

2ND ANNUAL
CAPE COASTAL
CONFERENCE

JUNE 5, 2014



Linking Science with Local Solutions and Decision-Making

Alternative Onsite Septic Systems and Their Potential Role in Wastewater Management Strategies.

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Barnstable County Department of Health and Environment
and
The Massachusetts Alternative Septic System Test Center

Alternative Onsite Septic Systems

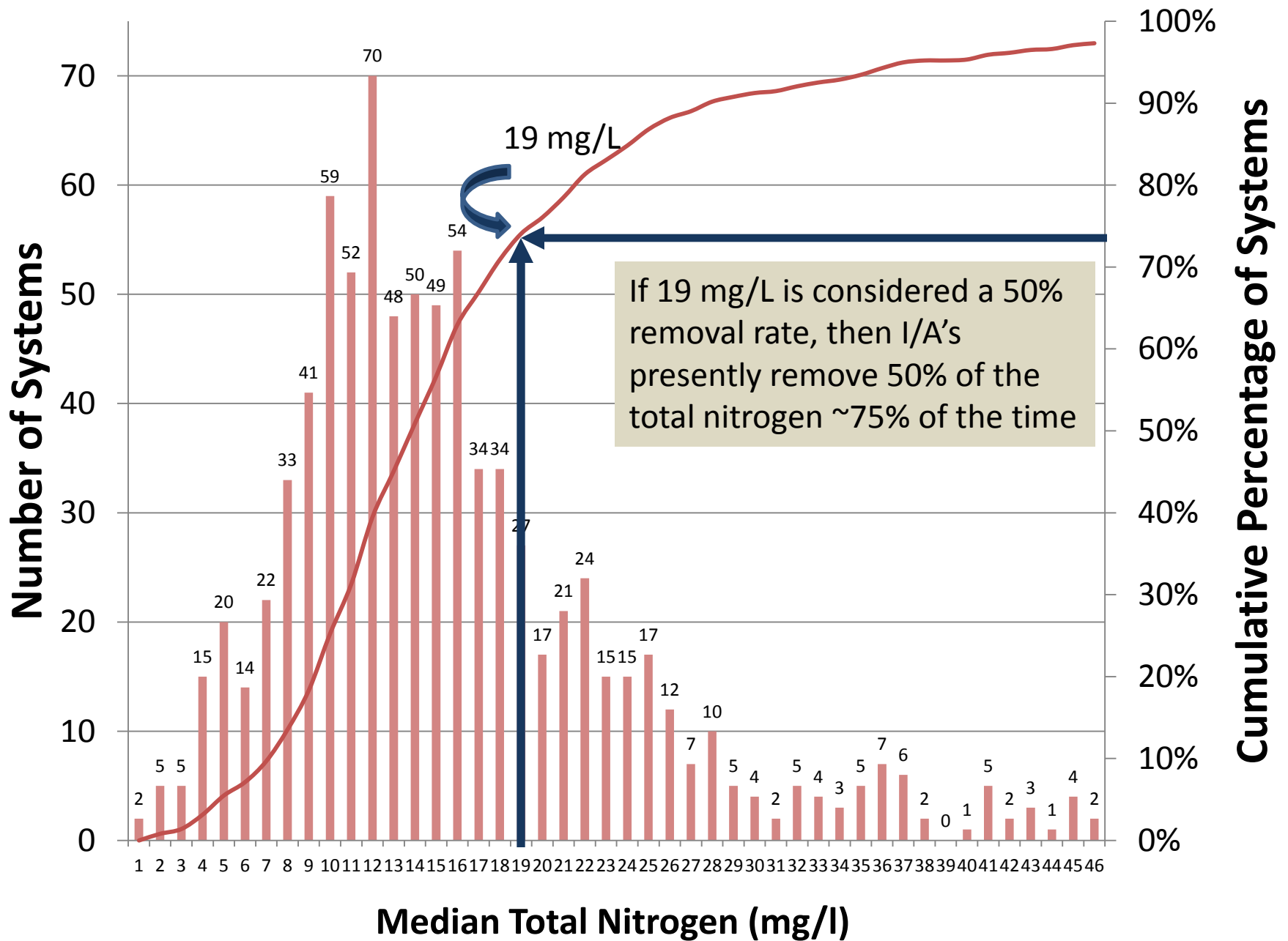
What do we know about their performance and
how do we know it ?



Barnstable County Department of Health and Environment has been monitoring the performance of alternative onsite septic systems for the past ten years on behalf of 14 Barnstable County Towns. It presently tracks over 1650 I/A systems.

I/A Monitoring and Compliance

- In 2005, BCDHE created a web-based database to collect maintenance and sample reports for I/A systems for 14 towns in Barnstable County.
- Provide the initial level of compliance on behalf of town Boards of Health.
- Analyze incoming data and provide reports to the public to help determine efficacy of various technologies and I/A in general.



Why 19mg/l for Nitrogen?

Assumptions:

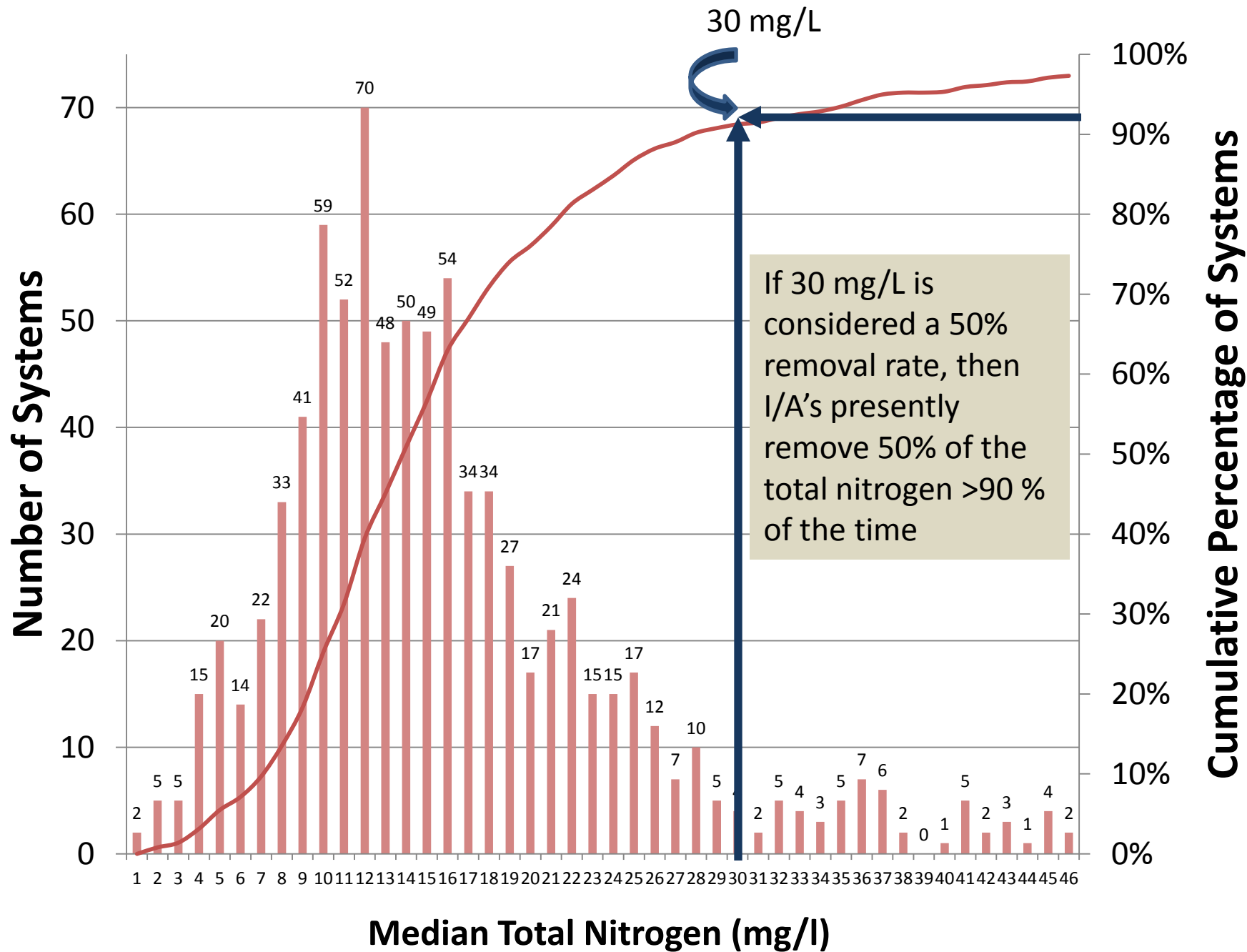
- 2.9kg nitrogen per person per year
- 55 gallons water use per person per day

System Influent Concentration:

~38 mg/l Total Nitrogen

50 Percent Removal:

19 mg/l Total Nitrogen



What do others say ?

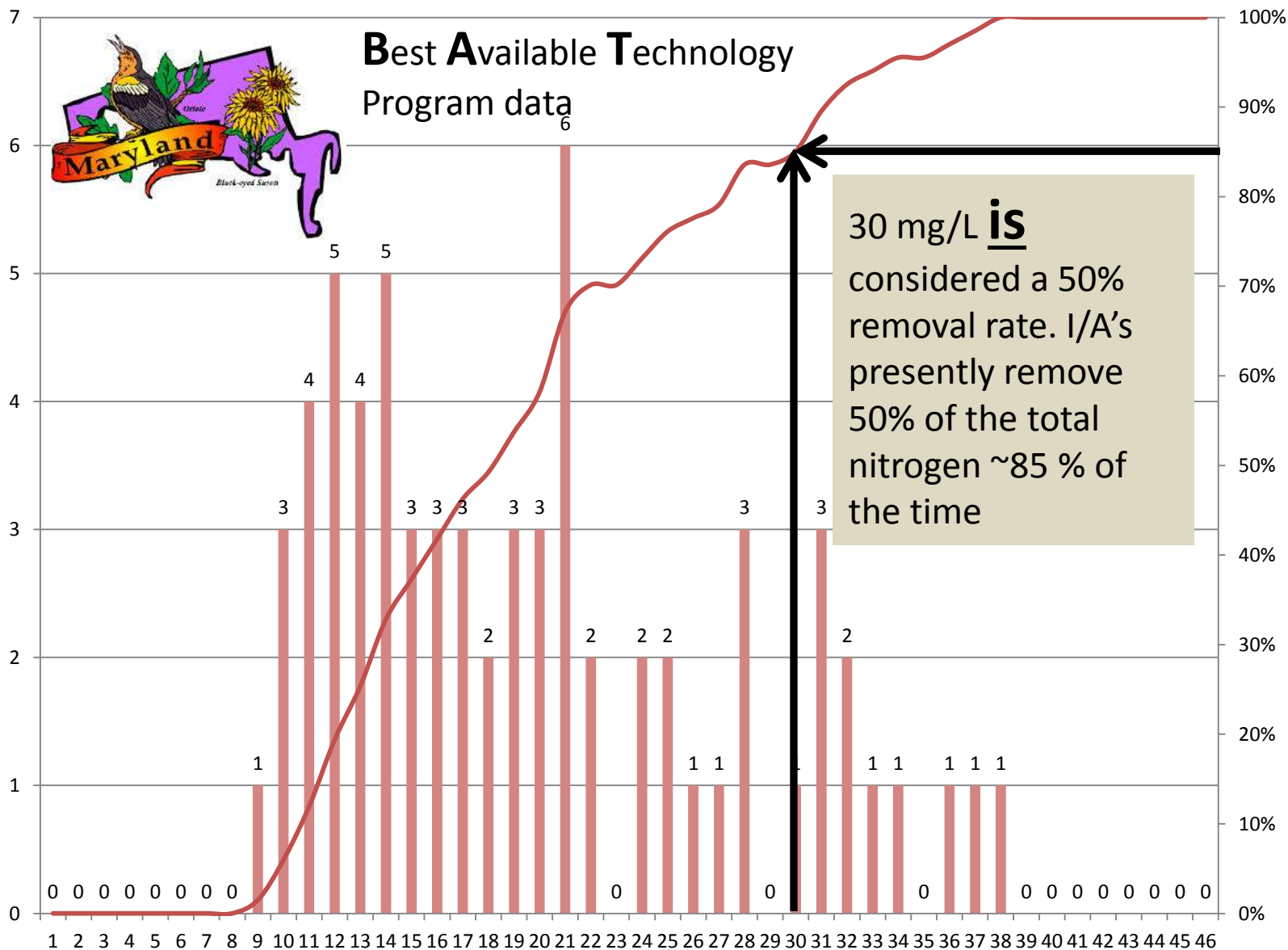


Data Source:

Number of Systems



Best Available Technology
Program data



Cumulative Percentage of Systems

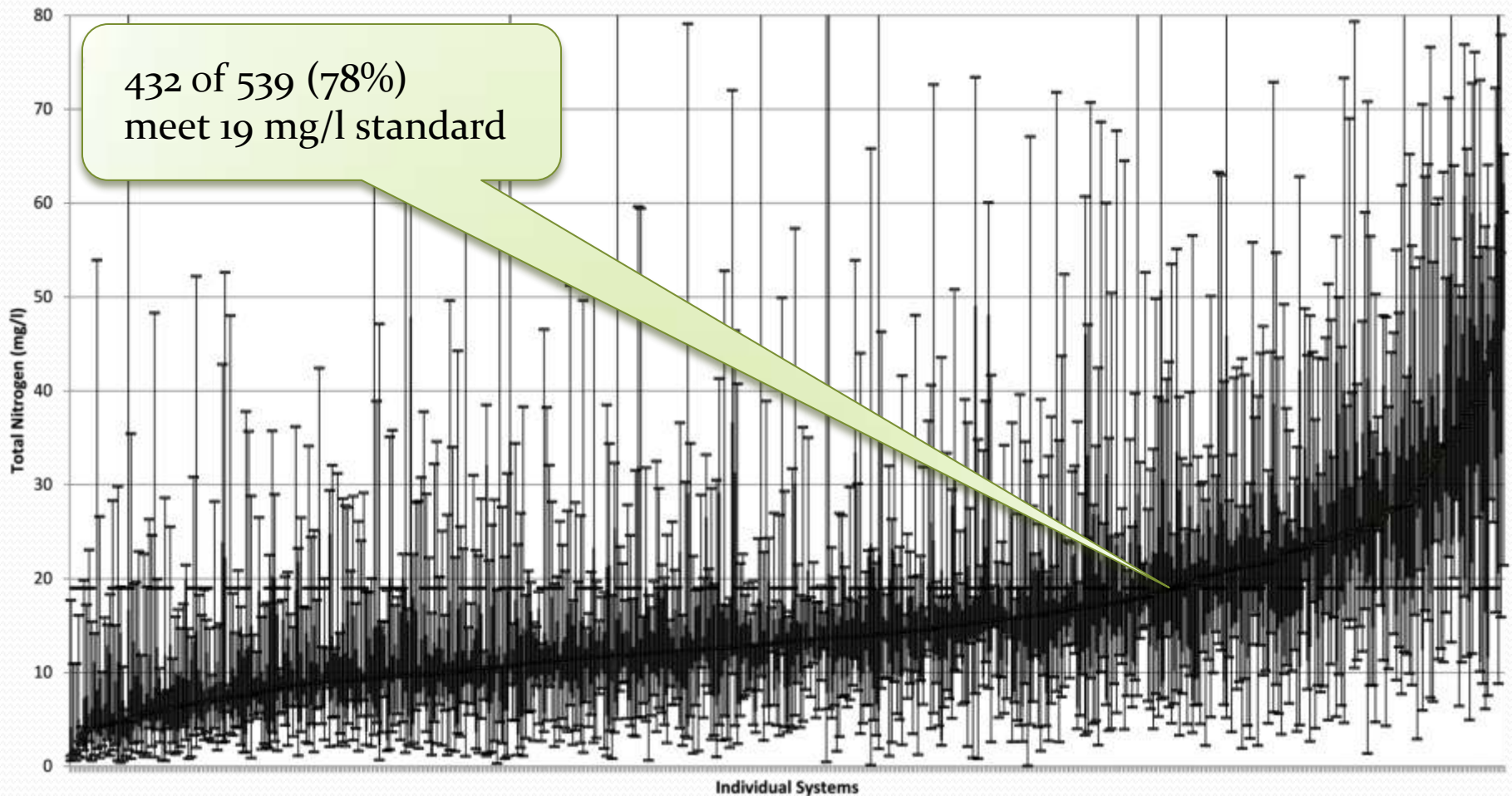
Median Total Nitrogen (mg/l)

Performance Stability

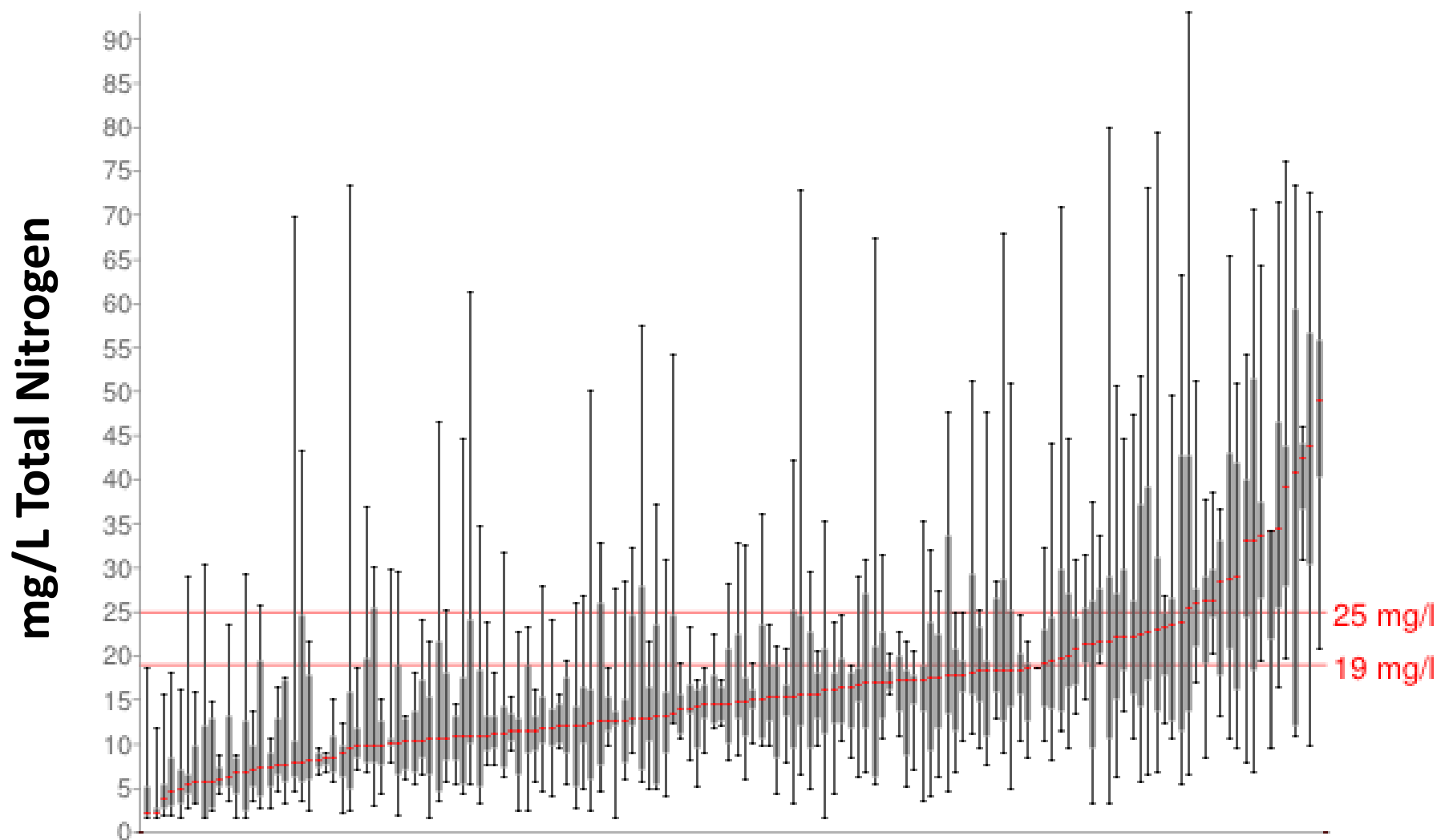
The key to predicting outcomes in the TDML process



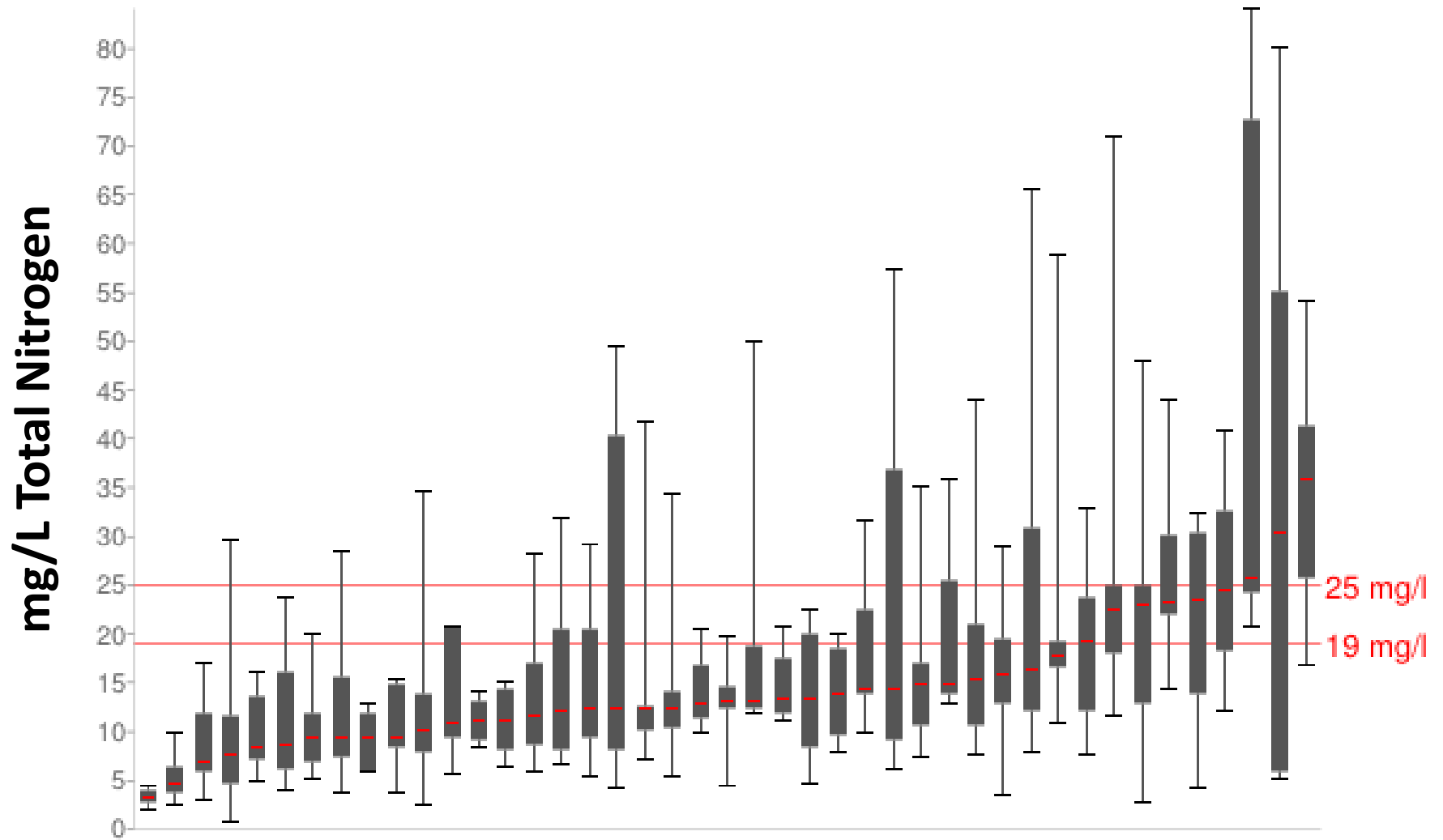
Nitrogen Removal Single Family Systems



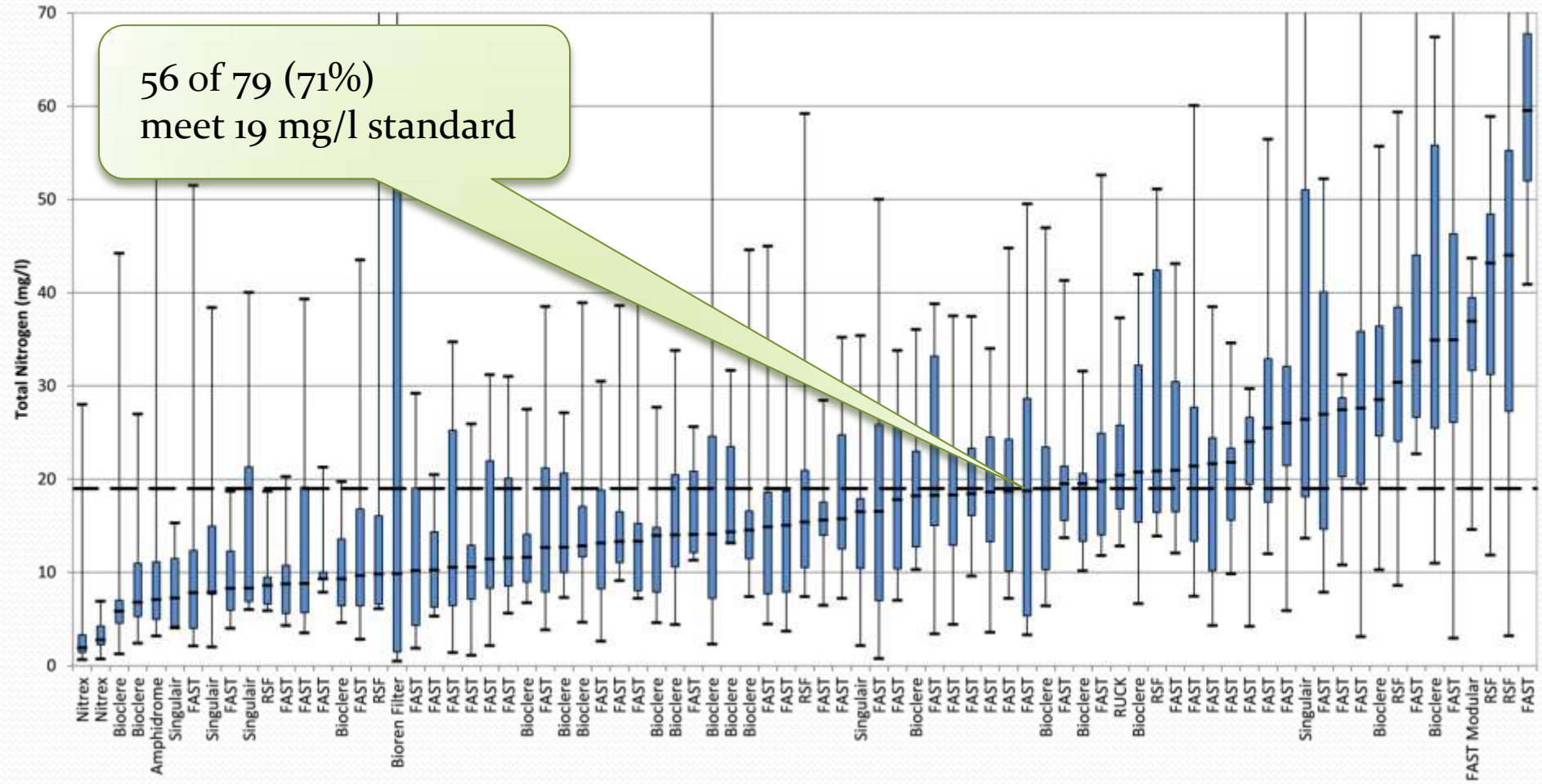
Single Family Total Nitrogen(in mg/l)
All Technologies in the town of Mashpee (148 systems)



Single Family Total Nitrogen(in mg/l)
FAST Systems in the town of Falmouth (43 systems)



Nitrogen Removal Multi-Family Systems



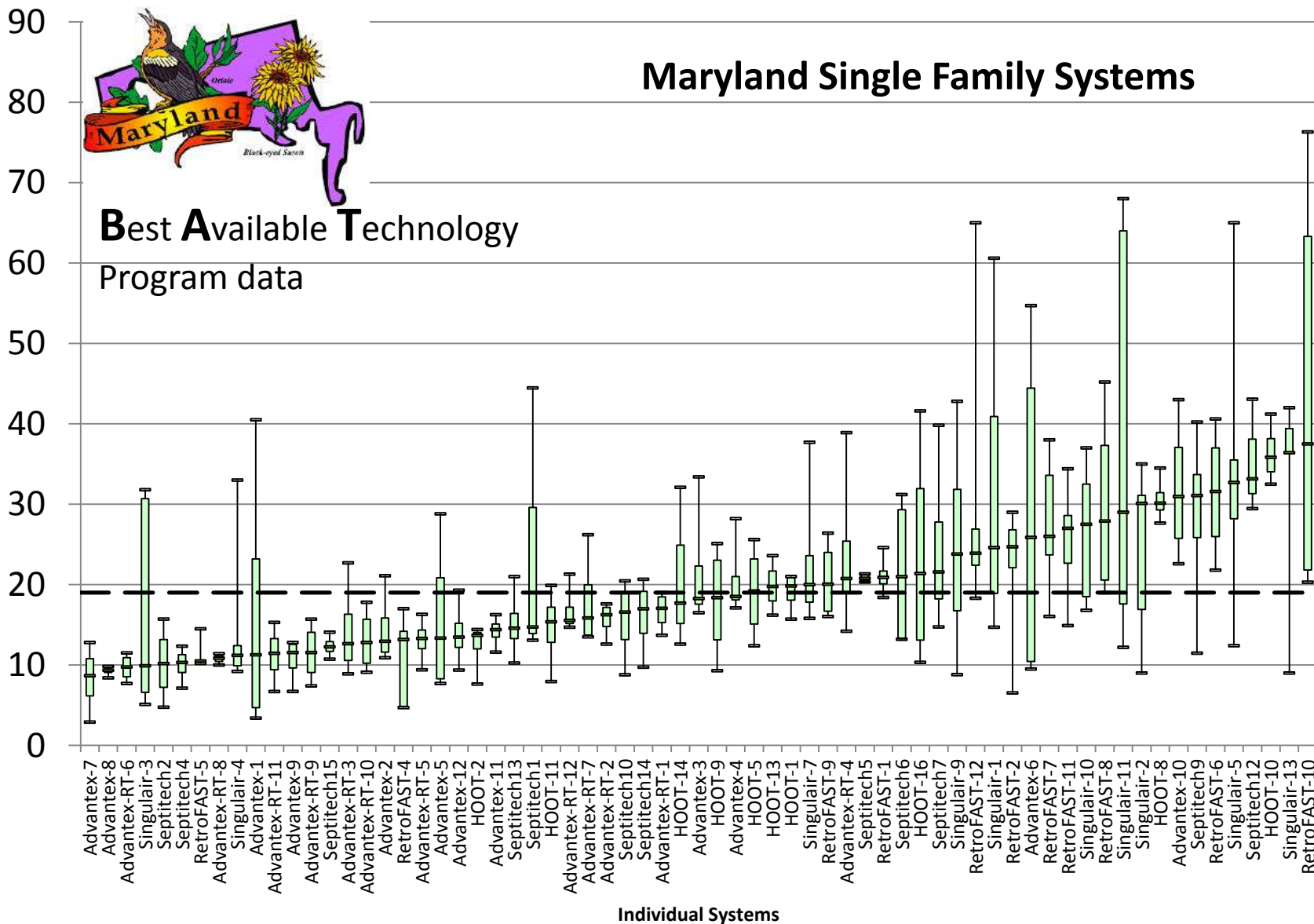


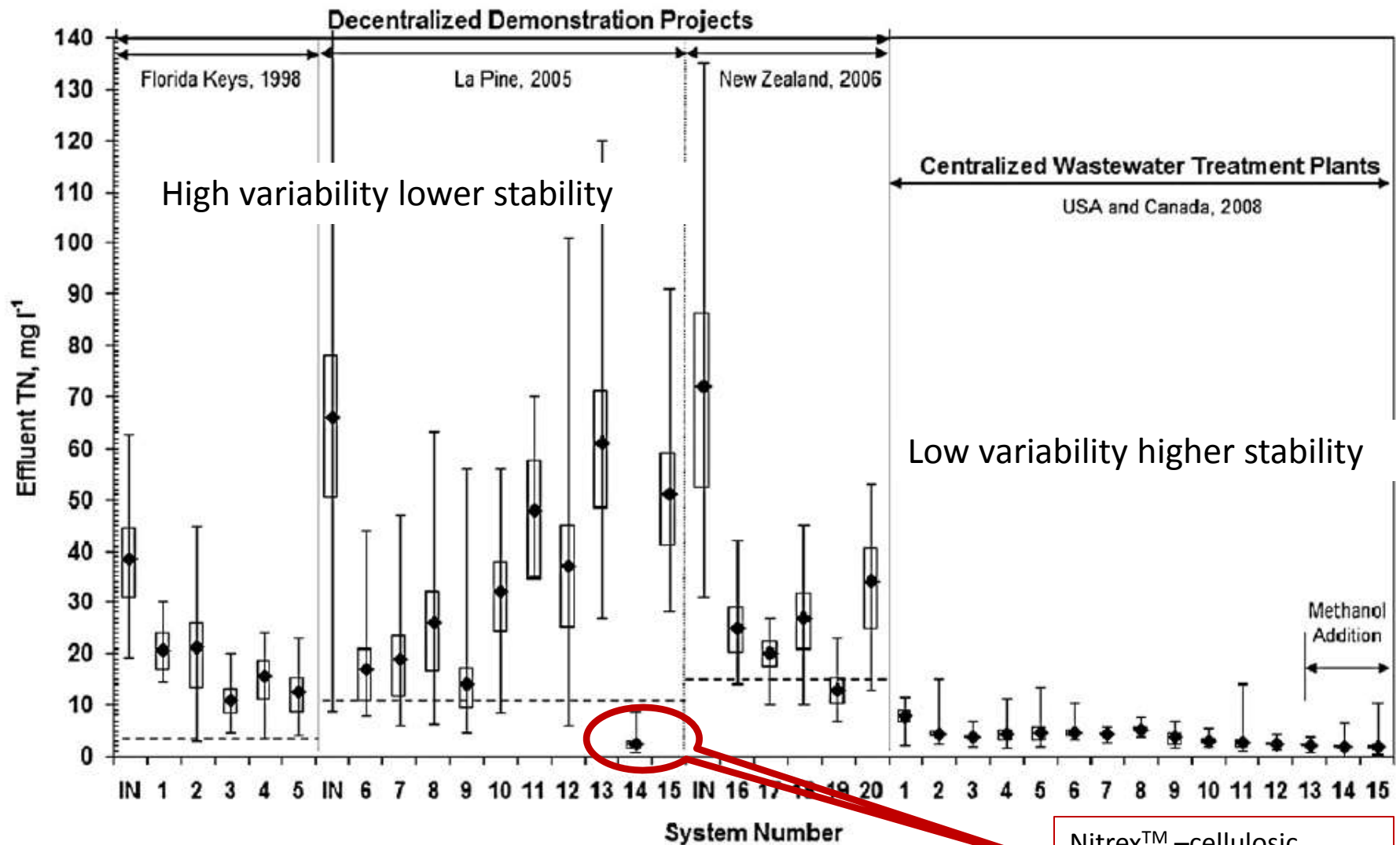
Maryland Single Family Systems

Total Nitrogen(mg/l)

Best Available Technology

Program data





Nitrex™ –cellulosic material used for denitrification

Source: Oakley, S.M., Gold, A.J. & Oczkowski, A.J. Nitrogen control through decentralized wastewater treatment: Process performance and alternative management strategies. *Ecological Engineering* **36**, 1520–1531 (2010).

Presently efforts are underway to determine how to use existing data to help assign appropriate credits for the use of alternative onsite septic systems, given the variability of the data.

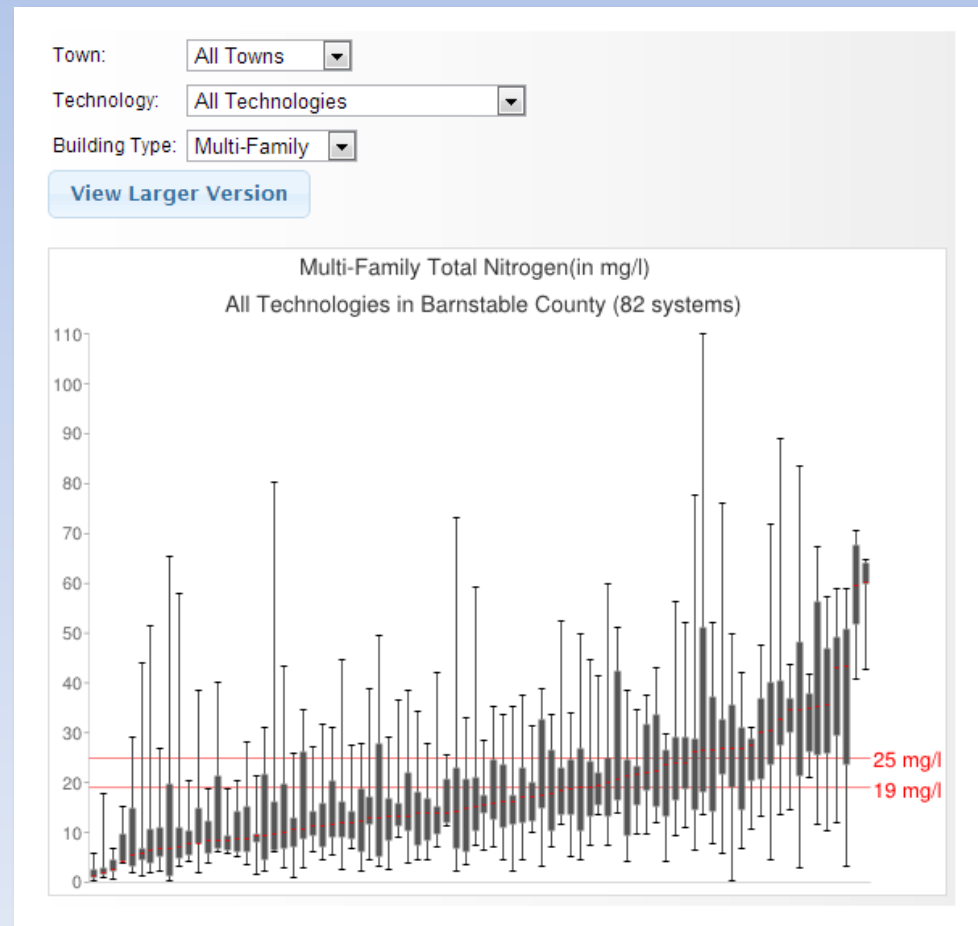


More Data Online!

www.barnstablecountyhealth.org/ia-systems/information-center/data-and-statistics

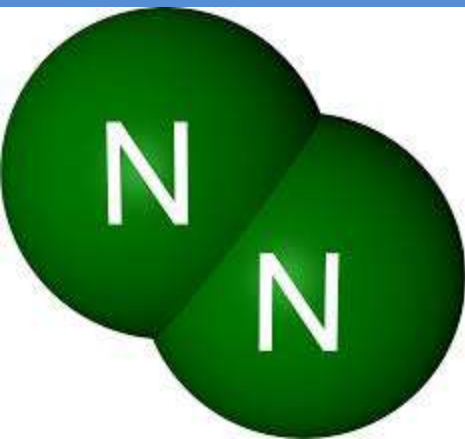
Interactive I/A Data

- Drill down by
 - Town
 - Technology
 - Building Type
- Data is updated on a regular basis.



“Passive” removal of nitrogen In the onsite setting

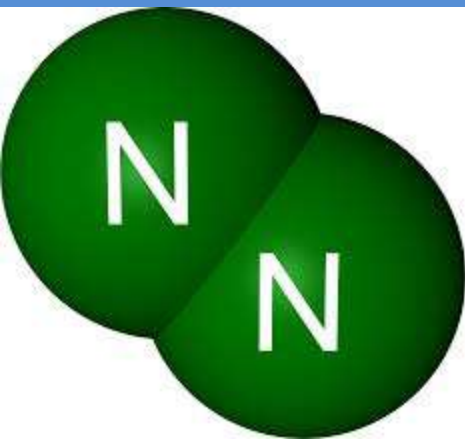
**Non-proprietary means for removing nitrogen
with minimum power consumption**



Three Strategies

Learning from three publically funded projects

1. **Florida passive nitrogen removal** (Florida DOH and partners)
2. **Horizontal reactive barrier** (WBNEER)
3. **Horizontal flow woodchip bioreactor** (Washington State)
4. **Hybrid best guess design using woodchips** (possible)





Florida Passive Nitrogen Removal Project



Objective:

To develop nitrogen reduction strategies for onsite sewage treatment and disposal systems (OSTDS) in Florida

Florida Onsite Sewage Nitrogen Reduction Strategies Project

FDOH Contract CORCL

Study Areas:

- A* Development and pilot testing of passive nitrogen reduction systems (PNRS)
- B* Field testing of full-scale nitrogen reduction systems to determine performance and cost
- C* Assessment of the fate and transport of nitrogen from OSTDS in soil and groundwater
- D* Development of decision support tools for OSTDS planning and nitrogen reduction

HAZEN AND SAWYER
Environmental Engineers & Scientists

in association with



AET
Applied Environmental Technology

OTIS
ENVIRONMENTAL
CONSULTANTS



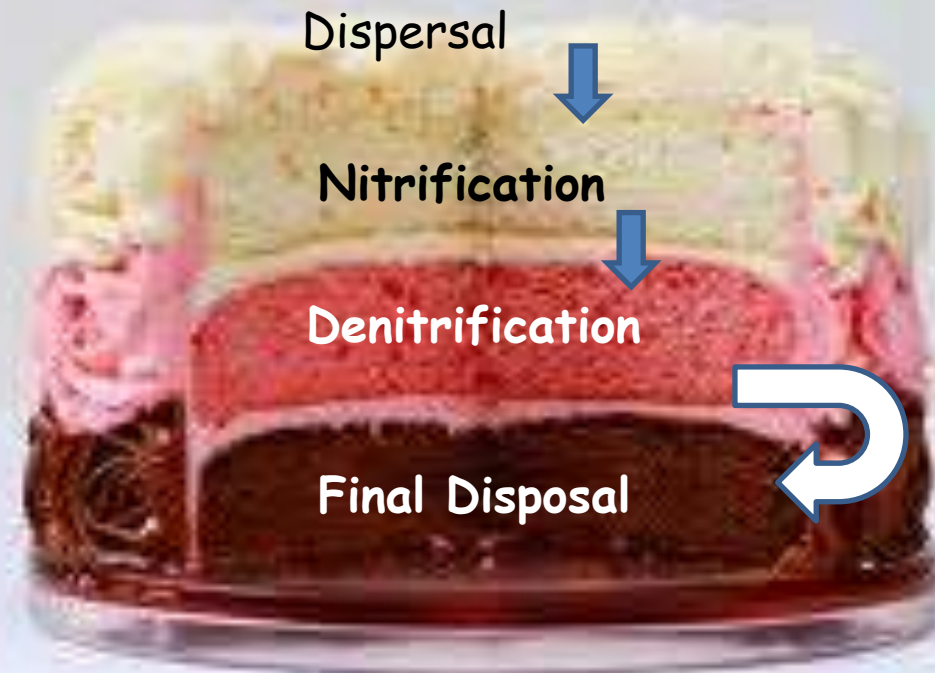
What is “Passive” ?

Passive nitrogen reduction system are systems that reduce effluent N using reactive media for denitrification and a single liquid pump, if necessary.

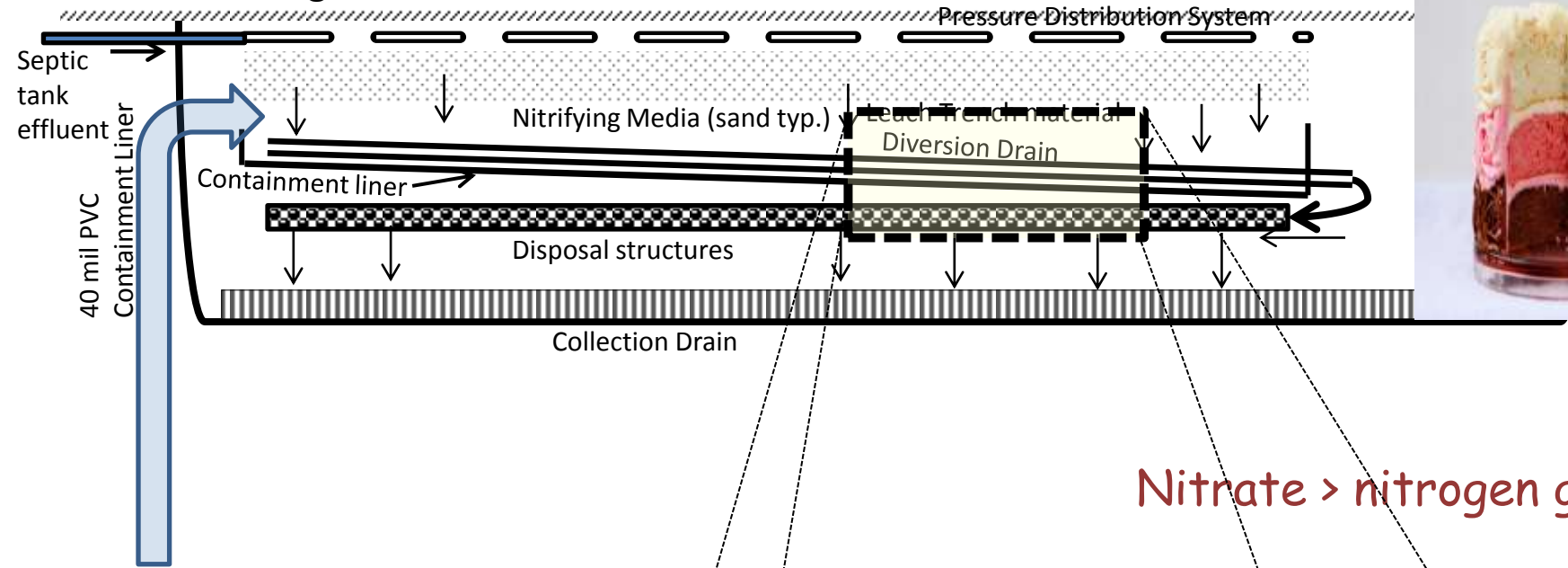
What design is most promising for our area?

Source: Damann L. Anderson, P.E.,
Hazen and Sawyer, P.C.

Layer Cake

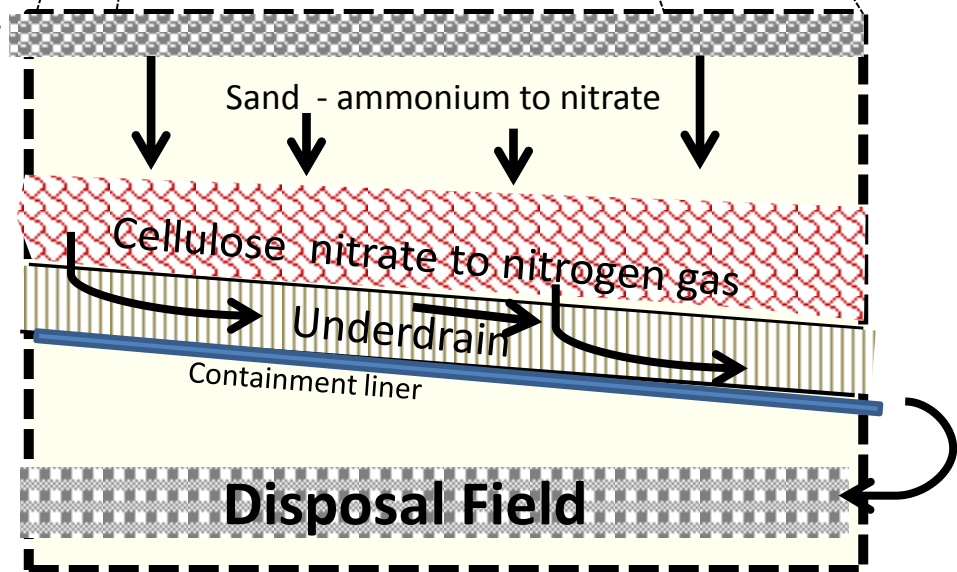


"Florida" Design Cell

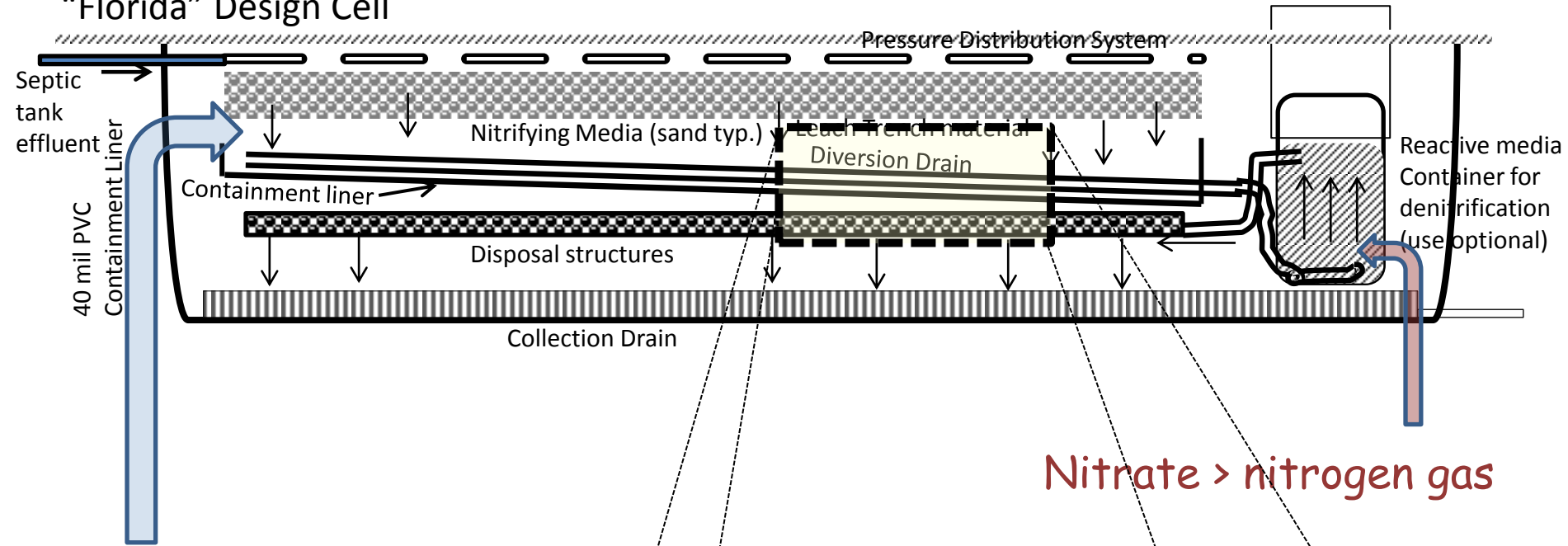


Ammonium > nitrite > nitrate

Nitrate > nitrogen gas

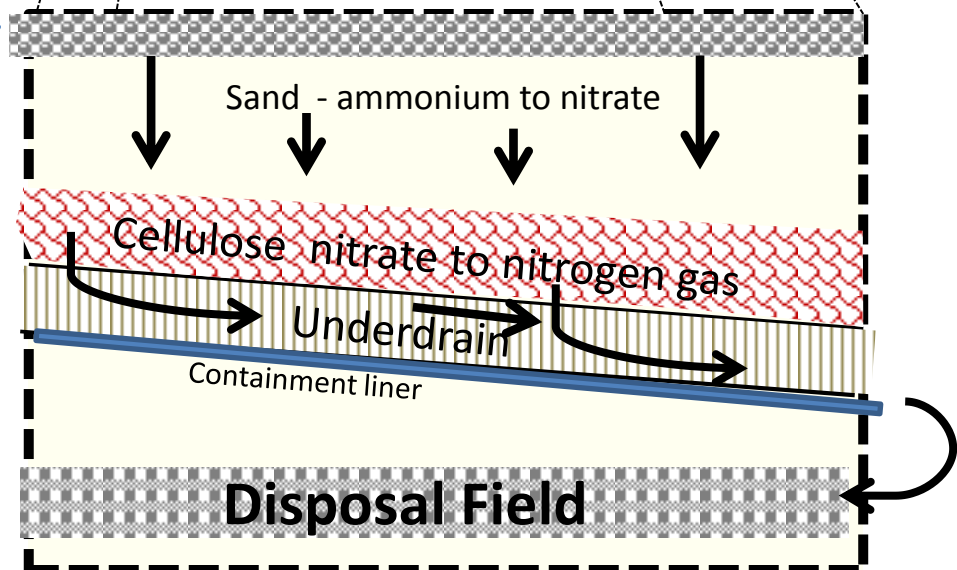


"Florida" Design Cell



Nitrate > nitrogen gas

Ammonium > nitrite > nitrate

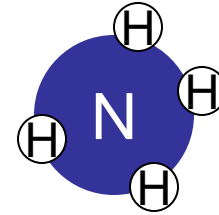




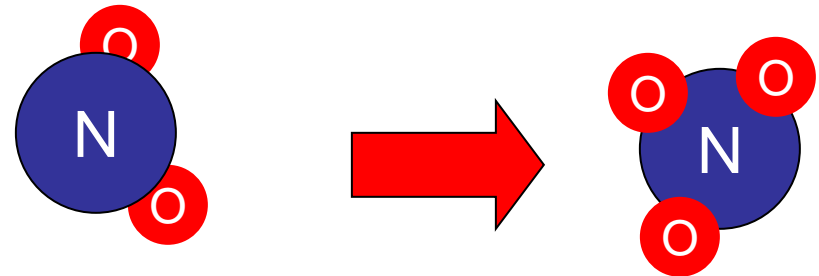
Horizontal Reactive Barrier

Installed at a bed and breakfast in mid 90's but never adequately validated

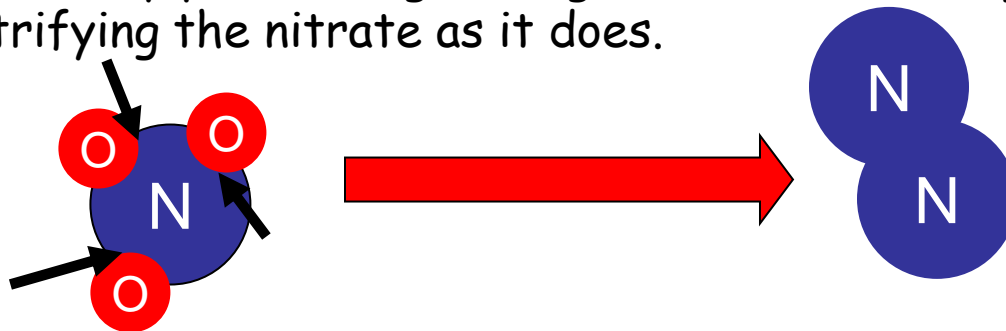
Septic tank effluent is distributed to leachfield



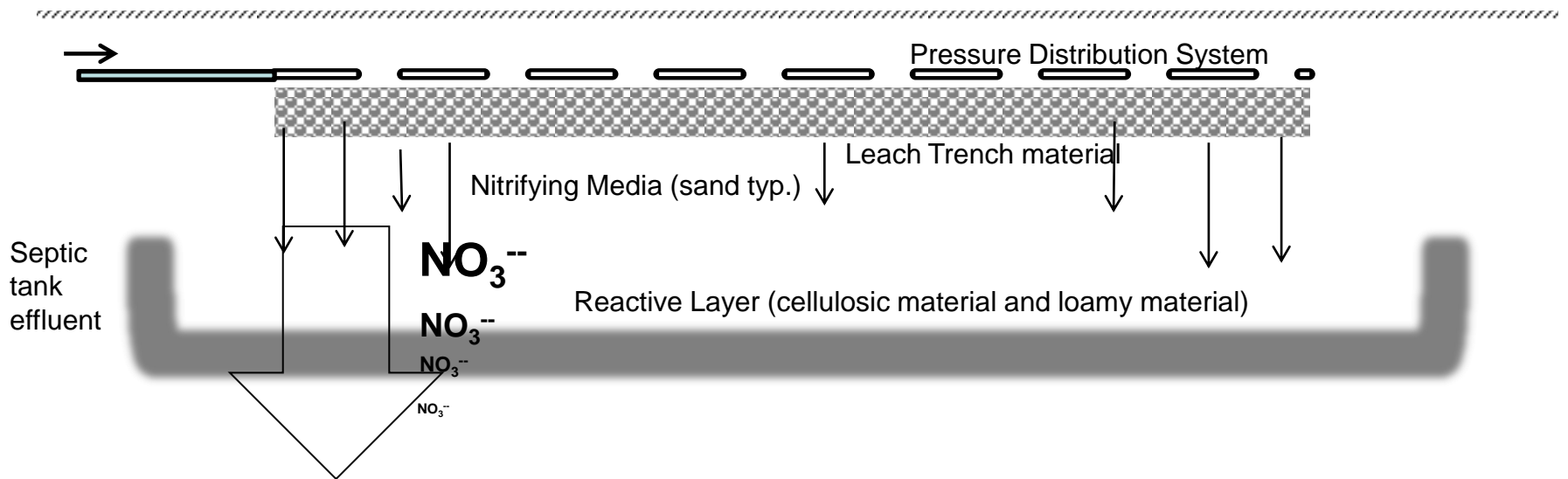
Septic tank effluent percolates through layers of sand, nitrifying ammonium to nitrate.



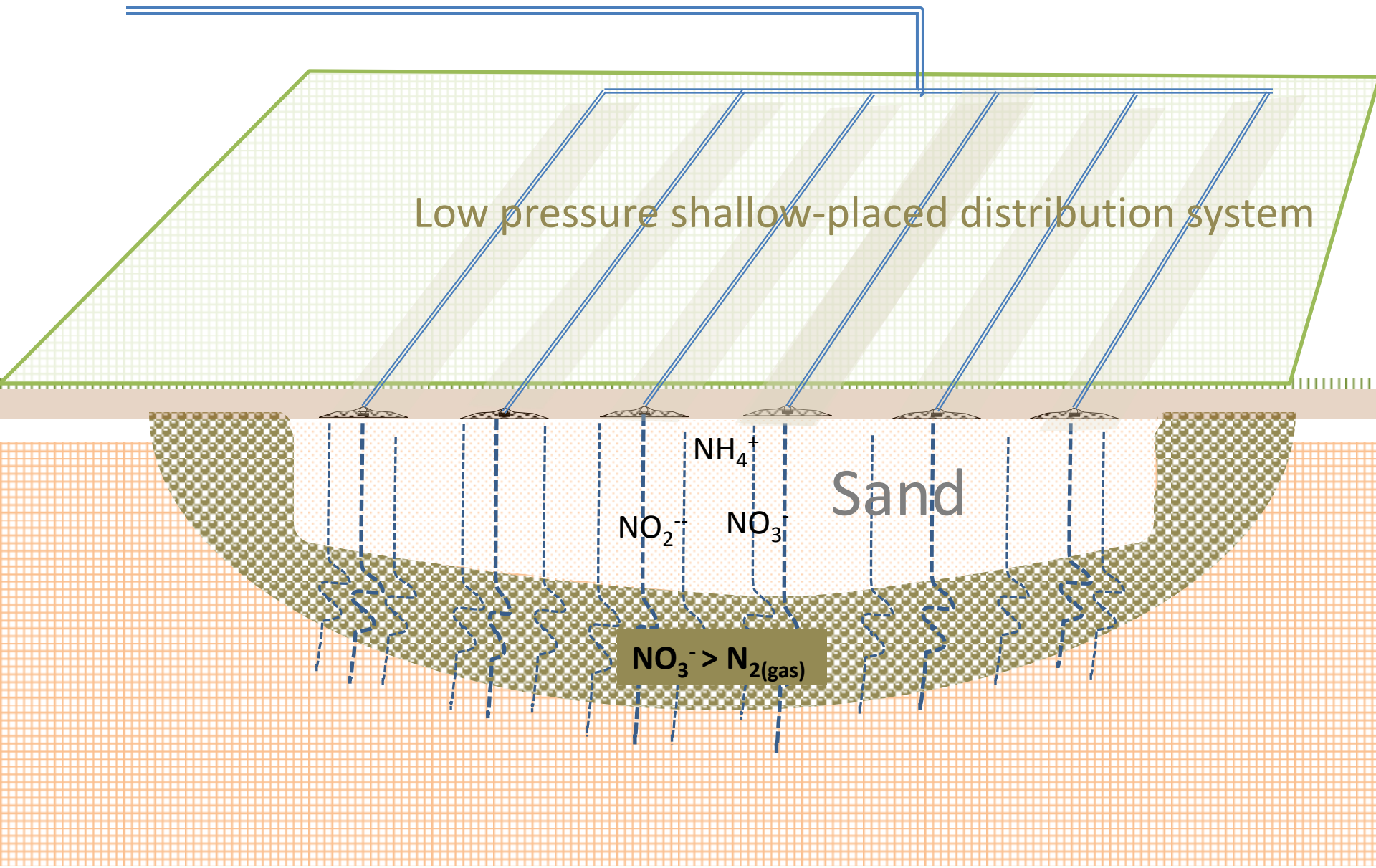
Nitrified effluent encounters saturated cellulose media (wood chips, sawdust, etc) embedded in less-permeable layer, slowly percolating through the saturated layer - denitrifying the nitrate as it does.



In the mid 1990's the Waquoit Bay National Estuarine Reserve installed a horizontal permeable reactive barrier. Unfortunately its performance could not be verified because of the inability to install and verify sampling wells.



In June 2014 MASSTC will be installing a system like above and testing it for nitrogen treatment.





State of Washington

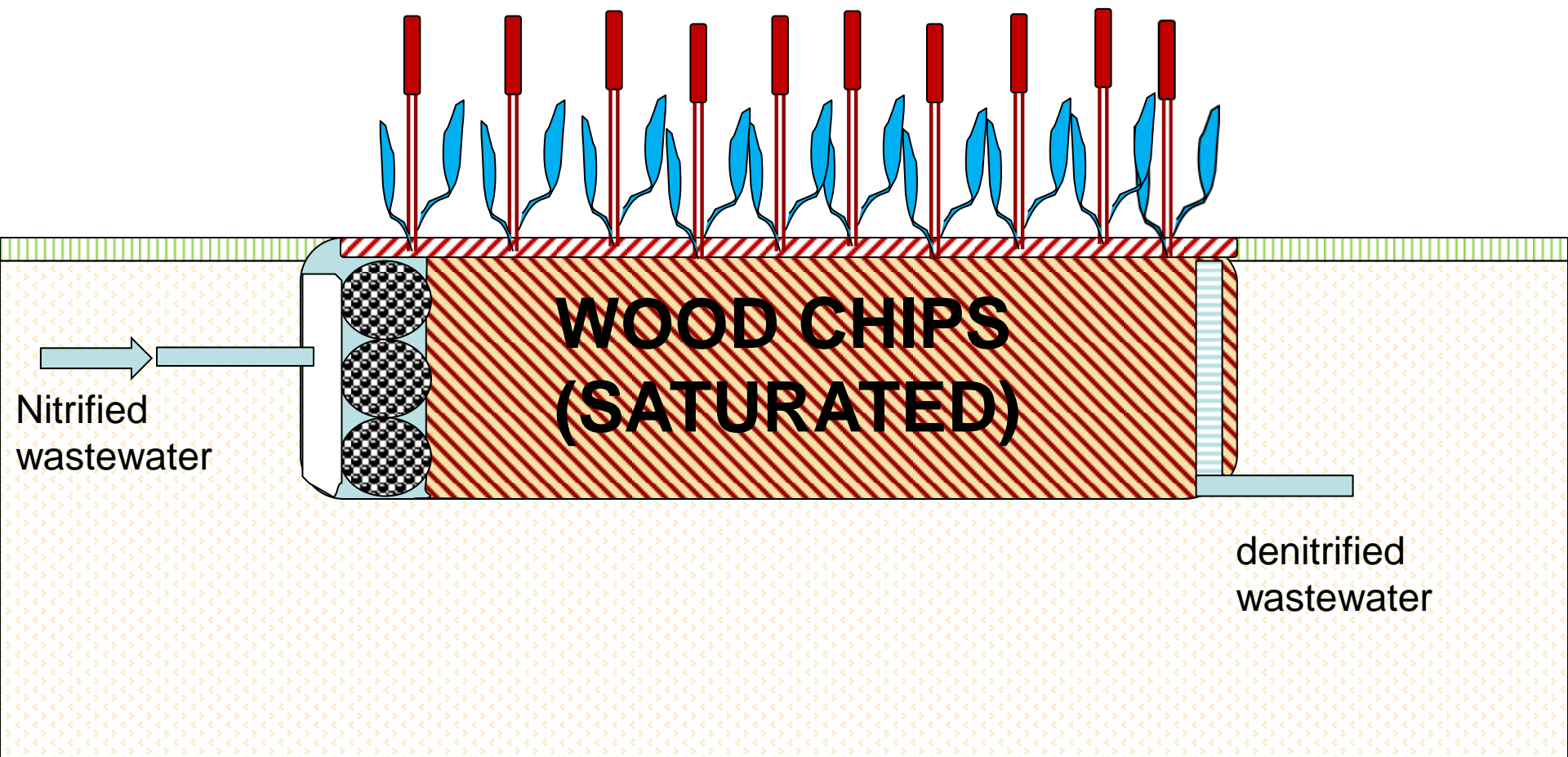
Evaluation of On-Site Sewage System Nitrogen Removal Technologies

Recirculating Gravel Filter and Vegetated Denitrifying Woodchip Bed



Recirculating Gravel Filter and
Denitrifying Woodchip Bed Test Site





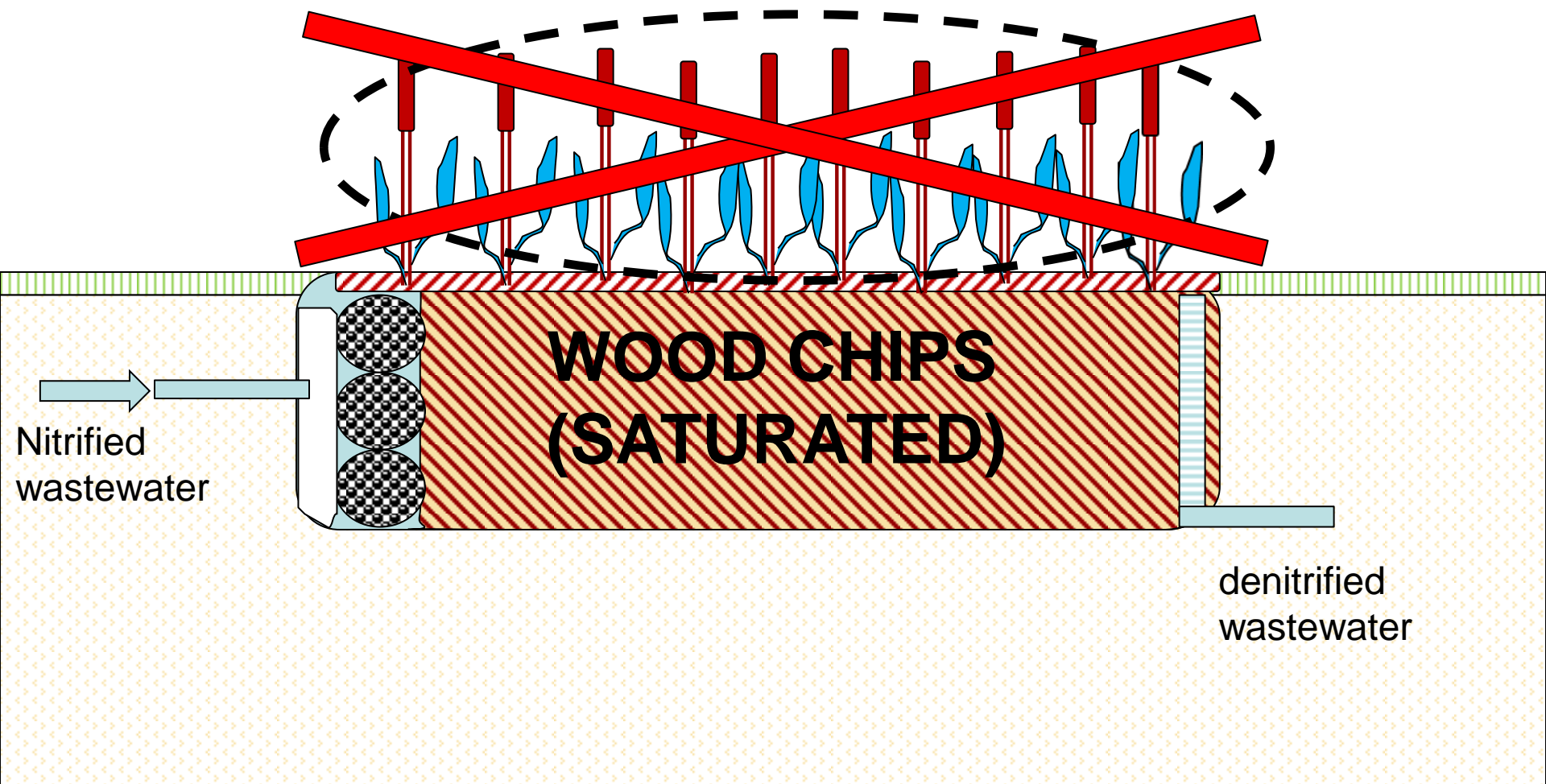




Photo supplied by Rich Piluk, [Anne Arundel County, Maryland](#)

Composting and Urine Diversion Toilets

The Falmouth Eco-Toilet Program

Composting Toilets

- Remove solids from wastewater stream.
- Still need to safely dispose of greywater.



Urine Diversion Toilets

- Separates urine (and primary source of nitrogen) from wastewater stream.
- Potential for recovery of nitrogen for re-use

County Health Dept

Emergency Planning

Medical Reserve Corps

Septic Loan Program

Tobacco Control

Barnstable County



MASSTC

The Massachusetts Alternative Septic System Test Center

MASSTC

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Thinking of Testing Your Product?

There are

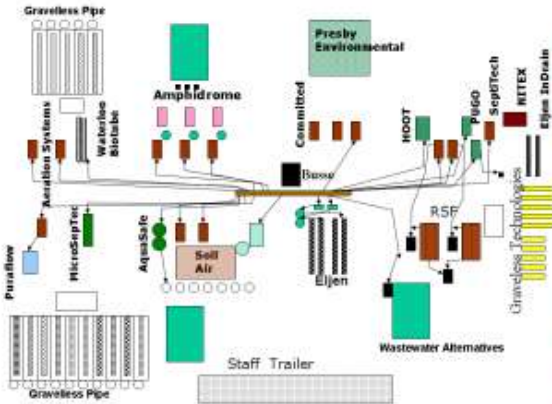
4

testing locations currently available.

Site Search


Search

The Massachusetts Alternative Septic System Test Center



The diagram illustrates the layout of the MASSTC facility. It features a central horizontal line representing a main road or pipeline, with various testing areas and equipment connected to it. On the left side, there are sections for 'Gravelless Pipe', 'Amphidrome', 'Committed', 'HOOT', 'PUGO', 'RTECH', 'Eljen Indulin', 'Gravelless Technologies', 'Wastewater Alternatives', 'Staff Trailer', and 'Gravelless Pipe'. On the right side, there are sections for 'Presby Environmental', 'Committed', 'HOOT', 'PUGO', 'RTECH', 'Eljen Indulin', 'Gravelless Technologies', 'Wastewater Alternatives', 'Staff Trailer', and 'Gravelless Pipe'. The diagram also shows a 'Paraflex' section on the far left and a 'MicroSap' section near the center.

Beginning in the early 1990s, Barnstable County, Massachusetts (Cape Cod) began realizing that nitrogen from septic systems was dramatically affecting our marine environments, causing accelerated eutrophication and nuisance algae blooms. Searching for technologies to address the issue, the Barnstable County Department of Health and Environment in conjunction with Massachusetts Coastal Zone Management through the Buzzards Bay Project began what is now called the Massachusetts Alternative Septic System Test Center (MASSTC). The Test Center began in 1999 testing advance onsite septic treatment technologies in triplicate under a program of the U.S. Environmental Protection Agency (EPA) called the Environmental Technology Initiative (ETI). Working with EPA and the National Sanitation Foundation (NSF) of Ann Arbor Michigan, MASSTC conducted a refined nutrient testing protocol in 2002 referred to as the Environmental Technology Verification (ETV). Further refinement of the nutrient standards was completed in 2007 by NSF and has resulted in the NSF Standard 245. MASSTC has conducted the majority of these test protocols on over 25 leading technologies. Today, MASSTC is operated by the Barnstable County Department of Health and Environment and continues to conduct testing, and allow for the research and development of products that remove the myriad of contaminants found in domestic wastewater. Its facility can accommodate over 20 concurrent tests, allowing companies to conduct research and development on their products or complete any number of standardized test protocols.



Questions?

