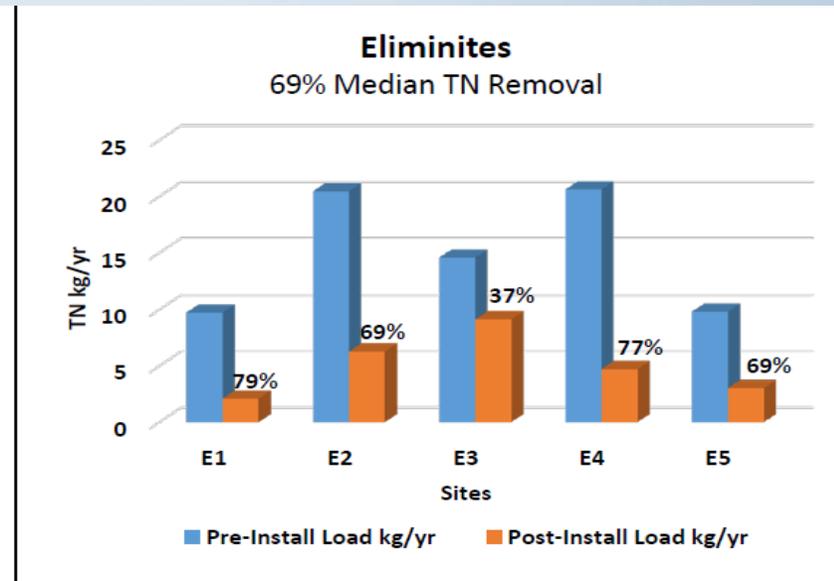
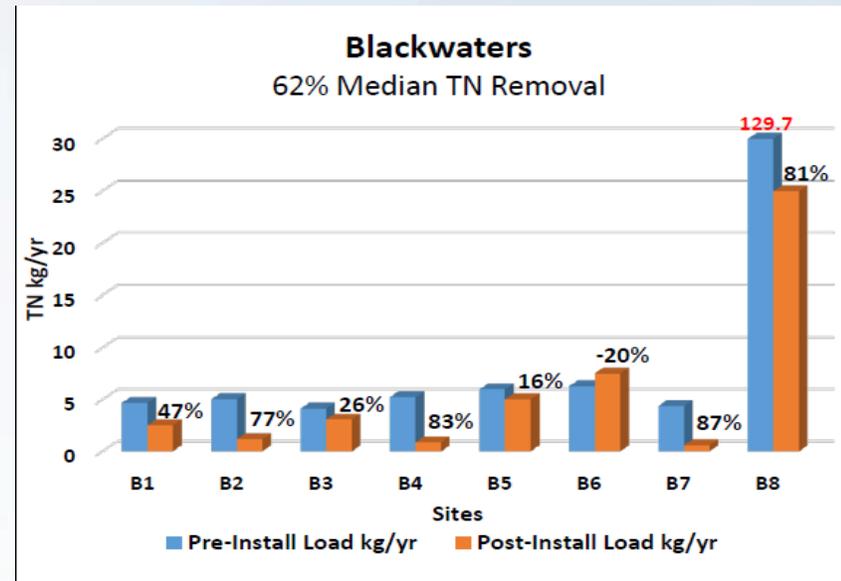
1 NitROE (33%) performed ≤ 6 mg N/L

Performance of I/A systems installed as part of the West Falmouth demonstration project

Project goal was to achieve at least 12 mg TN/L and/or at least 67% TN reduction

Only 7 of 24 systems on average perform ≤ 12 mg TN/L

Only 14 of 24 systems achieved a 67% or higher reduction



Conclusions about I/A systems installed in Falmouth

- Most systems with General Use approval in Massachusetts for nitrogen reduction did not perform at their required level of 19 mg N/L and do not remove sufficient nitrogen to justify their cost.
- Percentage of systems with General Use approval that on average met the performance level of 19 mg N/L in Falmouth; 86% of RUCK installations, 67% of RSF installations, 60% of HOOT installations, 22% of MicroFAST installations and 13% of Singulair installations.
- The only systems that do perform well and could have a meaningful impact on nitrogen reduction do not have General Use approval (e.g., NitROE, Nitrex).

Capital / O&M / sampling / inspection / compliance / costs

- For installations with General Use approval, MaDEP requires quarterly sampling for the first year then 10% of systems sampled monthly until all systems are sampled at least once per year under a watershed permit, twice a year under title 5. (If adequate performance; if inadequate performance, quarterly sampling continues.)
- Installations with General Use approval require monthly physical inspections of mechanical components by a licensed plant operator for two years. (If adequate performance, then once annually thereafter.)
- MaDEP does not allow for remote monitoring of an I/A system for compliance.

Capital / O&M / sampling / inspection / compliance* / costs

From Wright-Pierce Memo within the Pleasant Bay Report (2020):

Projected capital costs: \$33,900 + \$1,560 = \$35,460

Borrowing capital costs* at 0% over 20 years: \$1,773

Projected average O & M (after the first year): \$798

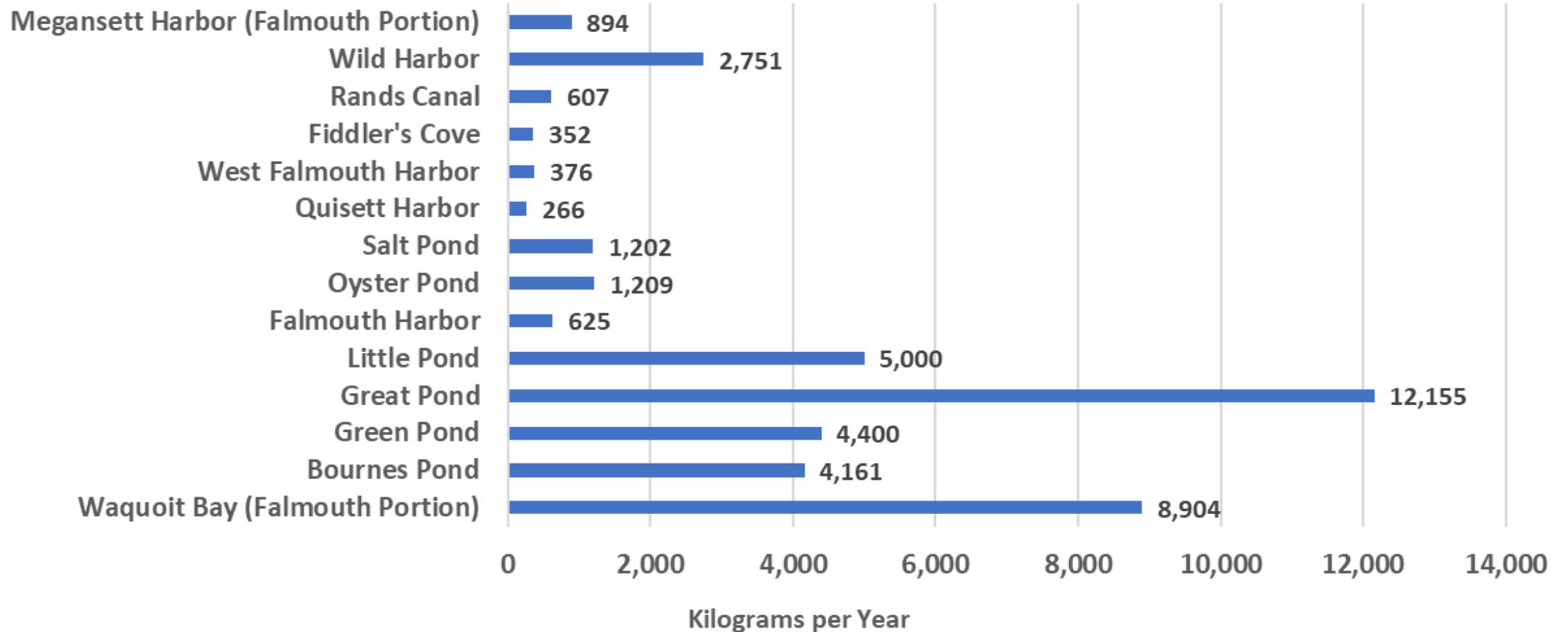
Projected inspection and sampling (after the first year): \$780

Total annual costs (capital loan / O&M / I&S): \$3,351

*Capital Costs include survey and design, permitting, easements, I/A, upgrade leaching field, site restoration, upgrade electrical service among others. O&M includes electricity, septage pumping, chemicals, repairs and program costs. Compliance costs are currently unknown.

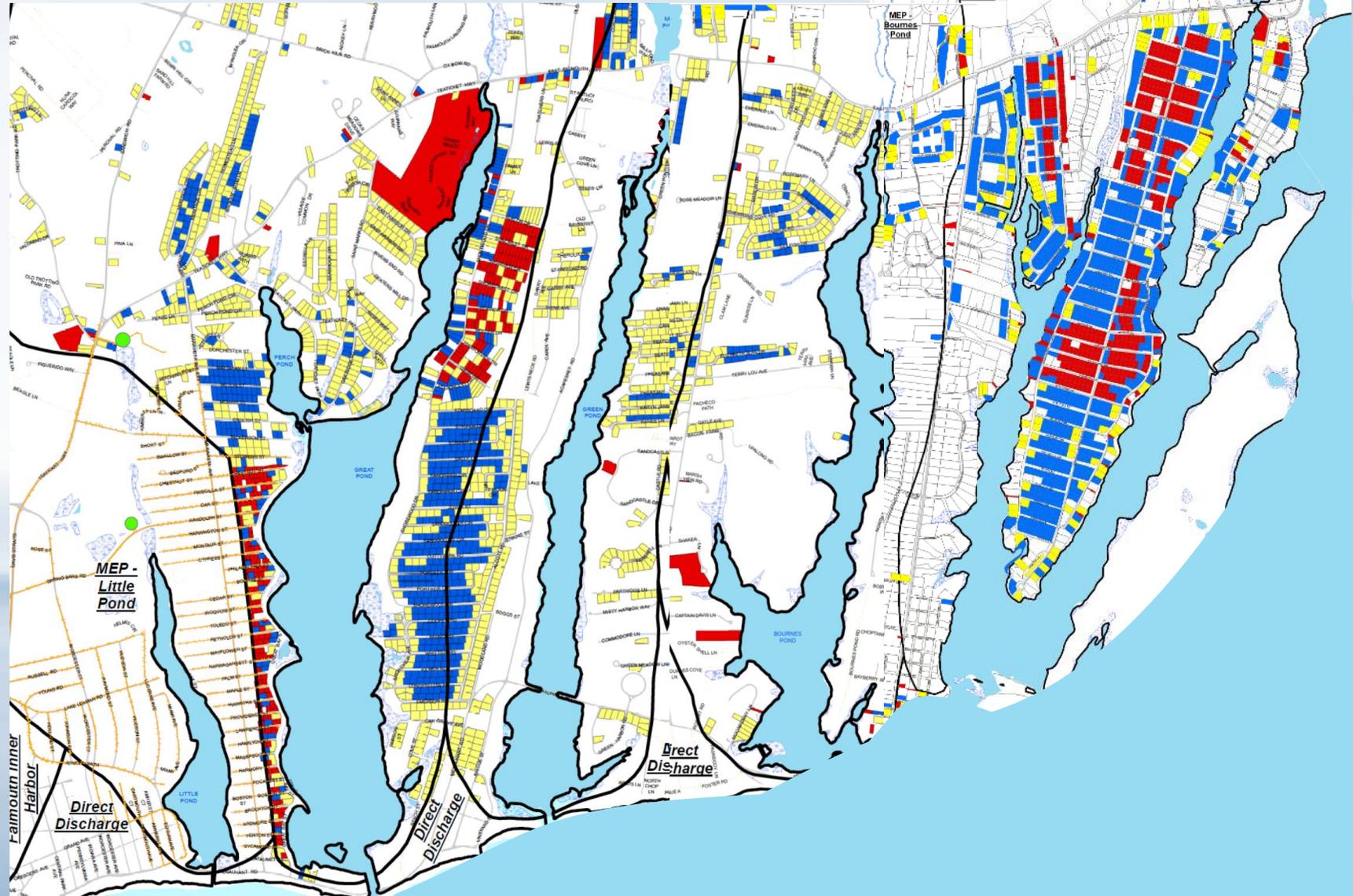
Nitrogen removal required to meet the TMDLs

Nitrogen Required to be Removed to Restore Each Estuary
(Massachusetts Estuaries Project)

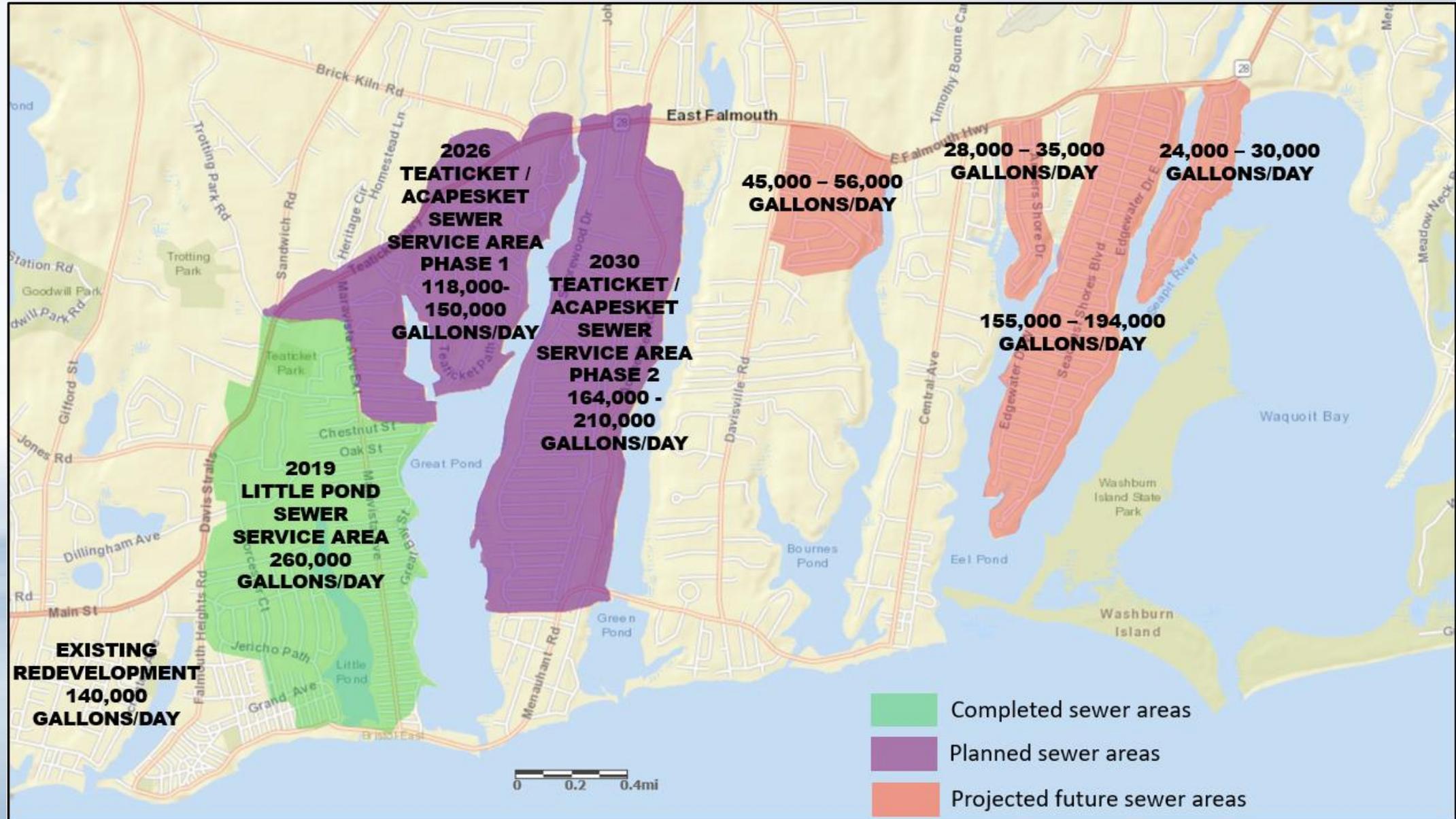


Map of parcel sizes on the south coast

-  : Less than 8,000 sf
-  : 8,000 sf to 10,000 sf
-  : 10,000 sf to 15,000 sf



Completed / planned / projected sewer areas



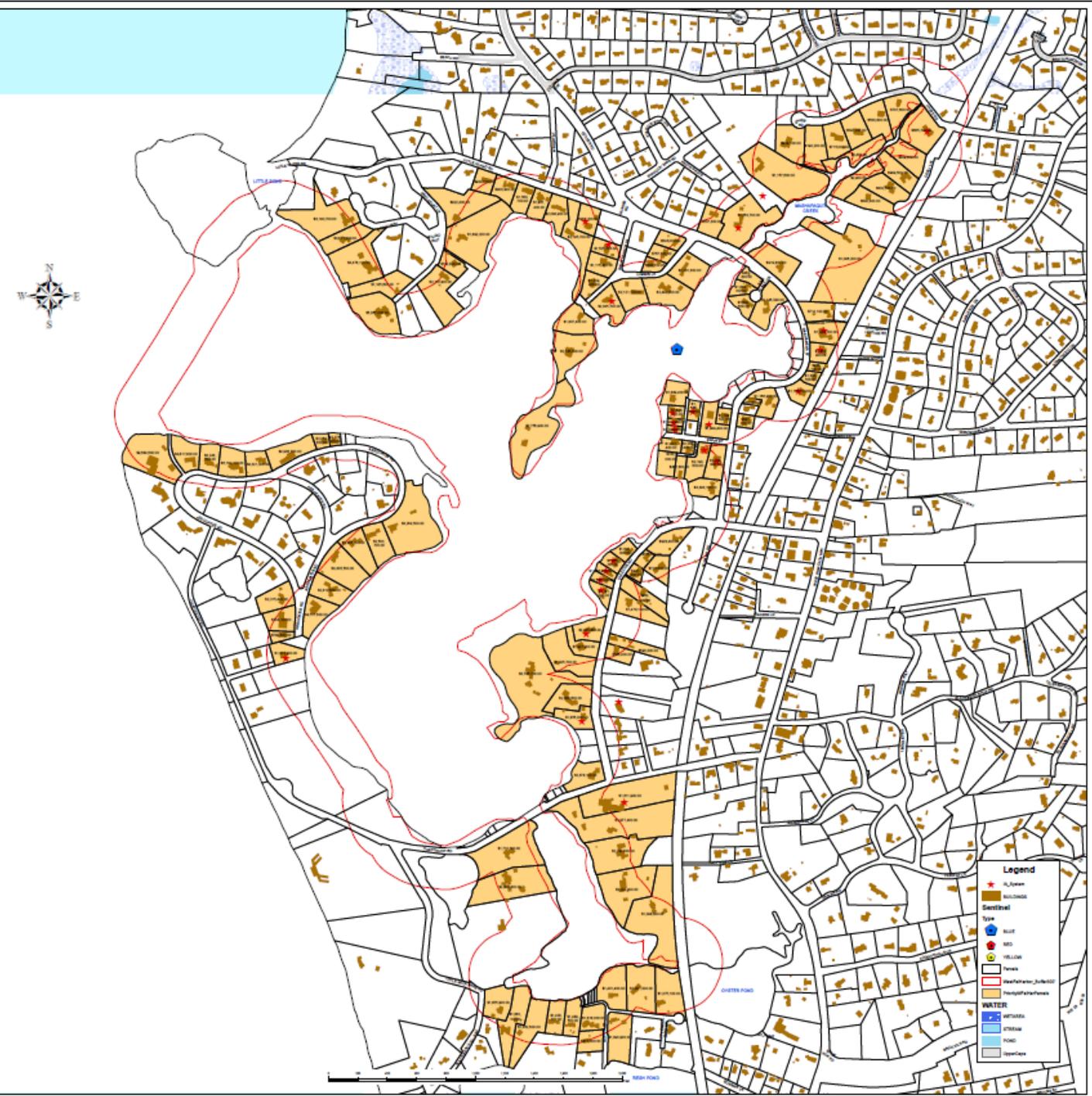
Working group draft of a potential I/A bylaw requiring the use of I/A's in certain Falmouth Buzzards Bay estuaries

- I. Areas Covered: those properties in Falmouth where a lot lies within 300 feet of impacted waterbodies that discharge into Buzzards Bay and have a TMDL (i.e., Rands Canal, Fiddlers Cove, West Falmouth Harbor and Quissett Harbor).
- II. Conditions and timelines requiring the installation of advanced I/A's.
 - a. new construction
 - b. substantial improvement
 - c. at transfer of Title
 - d. at Title 5 failure
 - e. at time trigger

Fiddlers Cove



West Falmouth Harbor



Quissett Harbor



Approximate Number of Parcels

West Falmouth Harbor	110
Fiddlers Cove	58
Quissett	25
Total	193

The background of the slide is a blurred, artistic photograph of a beach scene. It shows a sandy beach in the foreground, the ocean extending to the horizon, and a bright, hazy sky. The overall color palette is light and airy, dominated by blues, whites, and soft yellows.

Discussion