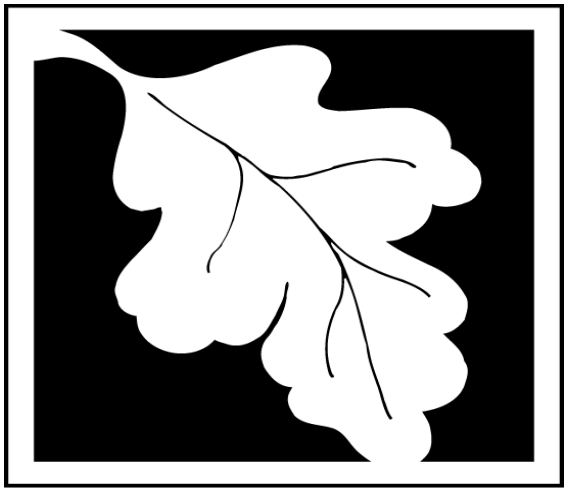
Massachusetts Health Officers Association



Massachusetts Department of ENVIRONMENTAL PROTECTION

November 2003

This presentation
In Memory of
James F. Murphy
1939 - 2003

Massachusetts Department of ENVIRONMENTAL PROTECTION

I/A Treatment Technologies - 2003

- Approved Technologies
- How effective are these technologies at reducing BOD, TSS, Total Nitrogen?
- In the Field?
- At the Test Center?
- Why?

Steven H. Corr, P.E.

Massachusetts Department of Environmental Protection

Massachusetts Department of ENVIRONMENTAL PROTECTION

I/A Treatment Technologies - 2003

- Most are Biological Treatment
- Highly variable and Tempermental living systems
- Systems are affected by:
  - Temperature – cold / hot
  - Toxics – bleach / antiseptics / complex cleaners
  - Life Style – parties/vacations
  - Maintenance – pumps/motors
  - Acts of God -

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Three Tier Approval Process for I/A Technologies

- Piloting

  experimental, not many around

- Provisional

  many around but not many with operating data

- General use

  passed all the tests, can be used anywhere

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I/A Technologies with Piloting Approval*

Nitrogen reduction to <10 mg/L

- Amphidrome, Cromaglass, MicroSeptec Singulair 960 DN, Nitrex, RUCK CFT, OAR

Nitrogen reduction to <19 mg/L

- SeptiTech

Advanced treatment to reduce SAS sizing

- Waterloo Biofilter

Phosphorous reduction technology

- RID Phosphorous Removal System

*as of Nov, 2003.

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I/A Technologies with Provisional Use Approval*

Nitrogen Reduction to < 19 mg/L for residential facilities with design flows <2000 gpd and <25 mg/L for residential facilities ≧2000 gpd and all non-residential facilities

- Amphidrome
- Aquapoint Bioclere
- FAST Technology by Bio-Microbics and Smith & Loveless
- Waterloo Biofilter
- Zenon/Cycle-Let

*as of Nov, 2003.

I/A Technologies Certified for General Use*

Technology approved as equivalent to a conventional Title 5 system but not for nitrogen reduction in a DEP defined NSA

- Amphidrome
- Aquapoint Bioclere
- Cromaglass
- MicroFAST, NitriFAST and High Strength FAST by Bio-Microbics
- Modular FAST by S&L
- JET Aerobic
- Singulair
- Saneco Low Rate ISF by Orenco
- Waterloo Biofilter

*as of Nov, 2003.

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I/A Technologies Certified for General Use*

Technology for Nitrogen Reduction

- Recirculating Sand Filter
- RUCK

Alternative SAS and Chamber Technology

- ADS Biodiffuser Chambers[1]
- Cultec Chambers
- Infiltrator Chamber[1]
- Hancor Enviro Chamber
- Eljen In-Drain
- Eljen Xpandable Chamber

1. Upto 40% reduction in SAS size allowed

*as of Nov, 2003.

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I/A Technologies with Remedial Use Approval*

Remedial Use to reduce BOD and TSS

- Recirculating Sand Filter
- Amphidrome
- Aquapoint Bioclere
- Biocycle
- Cromaglass
- Ecoflo Biofilter
- Jet Home Aerobic
- MicroFAST, NitriFAST, HighStrength FAST by Bio-Microbics

*as of Nov, 2003.

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I/A Technologies with Remedial Use Approval*

- Modular FAST by S&L
- Premier Tech
- Puraflow Peat Fiber Biofilter
- Orenco Advantex
- Saneco High & Low Rate ISF by Orenco
- SeptiTech
- Singulair
- Waterloo Biofilter

*as of Nov, 2003.

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I/A Technologies Currently Under Review*

- Remedial Use Approval
  - Presby Enviro-Septic
  - Piranico
  - White Knight
- Pilot Use
  - BAM Aerobic
- Provisional Use Approval
  - FAST (additional models)
- General Use
  - EZFlow
  - Cultec
  - Advantex

*as of Nov, 2003.

I/A Approval Letters

- All I/A technology approval letters are available on the DEP website at: http://www.mass.gov/dep/water/wastewater/iatechs.htm

- DEP website is being redesigned to be more user friendly

- Title 5 I/A section updated at least monthly

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I/A Systems by Permit Type

Permit Type	Number of Systems
Remedial	1205
Piloting	99
Provisional Use	203
General Use	540
Other	8
Total	**1965**

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I/A Systems by Technology & Region

System Type	CE	NE	SE	WE	Total
ADVANTEX		2	2		**4**
AMPHIDROME	3	3	13		**16**
BIOCLERE	38	54	268	14	**336**
BIOREN LF			1		**1**
CERES III			1		**1**
CROMAGLASS		2			**2**
FAST	123	361	577	34	**972**
GEOFLOW W/ FAST		9	3		**12**
JET	7	105	96	21	**222**
NITREX			1		**1**
OAR			3		**3**
PEAT FILTER			7		**7**
RSF	6	65	24	8	**97**
RUCK	4	19	59	1	**79**
SANECO ISF	6	45	13	16	**74**
SEPTITECH	2	14	3		**17**
SINGULAIR	15	28	47		**75**
WATERLOO BIOFILTER	2	40	3		**43**
WISCONSIN MOUND	1	3		4	**7**
ZENON		1			
TOTAL	**207**	**749**	**1119**	**98**	**1965**

Includes systems approved by DEP Boston and most systems approved by local BOHs or DEP regional offices.

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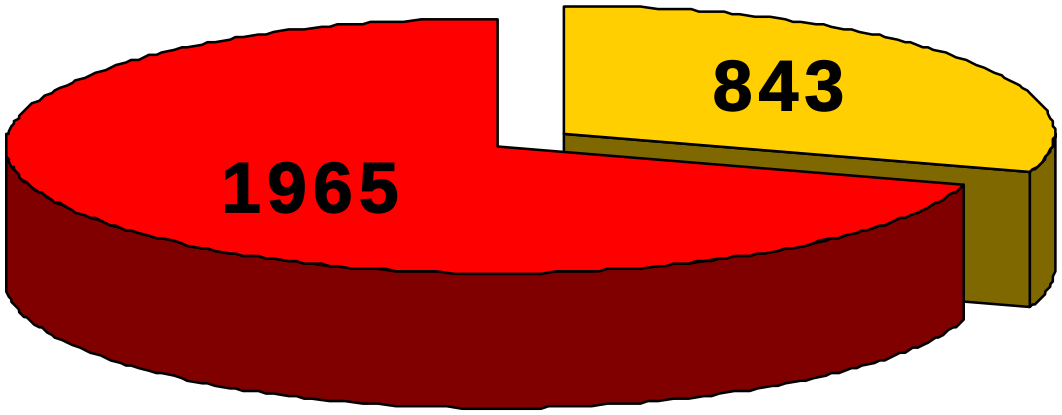
Growth of I/A Systems in Massachusetts

Total Number of I/A Systems Approved



Nov-00

Sep-03

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How are I/A Technologies Performing?

In the Field?

At the Test Center?

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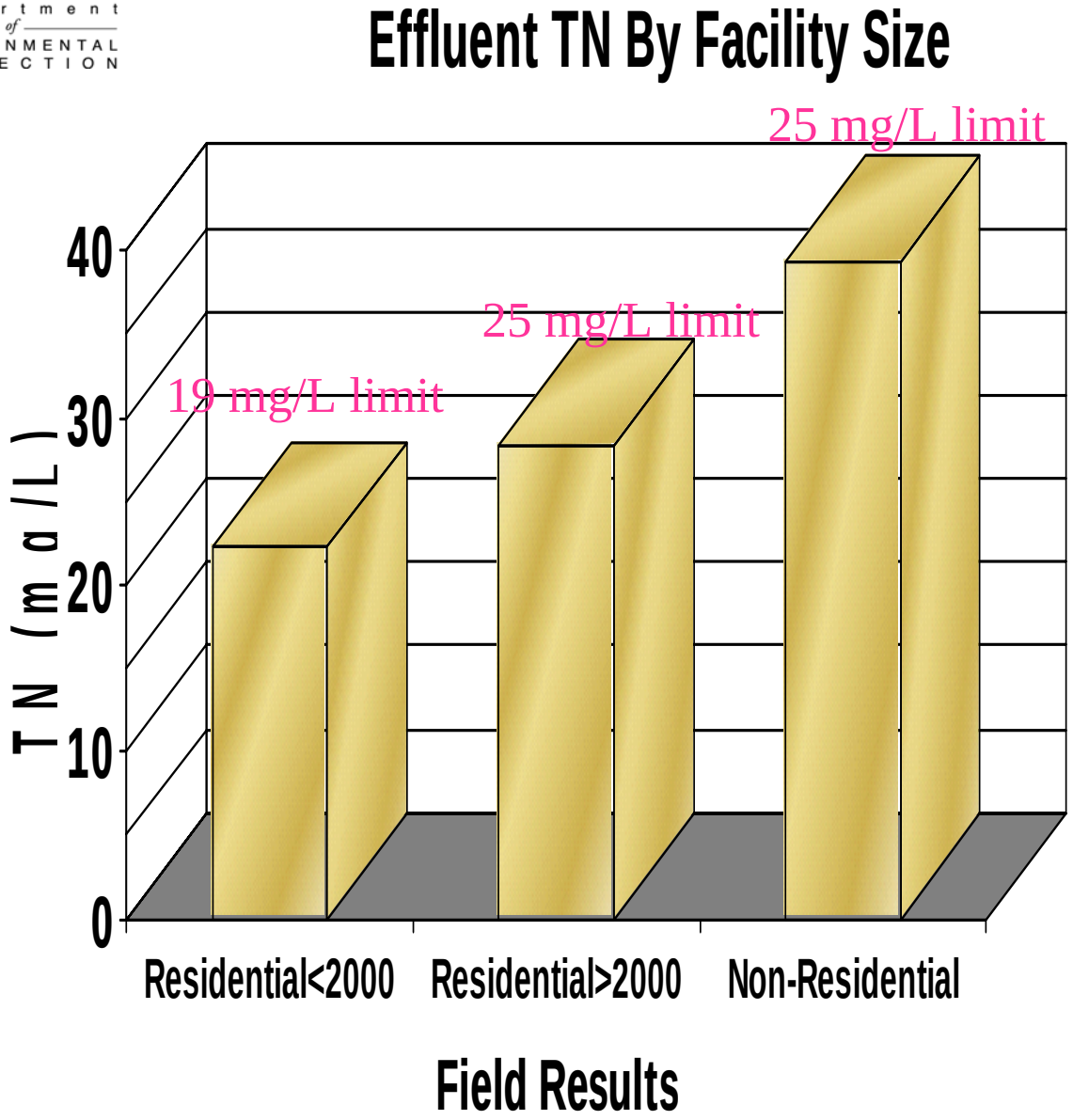
Mean TN Effluent



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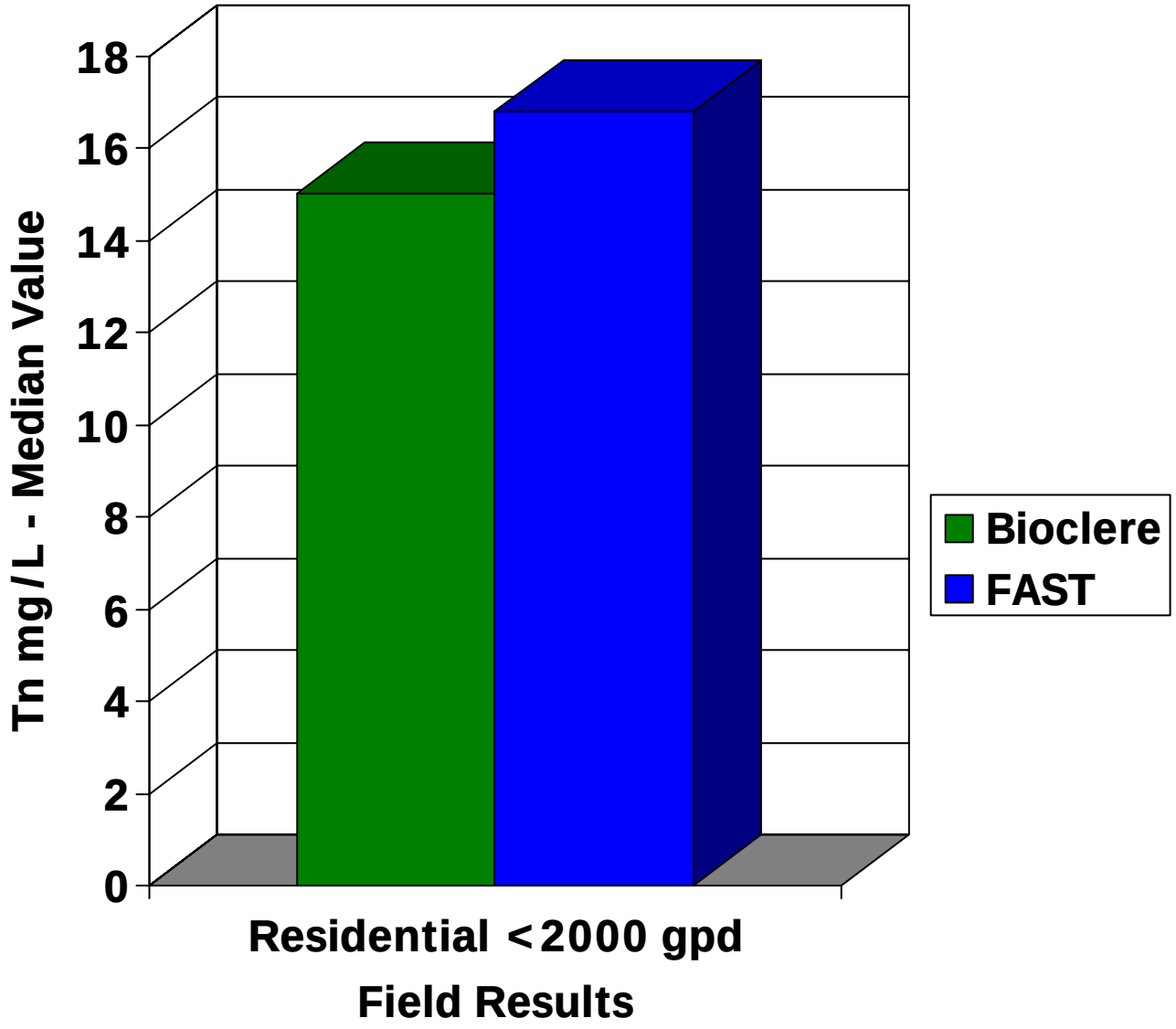
Median TN Effluent



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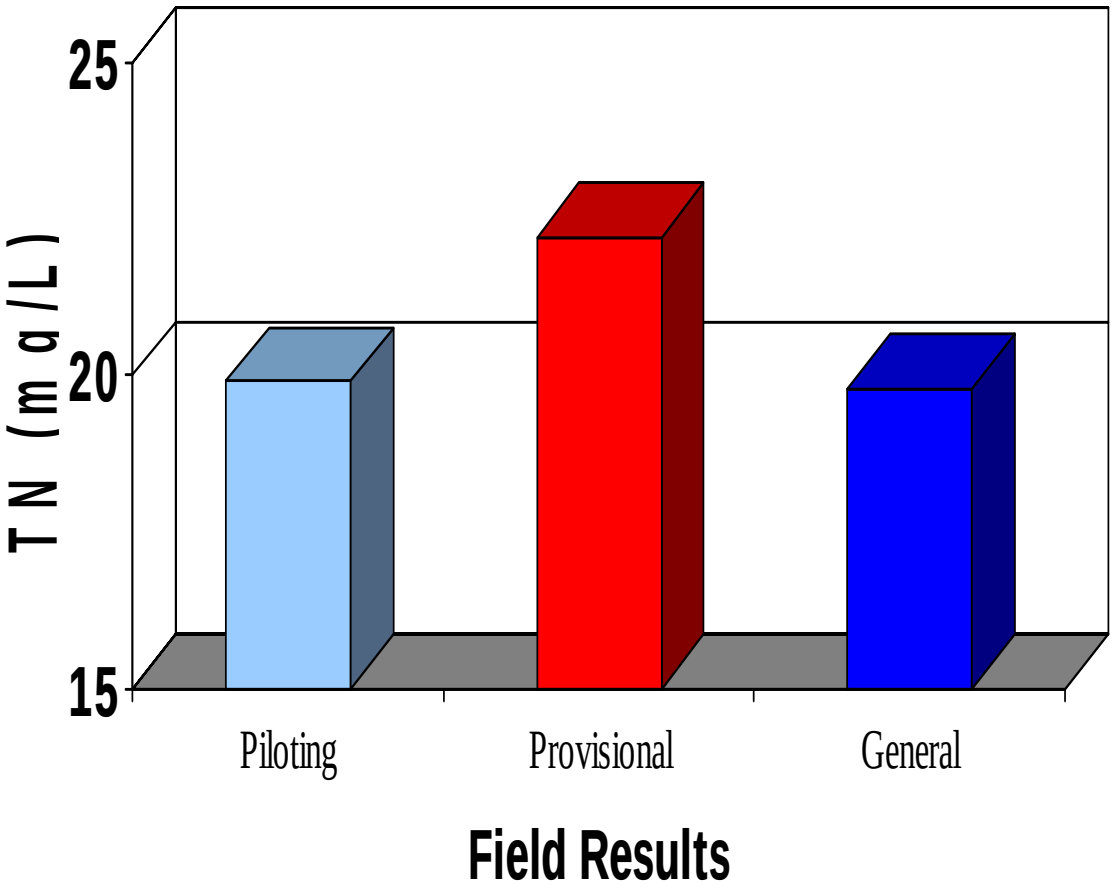
Mean TN Effluent

Effluent TN Residential Facilities w/ Design Flows <2000 gpd (19 mg/L limit)



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Field Performance Summary

Nitrogen Reducing Applications	Mean TN mg/L	Sample Count
Residential Piloting < 2000	19.9	207
Residential Provisional < 2000	22.2	537
Residential General < 2000	19.8	163
Residential Provisional > 2000	26.6	73

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I/A Technology 2003

Test Center Results

www.buzzardsbay.org/etimain.htm

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I/A Technology 2003

Test Center Design

- Domestic sewage from Coast Guard housing – NSF Std. 40 Quality & Flow Pattern
- Three 3-part systems
  - 1500 gallon septic tank
  - Distribution box
  - leachfield (2'W X 2'H) 4"pipe on stone
    - sand (5.5 feet)
    - loading rate = 0.74 gal./day/sq. ft.

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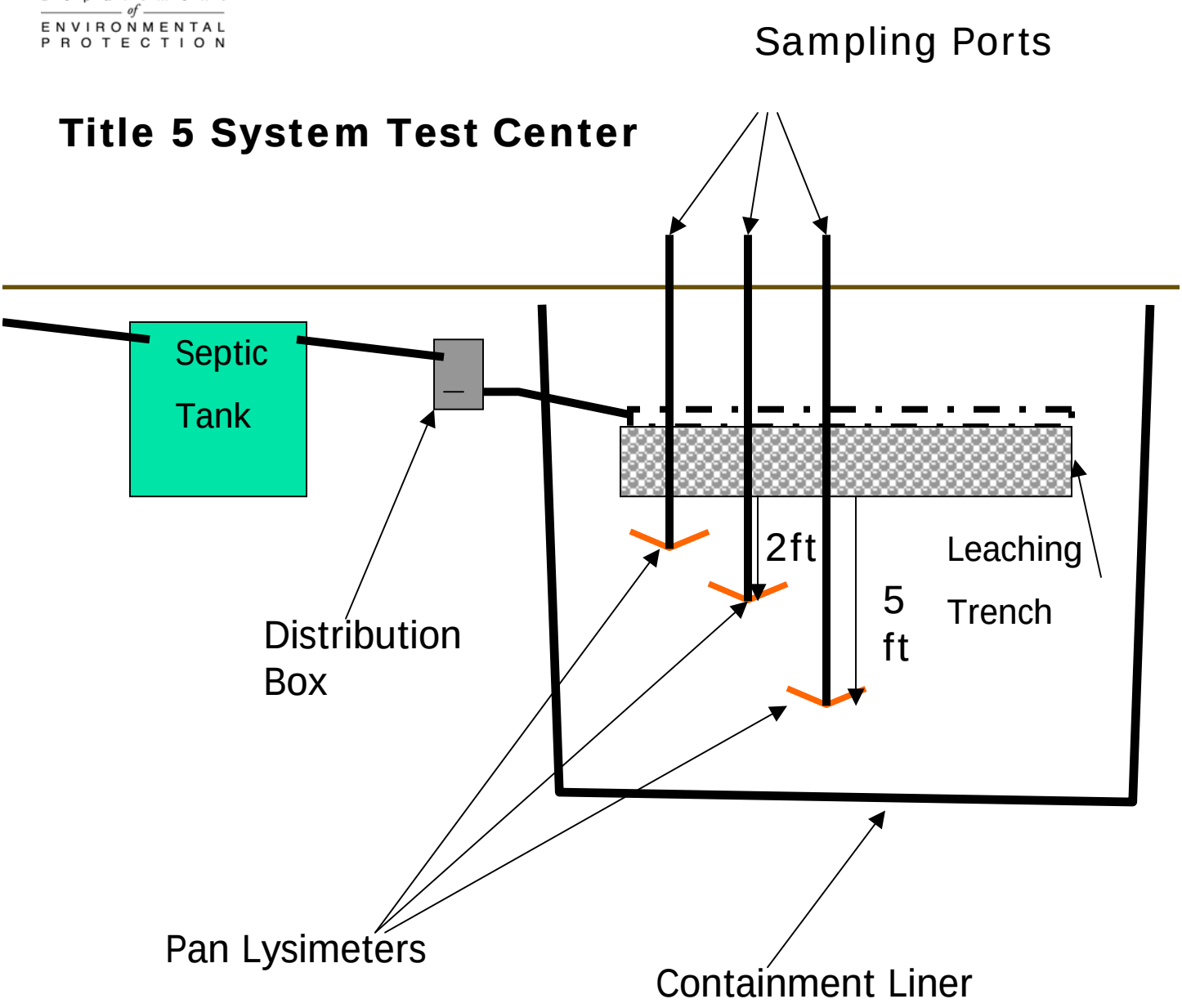
I/A Technology 2003



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I/A Technology 2003

TC Sampling Points

- Septic Tank Influent
- Septic Tank Effluent (D-Box)
- Technology Effluent
- 1 foot below trench
- 2 feet below trench
- 5 feet below trench
- sump (5.5 feet plus lateral movement - probably saturated flow)

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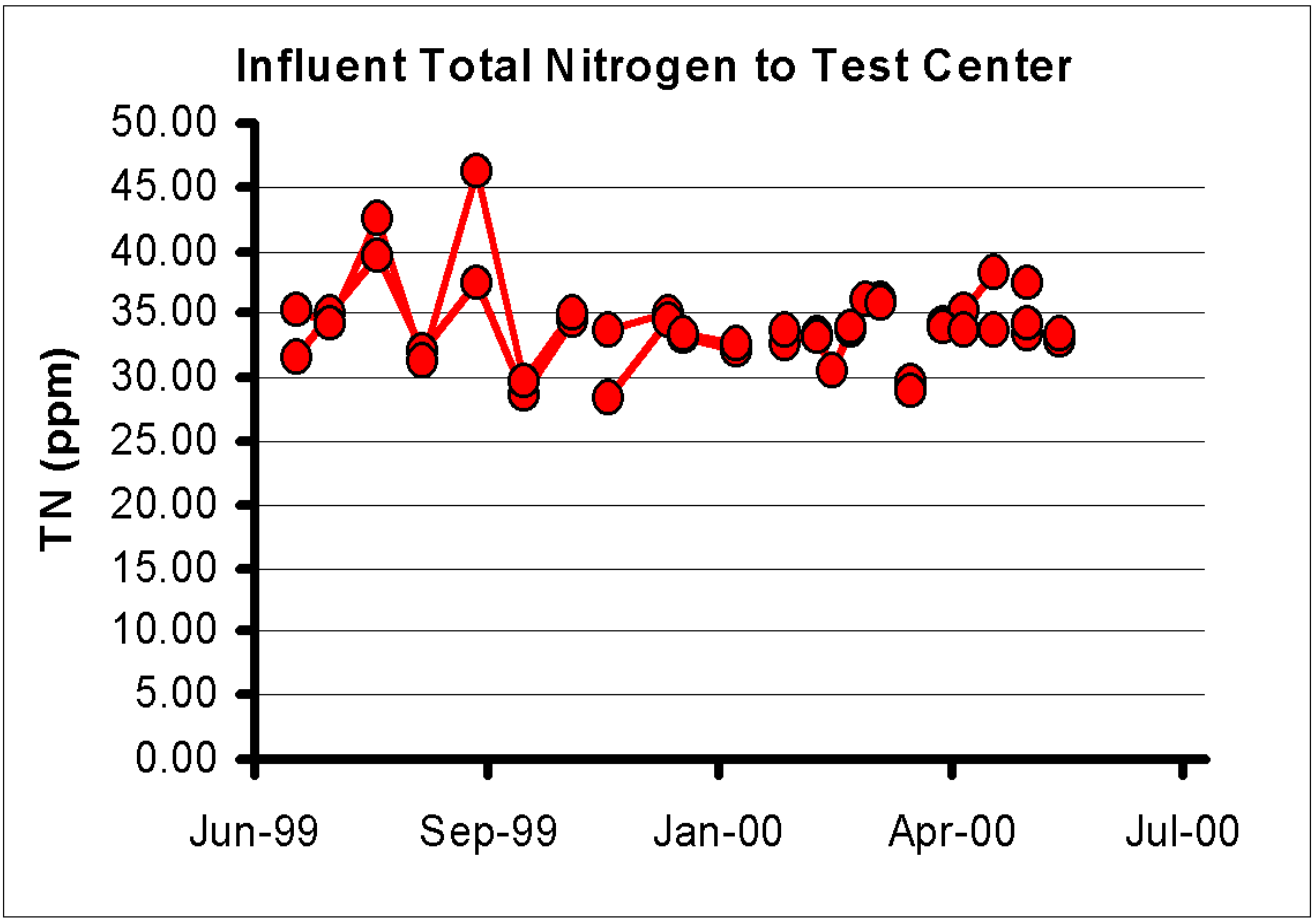
I/A Technology 2003



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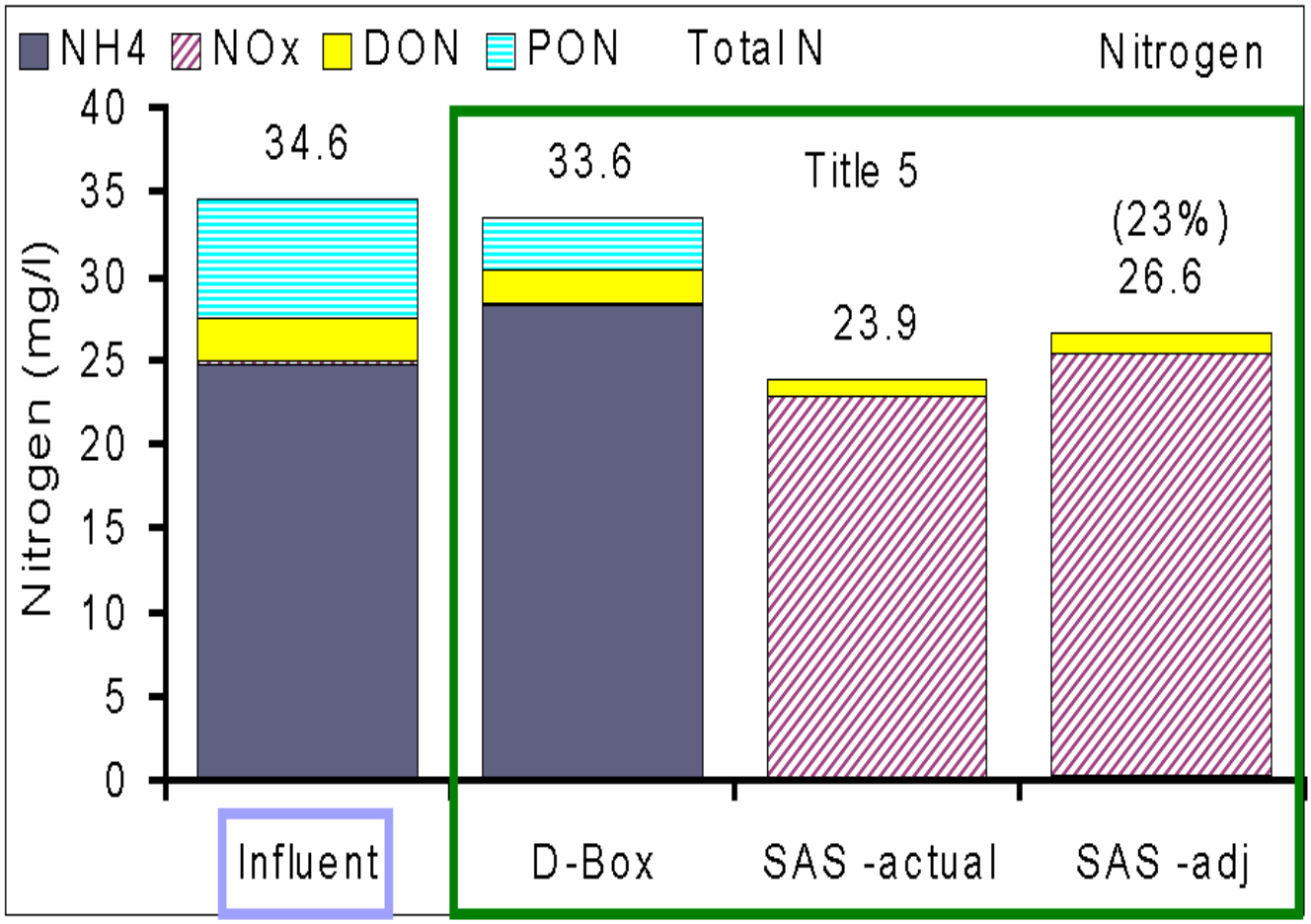
Conventional System Nitrogen



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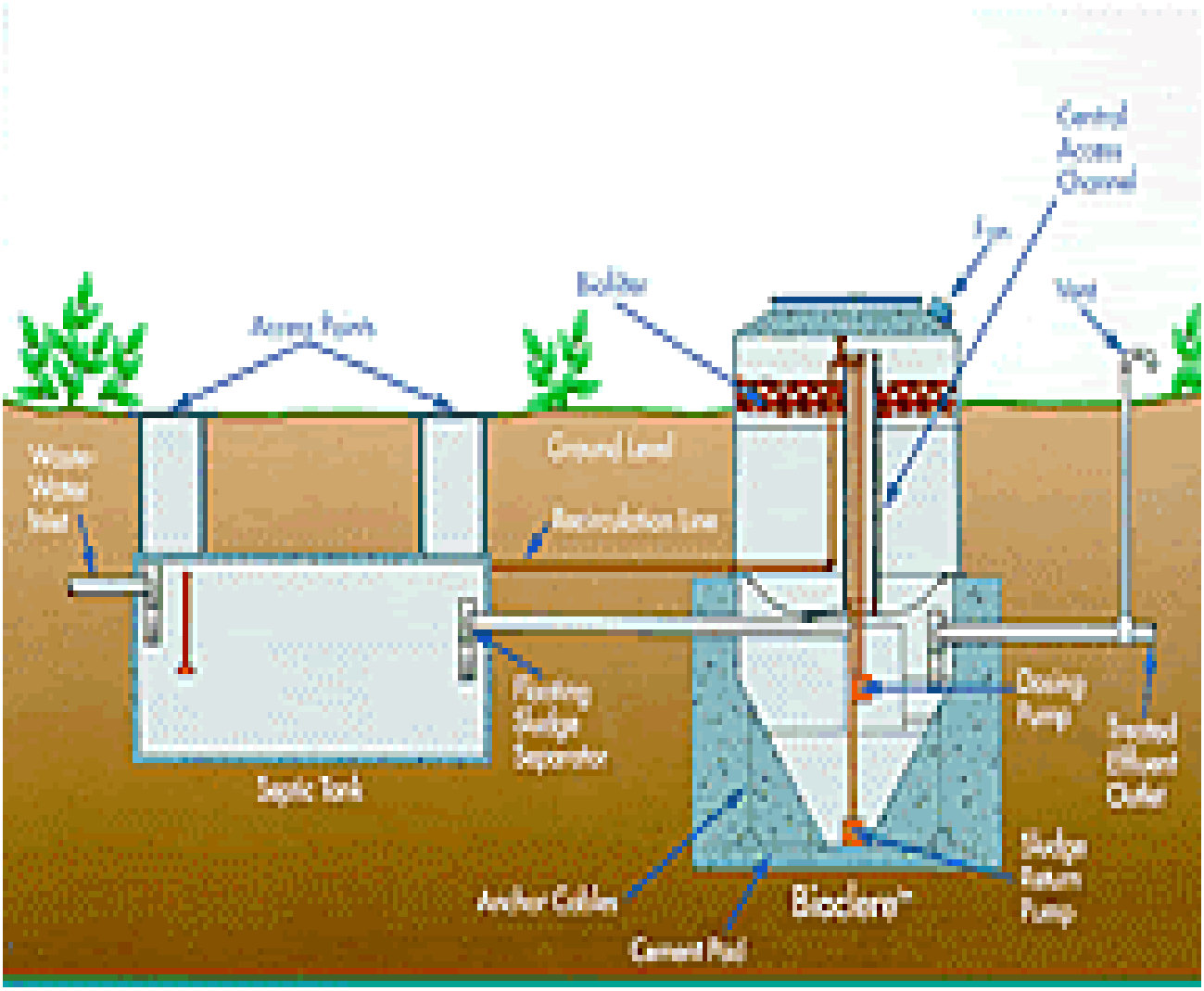
Aquapoint Bioclere Trickling Filter



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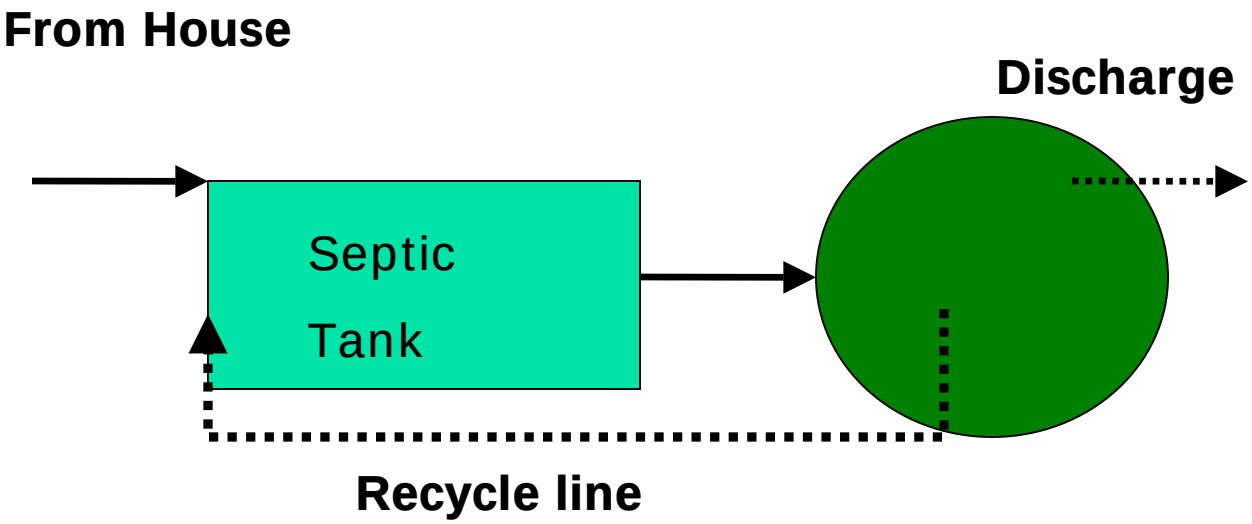
Bioclere



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I/A Technology 2003

Aquapoint Bioclere Results

Single unit 18 months	Influent TN mg/L	Effluent TN mg/L
Average	37.4	17.2
Maximum	46.0	36.18
Minimum	24.0	6.23

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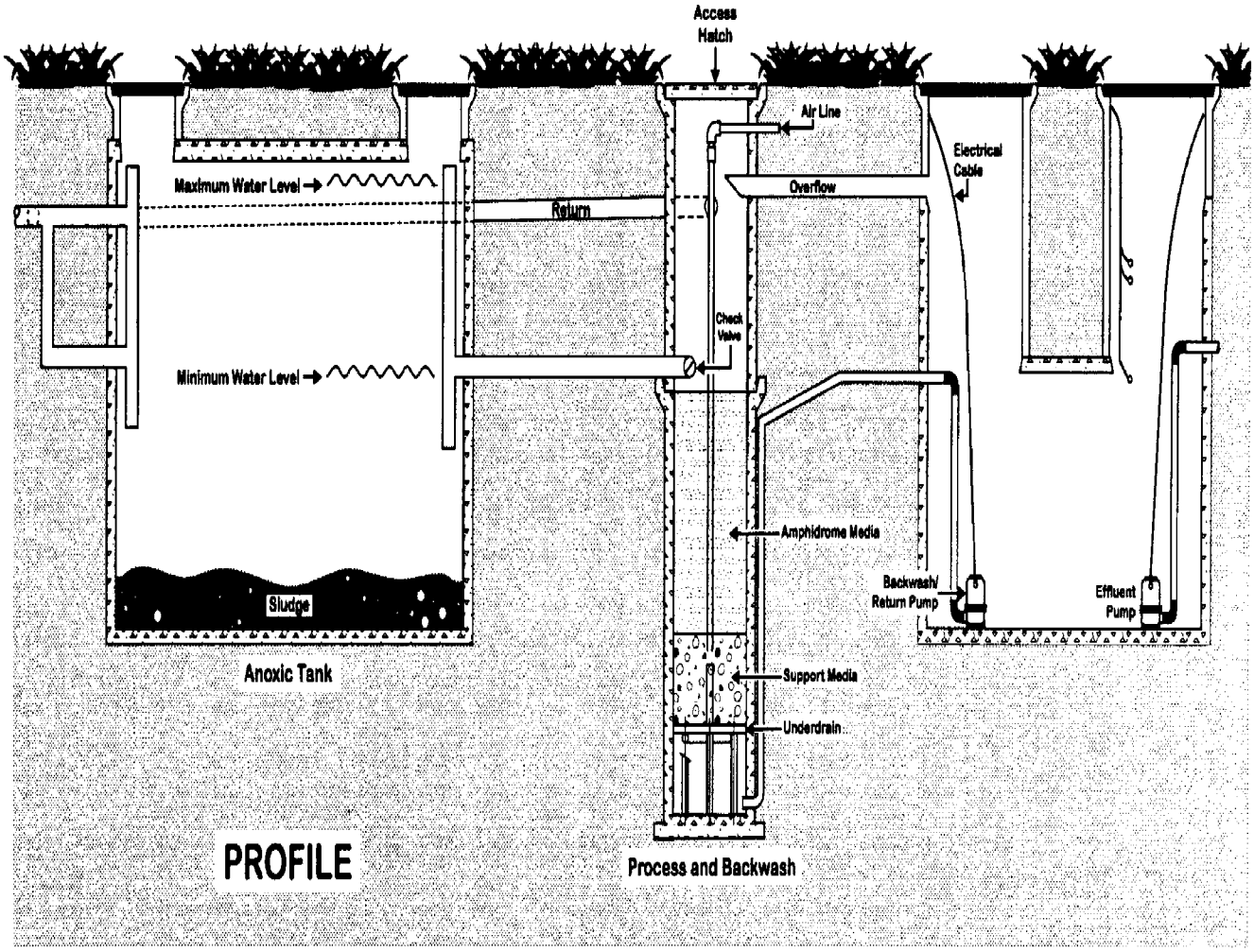
Amphidrome Sequencing Batch Reactor



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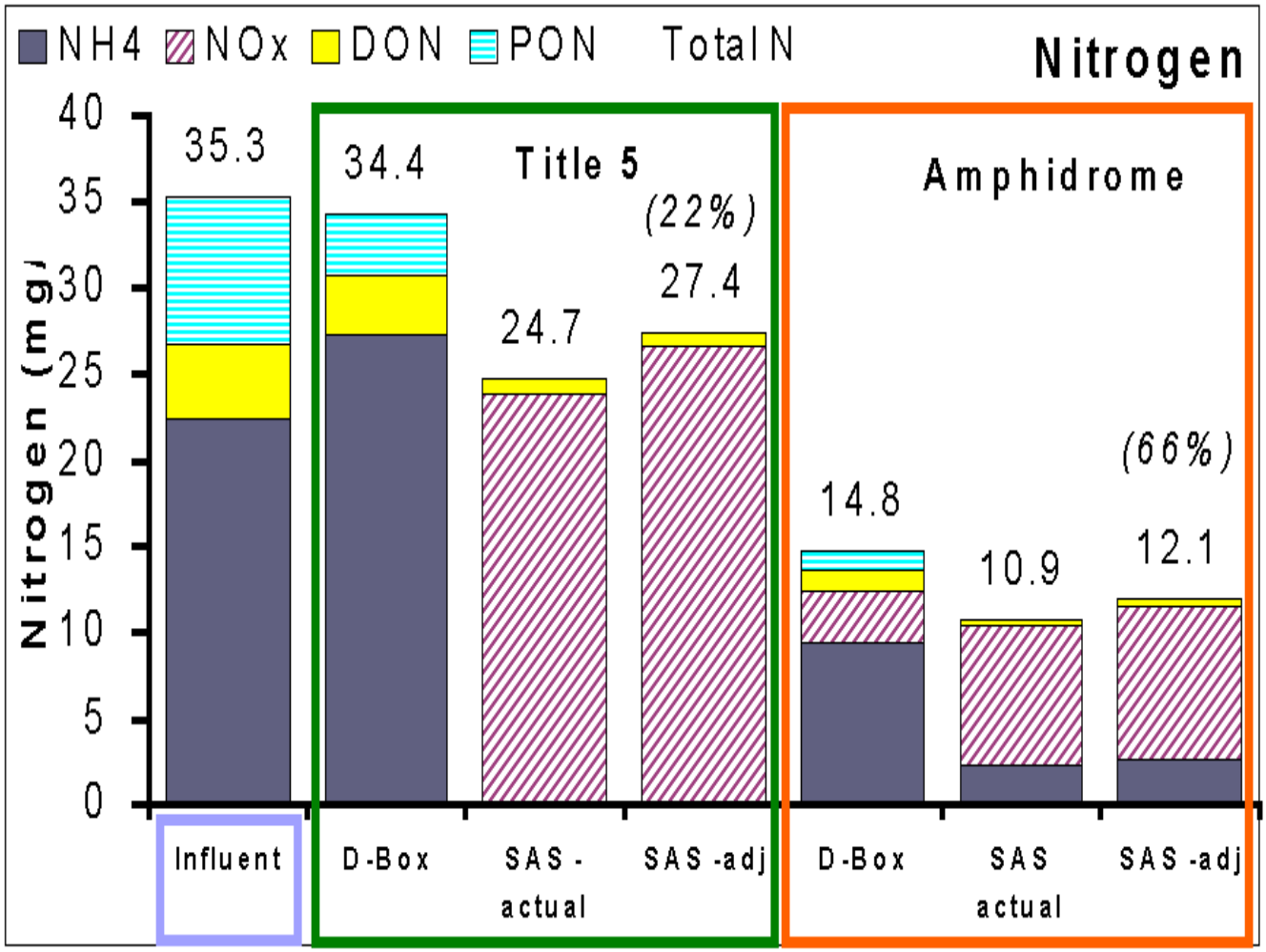
Amphidrome System Nitrogen



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AMPHIDROME T C DATA

Total N mg/L	Sys. #1	Sys. #2	Sys. #3	Infl.	Mean	% Rem.
Avg.	8.3	11.1	11.2	34.5	10.8	68.7
Max.	9.9	32.4	38.5	42.3		
Min.	5.8	6.4	6.7	23.9		

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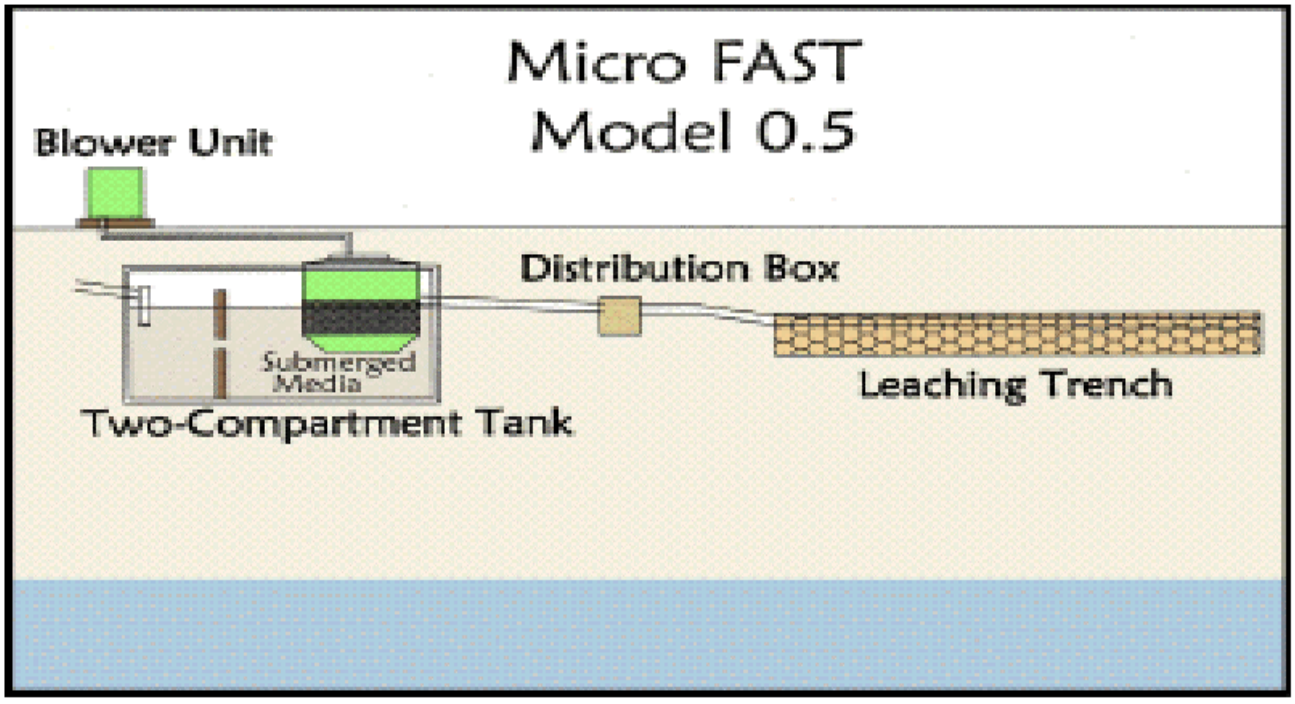
Micro-FAST

Fixed Film Activated Sludge Reactor



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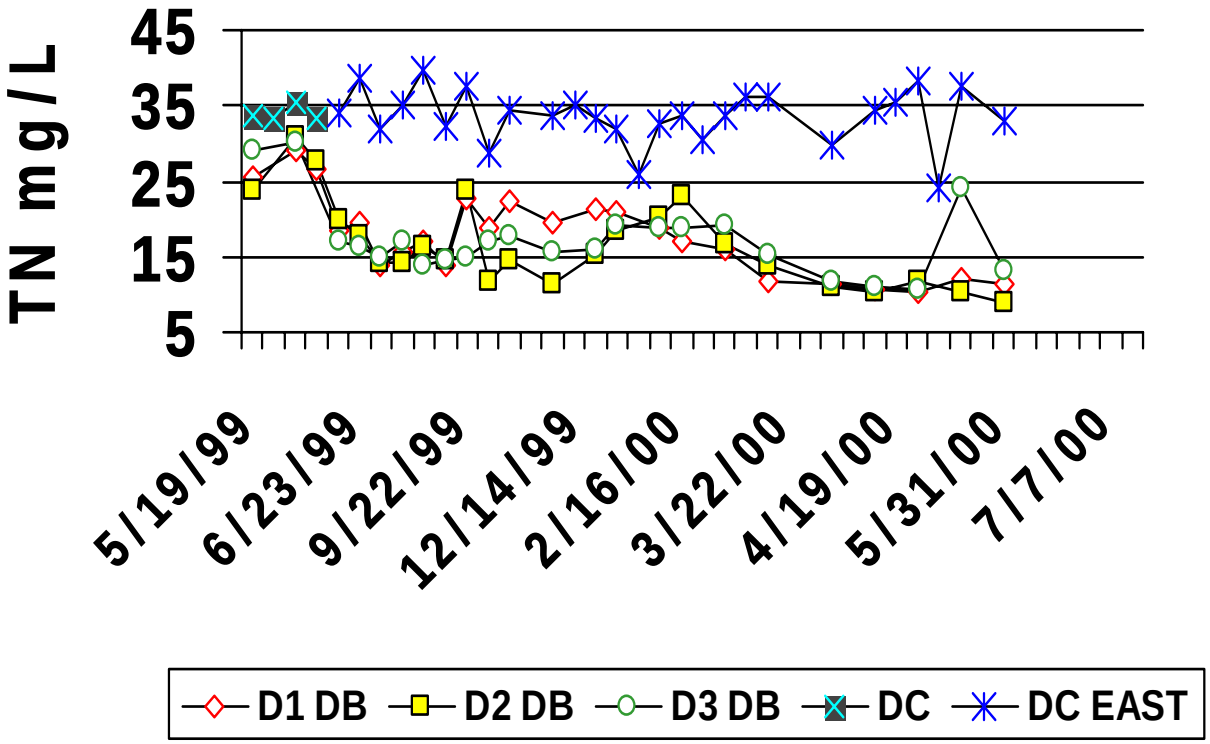
Bio-Microbics MicroFAST TN



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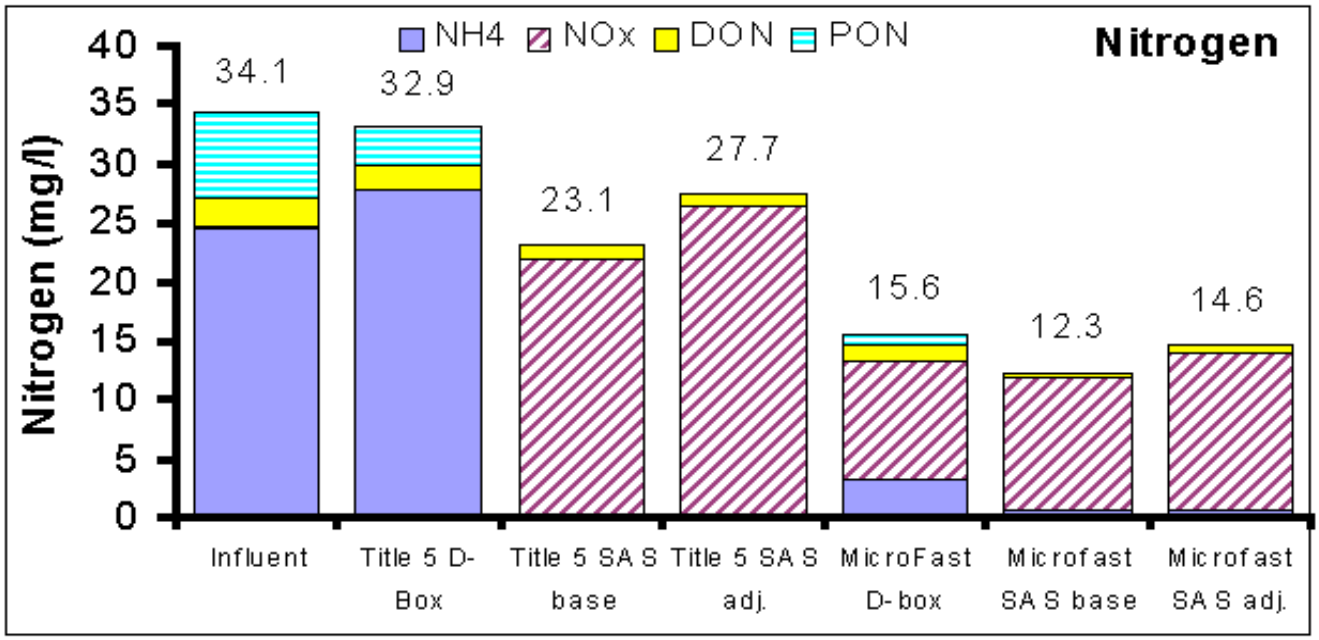
Micro-FAST System Nitrogen



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FAST TC Results

Total N mg/L	Sys. #1	Sys. #2	Sys. #3	Infl.	Mean	% Rem.
Avg.	17.6	16.3	17.8	34.3	17.4	51.0
To 6/00	16.1	15.0	15.7	34.5	15.6	54.8
After 6/00	19.0	20.5	19.8	36.4	19.9	45.2

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Field Performance Summary

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Residential Piloting < 2000	19.9	207
Residential Provisional < 2000	22.2	537
Residential General < 2000	19.8	163
Residential Provisional > 2000	26.6	73

Conclusions

- BOD & SS removal is very good with I/As (<30 mg/L)
- Nitrogen removal efficiency varies by technology and by sewage type, temperature, other sewage characteristics

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Field Performance Summary

Nitrogen Reducing Applications

Mean TN mg/L Sample Count

Residential Piloting

< 2000 19.9207

Residential Provisional < 2000

22.2537

Residential General

< 2000 19.8163

Residential Provisional > 2000

26.673

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I/A Technology 2003

- Test Center results appear to be “better” than “real world” results
  - Sampling timing
  - System “maturity” differences
  - Consistent flow
    - No holidays, vacations, Super Bowl parties

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I/A Technology 2003

- Maintenance and Monitoring REGULARLY are a MUST
- These systems can NOT be installed and forgotten.

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Operation & Maintenance

- Lifetime O&M of system with one-year contract minimum for all systems
- For each O&M visit the operator must complete:
  - DEP Approved Inspection and O&M Form for Title 5 I/A Treatment and Disposal Systems
  - Technology specific checklist provided by technology proponent

Massachusetts Department of ENVIRONMENTAL PROTECTION

I/A Program Contact

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Please feel free to call with any questions.