



Wastewater
Treatment
Technologies

NitROE[®] and SanTOE[®] Waste-Water Treatment Systems

*Helping to Save the Waters of the
Cape and Islands
One Home at a Time*

By

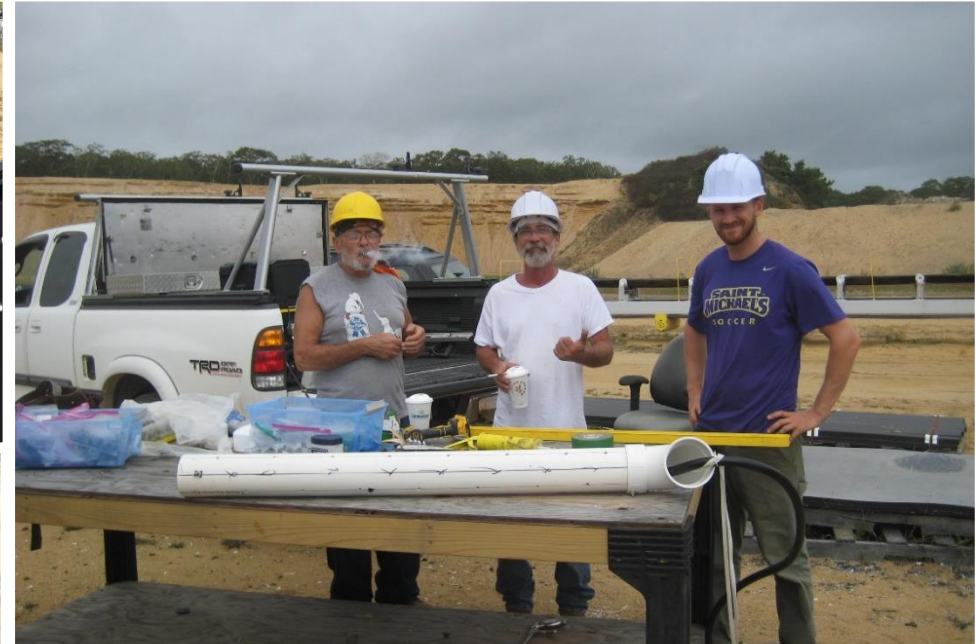
John R Smith

KleanTuSM LLC

January 29, 2020

KleanTuSM LLC IS

- A group of dedicated folks with 300+ years of experience and expertise
- Bringing low cost and effective wastewater treatment to the Cape and Islands
- An established presence on the Cape and Islands
- Invested and Committed
- **OPEN FOR BUSINESS!!!!**





Two Demonstrated Waste-Water Treatment System (WWTS) Technologies

1. NitROE® WWTS for Individual Homes
2. SanTOE™ WWTS for Multiple Homes, Complexes and Small Communities

**Proven Innovative Application of
Currently Practiced Science & Engineering Design Principles**



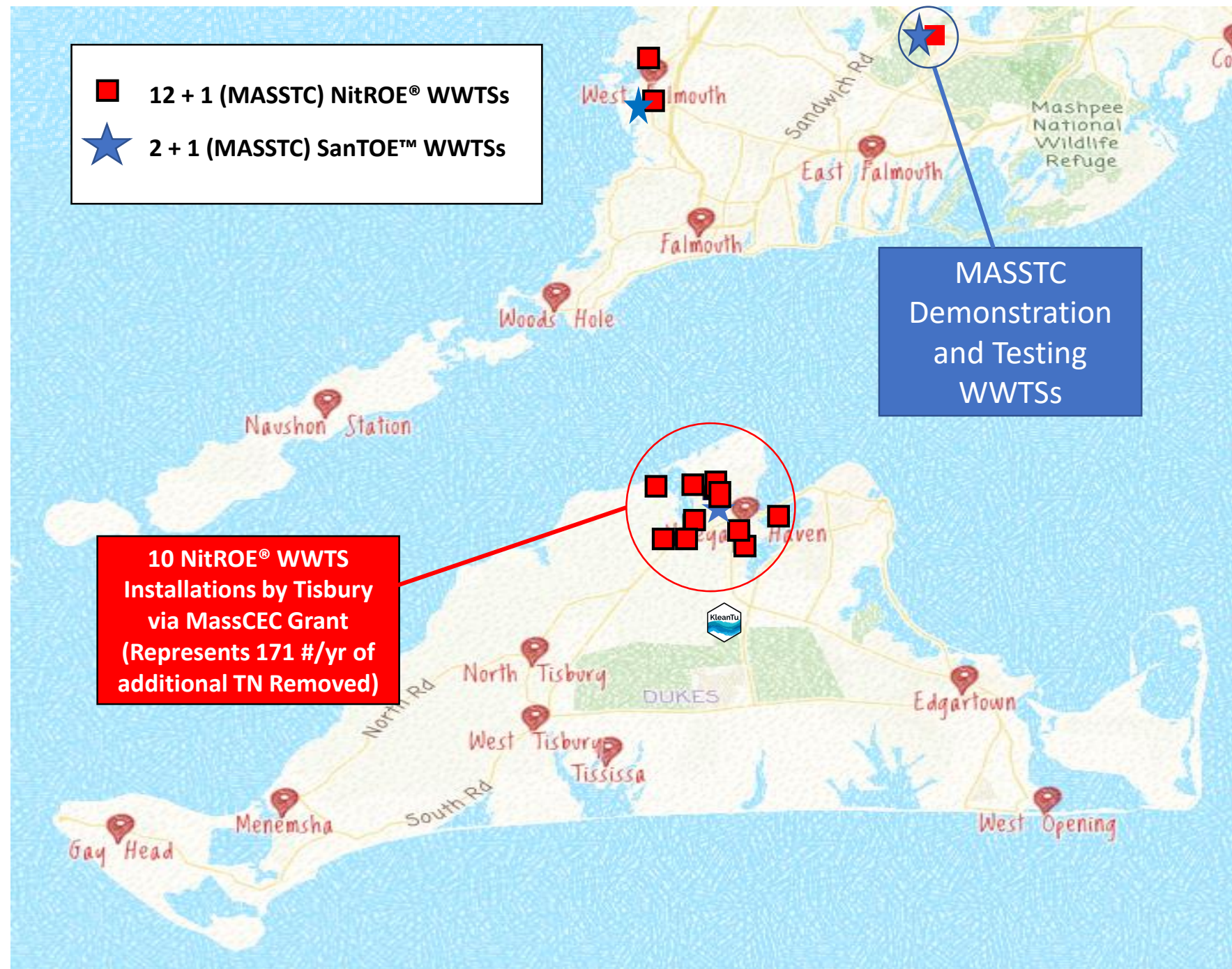
Design Focus is Simplicity of

- Fabrication
- Installation
- Operation

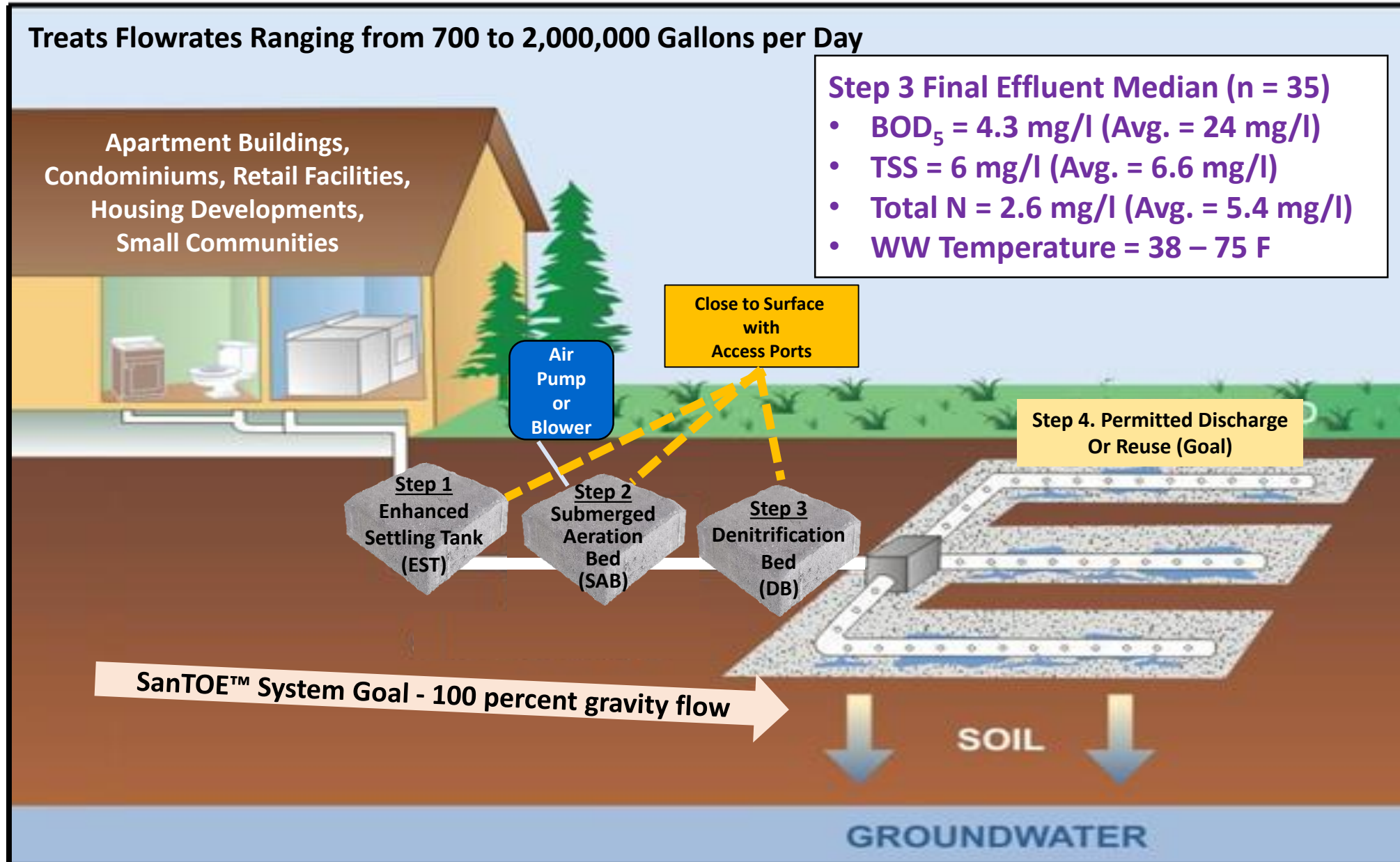
**To Deliver
A Highly Treated Wastewater
AT
LOW COST**



**2 - SanTOE[®]
And
12 - NitROE[®]
WWTS
Installations
Under
Mass DEP Pilot
Permits**



SanTOE[®] WWTS Concept – MASSTC Demo 2-Year Results

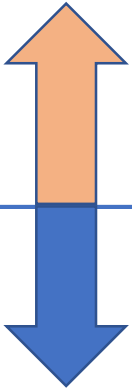
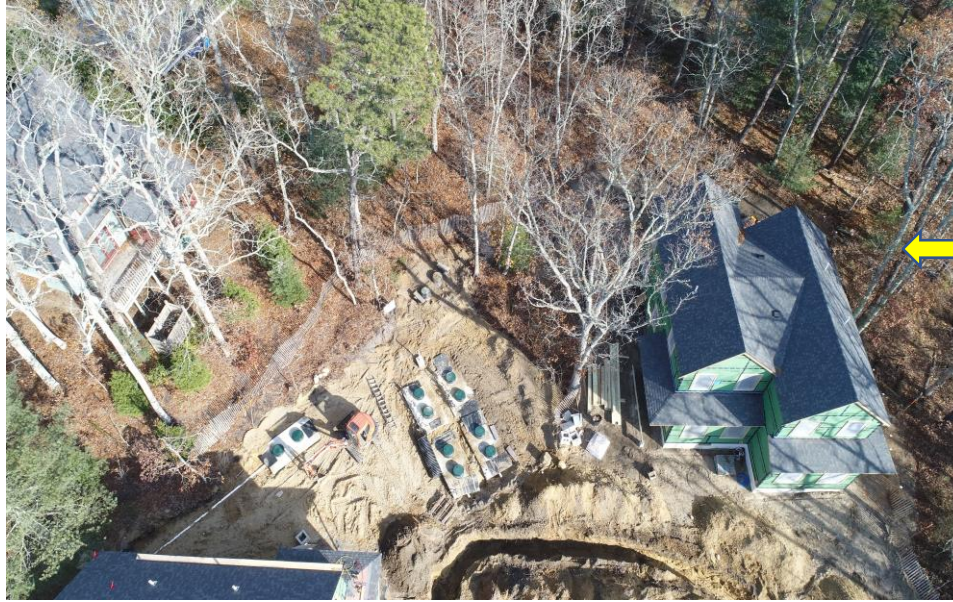




Two SanTOE™ WWTS Current Installations

(Mass DEP Pilot Permits Issued)

MV
2,000
GPD



Cape
6,000
GPD

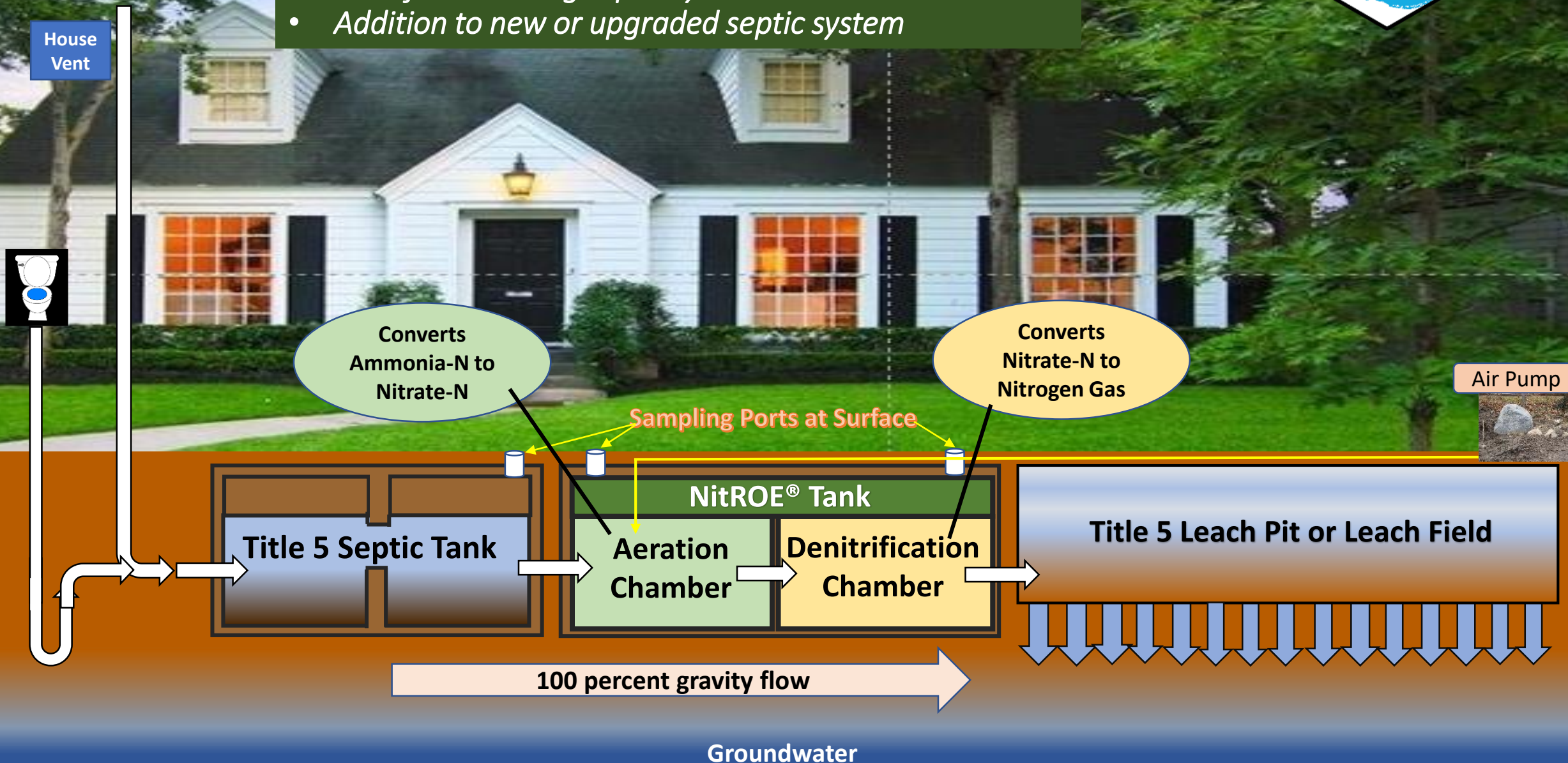


Conventional Title 5 Septic System



NitROE® WWTS Tank Supplement

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





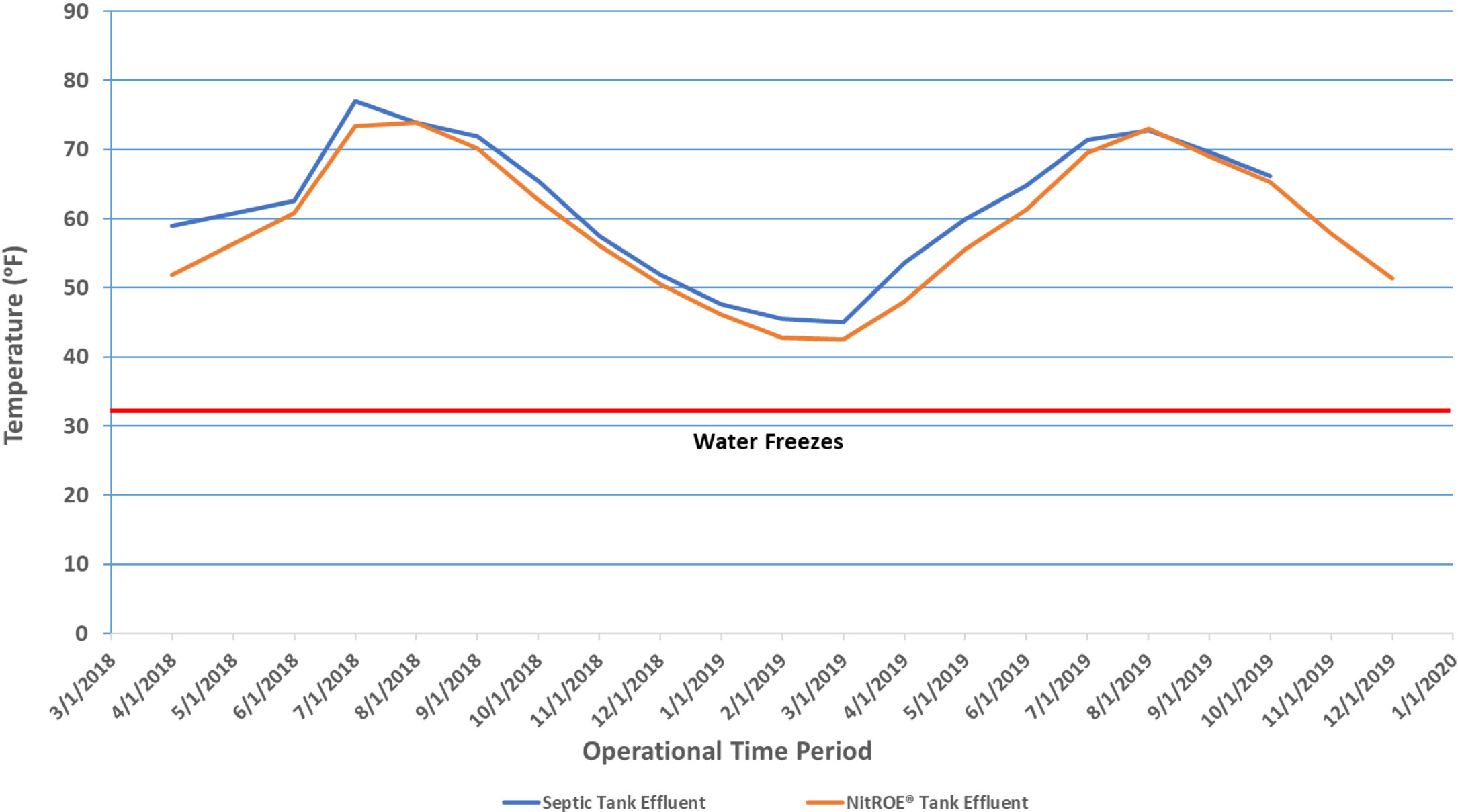
NitROE[®] WWTS Installation Steps

(West Falmouth Installation #11 Photos)



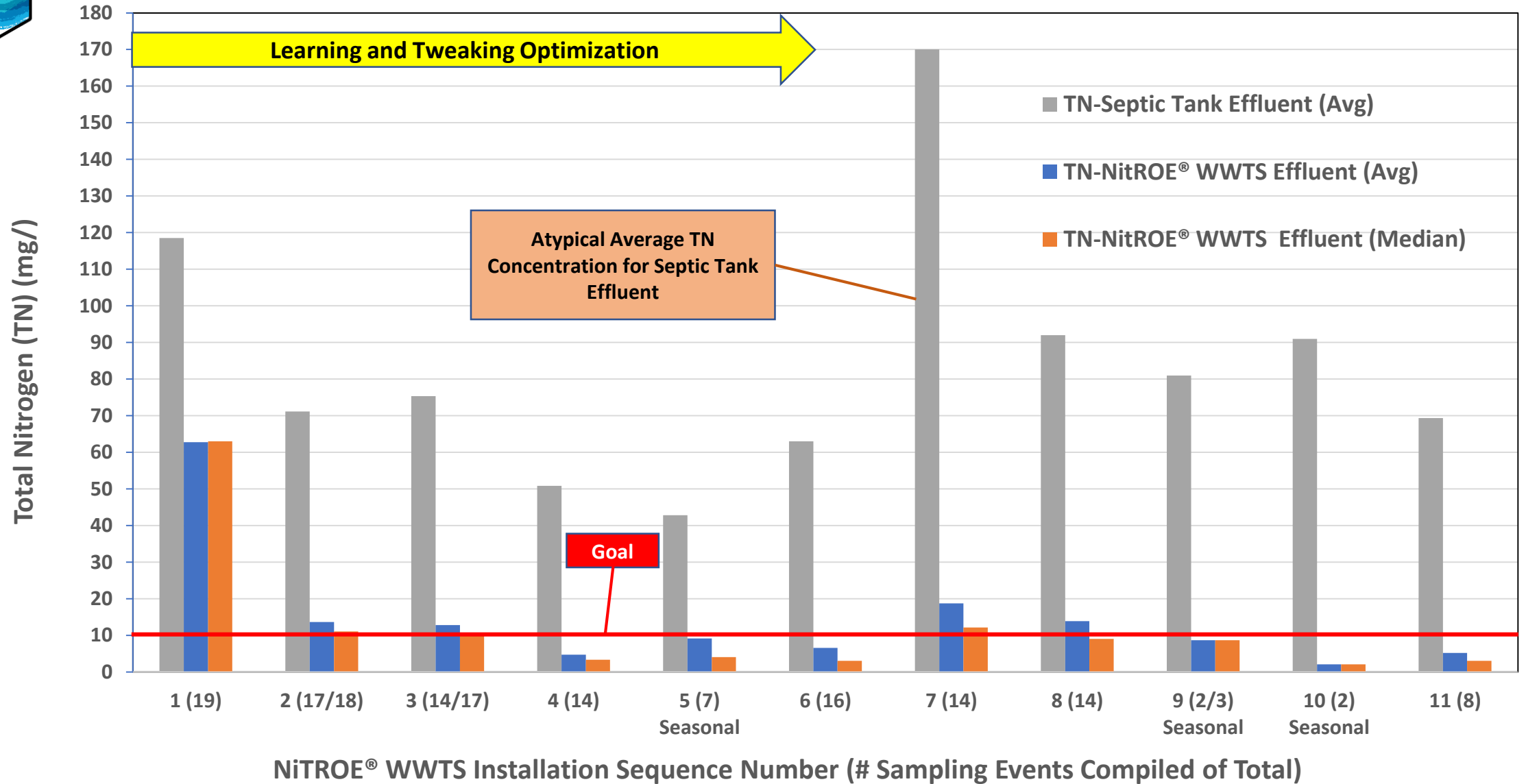


NitROE® WWTS Seasonal Wastewater Average Temperature Variations





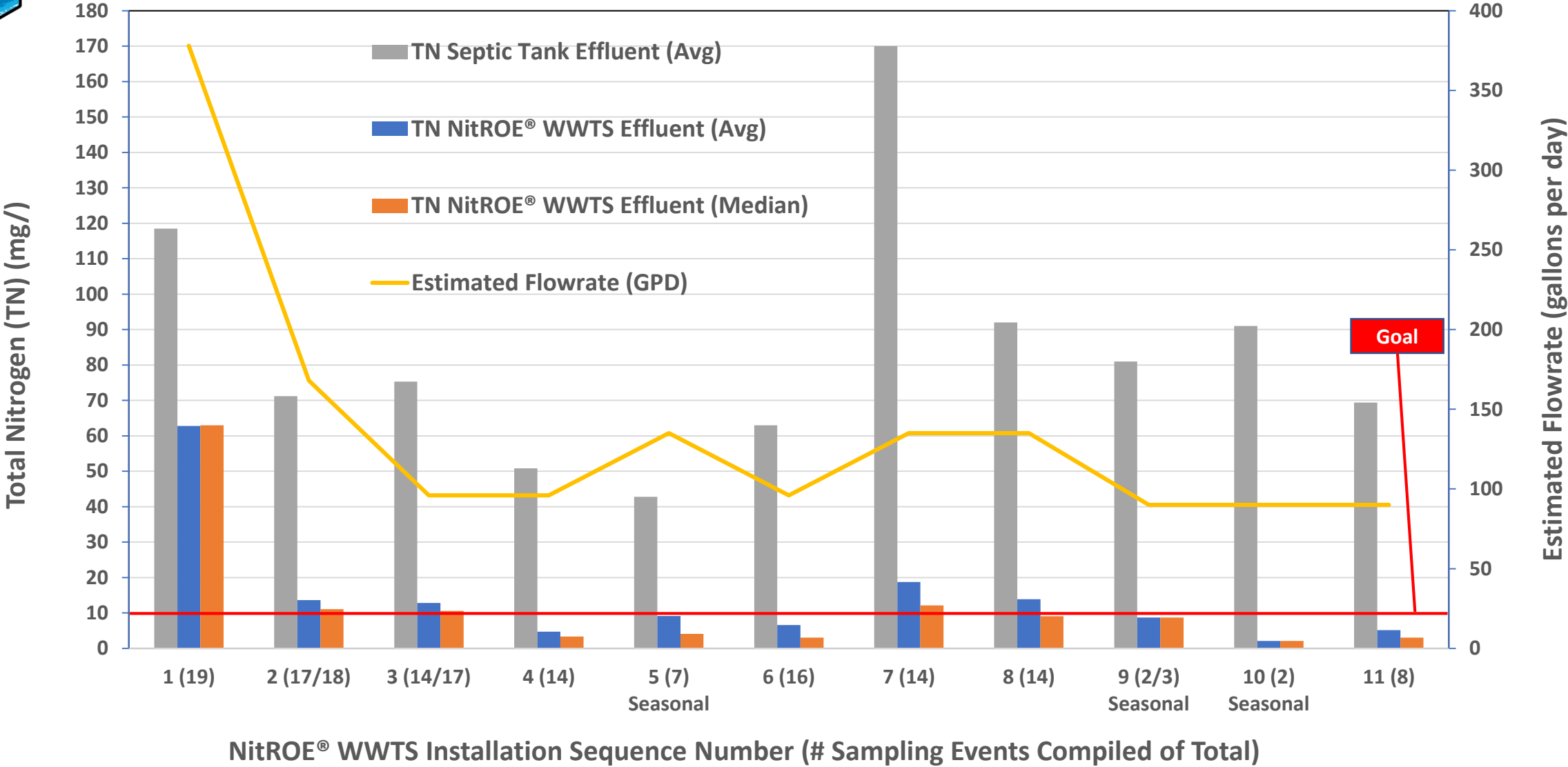
NitROE® WWTS Total Nitrogen Concentration Reductions (Through December 2019)





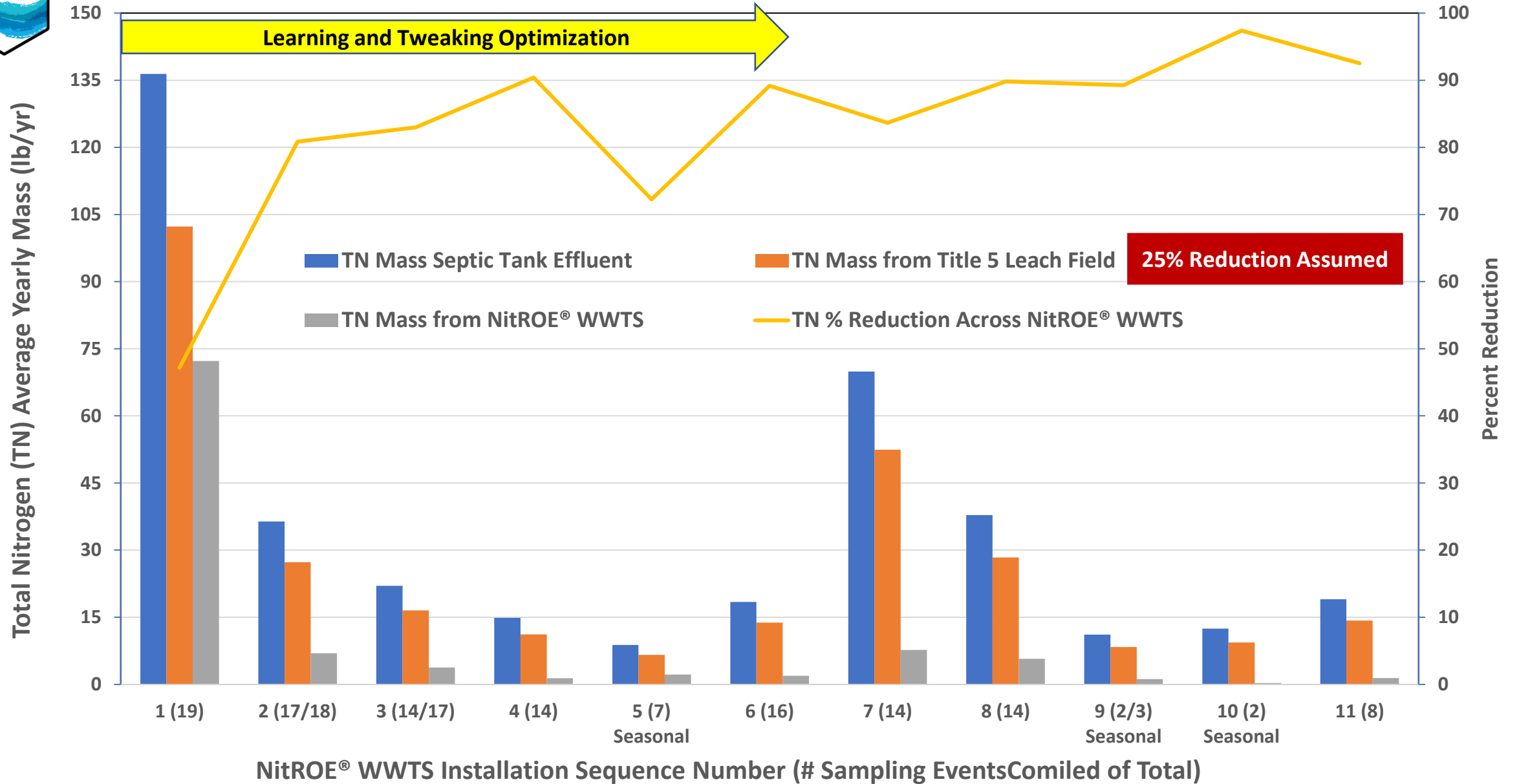
NitROE® WWTS Total Nitrogen Concentration Reductions and Flowrates

(Through December 2019)



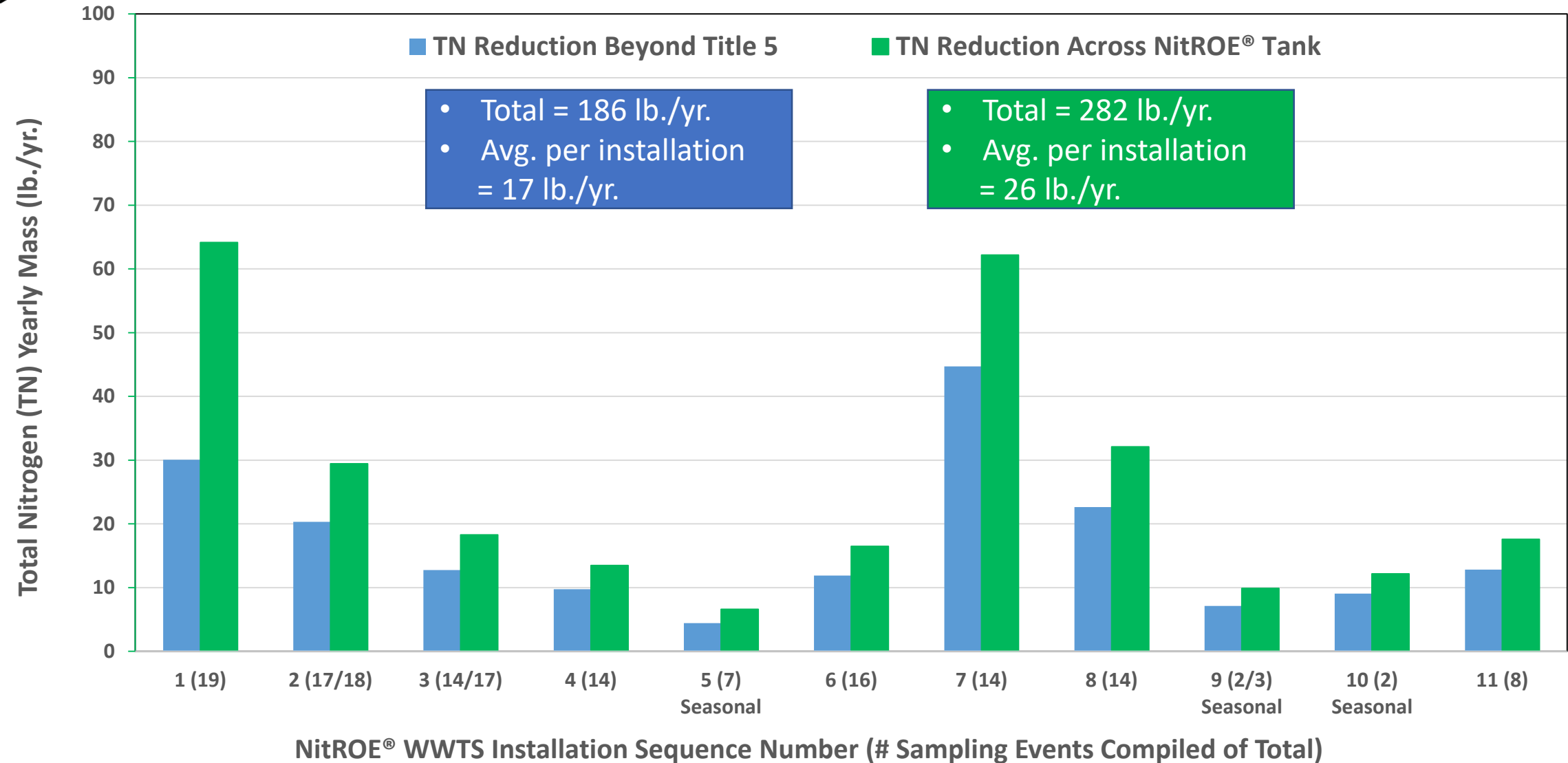


NitROE® WWTS Total Nitrogen Yearly Mass Reductions





NitROE® WWTS Total Nitrogen Yearly Mass Reductions Beyond Title 5





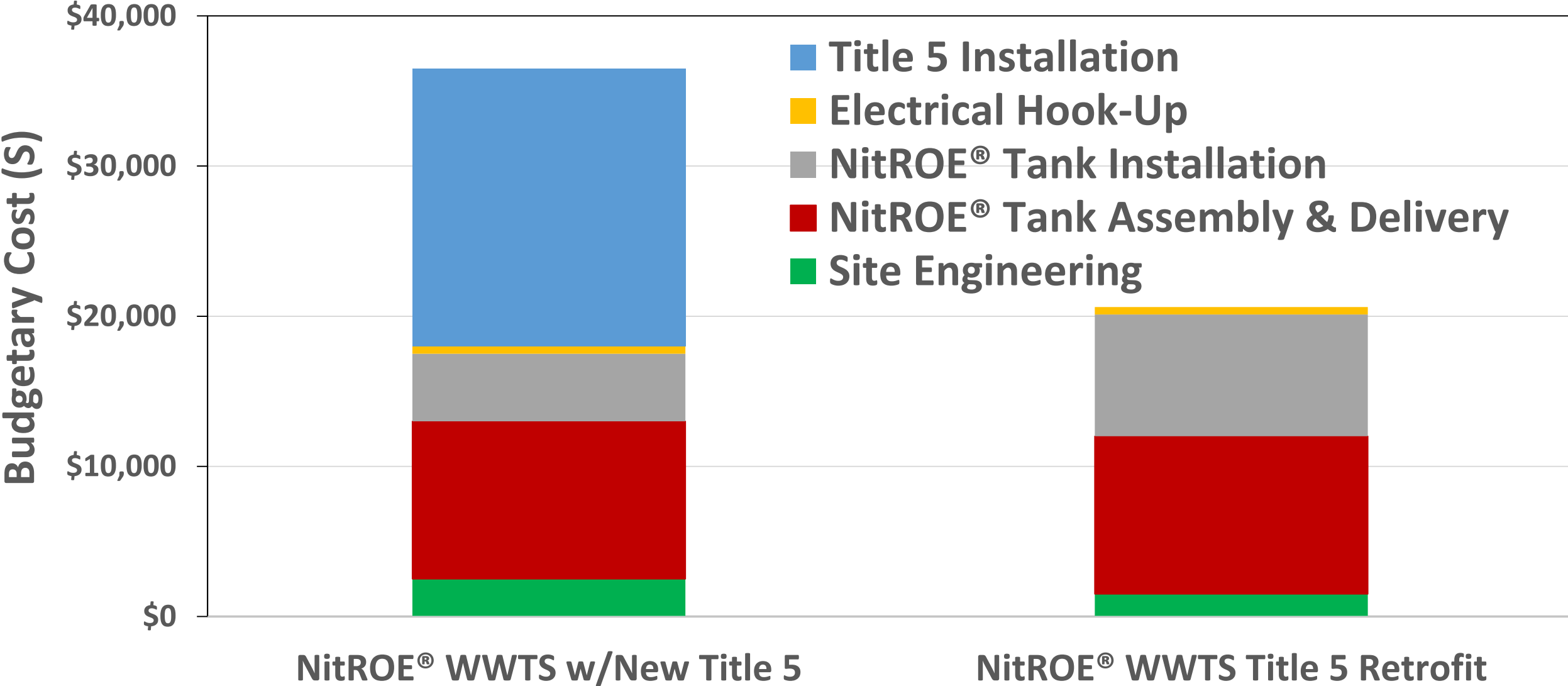
Summary of NitROE® WWTS Installations

Sampling and Monitoring Data

(Through December 2019)

PARAMETER	NitROE® WWTS Tank Treated Effluent Goal	Average Values		Median Values	
		Septic Tank Effluent (IN)	NitROE® WWTS Tank Effluent (OUT)	Septic Tank Effluent (IN)	NitROE® WWTS Tank Effluent (OUT)
# Data Points (n)	-	52	108	52	108
pH, su	6 - 9	7.1	6.8	7.1	6.7
Alkalinity (mg/l as CaCO ₃)	Record	300	211	280	190
Total Suspended Solids (TSS), mg/l	30	94	14	57	6
5-Day Biochemical Oxygen Demand (BOD ₅), mg/l	30	156	28	140	8
Total Kjeldahl Nitrogen (TKN), mg/l	-	76.7	6.6	71.0	3.4
Nitrite Nitrogen (NO ₂ -N), mg/l	1	NA	0.2	NA	0.1
Nitrate Nitrogen (NO ₃ -N), mg/l	10	NA	3.9	NA	0.2
Total Nitrogen (TN), mg/l	12 - 15	76.7	10.8	71.0	6.8

NitROE® WWTS Capital Cost Breakdown of Two Different Deployment Options





Estimated Annual O&M Costs Under Different Mass DEP Permits (\$/yr. for NitROE® WWTS)

<u>NitROE® WWTS Permit Scenario</u>	<u>Monitoring (\$/yr.)</u>	<u>Electrical (1.5 – 3.5 kwh/day) (\$/yr.)</u>	<u>O&M (\$/yr.)</u>	<u>Max. Total O&M (\$/yr.)</u>
Pilot Permit	\$3,000 (Monthly Eff; 1 st 6 Months Inf.)	\$80 - \$200	\$1,000	\$4,200
Provisional Permit	\$800 (Quarterly Eff)	\$80 - \$200	\$400	\$1,400
General Use	\$150 (Yearly Eff. Testing)	\$80-\$200	\$200	\$550

Issues/Opportunities

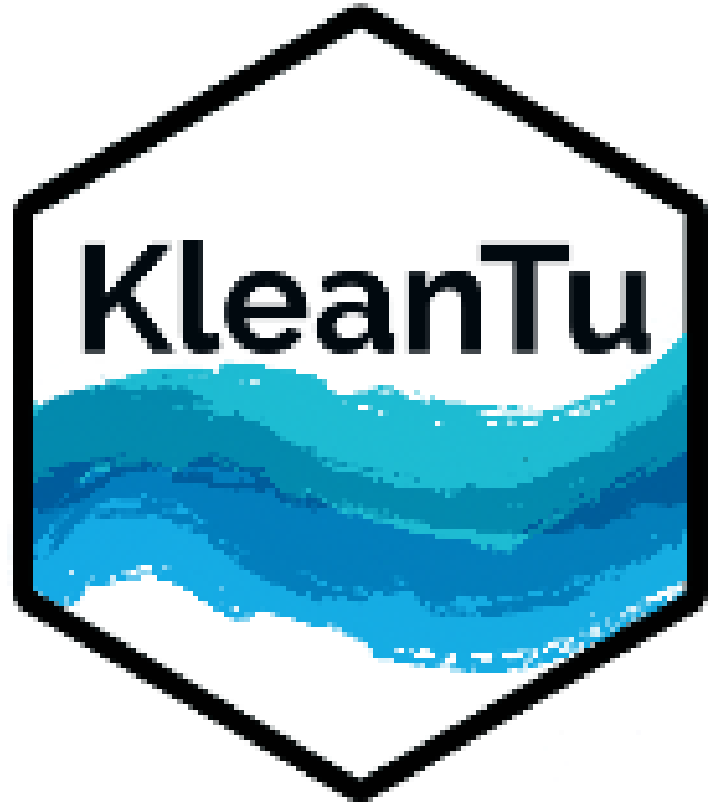


- Prototype testing of remote sensing monitoring and alarms on 3 installations
 - ❖ Future potential on key chemical parameters – EPA Initiative
- Solar powered air pumps
- Reducing size of leaching field
- Non-potable recycle/reuse
- Design, Fabrication, installation and Operation manufacturing Optimization
- For Permitting NitROE® WWTS
 - ❖ Move from Mass DEP Pilot Permit status to
 - ❖ Provisional Permit status
 - January 2020 Application to Mass DEP
 - ❖ **General Use Permit status**

Key Stakeholder Acknowledgements



- Town of Tisbury - MV
 - MassCEC Grant
- MV Commission
- Different Island Organizations
- Barnstable Clean Water Coalition
- Town of Falmouth
- Buzzards Bay Coalition
- **MASSTC - Enabled Focused Testing and Accelerated Commercial Development**



THANK YOU