# Appendix A-11
# Wastewater Treatment Analysis

N&P, LLP

July 27, 2015

## and Supplement

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July 27, 2015

Mr. Mark Hissey
Discovery Land Company
14605 N. 73rd Street
Scottsdale, AZ 85260

Re: Sanitary Disposal Options Report
The Hills at Southampton
Nelson & Pope Project 05105

Dear Mr. Hissey:

As part of our ongoing work, we have been investigating options for sewage treatment and disposal alternatives for the above project. We are currently considering all options for wastewater management for the proposed project, as well as measures to provide treatment and improved nitrogen removal at the site and within the Weesuck Creek and western Shinnecock Bay watershed. Measures under consideration include both on-site and off-site management options. The on-site options include: construction of a conventional sewage treatment plant, construction of alternative disposal systems including "super septic systems" and conventional sanitary systems. The off–site option contemplates connection to the closest Suffolk County Sewage District which is located on the Gabreski Airport property as well as supporting installation of alternative and/or improved treatment systems for existing high density residential areas some of which may include high groundwater conditions. This document will serve as a report of the options to date since some of the options have not been fully considered by the Suffolk County Department of Health Services (SCDHS) and the off-site alternatives require further input for SC Department of Public Works (SCDPW), SCDHS and the Town of Southampton. Please consider this as an interim report on the options available to date.

## On-Site Disposal Options

*Construction of an On-Site Sewage Treatment Plant*

To support the sanitary flow generated from the facility, this report considers construction of an on-site sewage treatment plant conforming to NYSDEC standards. If the site will be owned by one entity, no Sewer Agency Agreement or involvement will be required. Conversely, if there are multiple fee owners of the parcel(s), the STP will be designed in accordance with the Suffolk County Sewer Agency (SCSA) standards and will require a SCSA agreement.

The project is projected to generate 41,814 gpd at a maximum. Full scale treatment facilities can consistently meet the effluent dicharge permit of 10 mg/L TN if operated correctly. The project is projected to generate 41,814 gpd at a maximum. Given the nature of the community, the occupancy is expected to be somewhere between 25% - 75% of the maximum design flow rate. The challenge of this type of development is that occupancy of the units is highly variable. This will have an adverse impact on the operational capabilities of a conventional sewage treatment plant.

Under the current SCDHS code, the facility must be designed to accomodate the design flow of the facility. Thus, the plant will be sized to accommodate 42,000 gpd. The design of the facility would be modular in nature, with 4 tanks each treating approximately 10,500 gpd.

The construction of a modular facility will provide operational flexibility, but will increase the overall construction cost of the facility. In general, costs have been increasing ahead of the pace of inflation. At this time, it is safe to assume that a cost of $85.00 per gallon of capacity should be budgeted. This will bring the price of an on-site facility $3.57M in today's dollars without soft cost including legal fees and land cost.

Due to the variability of the occupancy, the design engineer cannot guarantee that the facility will be able to consistently meet the permit requirements of NYSDEC and SCDHS, especially during start-up and shut down of the system. To achieve steady state in a treatment facility, serveral weeks of consistent flow are required. This can not be gauranteed with the proposed development. Thus the permit limits at the facility may need to be addressed. Once a disposal option is decided upon, permit limits can be discussed with NYSDEC and SCDHS to accommodate the nature of the flow from the proposed development.

*Construction of Alternative On-Site Disposal Systems*

Suffolk County (DPW and DHS) have undertaken a demonstration project for small scale sanitary systems. The purpose of the project is to find alternative disposal systems for single family homes and small scale projects that are cost effective. Five manufacturers have agreed to provide sytems for testing at 19 different locations. Several manufacturers are providing two types of systems for consideration.

The systems are under design review at the County level. The expected timeline for approval and installation is mid to late June 2015. After 2 months of biological process development, steady state testing of the systems will commence. The expected duration for steady state testing is 6 months. Thus, by 2nd Quarter 2016, testing results and system recommendations will be issued. This will allow SCDHS to issue voluntary adoption standards for these systems. A list of the systems is attached for further evaluation.

At this time, it is recommended that any decision with respect to alternative systems be deferred until SCDHS performs the study. Once this infomaiton is available, it can be used in evaluations to assist in making a decision regarding on-site alternative disposal systems for the proposed project. Of foremost concern is the ability of these systems to treat effectively, and to meet the degree of treatment that the manufacturers report. Effective treatmetn will need to consider the variable flow that will result from the occupancy of the resort community.

One system that is currently approved, is Nitrex™. The system had previously been approved at the County level. As such, once the results of the other systems are obtained, they will be added to the cost and perfromance comparision.

**INNOVATIVE ADVANCED TECHNOLOGY VENDORS - SUMMARY**

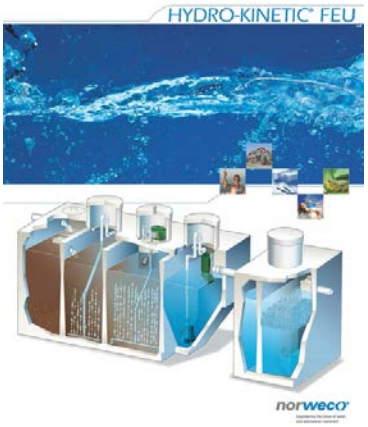
| # | Name of Technology (# of units committed) | Location of HQ | Type of Technology | How It Works | Total N Effluent | Where It's Installed and # | Cost Installed (self reported) | Annual Maintenance |
|---|---|---|---|---|---|---|---|---|
| 1 | Orenco Systems:<br>1) AdvanTex AX-20RT [1];<br>2) AdvanTex AX20 [1] | Sutherlin, OR (and regional rep in Lyme, CT) | Attached Growth Packed Bed Reactor | Process where microorganisms responsible for treatment are attached to textile media. | 1) 15 mg/l;<br>2) 17 and 19 mg/l | Approved & installed in MA (56), MD, RI. More than 20,000 systems in US and Canada | $10.5K-$12.5K (w. new septic tank total $12K-$15K) | $200-$300 |
| 2 | Norweco:<br>1) Singulair TNT [5];<br>2) Hydro-Kinetic [5] | Norwalk, OH | Extended Aeration Activated Sludge | See #2 (above). Singulair TNT consists of pre-treatment, aeration (DT > 24hrs) and secondary clarif-n chambers. Hydro-Kinetic consists of pre-treatment, aerobic, aeration (DT > 21 hrs.), clarification and final filtration chambers. | 1) 12 mg/l; 2) 9 mg/l | Approved & installed in MA (140 systems), MD, OH, RI and N. Canada. | Singulair - $3K-$5K (w/o excavation); Hydro-Kinetic - $5K-8K (w/o excavation) In MD, Singulair TNT costs $11K (w. 5 yr. warranty). | $300-$500 |
| 3 | Busse Green Technologies - Busse MF [2] | Oak Park, IL; (and local rep in Bridgehampton, NY) | Membrane Bio Reactor | Don't need a pre-treatment septic tank; reduced system footprint. | 16 mg/l | Approved & Installed in ME (4). Approved in MD, NJ. General use approval MA (2). | $23K | $600 |
| 4 | Hydro-Action Industries - AN Series [5] | Plymouth, IN | Extended Aeration Activated Sludge | Modification of activated sludge process where organisms remain in treatment process for longer period (Detention Time of > 24 hrs.) | 15 mg/l | IL - 7,700 units, OH- 5,600 units, MD - 35 units | $16.5K | $325-$450 |

## 1.1 ORENCO AdvanTex AX-20RT

## 1.2 ORENCO AdvanTex

## 2.1 NORWECO Singulair

## 2.2 NORWECO Hydro-




## 3. BUSSE MF

## 4. HYDRO-ACTION AN

## Off Site Disposal Options

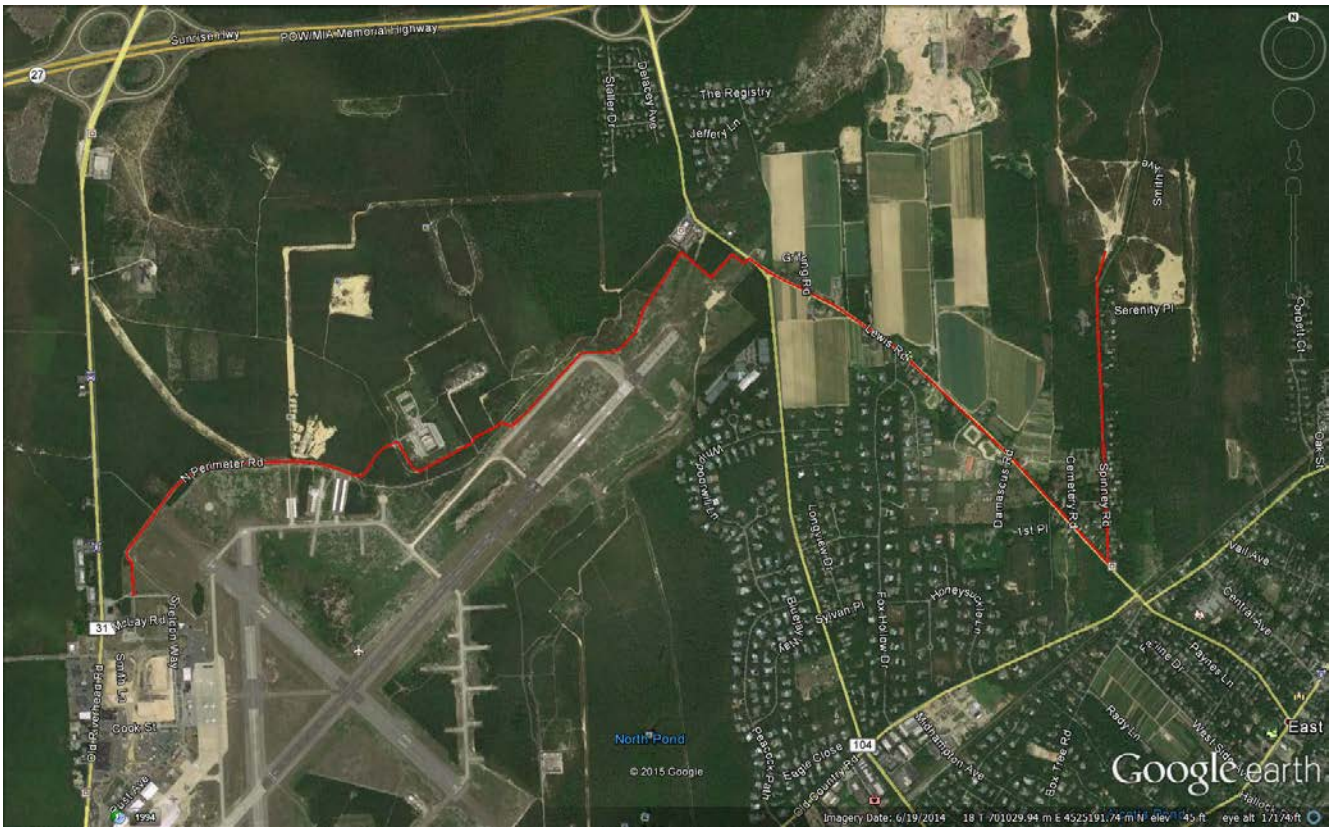
*Gabreski Airport Sewage Treatment Plant (STP)*

We have investigated the feasibility of connecting the parcel to the Gabreski Airport – Air National Guard STP located on the airport parcel. The approximate force main route depicted beolw is 25,000 feet of force main. As can be seen in the picture, the route is somewhat circuitous, but uses existing roadways/accesways to eliminate the need to clear prior to construction.

This equates to about a five mile traverse to the Gabreski Airport STP. That equates to approximately $5,000,000 in force main construction. The on-site pump station would cost another $500,000 and the connection fee to the facility is approximately $1.25M. Barring any of the large obstacles, the cost to perform the connection well exceeds the other options available at approximately $6.75M.

One major obstacle to construction is the proposed routing across the airport property. Although the force main will be buried, it requirements of construction on the property may be onerus. Specifically, construction hours may be limited, or construction methodolgies may be modified to assure that the force main does not intefere with airport operations.

Most importantly, during discussions with SCDPW, the operator of the facility, they indicated that although there is currently unused capacity, it is allocated to other projects that are proximate to the STP. Thus, a plant improvement program would need to be implemented. Although it is entirely feasible, the upgrade will require SCDHS and SCDPW approval as well as the time to construct the upgrade. Typically a plant improvement program endures for a 3 year period.



*Other Off-Site Options*

It is noted that the proposed project is significantly less than the density allowed by SCDHS. It is further noted that the proposed project is expected to meet any and all wastewater requirements including more stringent recommendations of the 1983 Cornell Water Resources Institute study of 2-3 mg/l of nitrogen in recharge (Hughes & Porter, 1983). Given the low density use and low nitrogen contribution of the proposed project, coupled with limitations of on-site options due to variable flow, ability to meet discharge permit limitations and cost, and the cost of off-site conveyance for treatment at the Gabreski STP, other options merit consideration. Such options include:

- Contribution of significant funding toward treatment of existing sources of wastewater on substandard lots within the watershed.
- Coordination and cooperation with the Town and County to implement alternative wastewater system installation in high density residential areas.
- Coordination and cooperation with the Town and County to install upgraded conventional sanitary systems in areas of high groundwater in order to improve conventional treatment efficiency.

Any and all of these options can be considered (as well as other potential options) and may in fact provide greater benefit in terms of nitrogen removal in the Weesuck Creek and western Shinnecock Bay watershed. The applicant is committed to complying with all applicable wastewater treatment and disposal requirements, staying current with techology, supporting alternative wastewater treatment methods and reducing nitrogen in the watershed to provide long-term environmental improvement in the area of the proposed project.

**Preliminary Recommendations**

At this time, due to the preliminary nature of the on-site alternative systems, it is incumbent to get further information regarding the on-site alternative systems prior to offering a recommendation of sewage disposal for the project. Without a clear understanding of the perfromance capabilities of the systems, any recommendations would be premature. In addition, it is recommended that the applicant continue to seek other off-site options that would provide more benefit for dollars spent and ultimately provide greater nitrogen removel benefit in the watershed.

Sincerely yours,

NELSON & POPE
ENGINEERS & SURVEYORS

Thomas F. Lembo P.E.
Partner

COUNTY OF SUFFOLK

**STEVEN BELLONE**
**SUFFOLK COUNTY EXECUTIVE**

REPORT ISSUED BY SUFFOLK COUNTY
DEPARTMENTS OF ECONOMIC DEVELOPMENT & PLANNING, HEALTH SERVICES, AND PUBLIC WORKS

# Advanced Wastewater & Transfer of Development Rights Tour Summary

April 28, 2014

Participants:
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Suffolk County Legislator Kara Hahn
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Report prepared by:
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*Funded by HUD's Sustainable Communities Initiative*

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## Executive Summary:

A delegation of Suffolk County staff, County Legislator Kara Hahn, Federal, State and nonprofit partners met with leaders from the Maryland Department of Environment, New Jersey Pinelands Commission, University of Rhode Island New England Onsite Wastewater Training Program, and Barnstable County Department of Health's Massachusetts Alternative Septic Systems Test Center, referred as the Septic Tour herein, from March 19 to 21, 2014. The Tour enabled Suffolk County and our partners to gain valuable insight into the development, implementation, and operation of a variety of innovative advanced (I/A) onsite septic system programs that have been in place for over 10 years in order for the County to begin the development of our own I/A onsite septic system program. Key takeaways of the Septic Tour include:

**Wastewater Planning Is Important:** The development of I/A programs in the regions visited were compelled by the need to improve and protect the water quality. Water quality plans were established in each region to develop water quality goals such as Maryland's Watershed Implementation Plan based on EPA established total maximum daily loads (TMDL) for the Chesapeake Bay, The New Jersey Pinelands Commission Pinelands Comprehensive Management Plan, Rhode Island Special Area Management Plans (SAMPs), and the Cape Cod Commission's Regional Policy Plan, which operates within the context of TMDL. These plans were key to establishing an I/A program to defined areas where I/A systems would be required to be installed, either for new construction or upgrades, to meet established water quality goals.

**Technology Demonstration Projects Are Effective:** In an effort to identify acceptable I/A systems, each region established pilot programs and/or standards outlining piloting requirements to evaluate technologies in advance of broader installations. In advance of more widespread installations, the State of Rhode Island and the New England Onsite Wastewater Treatment Center (NEOWT) at the University of Rhode Island conducted a series of demonstration projects to train local designers and contractors to install, maintain, and operate, I/A technologies. Critically, homeowners will be exposed to the requirements of a new utility that requires understanding and upkeep.

**Program Design Influences Homeowner Costs and Participation**: There are more than 25,000 I/A systems capable of nitrogen reduction installed in the regions visited. Treatment unit costs range from $10,000 to $20,000 above the cost of installation of a conventional onsite septic system. Depending on the program, treatment units are sold with a 2 or 5 year operations and maintenance (O&M) contract. After the manufacturer's O&M contract expires, then property owners are required to maintain a yearly O&M contract at an approximate cost of $250 per year. Depending on the technology selected, property owners may incur a higher electric bill to run the treatment unit. If treatment units are well maintained, then the expected life can be 20 years or more.

**Low Interest Loans Can Be An Effective Means Of Incenting Homeowner Participation:** The jurisdictions visited had a robust involvement, commitment, and investment from state agencies to fund the installation of I/A systems. Rhode Island, with the most number of systems installed, provides low interest loans to homeowners to upgrade their septic systems to I/A systems through the use of a portion of their "big pipe" Federal Clean Water Act Revolving Fund to the State, that were then loaned to local government agencies at low to zero interest rates. The local government would then issue a loan to homeowners with an interest rate of 2% [RI] to 5% [MA] at a 10 or 20 year term. The Maryland Department of Environment provides grant funding to pay for I/A system only (excludes the cost of

leaching field and septic tank) through a State bill creating the Bay Restoration Fund (BRF). The BRF is funded through a fee assessed to the property and added as a property tax or part of a separate bill depending on municipality. The State of Massachusetts offers a tax credit for repair or replacement of failed cesspools or septic systems for 40% of the cost up to $6000, spread over 4 years at $1500 per year.

**Program Infrastructure is Needed to Effectively Manage Program**: In order to track O&M contracts, maintenance, and performance, Barnstable County has deployed an online tracking system known as the Carmody system, as does Rhode Island as a part of their Web-based Information System [RIWS].

**A Variety of Technologies Are Viable Candidates for Further Investigation in Suffolk County**: Bio Microbics FAST, Bioclere, Amphidrome, SeptiTech, AdvanTex AX20, and Singulair TNT appear to be the most common units installed in the regions visited and have proven capable of reducing nitrogen in residential sanitary wastewater. In addition, Busse GT and Bio Microbics Bio Barrier are newer onsite treatment technology units that appear to have the ability to remove some personal care and pharmaceuticals products (PPCP) in addition to reducing nitrogen. None of the four state programs allowed in-kind replacement of cesspools.

**Septic Test Centers Are 24/7 365 Endeavors**: The Barnstable County Department of Health created the Massachusetts Alternative Septic Systems Test Center to test advanced onsite septic systems capable of reducing pollutants in wastewater. PPCP removal, nitrogen reducing systems, and other innovative technologies are being pioneered at the test center. The drawbacks of the center are the high operating costs, it is labor intensive, and the center did not significantly contribute to local business development (of 31 systems tested in Cape Cod, only three came from MA).

**Transfer of Development Rights' Programs Were Not Directly Connected to I/A Systems:** Transfer of development right (TDR) programs for each region were evaluated to determine if TDR's were an integral part of the control of nitrogen within each municipality. The NJ Pine Barrens Commission, with the least robust program, was the only jurisdiction visited that had an established TDR program to permit increased density within the region. TDR's within the NJ Pine Barrens Region permits property owners to obtain credits for their parcel if they are located in one of three Pineland sending areas. These credits may be purchase by developers wishing to increase density in designated regional growth areas. There was use of I/A to allow development on nonconforming lots, such as NJ which required I/A if lot was less than 3.2 acres. RI required developers to upgrade another system that is in the same sub-watershed as well as the proposed development, so that there is a net zero increase in nitrogen loading.

**Next Steps:**

In order for Suffolk County to implement an I/A septic program, we suggest several next steps to consider:

1. Develop a baseline inventory of onsite systems and their performance;
2. Identify priority areas for wastewater upgrades based on risk assessment characteristics including public health, water quality modeling, environmental info, etc;
3. Develop a Wastewater Action Plan as part of the Comprehensive Water Resources Management Plan with updated information from water quality and wastewater studies;
4. Review and update ordinances for uniformity to achieve goals outlined in the Wastewater Action Plan and identify sources for incentives;

5. Implement demonstration projects comparable to demonstration projects completed by Rhode Island. Evaluating a decentralized community cluster septic is an added aspect that Suffolk would include;
6. Establish a Responsible Management Entity (RME) to oversee the program and be a conduit for financing;
7. Conduct a nitrogen reduction assessment study that will track the effectiveness of the program to improve water quality;
8. Craft viable financing options, such as access to NYS Environmental Facilities Corporation low interest loans, tax credits, and/or grants; and
9. Develop the appropriate internal infrastructure to implement such a program and evaluate laws and/or standards that must be implemented or updated to operate an I/A program.

## Section 2: Overview

Suffolk County, a region with a federally designated sole source aquifer (deriving its drinking water from the ground) must pay particular attention to the 360,000 legacy septic systems and cesspools. Suffolk County has estimated that approximately 200,000 systems are degrading our marshland habitats that act as a second line of defense during storm events like Sandy and/or contributing to groundwater degradation. Septic and cesspool systems are particularly problematic in areas with high water tables in close proximity to surface waters. When flooded or submerged in groundwater, septic systems do not function as designed and fail to adequately treat pathogens. Excess nitrogen from this sewage threatens our valuable natural resources, coastal defenses, and human health. Instituting an innovative and alternative (I/A) onsite septic system program for Suffolk County is, along with sewering, intermediate-sized, clustered community systems, and managing other nitrogen sources like lawn fertilizer, a key component in the mission in reversing the upward trend of nitrogen in our drinking water and our surface waters from legacy septic and cesspool systems.

Figure 1 and 2 compare the population of Suffolk County with the areas visited. The population of Suffolk County exceeds three of the jurisdictions visited (Rhode Island, NJ Pinelands, and Barnstable County, MA) and is about 1/4 the population of the entire state of Maryland. In addition, the density of people per square mile in Suffolk County is greater than all jurisdictions visited. Even though the population and size of the jurisdictions visited vary, they share the same mission as Suffolk County to improve and protect the water quality of their region.

| Area | Population |
|---|---|
| *Suffolk County, NY* | *1,499,273* |
| State of Maryland | 5,928,814 |
| NJ Pinelands | 870,000 |
| State of Rhode Island | 1,051,511 |
| Barnstable County, MA | 214,990 |

**Figure 1: Population of Jurisdictions Visited**[1]

| Area | Land Area (square Miles) | Persons per square mile, 2010 |
|---|---|---|
| *Suffolk County, NY* | *912.05* | *1,637.4* |

[1] http://quickfacts.census.gov/qfd/index.html#

| | | |
|---|---|---|
| State of Maryland | 9,707.24 | 594.8 |
| NJ Pinelands | 1,449 | 600.41 |
| State of Rhode Island | 1,033.81 | 1,018.1 |
| Barnstable County, MA | 393.72 | 548.8 |

**Figure 2: Land Area VS. Persons per square mile**[1]

As with Suffolk County, all the areas visited have residences that utilize onsite sewage disposal systems as the primary means of wastewater discharge. Figure 3 depicts the number of onsite sanitary systems in the places visited compared to Suffolk County. As depicted by the figure 1 and 3, Maryland has 4 times the population of Suffolk County but only 60,000 more onsite sanitary systems. Suffolk has nearly three times as many septic/cesspools than the entire State of Rhode Island.

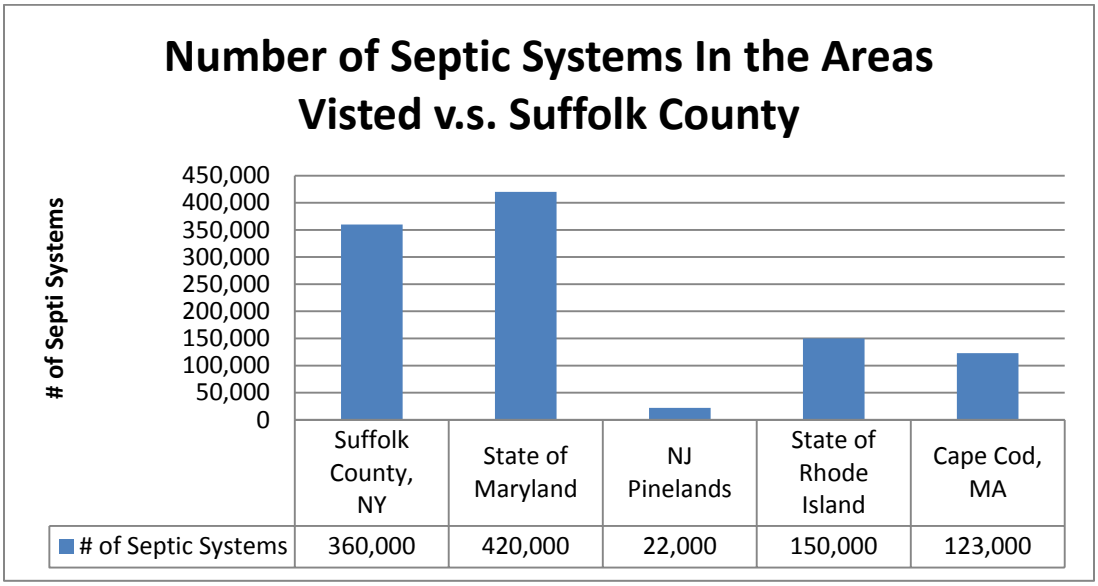


**Figure 3: Number of Septic Systems in Jurisdictions Visited Compared to Suffolk County [Note: The NJ Pinelands is a small area within NJ]**

**<u>Highlights from each State</u>**:

**Maryland** has 420,000 onsite septic systems in a state 4 times the population of Suffolk County, which, by their estimation, contributes 5-9% of the total nitrogen load to the Chesapeake Bay. Of the 420,000 onsite septic systems, approximately 17,000 of these are located in critical areas (land within 1,000 ft of the mean high water line of tidal waters or the landward edge of tidal wetlands and all waters of and lands under the Chesapeake Bay and its tributaries) and directly contribute to the TMDL. Maryland has developed the Maryland's Bay Restoration Fund to provide grants for onsite septic system upgrades, wastewater treatment plant upgrades and to reduce agriculture pollution. They've implemented the Bay Restoration Fund (BRF) fee where 60% of the BRF goes to onsite sanitary system and wastewater treatment plant upgrades, 40% to Agriculture Water Quality Cost Share Program to fund conservation measures to prevent soil erosion manage nutrients and safeguard water quality, and 0.5% for administrative fees. The BRF fee, assigned to the property tax, began at $30/household and brought in $60M annually. Last year, the fee was doubled to $60 per household. Maryland has upgraded 5,500

onsite septic systems to date and advised Suffolk County to use property transfer as a program lever for onsite septic system upgrades. Programmatically, they recommended a sole responsible management entity (RME) to both operate and finance an alternative onsite sanitary system program.

The **New Jersey** Pinelands Commission uses transfer development rights (TDR) in addition to the use of alternative onsite septic systems to permit increased density. In Gladstone, NJ, the Willow School in Gladstone, NJ constructed wetlands wastewater treatment system (Figure 16) has been effectively treating 5,000gpd for the past 12 years.

**Rhode Island has, far and away, installed the most I/A systems** The University of Rhode Island New England Onsite Wastewater Training Center's George Loomis conducts continuing education workshops on I/A systems across the Northeast. Rhode Island commits 5% of the Clean Water State Revolving Fund (CWSRL) to upgrading onsite septic systems and, in the 14 years of their program, has permitted over 19,000 alternative & experimental systems of which 5,809 have nitrogen reducing capabilities. Their Community Septic System Loan is funded at 0% from CWSRL, which it extends up to $25,000 to homeowners at 2% interest for 10 years. Loomis recommended that Suffolk County apply resources to program development and not re-invent the wheel by replicating components that are already highly evolved in Rhode Island and Massachusetts.

In **Barnstable County, MA**, George Heufelder has been testing and evaluating emergent onsite septic systems at the Massachusetts Septic Test Center for 20 years. He noted that a test facility such as the one in Barnstable County is 24/7, 365 days-a-year operation and cautioned against starting up a facility elsewhere. Local towns are responsible for permitting onsite septic systems and determine when an alternative system must be installed for new construction or upgrades. Out of an estimated 1,200 failures per year, only 400 go to I/A. The Cape Cod region has 123,000 septic systems. Barnstable Community Loan Program provides borrowers with loans to upgrade onsite septic systems at 5% over 20 years with a lien placed on the property to ensure repayment. The state offers a tax credit for 40% for repair or replacement of failed cesspools or septic to $6,000, which is spread over 4 years at $1,500 per year. Out of the programs visited, Barnstable County maintains the best tracking system of I/A technologies, known as the Carmody Data System.

## Section 3: Water Quality Planning Goals

There is collective recognition in these jurisdictions of the necessity for enhanced wastewater treatment. The US EPA developed Total Maximum Daily Load (TMDL) for the Chesapeake watershed and there is a collective recognition in surrounding jurisdiction of the necessity for enhanced wastewater treatment. The watershed included the states of Maryland, Delaware, New York, Pennsylvania, Virginia, and West Virginia. Each state in the watershed had to develop plans to meet the TMDL's. Maryland's Watershed Implementation Plan consists of three phases. The plan addresses nitrogen reduction from sources such as wastewater treatment plants, onsite sewage disposal systems, fertilizers, agricultural waste, and storm water.

In Maryland only 5-9% of nitrogen stems from onsite sewage disposals systems as compared to Suffolk County where 70% of the nitrogen load originates from onsite sewage disposal systems. Maryland requires all new or replacement onsite sanitary systems located in identified critical areas (land within 1,000 ft of the mean high water line of tidal waters or the landward edge of tidal wetlands and all waters of and lands under the Chesapeake Bay and its tributaries) to be alternative onsite septic systems

capable of reducing nitrogen. Comparable systems must be installed elsewhere within the Chesapeake Bay watershed and Atlantic Coast bays. Such systems must meet a maximum effluent total nitrogen concentration of 30mg/l. In addition, Maryland adopted the Sustainable Growth and Agricultural Preservation Act of 2012 where Maryland limits the spread of onsite septic systems on large-lot residential developments to reduce nitrogen pollution to the Chesapeake Bay and other waterways. The Act divides the state of Maryland's into tiers as follows:

Tier I: Areas currently served by sewers

Tier II: Future growth areas planned for sewers

Tier III: Large lot developments and rural villages on septic systems

Tier IV: Preservation and conservation areas where no major subdivisions are permitted on septic systems (A major subdivision is defined as 7 or more lots depending on the county).

The New Jersey Pinelands Commission developed the Pinelands Comprehensive Management Plan to promote orderly development of the Pinelands so as to preserve and protect the significant and unique natural, ecological, agricultural, archaeological, historical, scenic, cultural and recreational resources of the Pinelands.[2] The Pinelands Comprehensive Management Plan developed the Pinelands Septic Dilution Model, which shows the minimum residential lot size required in the NJ pinelands to be 3.2 acres in order to maintain 2.0 mg/l total nitrogen in groundwater at the property line. In order to build on lots smaller than 3.2 acres and meet the 2.0mg/l in groundwater at the property line alternate onsite septic technologies capable of reducing nitrogen must be used. Even with alternative onsite septic system technologies there is a minimum lot size of 1 acre, based on the assumption that these onsite treatment technologies can consistently achieve the Pinelands Pilot Program total nitrogen effluent performance standard of 14 mg/l. As part of the Plan the Alternative Septic System Program was developed to identify nitrogen removing onsite sewage disposal system that could be installed in the region to improve water quality and to permit higher density development. Only 241 systems have been installed in this program.

The Cape Cod Commission, established in Barnstable County, MA developed a regional policy plan, which is updated every five years to protect the region's resources such as public/private drinking water wells and surface waters. In addition, each town in the County may prepare a local comprehensive plan to define the town's vision for how to achieve the goals. These plans must be consistent with regional plans and certified by the Cape Cod Commission. Also, the County is updating their Section 208 US Clean Water Act Plan that was, previously approved in 1978. Their updated 208 Plan is expected to be approved by mid-2014. The approved 208 Plan Update is expected to sit alongside the Regional Policy Plan, but not be formally adopted as part of it. The Cape Cod Commission has also developed the Regional Wastewater Management Plan (RWMP).[3] The RWMP provides models depicting percent nitrogen removal to meet TMDL's. The county has spent approximately $12 million over the past 20 years to identify nitrogen loading targets for embayments and sub-watersheds (Figure 4). Approximately 85% of the parcels located on the Cape are served by onsite sewage disposal systems, which contribute 80% of the nitrogen loading. Alternative onsite septic technologies capable of reducing nitrogen installed on Cape Cod must produce effluent with a total nitrogen concentration of 19- 25 mg/l (approximately a 50% reduction, which, while good, is not perfection).

[2] http://www.state.nj.us/pinelands/cmp/
[3] http://www.capecodcommission.org/resources/RWMP/RWMP_ea_water.pdf

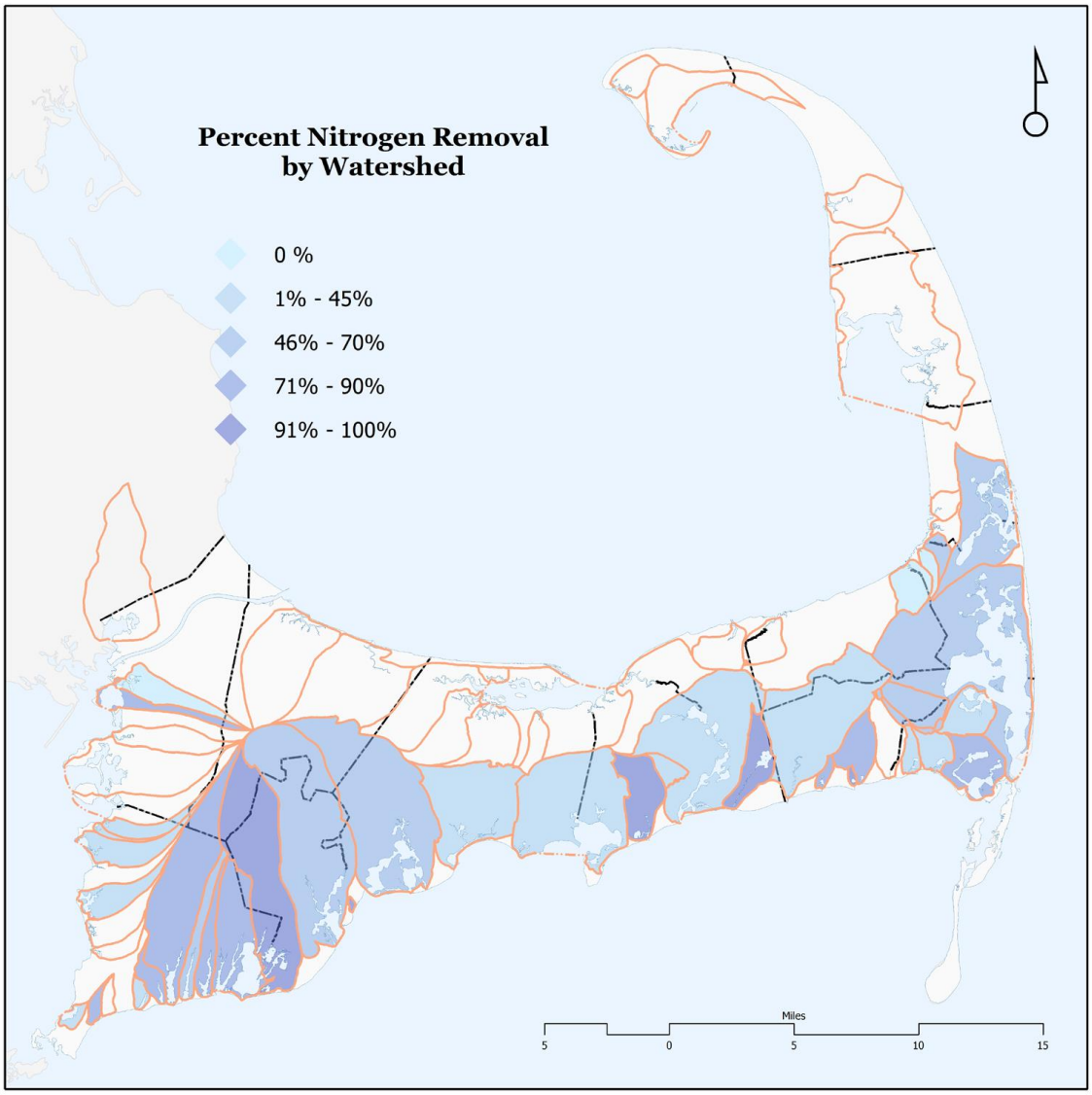


**Figure 4: Cape Cod Commission Regional Wastewater Management Plan Model depicting percent nitrogen removal required to meet TMDL's**

In Rhode Island the Coastal Resources Management Council (CRMC) was authorized under the federal Coastal Zone Management Act of 1972 to develop and implement Special Area Management Plans (SAMPs) to address specific regional issues. These plans are ecosystem-based management strategies that are consistent with the council's legislative mandate to preserve and restore ecological systems. The CRMC coordinates with local municipalities, as well as government agencies and community organizations, to prepare the SAMPs and implement the management strategies.[4] Based on the CRMC Special Area Management Plans for the South Shore Salt Ponds and Narrow River, all onsite septic systems located within these areas are require to be advanced septic system capable of nitrogen reduction. Currently there are approximately 40,000 to 50,000 onsite septic systems installed CRMC Special Area Management Plans for the South Shore Salt Ponds and Narrow River.

[4] http://www.crmc.ri.gov/samps.html

## Section 4: Pilot Programs

Conventional onsite septic systems and cesspools marginally reduce nitrogen in wastewater (Effluent nitrogen from a conventional septic system is approximately 38 mg/l). Based on the water quality plans/goals prepared in the areas visited, pilot programs were implemented to test and select nitrogen reducing onsite septic system technologies.

The Maryland Department of Environment formed the Best Available Technology (BAT) Verification Program to review proposed I/A systems. An application is submitted to Maryland Department of Environment. The BAT Review Committee, comprised of the BRF chair, the division chief of MDE and county representative, evaluates 3rd party certification test methods, independent performance evaluations and test results to verify the vendors' claim. If the Committee accepts the claims then provisional technologies enter a Field Verification Process. Twelve systems plus 3 reserve systems may be installed during the field verification process and must be sampled 4 times each year with a minimum of 1 winter sample. The average total nitrogen concentration in the effluent must be below 30 mg/l. After passing the Field Verification Process a final report with sample results is submitted to the BAT review committee for evaluation. If the committee accepts the report then the system is classified as "Best Available Technology, Field Verified".

In 2002, the New Jersey Pinelands Comprehensive Management was amended to establish a Pilot Program for Alternative Design Wastewater Treatment Systems to reduce groundwater pollution from residential onsite septic systems. The Commission created a pilot study to determine the best systems to be installed within the Pinelands. A Committee was formed to perform a 2-year study to research and evaluate onsite treatment technologies capable of reducing nitrogen. Five advanced treatment technologies were selected to participate in a 5-year Pilot Program to demonstrate their effectiveness at removing nitrogen from residential wastewater. The five systems were recommended by a consultant in a 2001 report, "Performance Expectations for Selected On-Site Wastewater Treatment Systems" (See NJ Pinelands Commission Section for further info regarding the pilot program). A yearly report is issued by the commission outlining the results of the pilot test systems. Three of the 5 systems approved in the 1st round of pilot systems are still permitted today. A 2nd pilot program to evaluate 4 new systems has commenced. Systems selected for the 2nd round where required to be NSF 245 certified and pay $5,000 fee to apply. The two (2) systems that did not complete the 1st round of testing were Cromaglass (residential household model) and Ashco RFSIII. The Commission allows homeowners of failed pilot systems that were removed from the program to update their system with a conventional onsite septic system.

Rhode Island Onsite Wastewater Demo Projects, 1996 to 2005, was conducted by New England Onsite Wastewater Treatment Center (NEOWT) and the knowledge gained from the project was transferred to Department of Environmental Management (DEM), which helped with policy/rule revisions. The demonstration project was a series of 5 demonstration projects in 7 communities. They installed 58 demonstration systems on sites with failed septic systems. Sites were selected using a lottery for homeowners that had failed septic systems. The program provided the systems at a reduced cost or no cost to homeowners on condition that the owner granted a 3-year access period to the property, to allow staff to install, test, and maintain the systems. Labor was provided gratis to gain experience installing new technologies. Today, I/A systems are approved for use by the RI DEM. New alternative treatment systems can be approved by the RI DEM as nitrogen reducing systems per the DEM Onsite wastewater treatment (OWTS) rules governing pilot systems. In order to receive approval for a nitrogen reducing technology:

-The applicant provides certification that the technology meets NSF/ANSI "Standard 245-Wastewater Treatment Systems- Nitrogen Reduction" and the testing results show a preponderance of treated effluent nitrogen concentrations of nineteen (19) mg/l or less; or

-demonstrates approval for use in another jurisdiction in an area where the temperature conditions are similar to or colder than those in Rhode Island and with technology review criteria substantially equivalent to Class One or Class Two summarized above and detailed in OWTS Rules 37.4.1 or 37.4.2 (A)-(B).

- Nitrogen removing systems require renewal every five years

Non-proprietary systems may be approved under the OWTS Rules as an experimental system as follows:

**Experimental Systems** - This category is designed to allow innovative systems, which have been demonstrated to work in practice or theory, to be installed on a limited basis as they are further tested and studied.

Experimental use is approved when:

1. The applicant demonstrates that the technology will work in practice and in theory;
2. Provides for three (3) to ten (10) proposed installations, a suitable area at each location for the installation of an OWTS permitted under the OWTS Rules, or a Class One A/E OWTS Technology;
3. The applicant proposing the Experimental Technology, the property owner(s) and subsequent purchaser(s) submit a signed statement to the Director agreeing to abandon the Experimental Technology and install an OWTS permitted under these Rules, or a Department approved Class One A/E OWTS Technology if the Experimental OWTS fails to perform as designed; and
4. The applicant submits documentation securing a bond or other form of financial security acceptable to the Director, to replace the entire OWTS in the event it fails to perform as designed.

RUCK, Cromaglass (residential household model), and Biocyle were previously permitted in Rhode Island but were subsequently delisted for use in the state.

The Massachusetts Energy and Environmental Affairs Department approves the types of alternative systems allowed to be installed in the state and outlines the piloting requirements for nitrogen reducing onsite septic systems in their "Title 5" section 15.285 and 15.286. The Department approves the pilot of a new system for up to 15 installations after it reviews technical data, receives an environmental and reporting plan covering at least 18 months for each pilot facility from the vendor, and received assurance from the local authority stating the necessary operation and maintenance activities will be performed and monitored. If successful then the system can move into provisional status, where 50 units can be installed for 2 years. After completing the provisional status requirements then the system is issued a general use permit. Currently there are only three (3) nitrogen reducing systems with a general use permit.

| Region Visited | Nitrogen Effluent Requirement for Alt Systems |
|---|---|
| State of Maryland | 30 mg/l |
| NJ Pinelands | Reduction Based on model to maintain 2 mg/l at property line |
| State of Rhode Island | 19 mg/l |
| Barnstable County, MA | 19 to 25 mg/l |

Figure 5: Alternative Onsite Septic Systems Nitrogen Effluent Limit

## Section 5: Alternative Onsite Sewage Disposal Systems Capable of Nitrogen Reduction

Figure 6 depicts the number of alternative onsite sewage disposal systems currently installed in the jurisdictions visited. Compared to the total number of onsite sewage disposal systems, Rhode Island has the highest percentage of alternative septic systems installed. Approximately 3.86% of the systems installed in Rhode Island are alternative systems capable of nitrogen reduction. The number of alternative systems in the other areas visited account for approximately 1.0% to 1.4% of the total onsite sewage disposal systems.

Figure 7 outlines the system models that have been installed and are currently still permitted to be installed in the jurisdictions visited on the Tour. Bio Microbics FAST is the only system approved for use in all four jurisdictions visited. Bioclere, Amphidrome, SeptiTech, AdvanTex AX20, and Singulair TNT are approved in at least 3 of 4 regions visited. Most of the systems approved for use utilize an Integrated Fixed Film Activated Sludge (IFAS) Process. The membrane bioreactor (MBR) systems, according to George Heufelder at Massachusetts Alternative Septic Systems Test Center, provide the ability to remove some pharmaceuticals products that could impact groundwater quality. There is much about the University of Florida's Gulf Coast Research and Education Center is well along with a non-proprietary, passive biofiltration system.

Approximately 400 new advanced technology systems are installed in Barnstable County, MA per year. Local towns are responsible for permitting septic systems and determine when an alternative system must be installed for new construction or upgrades. In Barnstable County flow per acre is limited to 440 gpd/ac, in order to increase flow per acre, nitrogen reducing alternative systems may be installed. In addition, if flow is over 2000gpd then nitrogen reducing alternative system must be installed.

In Maryland there are approximately 1,200 and 2,000 new I/A system installs each year. Maryland requires all new or replacement onsite sanitary systems located in identified critical areas to be nitrogen removing. In addition, all new sanitary systems within the Chesapeake Bay watershed and Atlantic Coast bays or in other bodies of water impaired by nitrogen.

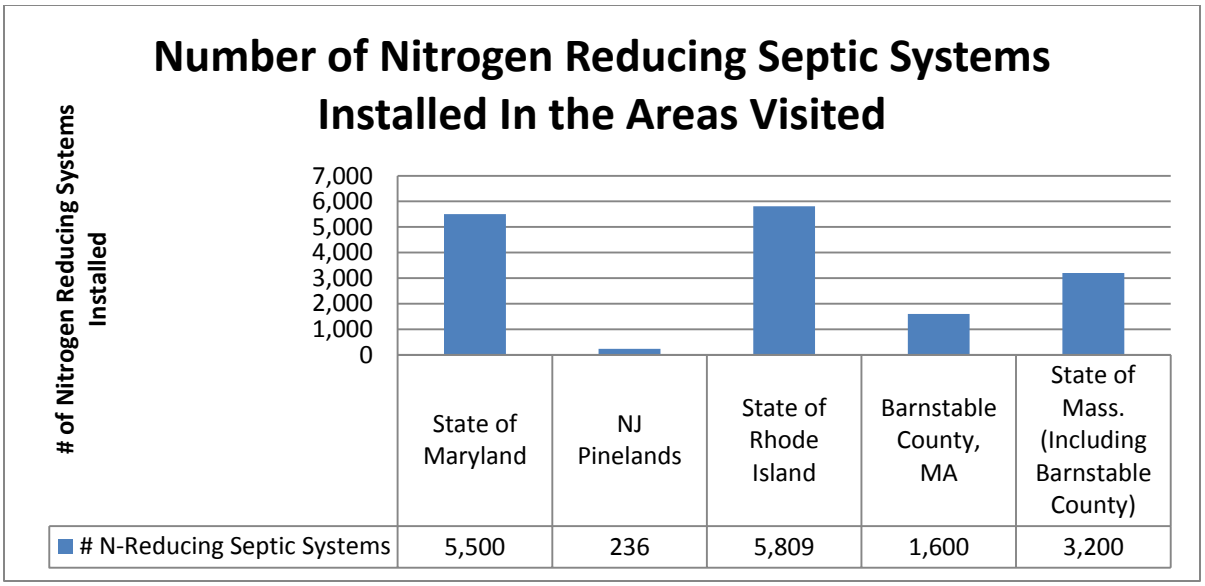


Figure 6: Number of Nitrogen Reducing Septic Systems Installed

| Nitrogen Reducing Alternative Septic Systems Permitted to be Installed In Areas Visited | | | | | | |
|---|---|---|---|---|---|---|
| **System** | **Company** | **Type of Treatment** | **Maryland** | **NJ Pinelands** | **Rhode Island** | **Barnstable County, MA** |
| Amphidrome | F.R. Mahony & Assoc | Fixed Film SBR | | X | X | X |
| Bioclere | Aqua Point Inc | Modified trickling filter | | X | X | X |
| Cromaglass | Cromaglass Corp | SBR | | | | |
| Fast | Bio-Microbics, Inc | IFAS | X | X | X | X |
| MicroFAST | Bio-Microbics, Inc | IFAS | | | | X |
| Bio Barrier | Bio-Microbics, Inc | MBR | | X | | X |
| Busse GT | Busse Green Tech. | MBR | | X | | |
| Hoot ANR | Hoot Systems, LLC | Extended Air | X | X | | |
| SeptiTech | SeptiTech, LLC | IFAS | | X | X | X |
| Singulair TNT | Norweco | Extended Air | X | | X | X |
| Singulair Green | Norweco | Extended Air | X | | X | |
| AdvanTex AX20 | Orenco | IFAS | X | | X | X |
| AdvanTex AX100 | Orenco | IFAS | | | X | X |

| Nitrogen Reducing Alternative Septic Systems Permitted to be Installed In Areas Visited (continued) | | | | | | |
|---|---|---|---|---|---|---|
| **System** | **Company** | **Type of Treatment** | **Maryland** | **NJ Pinelands** | **Rhode Island** | **Barnstable County, MA** |
| Advantex AX-RT | Orenco | IFAS | X | | X | X |
| RUCK | Innovated RUCK Systems | | | | | X |
| Waterloo Biofilter | Waterloo biofilter | Attached growth Trickling Filter | | | | X |
| Recirculating Sand Filters | | Recirculating Sand filter | | | | X |
| Nitrex | Lombardo Associates | Trickling Filter | | | | X |

**Figure 7: Types of Nitrogen Reducing Systems Installed (IFAS – Integrated Fixed Film Activated Sludge Process, SBR – Sequence Batch Reactor, MBR – Membrane Bioreactor)**

## Section 6: Training and Testing Centers

University of Rhode Island New England Onsite Wastewater Training Program center and Barnstable County Department of Health Massachusetts Alternative Septic Systems Test Center were, respectively, toured as part of the trip.

The University of Rhode Island New England Onsite Wastewater Training (NEOWT) Program is operated by George Loomis. NEOWT offers classroom and field training experience for wastewater professionals, regulators, municipal and state officials, watershed groups, and homeowners. The Onsite Wastewater Training Center ("OWTC") located at the University's Peckham Farm. It is a demonstration and field training facility for both conventional and innovative and alternative septic system technologies. The center is operated in partnership with over 40 private sector contractors, the RI Department of Environmental Management, the USEPA and others. They have twenty-two full scale systems constructed above ground for hands-on learning at the OWTC. Additionally, there are over fifty demonstration and research systems installed in six Rhode Island communities. Monitoring data from these systems are currently being reviewed to help evaluate system performance.

NEOWT provides training classes to installers, operators, design professionals, and governmental officials. The center conducts approximately 50 classes a year with registration fees varying from $120 to $225 per class. Classes are conducted on installation of septic systems, surveying, system inspections, designing systems, and system operation. Systems installed at the test center for classes are above ground and operated with clean water.

**Figure 8: New England Onsite Wastewater Training Center**

Barnstable County Department of Health Massachusetts Alternative Septic Systems Test Center is operated by George Heufelder. The test center went into operation in 1999 testing advanced onsite septic systems capable of reducing pollutants in wastewater, which include nitrogen reducing technologies. Companies pay to have the center test their systems to certify that they system meet one of these four accepted certifications: (1) National Sanitation Foundation (NSF) NSF 245 standards, (2) U.S. Environmental Protection Agency (EPA) Environmental Technology Initiative (ETI), (3) National Sanitation Foundation (NSF) Environmental Technology Verification (ETV), (4) National Sanitation Foundation (NSF) NSF 40 standards. In addition to certification tests, the center performs various other research projects.

**Figure 9: Barnstable County Department of Health Massachusetts Alternative Septic Systems Test Center**

## Section 7: Septic System Inspections at the Time of Property Transfers and Septic System Upgrades

New Jersey requires sanitary systems with cesspools be upgraded at the time of property transfers to a conventional septic system. As of 2012, New Jersey requires all cesspools be upgraded to a conventional onsite septic system.

Each town in Barnstable County has their own health department with the authority to approve the installation of onsite septic systems. In addition, the towns can require septic system inspections at the time of transfer, as the Town of Eastham does. The local Health Department reviews the inspection report to determine if the septic system must be upgraded. The state requires the inspections at time of transfer, but a town may obtain approval for another approach – one town required inspections every 7 years and therefore did not require inspections at the time of transfer.

Rhode Island enacted the Cesspool Phase-Out Act in 2007 requiring all existing parcels utilizing cesspools to be upgraded with a new onsite wastewater treatment system or connected to a sewer system by 2014. Cesspools located within 200ft of a water body or public/private drinking water (critical area) well must be upgraded. Parcels located within specified critical areas that did not have a system on record or sewer connection were notified to be compliant within 3 years. Cesspools located within the Special Area identified by CRMC must be upgraded to nitrogen reducing systems. Rhode Island's attempt to pass a point of sale law eliminating all cesspools failed twice, but will be reintroduced. Since 2008 Rhode Island requires nitrogen reducing septic system if the property is located in a critical resource area and when an alteration by increasing dwelling area by 50%, repairs, or new construction takes place (adding 2 bedrooms is considered new construction).

## Section 8: Financing Installation of Alternative Onsite Sewage Disposal Systems

Alternative septic systems capable of nitrogen reduction can cost $9,000 to $24,000 for the treatment system alone (not including septic tank and leaching field). In order for individual homeowners to pay for the advanced system the regions visited provide grants, low interest loans, and/or tax incentives, as well as a hardship provision that extends time for installation (RI).

Figure 10 lists the cost of approved systems with 5 years of O&M for Maryland-approved technologies. In addition to unit cost, the homeowner must pay the increased electrical cost to operate the system ($50 to $100 per year). After five years the homeowner must continue an O&M contract ranging from $90 to $400 per year.

| BAT Approved technologies | Cost of Purchase, installation and 5yr O&M | O&M Per Year After 5 year Contract |
|---|---|---|
| Orenco Advantex AX20 | $12,300 | $200 |
| Orenco Adevantex AX20RT | $12,300 | $200 |
| Hoot BNR | $11,954 | $150 |
| Norweco Singulair TNT | $11,079 | $90.88 |
| Norweco Singulair Green | $11,079 | $90.88 |
| Septitech M400 denite | $13,056 | $399 |
| Bio-Microbics RetroFAST | $9,405 | $300 |

**Figure 10: Cost of Maryland Nitrogen Reducing Treatment Unit**

The Maryland Department of Environment (MDE) provides grant funding to pay for the nitrogen reducing treatment system only (excludes the cost of leaching field and septic tank) through the Bay Restoration Fund (BRF). Revenue for the BRF is collected by a charge to sewered and on-site septic users. The fee for sewer users is $5.00 per month and is used to upgrade sewage treatment plants to meet an effluent of 3.0 mg/l nitrogen (Wastewater Treatment Plant Funds). The fee for onsite septic system users (Onsite Disposal Fund) is the same on an annual basis at $60 and goes toward the upgrading of existing systems to nitrogen-removing systems or sewers connections.

The BRF fee is added as a property tax or separate bill depending on municipality. If there is a water company, the surcharge is added to the water bill as a separate line item. Each county is responsible for collecting the fees and submitting them to the state comptroller. The comptroller then takes 0.5% for administrative costs, 60% dispersed to MDE to fund upgrades to sanitary systems, and 40% to Agriculture Water Quality Cost Share Program. The Agriculture Water Quality Cost Share Program provides farmers with grants to cover up to 87.5% of the cost to install conservation measures to prevent soil erosion manage nutrients and safeguard water quality. MD stated they prefer not to fund new systems and just require the denitrification component, thus using most funding for existing systems, to realize full benefit of the program. These funds are distributed to the local municipalities based on total numbers of septic systems versus the number of systems in the critical area.

The BRF prioritizes onsite sewage disposal system (OSDS) upgrades as follows:

1. Failing OSDS or holding tanks in the Critical Areas (Critical area within 1,000ft from tidal areas)

2. Failing OSDS or holding tanks not in the Critical Areas

3. Non-failing OSDS in the Critical Areas including new BAT systems

4. Non-Failing OSDS outside the critical areas

Approximately 1,200 of the 2,000 BAT systems installed per year are 100% funded by the BRF. In addition, grant funding can be used to pay for the full cost of the system (BAT system plus septic and leaching) for low income participates. Granted funds are paid for BAT systems when the homeowner submits three (3) bids for MDE for review. After completion of installation of the upgraded system, payment is made directly to the installer following a double sign-off by the State and the property owner (MD initially reimbursed the homeowner, but found that some homeowners were not installing and pocketing the grant money). MD found that prices were being inflated, so they RFPed and set

reimbursement rates. There could be a tiered rate based on level of treatment if targeting various mitigation levels.

Figure 11 states the cost of onsite septic system treatment unit with 5 years of O&M for NJ Pinelands Commission approved technologies. In addition to the unit cost, after five years the homeowner must continue an O&M contract ranging from $600 to $1000 per year. It is the priciest of the four states.

The NJ Pinelands Commission does not offer any financing options for upgrades to existing sanitary systems. The New Jersey Environmental Infrastructure Financing Program can provide funding to replace failing systems provided the local governing body or utilities authority establish a septic management district for financing, planning and corrective measure costs. The New Jersey Pinelands Commission has contracted with Stone Environmental Inc. to assist local entities throughout the Pinelands Area, (towns, counties, etc.) in the development and implementation of long term programs for the management of septic systems.

| System | Ave. Treatment System Cost & 5yr Service Cost | Ave. Total Cost |
|---|---|---|
| Amiphidrome | $19,196 | $31,492 |
| Bioclere | $17,654 | $31,866 |
| Cromaglass | $22,345 | $35,262 |
| FAST | $17,819 | $29,633 |
| Bio Barrier | $15,000 | N/A |
| Busse GT | $24,000 | N/A |
| SeptiTech | $16,700 | N/A |
| Hoot ANR | $14,500 | N/A |

**Figure 11: NJ Pinelands Alternative Septic System Costs**

The Rhode Island Clean Water Finance Agency uses State Revolving Loan Fund to provide 2% loans to residential borrowers to upgrade/repair onsite sanitary systems provided the community has a state-approved wastewater management plan. The community receives a 0% loan from the Clean Water Finance Agency, then issues to the borrower at 2% for 10 years with a max loan of $25,000. If the borrower defaults, a lien is placed on the property.

Barnstable Community Loan Program loans homeowner money to upgrade their sanitary system in the event of a system failure. The County borrows money from the state revolving loan fund at a 0% interest rate, then issues to the borrower at 5% for up to 20 years. If a composting Eco-toilet is installed, it's at 0%. A single-party check issued to contractor for work completed with benefit assessment to the property securing payment.

In addition to the loans, the State of Massachusetts offers a tax credit for 40% for repair or replacement of failed cesspools or septic systems up to $6000, spread over 4 years at $1500 per year (none have been extended to date).

| Region | Loan | Grant | Tax Incentive |
|---|---|---|---|
| Maryland | -- | Bay Restoration Fund Provides grants for total cost of treatment unit. Funded by $60/year fee assessed to onsite septic system owners | -- |
| NJ Pinelands | NJ Environmental Infrastructure Financing Program can provide funding to replace failing systems. The local governing body or utilities authority must form a septic management district to receive financing. | --- | --- |
| Rhode Island | RI Clean Water Finance Agency issues loan to local community (w/ plan) at 0% which issues to the borrower @ 2% for 10 years with at a max of $25,000 | --- | --- |
| Barnstable County, MA | Barnstable Community Loan Program 5% for 20 years. 0% loan for composting unit | --- | tax credit for 40% for repair or replacement of failed cesspools or septic systems up to $6000, spread over 4 years @ $1500/year |

Figure 12: Septic System Financing Options

## Section 9: Operations and Maintenance & Tracking

Each jurisdiction requires the cost of alternative systems include an operation and maintenance (O&M) agreement for varying periods of time. Maryland BAT technologies require a 5-year O&M contract, and property owners are expected to continue thereafter. Maryland hasn't instituted an enforcement system to determine whether homeowners are in compliance on O&M. All BAT technologies must be inspected at least once every year and the service provider must notify the local authority, MDE and the manufacturer of the service performed, and service record maintained, available to MDE or approving authority upon request.

O&M for NJ Pinelands Commission includes quarterly samples for 3 years. After the contract expires the NJ local Health Departments are required to make sure O&M contracts are in place.

Rhode Island requires a minimum 2-year O&M contract with yearly extensions thereafter. The O&M contracts must be recorded with the State Land Evidence Records before a certificate of occupancy is issued. The state does not track the O&M contract after the 2 years.

Barnstable County, MA also requires such a minimum of 2 years O&M contract with yearly extensions thereafter. In 2005, the county deployed a tracking database designed by Carmody Data Systems. All maintenance and sample results must be entered into the tracking system. The system identifies failure rates and pumping rates to determine if system is failing. Alerted to O&M expiration, the County calls the owner and sends a letter notifying the homeowner. Upon a 2nd alert, a certified letter is issued and the homeowner may be called into a hearing. Local Boards of Health can fine (approximately $250) homeowners if O&M not maintained.

Figure 13 (below) indicates the approximate maximum range of effluent total nitrogen in some of the models of alternative systems installed on Cape Cod based on tracking information from their Carmody System.

| System | Approximate Max. Effluent TN mg/l Range |
|---|---|
| BioMicrobics Fast | 10 to 45 |
| HOOT | 53.9 (1 sample) |
| Advantex | 12 to 45 |
| Amphidrone | 18 to 70 (7 samples) |
| SeptiTech | 10 to 30 |
| Singulair | 10 to 50 |
| RUCK | 16 to 65 |

**Figure 13: Effluent Nitrogen from Barnstable County Tracking System based on Maximum Effluent Data (Note: these are approximate ranges)**

The Carmody System provides the ability to generate box-whisker diagrams using minimum and maximum total nitrogen sample data. These diagrams may be used to help evaluate a systems performance. Figure 14 depicts the diagram using the nitrogen data from the 449 BioMicrobics FAST systems installed on Cape Cod. The required effluent nitrogen range of 19 to 25 mg/l is stated on the right side of the diagram. It should be noted that some of the data falls outside the average effluent nitrogen range, which may be attributable to system downtime due to maintenance or fluctuations in water usage, nitrogen and BOD loading, temperature, and occupancy.

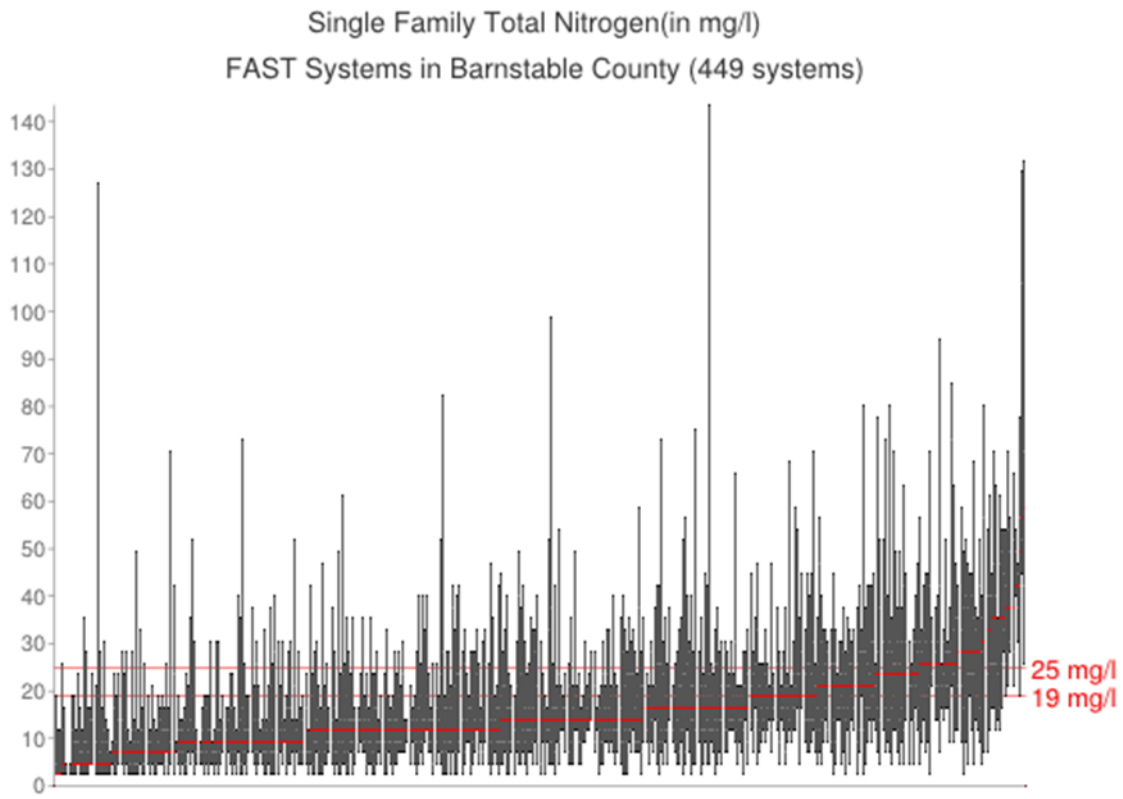


Figure 14: Barnstable County BioMicrobics FAST Total Nitrogen Effluent Data Graph

## Section 10: Transfer of Development Rights

Transfer of development right (TDR) programs for each region were evaluated to determine if TDR's were integral to the control of nitrogen within each municipality. Maryland does not have a TDR program at the State level, but rather within the local county jurisdictions.

Rhode Island does not have a transfer of development right program, but permits upgrading of neighboring sanitary systems to nitrogen reducing technologies to permit the increase in dwelling bedrooms on a small lot. For example: The minimum lot size for a dwelling with 3-bedrooms is 20,000sf with a conventional system or 10,000sf with a nitrogen reducing system. Therefore, when proposing a 4-bedroom dwelling on a 10,000sf lot with a nitrogen reducing system then you may propose to upgrade a neighboring septic system to a nitrogen reducing system to obtain the 4th bedroom (Only 2 since 2008).

Property owners within the New Jersey Pinelands can sell credits from their property if it is within three designated sending areas. These credits then may be purchased by developers wishing to increase density in designated regional growth areas.

The Barnstable County Cape Cod Commission, as part of their regional policy plan, will evaluate the feasibility of a regional transfer of development rights program. The Cape Cod Commission has established areas where there can be no net increase in nitrogen loading. Like Rhode Island, for new construction requires the installation of an I/A nitrogen-reduction system on the subject parcel as well on a neighboring lot.

## Section 11: Constructed Wetlands Wastewater Treatment Systems

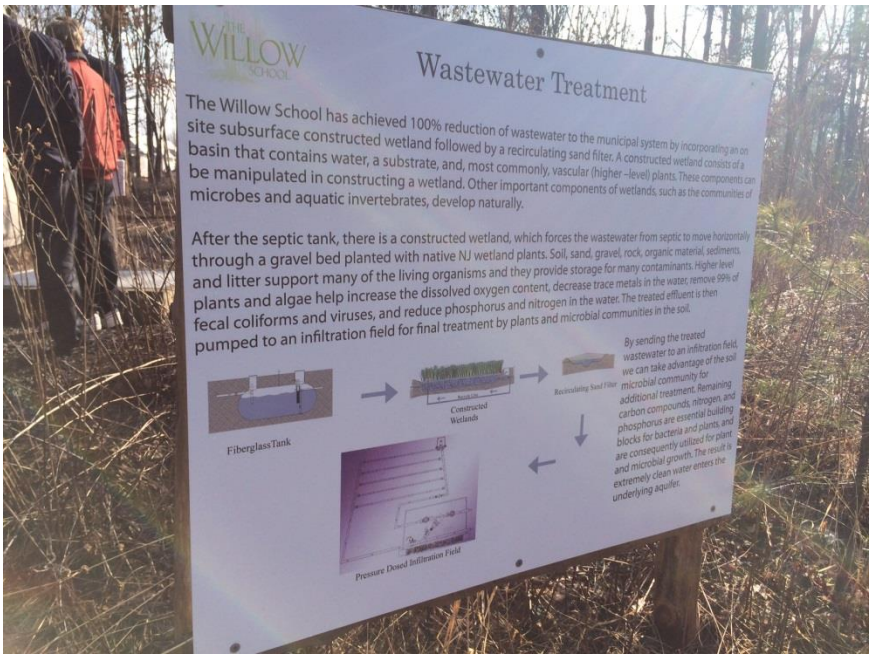


**Figure 15: Willow Wood System Treatment Plan Sign and Description of Process Posted at Site**

The group toured the vegetated recirculating gravel filter wastewater treatment system at the Willow School in Gladstone, NJ. Dave Smith, P.E., of Natural Systems Utilities, which installed the system, described how it is designed for a flow of 5,000 gpd to serve 216 students and faculty. The system measures approximately 45’ x 90’. Flow is collected via sewer collection system and discharged into a septic tank (Figure 16). Flow from the septic tank enters a gravel bed planted with native NJ wetlands plants where nitrogen reduction results from recirculation (recirculation rate of approximately 5x flow, according to Smith). Soil, sand, gravel, rock, organic material, and sediments support many of the living organisms and store many contaminants. Higher level plants and algae help increase the dissolved oxygen, decrease trace metals in the water, remove 99% of fecal coliforms and viruses, and reduce phosphorus and nitrogen in the water. The treated effluent is sent to a recirculating sand filter for polishing then pumped to an infiltration field for final treatment by plants and microbial communities in the soil.

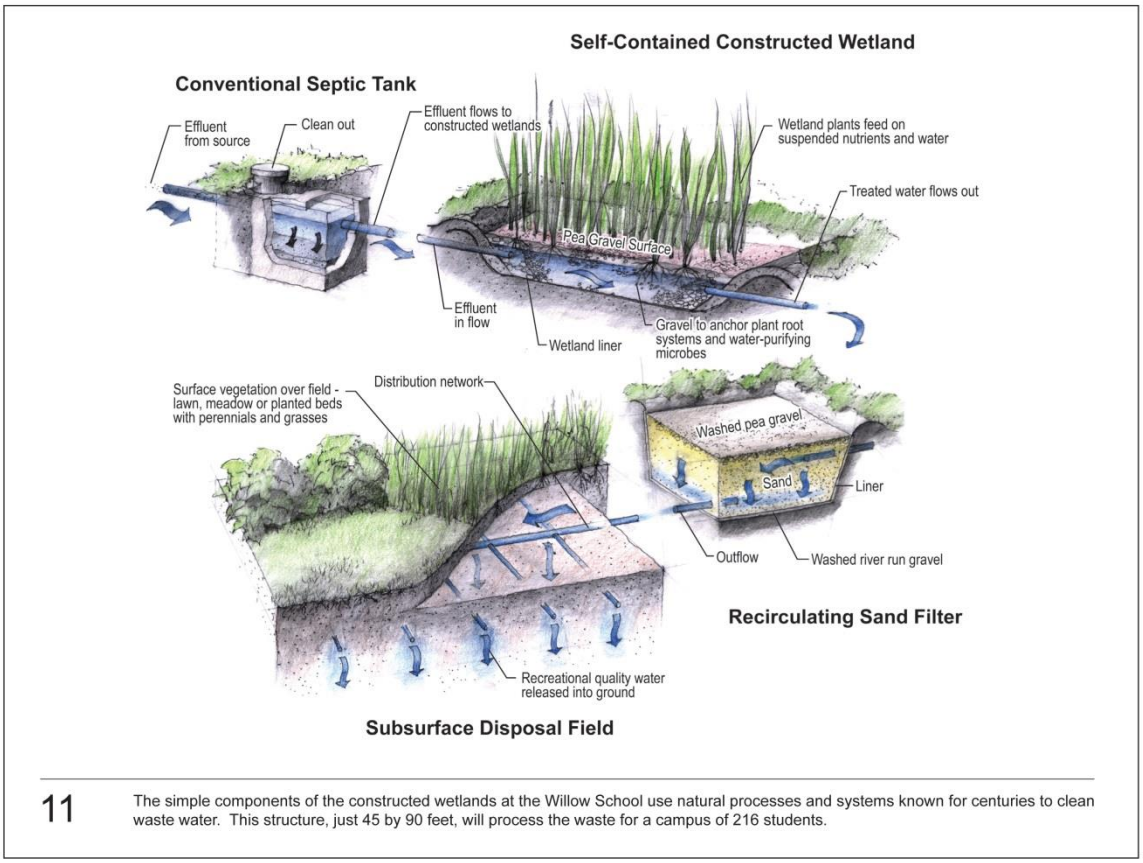


**Figure 16: Diagram of Constructed Wetlands Treatment Unit Installed at the Willow School**

## Section 12: Suffolk County Policy Formulation/Plan for the future use of alternative onsite septic systems

***Planning***:

- Update master plan for the county covering issues of development and protection/improvement of water quality. Plan should be updated with information from water quality and wastewater studies
- Water quality study –develop a water quality baseline, set groundwater nitrogen limits, determine/update TMDL's for surface waters, and model % reduction of nitrogen in wastewater to meet goals on a sub-watershed level.
- Wastewater study - Based on water quality study goals, determine areas to be sewered, areas to utilize decentralized systems, areas to use nitrogen reduction onsite septics, and areas for conventional systems. Model impacts to justify areas, given that, according to one source, "97% of Suffolk County lies within an area in need of water protection."
- Subsequent to implementation, Suffolk County should perform follow-up to determine the efficacy of nitrogen reduction in the groundwater and surface waters.
- Demonstration Program - Suffolk County is currently in the process of issuing a Request for Expressions of Interest (RFEI) from manufactures.
    - Review technical data, such as NSF 245 certification reports, energy consumption data, maintenance requirements, from those manufacturers wishing to install systems in Suffolk County to determine eligibility.
    - Recruit suitable Suffolk residents for the right to install such systems with the proviso to install, test, and maintain systems over a three-year period.
    - Site selection should be prioritized based on (a) a failing system, (b) an existing block cesspool (c) an existing precast cesspool systems (d) a conventional system close to a public well or surface waters (e) all other types of sites.
    - Possible candidates installed in four jurisdictions visited are Bio Microbics FAST, Bioclere, Amphidrome, SeptiTech, AdvanTex AX20, and Singulair TNT. In addition, Busse GT and Bio Barrier should be also be evaluated for capacity to remove some pharmaceuticals.
    - Key system characteristics include efficacy, footprint, initial cost, O&M cost
- Review the use of non-proprietary systems as compared to proprietary systems in terms of engineering, design, liability, operation and maintenance, affordability, etc.
- Investigate and if applicable, promote the use of alternative leaching technologies as approved under NYS Appendix 75A and used in the jurisdictions visited. Such technologies are pressure dosing leaching systems, shallow narrow drain fields, etc.
- Develop a Responsible Management Entity (RME) and online tracking system
- In conjunction with SUNY Stony Brook University and/or URI, Suffolk may want to evaluate a training center similar to Rhode Island's to provide classes to local and out-of-state operators, installers, and design professionals. Classes, modelled on URI would

teach fundamentals of installation, maintenance, operation, sampling, monitoring, and design. This would be an avenue to licensing installers and operators testing non-proprietary solutions and new/other systems.

***Financial:***

- Investigate the use of NYS SRF fund to provide loans to homeowners for sanitary system upgrades
- Evaluate grant funds and tax incentives for sanitary system upgrades
- Ascertain construct of RME
- Develop cost/benefit case for alternative nitrogen reduction systems

***Staffing:***

- Determine the staffing requirements for septic upgrade program (SUP):
  - Permitting installations,
  - Inspections
  - Monitoring
  - Enforcement
  - Financing

***Standards/laws:***

- Evaluate enabling legislation and code for upgrades
- Consider certification of sanitary systems at time of property transfers
- Evaluate fee's akin to Maryland's BRF and assignment to tax water or sewer bills as well as grant funding.
- Consider tax credits for upgrades.
- Consider law requiring upgrades to cesspools
- Update the SC Sanitary Code Article 6 to provide powers to the SC Dept. Health to act in concert with a management district requiring tracking, piloting requirements, enforcement of O&M's, Update SC Dept. Health Services Office of Wastewater Management Residential and Commercial Standards to permit the use of alternative sanitary systems with construction standards such as setbacks, locations, nitrogen number as well as flow analysis. Evaluate locations that need a change in minimum lot size. Reexamine 'grandfathering' of systems and permitting requirements, depths to groundwater, etc.

## <u>Appendix A:</u> Maryland Meeting Notes March 19, 2014 with Maryland Department of Environment (MDE) Onsite Systems Division

*Attendees from Maryland:*

*Jay Prager, Deputy Program Manager Bay Restoration/On-site Disposal Systems*

*Barry Glotfelty*

*Brian Cooper*

*Craig Williams*

From the Division's website the functions of the division are as follows:

> *"From the Onsite Systems Division provides technical assistance and direction to County Health Departments and Local Approving Authorities for the implementation of delegated programs for Onsite Sewage Disposal Systems (OSDS) and individual wells. This is of the utmost importance in carrying out our mission of protecting groundwater quality and public health.*
>
> *Some of the functions of the Onsite Systems Division are:*

1) *Co-review of OSDS equal to or greater than 5,000 gpd for compliance with the Large System Guidelines.*
2) *Provide guidance on the applicability and design of alternative and innovative systems*
3) *Provide guidance on the proper interpretation and enforcement of COMAR regulations 26.04.02, 26.04.03, 26.04.04 and 26.04.05, concerning onsite sewage disposal systems, subdivision of land, well construction and shared facilities*
4) *Provide guidance for site and soil evaluation, construction inspections, and enforcement issues, etc.*
5) *Certify Sand Mound Installers*
6) *Maintain a list of Individuals who have taken an approved course in the proper inspection of OSDS for property transfer*
7) *Well Construction"*[5]

The Chesapeake Bay watershed is composed of area from the states of Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia and the area of the District of Columbia (Bay Watershed partners). The US Environmental Protection Agency (EPA) has established the Chesapeake Bay Total Maximum Daily Load (TMDL). TMDL sets pollution limits necessary to meet applicable water quality standards in the Bay and its tidal rivers and embayment's. Specifically, the TMDL sets Bay watershed limits of 185.9 million pounds of nitrogen, 12.5 million pounds of phosphorus and 6.45 billion pounds of sediment per year (25% reduction in nitrogen, 24% reduction in phosphorus and 20% reduction in

5 http://www.mde.state.md.us/programs/Water/BayRestorationFund/OnsiteDisposalSystems/Pages/OnsiteSystems.aspx

sediment). These pollution limits are further divided by jurisdiction and major river basin based on state-of-the-art modeling tools.[6]

Based on the established TMDL Maryland developed a Watershed Implementation Plan. The plan provides a strategy to reduce pollution from sources (wastewater, storm water, and septic systems) within different geographic areas to meet final target loads. The Watershed Implementation plan is composed of three phases. Phase I was completed on December 31, 2010 and provide a series of proposed strategies that will collectively meet a 2017 targeted TMDL (70% of the total nutrient and sediment reductions needed to meet final 2020 goals). Development of Phase II of the plan occurred in 2011 and provides a more defined series of proposed strategies that will collectively meet the 2017 targeted TMDL (60% of the total nutrient and sediment reductions needed to meet final 2025 goals). The development of Phase III of the plan is expected to start development in 2017.[7]

Maryland has approximately 420,000 on-site septic systems. These septic systems contribute approximately 5-9% of the nitrogen loading to the Chesapeake Bay watershed (25% nitrogen from STP and 36% nitrogen from agricultural). Approximately 90% onsite septic system users also have a private well for means of a water supply. 52,000 of these systems are located in the "Critical Area" land within 1,000 feet of tidal wetlands. Approximately 5,500 septic systems have been upgraded to nitrogen reducing Best Available Technology (BAT). There are approximately 2,000 installs of BAT systems a year with approximately 500-600 voluntary upgrades a year.

The Maryland Department of Environment provides grant funding to pay for the nitrogen reducing treatment system only (excludes leaching field and septic tank) through the Bay Restoration Fund. In order to fund the Bay Restoration Fund a fee is charged to sewered users and on-site septic system users. The fee for sewer users is $5.00 per month and is used to upgrade sewage treatment plants to meet an effluent of 3.0 mg/l nitrogen (Wastewater Treatment Plant Funds). The fee for onsite septic system users (Onsite Disposal Fund) is a $60 annual fee and used to upgrade existing on-site septic system users to a nitrogen reducing system or connect lots to sewers.

Installers of BAT systems must be certified by the State of Maryland and the vendor. Each installer is required to take a state course before being certified by the State. In order for the state to issue final approval of the installed system, both the vendor and installer must approve the system before it is backfilled to protect the state from accountability.

The Bay Restoration Fund fee (approved by Maryland State Senate bill 320) is added as a property tax or separate bill depending on municipality. For example if there is a water company then the surcharge is tagged onto the water bill as a separate line item. Each county are responsible for collecting the fees and submitting to the state comptroller. The comptroller then takes 0.5% for administrative costs, 60% dispersed to DEP to fund upgrades to sanitary systems, and 40% to Agriculture Water Quality Cost Share Program. The Agriculture Water Quality Cost Share Program provides farmers with grants to cover up to 87.5% of the cost to install conservation measures to prevent soil erosion manage nutrients and safeguard water quality. These funds are distributed to the local municipalities based on the number of septic systems weighted against the number of septic systems in the critical area.

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6 http://www.epa.gov/reg3wapd/pdf/pdf_chesbay/FinalBayTMDL/BayTMDLExecutiveSummaryFINAL122910_final.pdf

7 http://www.mde.state.md.us/programs/Water/TMDL/ChesapeakeBayTMDL/Pages/programs/waterprograms/tmdl/cb_tmdl/index.aspx

The Bay Restoration fund prioritizes onsite sewage disposal system (OSDS) upgrades as follows:

1. Failing OSDS or holding tanks in the Critical Areas (Critical area within 1,000ft from tidal areas)
2. Failing OSDS or holding tanks not in the Critical Areas
3. Non-failing OSDS in the Critical Areas including new BAT systems
4. Non-Failing OSDS outside the critical areas

Approximately 1,200 of the 2,000 BAT systems that are installed a year are 100% funded. In addition, grant funding can be used to pay for the full cost of the system (BAT system plus septic and leaching) for low income participates. In order for grant funds to pay for the BAT system, the homeowner must submit three (3) bids for review by DEM then after the completion of installation of the upgraded systems the payment is paid directly to the installer after a double sign-off by the State and the property owner is received (MD initially reimbursed the homeowner, but found that some homeowners were not installing the systems and keeping the grant money).

The Maryland Department of Environment has formed the BAT Verification Program used to select systems that are capable of meeting nitrogen requirements. A system must achieve either a 50% or higher reduction of Total nitrogen at the arithmetic mean and/or a treated effluent total nitrogen of 30 mg/L or less, based on an influent of at least 60 mg/L or influent to effluent comparison. The verification process is outlined in figures 17 and 18. Figure 17: Flow Chart of MD Dept. of Environment BAT Verification Process Page 1.

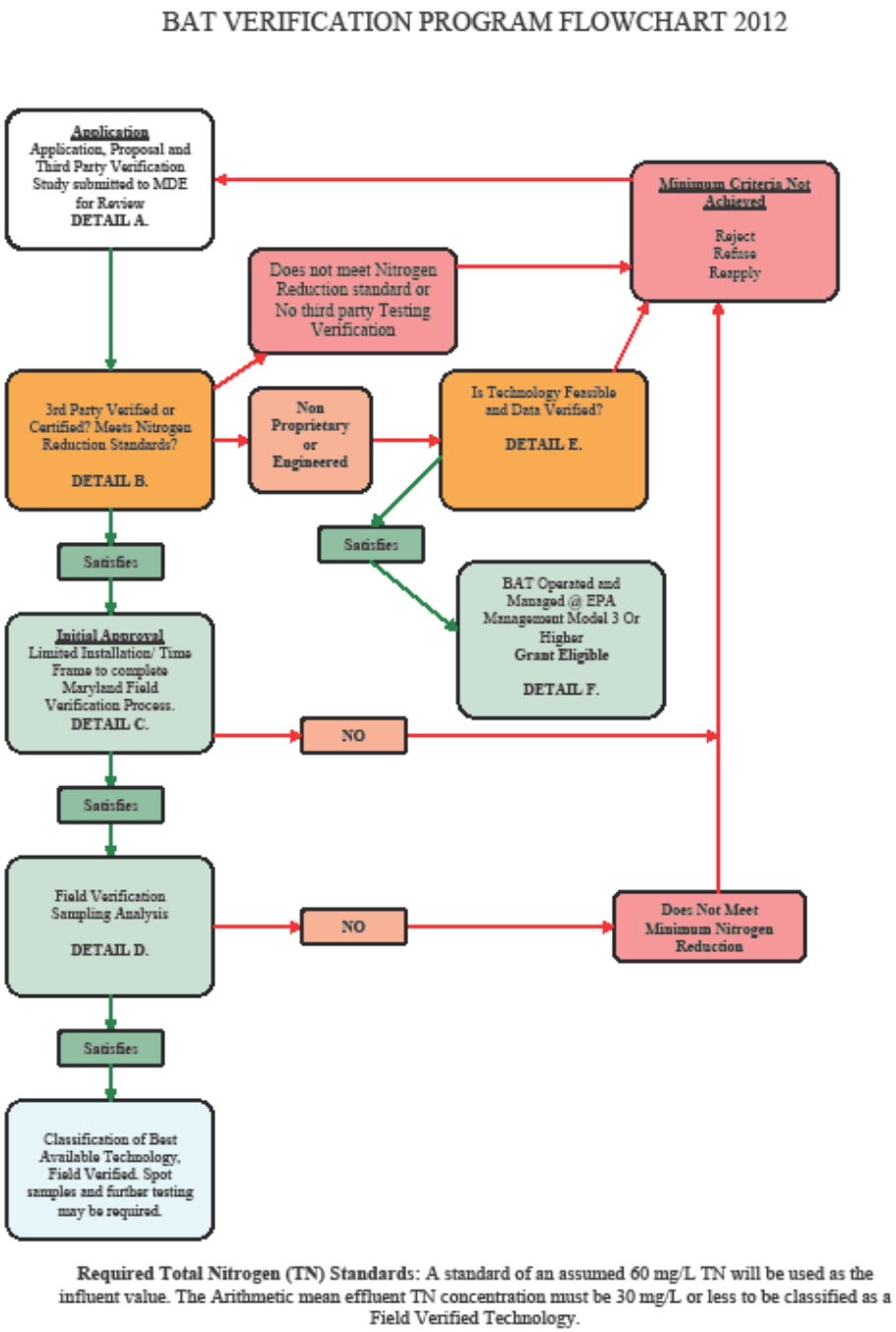



Figure 17: Flow Chart of MD Dept. of Environment BAT Verification Process Page 1

## BEST AVAILABLE TECHNOLOGY (BAT)

## VERIFICATION PROGRAM FLOWCHART DETAIL 2012

**Detail A.** Submit an application for BAT review to the Maryland Department of the Environment (MDE) including vendor contacts, general technology description, operating manuals and third party performance verification. NSF/ANSI 245-2010 is an example of a third-party testing standard for nutrient reduction residential wastewater treatment systems. The application is reviewed by the BAT Review Committee, which consists of 3 individuals with expertise and knowledge in nutrient reduction technologies. Any changes to the technology, throughout tenure of BAT classification, must first be presented to the BAT Review Committee for approval.

**Detail B.** The BAT Review Committee evaluates the third party evaluation/certification's test methods, independent performance evaluations and test results to verify the vendor's claim. The application must include average daily ambient temperature data. Daily average ambient air temperatures will be compared from the testing location for the duration of the testing to the Baltimore Region for the same time period. Not more than ten (10) sampling days in the test period should be greater then fifteen degrees (15°F) Fahrenheit warmer than that of the Maryland based comparison. If the results of the third party testing indicate the MDE nitrogen reduction standard can be met, the technology proceeds to Detail C and is approved as a provisional technology. If the results of the third party testing indicate the MDE nitrogen reduction standard cannot be met, the technology must re-apply. If the technology is individually engineered or deemed non-proprietary, proceed to detail E.

**Detail C.** Provisional technologies enter the Maryland Field Verification Process. The first twelve (12) installations, BRF funded or not, will be used in the initial analysis. Three (3) additional systems will be designated as reserve systems in the need of a replacement for one of the original twelve. MDE approval must be given prior to any changes. The vendor/applicant must submit a field verification plan that includes detailed instructions for collecting samples and a sampling schedule. All technologies must sample a minimum of 12 units 4 times each in consecutive quarters to include at least one quarter of winter time samples. Winter time is classified as December 15 through February 15 of a given season. Adequately trained sample collection personnel shall be provided by a certified laboratory and shall be independent of the technology vendor, technology vendor's authorized service provider and the system design engineer of record. The technology vendor is responsible for the training of the sampling laboratory personnel. All monitoring results must be reported to MDE and the local Approving Authority on an as sampled basis by the sampling organization. A service provider certified by the vendor and MDE shall be responsible for operating and maintaining the system. The review committee will analyze the sampling data on a quarterly basis. Should the arithmetic mean of the total nitrogen for the twelve systems in the verification program exceed 30 mg/L the technology will not be permitted to install any further systems for the duration of the field verification period. At the conclusion of the field verification period, the vendor/applicant shall submit to MDE final report that includes all monitoring information and a summary of all maintenance activities at the systems monitored.

**Detail D.** The BAT Review Committee is responsible for evaluating the final report submitted by the applicant/vendor at the conclusion of the field verification period. Forty eight (48) TN effluent data points per technology will be used in the analysis, no more or less will be considered unless previously approved by the review committee. The arithmetic mean of the effluent TN shall be equal to or less than 30 mg/l TN. If the nitrogen reduction standard has been met, the technology receives an unconditional approval. The Field Verification classification awards the Manufacturer to competitively market the BAT as a Field Verified Technology. Spot sampling may be required of technologies with unconditional approval. These spot samples may be used in an analysis for continuation of performance and viability of technology. Systems not meeting the nitrogen removal standard will either be rejected or remain in a modified field verification program. Any modified field verification program must be proposed by the vendor/applicant and approved by the BAT Review Committee. New installations of a technology will not be permitted while in a modified field verification program. The vendor must comply with all MDE and local regulations, policies and guidance.

**Detail E.** For non-proprietary technologies, the vendor/applicant must provide a detailed description of the technology process, which illustrates sound scientific fundamentals and engineering practice. Non-proprietary technologies which have undergone independent field verification through national demonstration projects, university research studies or other formal state verification programs may be approved as a highly managed system and enter Detail F. Technologies not demonstrated to meet the nitrogen removal standard are rejected.

**Detail F.** Highly managed systems must have renewable operating permits and/or a responsible management entity; or a combination of both. Plans must be submitted to and approved by the BAT Review Committee. Provisions must be made for sampling, reporting, maintenance and enforcement. Nitrogen reduction standards established for third party verified/certified systems must be met.

**Figure 18: Flow Chart of MD Dept. of Environment BAT Verification Process Page 2**

As of June 30, 2012 the technologies meeting the BAT verification include:

| BAT Approved technologies | Cost of Purchase, installation and 5yr O&M | O&M Per Year After 5 year Contract |
|---|---|---|
| Orenco Advantex AX20 | $12,300 | $200 |
| Orenco Adevantex AX20RT | $12,300 | $200 |
| Hoot BNR | $11,954 | $150 |
| Norweco Singulair TNT | $11,079 | $90.88 |
| Norweco Singulair Green | $11,079 | $90.88 |
| SeptiTech M400 denite | $13,056 | $399 |
| Bio-Microbics RetroFAST | $9,405 | $300 |

**Figure 19: Approved BAT, Cost of Install, and Yearly O&M Costs**

The BAT technologies come with a 5 year Operation and Maintenance Contract. After the 5yr contract has expired properties owners must continue a yearly maintenance contract (O&M between $90 to $400 per year plus electric of $50 to $100 per year). All BAT technologies must be inspected at least once every year and the service provider must notify the local authority, MDE and the manufacturer of the service performed. The service record must be maintained by the service provider and available to MDE or approving authority upon request.

In addition to the cost of the BAT unit, the homeowner must pay for the leaching. In Maryland they use shallow drain fields which can cost approximately $7,000. Drain fields are required to provide a minimum of 4ft vertical separation to groundwater, but in certain cases the separation is reduced.

Currently MD does not require system to be certified when property is transferred. In addition they do not require anything to be recorded against the property notifying future property owners that a BAT system is installed.

The state does not have a transfer of development rights (TDR) program. TDR programs are within the local counties jurisdiction.

## Appendix B: New Jersey Pinelands Commission Meeting Notes March 19, 2014

Representing the Commission: Edward Wengrowski, Environmental Technologies Coordinator

> "The New Jersey Pinelands Commission staff evaluates proposed unsewered development sites for their suitability for on-site wastewater systems based upon soil and groundwater conditions and for potential impacts from nitrogen releases. In addition, a number of advanced on-site treatment technologies are being tested in the Pinelands to determine their reliability in meeting groundwater quality standards. Further, the Commission is actively involved in assisting local governments throughout the Pinelands in the development of long-term institutional arrangements for the management of on-site wastewater systems."[8]

The New Jersey Pinelands is approximately 1 million acres and an estimated 22,000 onsite sanitary systems located in the Pinelands. Currently there are approximately 236 alternative onsite sewage disposals installed in the Pinelands. New Jersey requires sanitary systems with cesspools to be upgraded at the time of property transfers. As of 2012, New Jersey requires cesspools to be upgrade to a conventional onsite septic system.

The NJ Pinelands Commission does not offer any financing options for upgrades to existing sanitary systems. The New Jersey Environmental Infrastructure Financing Program can provide funding to replace failing systems provided the local governing body or utilities authority establish a septic management district for financing, planning and corrective measure costs. The New Jersey Pinelands Commission has contracted with Stone Environmental Inc. to assist local entities throughout the Pinelands Area, (towns, counties, etc.) in the development and implementation of long term programs for the management of septic systems.

In 2002, the Pinelands Comprehensive Management was amended to establish a Pilot Program for Alternative Design Wastewater Treatment System to reduce groundwater pollution form residential onsite septic systems. Based on the Pinelands Comprehensive Management Plan Pinelands Septic Dilution Model, the minimum residential lot size required in the NJ pinelands is 3.2 acres to provide 2.0 mg/l nitrogen at the property line. In order to build on smaller lots, to a minimum of 1 acre, and meet the 2.0mg/l in groundwater at the property line alternate nitrogen reducing technologies may be used. For a 1 acre lot to meet the 2 mg/l total nitrogen standard, these alternate nitrogen reducing technologies are expected to achieve the Pinelands Pilot Program effluent total nitrogen performance standard of 14 mg/l. A Committee was formed to perform a 2 year study to research and evaluate onsite treatment technologies capable of reducing nitrogen. Under the pilot program, five advanced treatment technologies were selected to participate in a 5 year Pilot Program to demonstrate their effectiveness at removing nitrogen from residential wastewater. The five systems were recommended by a consultant in a 2001 report titled "Performance Expectations for Selected On-Site Wastewater Treatment Systems" ( prepared by Anish R. Jantrania, Ph.D., P.E., M.B.A.).

The requirements of the pilot program are as follows:[9]

1) Plans for the systems must be prepared by a NJ professional engineer and must be certified by the technology vendor's in-house engineer.

[8] http://www.state.nj.us/pinelands/landuse/waste/
[9] http://www.state.nj.us/pinelands/landuse/waste/assp/index.html

2) The NJ professional engineer preparing the plan and the vendor's engineer will have to conduct final inspections and certify the system.
3) The systems must be covered under a 5 year warranty to assure homeowners that equipment failures will be covered during warranty period without additional cost to the homeowner.
4) The systems will be covered under a renewable, non-cancelable operation and maintenance contract which requires the service provider (vendors indicate these will be licensed wastewater treatment system operators) to periodically visit the site to monitor system operation, make necessary process adjustments, and pump solids as required.
5) The effluent from the systems will be sampled on a quarterly basis for a minimum of three years and analyzed by a NJ certified laboratory for nitrogen parameters. The results of the effluent monitoring will be provided to the Pinelands Commission which will maintain a database on each of the systems. In the event that a technology is determined to consistently fail to meet nitrate nitrogen removal expectations, the technology would no longer be considered for new installations;
6) The Pinelands Commission will conduct homeowner, engineer, installer, and registered environmental health specialist outreach and training efforts to facilitate proper use, design, installation and maintenance of the systems;
7) No more than ten of the same manufacturer's alternate design wastewater treatment system may be installed in the same subdivided development, except by special approval of the Executive Director; and
8) The property owner upon which an alternate design wastewater treatment system is installed needs to record with the deed to the property a notice that identifies the technology, acknowledges the owner's responsibility to operate and maintain it, and grants access to the property for the purpose of system monitoring.

The Original five Pilot Program reducing wastewater systems studied in the 1st round were:

| System Name | System Vendor | Treatment Process | Approx. Number Installed | Comments |
|---|---|---|---|---|
| Amphidrome | F.R. Mahony & Assoc | Fixed Film SBR | 100 | |
| Bioclere | Aqua Point Inc | Modified Trickling Filter | 57 | |
| Cromaglass | Cromaglass Corp | SBR | 56 | Recommend for Removal of Program 8/5/13 |
| Fast | Bio-Microbics, Inc | Fixed Film Activated Sludge | 23 | |
| Ashco RFSIII | Ashco-A-Corp | Recirculating Sand Filter | n/a | Removed from program 12/3/07 |

**Figure 20: Number of NJ Pinelands Commission Round 1 Pilot System Installed**[10]

[10] NJ Pinelands Commission, (August 5, 2013), *Annual Report to the New Jersey Pinelands Commission Alternate Design Treatment Systems Pilot Program.*

New NSF 245 Nitrogen Reducing Wastewater Systems to be studied in the 2nd round of the Pilot Program are:

| System Name | System Vendor | Treatment Process |
|---|---|---|
| Bio Barrier | Bio-Microbics, Inc | MBR |
| Busse GT | Busse Green Technologies | MBR |
| Hoot ANR | Hoot Systems, LLC | Extended Aeration/Activated Sludge |
| SeptiTech | SeptiTech, LLC | Fixed Film Trickling Filter |

**Figure 21: NJ Pinelands Commission Round 2 Pilot Systems[9]**

Pilot Program Technology Costs

| System | Ave. Treatment System Cost & 5yr Service Cost | Ave. Total Cost |
|---|---|---|
| Amiphidrome | $19,196 | $31,492 |
| Bioclere | $17,654 | $31,866 |
| Cromaglass | $22,345 | $35,262 |
| FAST | $17,819 | $29,633 |
| Bio Barrier | $15,000 | N/A |
| Busse GT | $24,000 | N/A |
| SeptiTech | $16,700 | N/A |
| Hoot ANR | $14,500 | N/A |

**Figure 22: Cost of NJ Pinelands Pilot Systems[9]**

Sites that utilize an alternative onsite sewage disposal system are required to file a deed notice to notify future homeowners of the existence of the system. If a system is removed from the pilot program then the homeowner may convert their system to a conventional onsite sewage disposal system. In 2012 New Jersey Department of Environmental Protection new standards require local Health Departments to ensure O&M contracts are maintained. Systems must be maintained by a licensed operator to perform O&M.

Transfer of Development Rights within the New Jersey Pine Barrens Region permits property owners to obtain credits for their parcel if they are located in one of three Pineland sending areas. These credits may be purchase by developers wishing to increase density in designated regional growth areas.

## Appendix C: Rhode Island Meeting Notes March 20, 2014 with New England Onsite Wastewater Treatment Center (NEOWT) at the University of Rhode Island and Rhode Island Department of Environmental Management (DEM)

*Attendees from Rhode Island:*

*Brian Moore, Rhode Island DEM*

*George Loomis, NEOWT*

*David Kalen, NEOWT*

Rhode Island DEM established Onsite Wastewater Treatment System Rules, which became effective July 9, 2012. The rules establishing minimum standards for the proper location, design, construction and maintenance of onsite wastewater treatment systems (OWTSs) used for the treatment and dispersal of wastewater. Rhode Island DEM issues all permits for onsite wastewater treatment systems. Rhode Island has approximately 150,000 onsite septic systems (15% of the septic systems are cesspools) installed. Between 30% and 50% of the onsite systems are cesspools.

In Rhode Island the Coastal Resources Management Council (CRMC) was authorized under the federal Coastal Zone Management Act of 1972 to develop and implement Special Area Management Plans (SAMPs) to address specific regional issues. These plans are ecosystem-based management strategies that are consistent with the council's legislative mandate to preserve and restore ecological systems. The CRMC coordinates with local municipalities, as well as government agencies and community organizations, to prepare the SAMPs and implement the management strategies. Based on the CRMC Special Area Management Plans for the South Shore Salt Ponds and Narrow River, all onsite septic systems located within these areas are require to be advanced septic system capable of nitrogen reduction (Standards for surface waters is 0.3 – 0.5 mg/L for TN and 14/100 m F coliform).

Failed onsite septic systems may be replaced with a conventional onsite septic system. In cases were the failed system is on very small lot, lot is in close proximity to wells and water bodies, or lots are subject to other constraints then a conventional onsite septic system may not be feasible and an alternative technology would be required. In addition under the Rhode Island septic system rules, cesspools within the CRMC Special Area Management Plans for the South Shore Salt Ponds and Narrow River have to be replaced with an advanced septic system that reduces nitrogen.

Only alternative technologies that have been approved and on Rhode Islands approved Alternative or Experimental Technology List are permitted to be installed. In addition, systems required to reduce nitrogen must reduce total nitrogen by 50% or to 19mg/l (takes approximately 100 days to develop process to reduce nitrogen in the system)). These systems are reviewed and approved by a nine member technical review committee composed of representatives of local government, the University of Rhode Island, CRMC, environmental organizations, and the private sector. Currently there are over 19,000 alternative and experimental OWTS installed in Rhode Island of which 5,809 have nitrogen reducing capabilities.

Nitrogen removing systems are classified as Alternative Class II systems in the DEM rules. In order to receive approval for a nitrogen reducing technology:[11]

- The applicant provides certification that the technology meets NSF/ANSI "Standard 245- Wastewater Treatment Systems- Nitrogen Reduction" and the testing results show a preponderance of treated effluent nitrogen concentrations of nineteen (19) mg/l or less; or
- demonstrates approval for use in another jurisdiction in an area where the temperature conditions are similar to or colder than those in Rhode Island and with technology review criteria substantially equivalent to Class One or Class Two summarized above and detailed in OWTS Rules 37.4.1 or 37.4.2 (A)-(B).

Class II certifications require renewal every five years.

The Following Systems are approved in Rhode Island for nitrogen removal:

1) AdvanTex AX20
2) AdvanTex AX100
3) AdvanTex AX-RT Series
4) Amphidrome
5) Bioclere
6) BioMicrobics Fast
7) Norweco Singulair TNT & Green TNT
8) SeptiTech M series

All installations of nitrogen reducing systems are required to come with 2 years of O&M and notice recorded into land evidence record to alert future property owners that the system exists. O&M contracts must be maintained after the 2 year period at an estimated cost of $250 to $400 per year. In addition, system maintenance and pumping is reported to jurisdictions via a web based system.

The Cesspool Phase-Out Act was passed in 2007 requiring all existing parcels utilizing cesspools to upgrade with a new onsite wastewater treatment system or connected to sewers system by 2014. The cesspool act affected areas where any cesspools located within 200ft of a water body or public/private drinking water well must be upgraded. DEM estimates the cost to upgrade to a conventional system to an ideal site to be$10,000 - $15,000 and $20,000 - $40,000 for a difficult site. In Comparison to cost to upgrade to an alternative system is $16,000 - $25,000 for an ideal site and $25,000 to $35,000 for a difficult site. For difficult sites, the cost to install an alternative system can be less expensive than the installation of a conventional system in some cases.

The Rhode Island Clean Water Finance Agency uses State Revolving Loan Fund to provide low interest loans to residential borrowers to upgrade/repair onsite sanitary systems provided the community has a state-approved wastewater management plan. Terms 2% for 10 years with a max loan of $25,000.

7 communities in Rhode Island have established a wastewater management plan, which requires mandatory inspection program. This permits the state to provide wastewater management planning grants to those communities. As part of wastewater management program, pumping records and point of sale ordinance can be considered in the plan.

[11] http://www.dem.ri.gov/programs/benviron/water/permits/isds/index.htm

Besides the Rhode Island Clean Water Finance Agency uses State Revolving Loan Fund other public funding options are available to homeowners:

Other sources of funding for Low to Middle class individuals:

- RIHMFC Home Equity Loans
- Home Equity Conversion Mortgage Loans for Senior Citizens
- CDBG Home Repair Program
- USDA Rural Development 504 Grants/Loans

Rhode Island does not have a transfer of development right program, but permits upgrading of neighboring sanitary systems to nitrogen reducing technologies to permit the increase in dwelling bedrooms on a small lot. For example: The minimum lot size for a dwelling with 3-bedrooms is 20,000sf with a conventional system or 10,000sf with a nitrogen reducing system. Therefore, when proposing a 4-bedroom dwelling on a 10,000sf lot with a nitrogen reducing system then you may propose to upgrade a neighboring septic system to a nitrogen reducing system to obtain the 4th bedroom (Only 2 since 2008).

Below is a description of the New England Onsite Wastewater Training Program (NEOWT) from their website:

"The New England Onsite Wastewater Training Program is located at the University of Rhode Island in Kingston, RI. The program offers classroom and field training experience for wastewater professionals, regulators, municipal and state officials, watershed groups, and homeowners. A primary component of the program is the Onsite Wastewater Training Center ("OWTC") located at the University's Peckham Farm. It is a demonstration and field training facility for both conventional and innovative and alternative septic system technologies. The OWTC is one of eight regional centers in the nation and has been in operation since 1993. It is operated in partnership with over 40 private sector contractors, the RI Department of Environmental Management, the USEPA and others. We have twenty-two full scale systems constructed above ground for hands-on learning at the OWTC. Additionally, there are over fifty demonstration and research systems installed in six Rhode Island communities. Monitoring data from these systems are currently being reviewed to help evaluate system performance."[12]

Rhode Island Onsite Wastewater Demo Projects, 1996 to 2005, was conducted by NEOWT and the knowledge gained from the project was transferred to DEM, which helped with policy/rule revisions. The demo project was a series of 5 demo projects in 7 communities. They installed 58 demo systems on sites with failed septic systems. Used lottery of failed systems, provided reduced costs to owner in return for 3 year access for education. The demo project obtained an agreement with homeowners for a 3 year period, which allowed staff to install, test, and maintain systems. Installation was donated by installers that wanted to understand how to install new technologies.

NEOWT provides training classes to installers, operators, design professionals, and governmental officials. The center conducts approximately 50 classes a year with registration fees varying from $120 to $225 per class. Classes are conducted on installation of septic systems, surveying, system inspections,

[12] http://www.uri.edu/ce/wq/OWT/index.htm

designing systems, and system operation. Systems installed at the test center for classes are installed above ground and operated with clean water.

## Appendix D: Massachusetts Meeting Notes March 21, 2014 with Massachusetts Alternative Septic Test Center, Cape Cod Commission, and Community Septic Management Loan Program

*Attendees from Massachusetts:*

*George Heufelder*, *Massachusetts Alternative Septic Test Center*

*Kendall Ayers, Community Septic Loan Management Loan Program*

Approximately 85% of Barnstable County, MA residences utilize onsite sewage disposal systems as a means of wastewater treatment. There are approximately 123,000 onsite septic systems installed in the county. These systems contribute a significant amount of nitrogen load to their groundwater and surface water resources.

Barnstable County, Massachusetts developed the Cape Cod commission, which developed a regional policy plan that is updated every five years to protect the region's resources such as public/private drinking water heads and surface waters. The county spent approximately $12 million over 20 years to perform studies and identify nitrogen loading targets for embayments. In addition they mapped nitrogen removal to meet goals by sub sheds. Approximately 80% of the nitrogen loading to surface and groundwater resources on the cape originates from onsite sewage disposal systems. Nitrogen reducing systems that are required to be installed on Cape Cod must reduce nitrogen by 50% to 19- 25 mg/l.

Each town in the County has their own Boards of Health that regulate the use of wells and onsite septic systems. The towns have delegated the county the rights to track innovative alternative septic (I/A) systems.

There are currently approximately 1,600 I/A systems installed in the Cape and additional 1,600 I/A installed elsewhere in the State. Approximately 400 new advanced technology systems are installed in Barnstable County, MA. per year. Local towns are responsible for permitting septic systems and determine when an alternative system must be installed for new construction or upgrades (normally required to be installed in determined nitrogen sensitive areas). In Barnstable County flow per acre is limited to 440 gpd/ac. If the proposed wastewater flow exceeds 440gpd/ac then nitrogen reducing alternative systems can be installed. In addition, if the wastewater flow is over 2000gpd then nitrogen reducing alternative system must be installed.

Barnstable County, in 2005, implemented a tracking database designed by Carmody Data Systems to track the systems installed. All maintenance and sample results must be entered into the tracking system. The system can identify failure rates and pumping rates to determine if system is failing. In addition, MA requires a minimum of 2 years of O&M with the purchase of the I/A system provided by the vendor. After the 2 year O&M expires homeowners are required to extend O&M on a yearly basis. O&M must be performed by licensed operators (Class 2 operator), When alert is received on the Carmody system indicating an O&M has expired, the County calls the owner and sends letter notifying the homeowner. If a 2nd alert is received then a certified letter is sent and the homeowner may be

called into a hearing. Local Boards of Health can issue a fine of approximately $250 to homeowners if O&M contracts are not maintained. The system can be accessed at http://www.barnstablecountyhealth.org/ia-systems/information-center/data-and-statistics/ia-box-whisker-diagrams to view performance data of the systems installed.

Massachusetts Energy and Environmental Affairs Department approves the types of alternative systems allowed to be installed in the state and outlines the piloting requirements for nitrogen reducing onsite septic systems in there "Title 5" section 15.285 and 15.286.

From their website:[13]

> *"Piloting: Piloting involves the installation, field testing, and technical evaluation to demonstrate that the technology can function effectively under the physical and climatological conditions at the pilot sites and provide environmental protection equivalent to a conventional Title 5 system. Click here for approval letters for technologies approved for piloting.*
>
> *•MassDEP will accept technologies for piloting when available data on the technology shows that it is likely to be able to provide a level of environmental protection at least equivalent to a conventional Title 5 system.*
>
> *•Piloting of a particular I/A technology may be conducted either for new construction or in remedial situations. Up to 15 sites per technology may be piloted.*
>
> *•Piloting must be done for at least 18 months and result in a full technical reporting of results. Piloting generally is not intended to address long-term operation and maintenance, although the information gathered during piloting should be used to understand these issues.*
>
> *•When a technology completes pilot testing, MassDEP can allow the technology to proceed to the Provisional Use Approval stage, require additional piloting, or disapprove the system. Piloting is considered successful if at least 75% of the pilot sites performed at the expected level of treatment for at least 12 months.*
>
> *•Piloting systems that meet performance goals are allowed to remain in place long-term. For piloting systems that exhibit problems, adjustments to system design and operation are necessary. In extreme circumstances, the piloting system may need to be replaced. To date, no piloting system has had to be replaced.*
>
> *Provisional Use: Provisional Use Approvals are intended to evaluate whether an I/A technology can provide environmental protection at least equivalent to a conventional system under actual field conditions in Massachusetts and with a broader range of uses than in the controlled environment of piloting. Click here for approval letters for technologies approved for provisional use.*

[13] http://www.mass.gov/eea/agencies/massdep/water/wastewater/massdeps-technology-approval-process-for-ia-systems.html

*•Provisional Use Approval typically occurs after a technology has been piloted successfully or has been proved satisfactory past performance over at least two years of general usage in one or more states outside Massachusetts. A system approved for Provisional Use can be installed in remedial situations or for new construction where a system in compliance with Title 5 could be built.*

*•Under Provisional Use Approval, a minimum of 50 systems must be installed and evaluated for at least three years.*

*•The Provisional Use Approval stage evaluates operation, maintenance, and monitoring issues, and MassDEP uses the data to set final discharge standards and other conditions for General Use.*

*•Provisional Use is considered successful if at least 90% of the installations have demonstrated over three year's performance at least equivalent to a conventional Title 5 system.*

*Certification for General Use: When an I/A technology has successfully completed the Provisional Use stage, it receives Certification for General Use. I/A systems certified for General Use can be installed at any site where a conventional Title 5 system can be installed. Additional monitoring and reporting is generally not required, although MassDEP has the option of requiring monitoring as part of its Certification.*

*MassDEP can determine that a technology certified for General Use may be used for new construction on lots that do not meet all of the requirements of Title 5 for installation of a conventional septic system. However, as of December 2003, no I/A technology has yet been certified for General Use for new construction on a lot that does not meet the required percolation rates, that does not have at least four feet of naturally occurring soil, or does not have the necessary separation from high groundwater."*

Currently there are only three (3) nitrogen reducing systems with a general use permit. Figure 23 lists the systems that are currently in use for nitrogen removal and in different stages of pilot program.

| | |
|---|---|
| Amphidrome | Norweco Singulair Green |
| Bioclere | Orenco AdvanTex AX100 |
| BioMicrobics Fast | Orenco AdvanTex AX-RT |
| BioMicrobics MicroFAST | RUCK |
| BioMicrobics Bio Barrier | Waterloo Biofilter |
| SeptiTech | Recirculating Sand Filters |
| Norweco Singulair TNT | Nitrex |

**Figure 23: Nitrogen removing systems permitted to be installed under Title 5 pilot requirements**

Barnstable Community Loan Program loans homeowner money to upgrade their sanitary system in the event of a system failure. The County borrows money from the state revolving loan fund at a 0% interest rate. Barnstable County then issues a loan to the borrower at 5% for up to20 years. If a composting toilet is proposed then the borrower can borrow the money at 0% to install the system. The borrower

makes payments monthly or quarterly to Barnstable County. A single-party check issued to contractor for work completed. A benefit assessment is placed against the property to ensure the payment of the loan (approximately 400 loans have been issued to date).

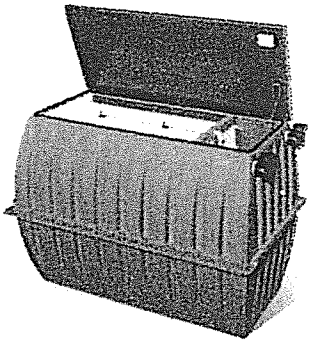
In addition to the loans, the State of Massachusetts offers a tax credit for 40% of the septic system cost up to $6000, which is spread over 4 years at $1500 per year.

The Barnstable County Department of Health Massachusetts Alternative Septic Systems Test Center is operated by George Heufelder. The test center went into operation in 1999 testing advanced onsite septic systems capable of reducing pollutants in wastewater, which include nitrogen reducing technologies. Companies pay to have the center test their systems to certify that the system meet one of four accepted certifications as follows: (1) National Sanitation Foundation (NSF) NSF 245 standards, (2) U.S. Environmental Protection Agency (EPA) Environmental Technology Initiative (ETI), (3) National Sanitation Foundation (NSF) Environmental Technology Verification (ETV), National Sanitation Foundation (NSF) NSF 40 standards. In addition to certification test, the center performs other various research projects.

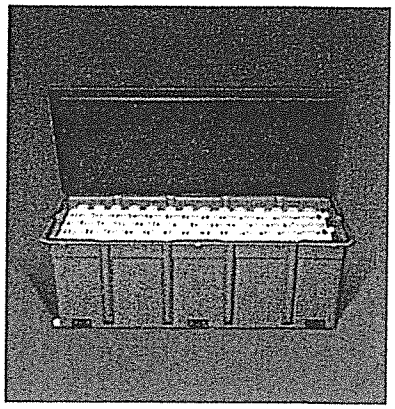
## INNOVATIVE ADVANCED TECHNOLOGY VENDORS - SUMMARY

| # | Name of Technology (# of units committed) | Location of HQ | Type of Technology | Treatment Process | Where It's Installed and # | Cost Installed (self-reported) | Annual Maintenance |
|---|---|---|---|---|---|---|---|
| 1 | Orenco Systems:<br>1) AdvanTex AX-20RT [1];<br>2) AdvanTex AX20 [1] | Sutherlin, OR (and regional rep in Lyme, CT) | Attached Growth Packed Bed Reactor | Process where microorganisms responsible for treatment are attached to textile media. | Approved & installed in MA (56), MD, RI. More than 20,000 systems in US and Canada | $12 - $15,000<br><br>Numbers assume using existing leaching pools | $200-$300<br><br>$12 Month Operating Cost |
| 2 | Norweco:<br>1) Singulair TNT [5];<br>2) Hydro-Kinetic [5] | Norwalk, OH | Extended Aeration Activated Sludge | Modification of activated sludge process where organisms remain in treatment process for longer period.<br><br>Singulair TNT consists of pre-treatment, aeration (Detention Time > 24 hrs) and secondary clarification chambers.<br><br>Hydro-Kinetic consists of pre-treatment, aerobic, aeration (DT > 21 hrs), clarification and final filtration chambers. | Approved & installed in MA (140 systems), MD, OH, RI and N. Canada. | Singulair – Installed Cost of $13,000<br><br>Hydro-Kinetic installed cost of $15,000<br><br>Numbers assume using existing leaching pools | $300<br><br>$12 Month Operating Cost |
| 3 | Busse Green Technologies Busse MF [2] | Oak Park, IL; (and local rep in Bridgehampton, NY) | Membrane Bio Reactor | Prepackaged Above Ground System with built-in Septic Tank; reduced system footprint. | Approved & Installed in ME (4). Approved in MD, NJ. Provisional use approval in MA (2). | $23K | $500 |
| 4 | Hydro-Action Industries - AN Series [5] | Plymouth, IN | Extended Aeration Activated Sludge | See #2 (above). (Detent-n Time > 24 hrs) | IL - 7,700 units, OH - 5,600 units, MD - 35 units | $12,500 Installed<br><br>Numbers assume using existing leaching pools | $250<br><br>Operation Cost in first year: $383.63<br><br>Operation Cost every year after: $205.34 |

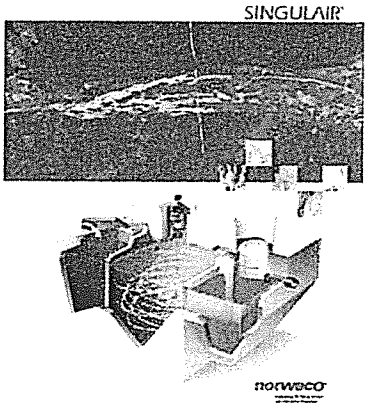
## 1.1 ORENCO AdvanTex AX-20RT



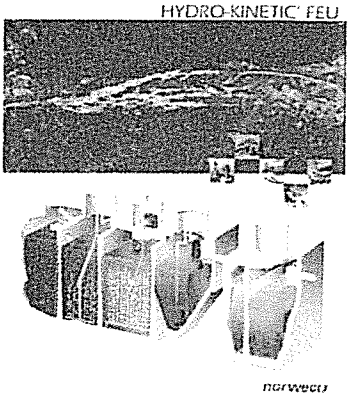
## 1.2 ORENCO AdvanTex AX20



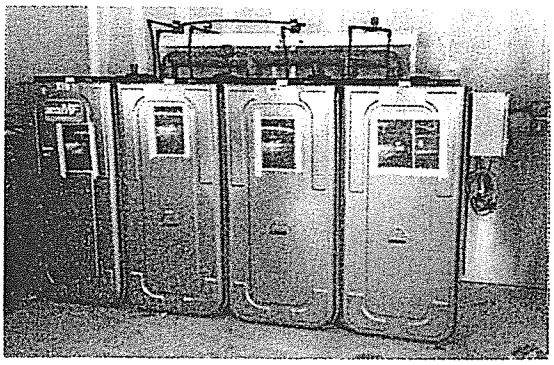
## 2.1 NORWECO Singulair TNT



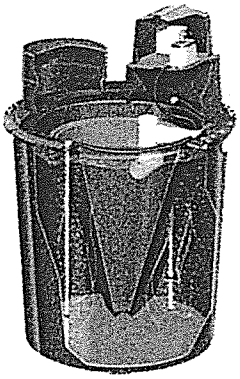

## 2.2 NORWECO Hydro-Kinetic




## 3. BUSSE MF



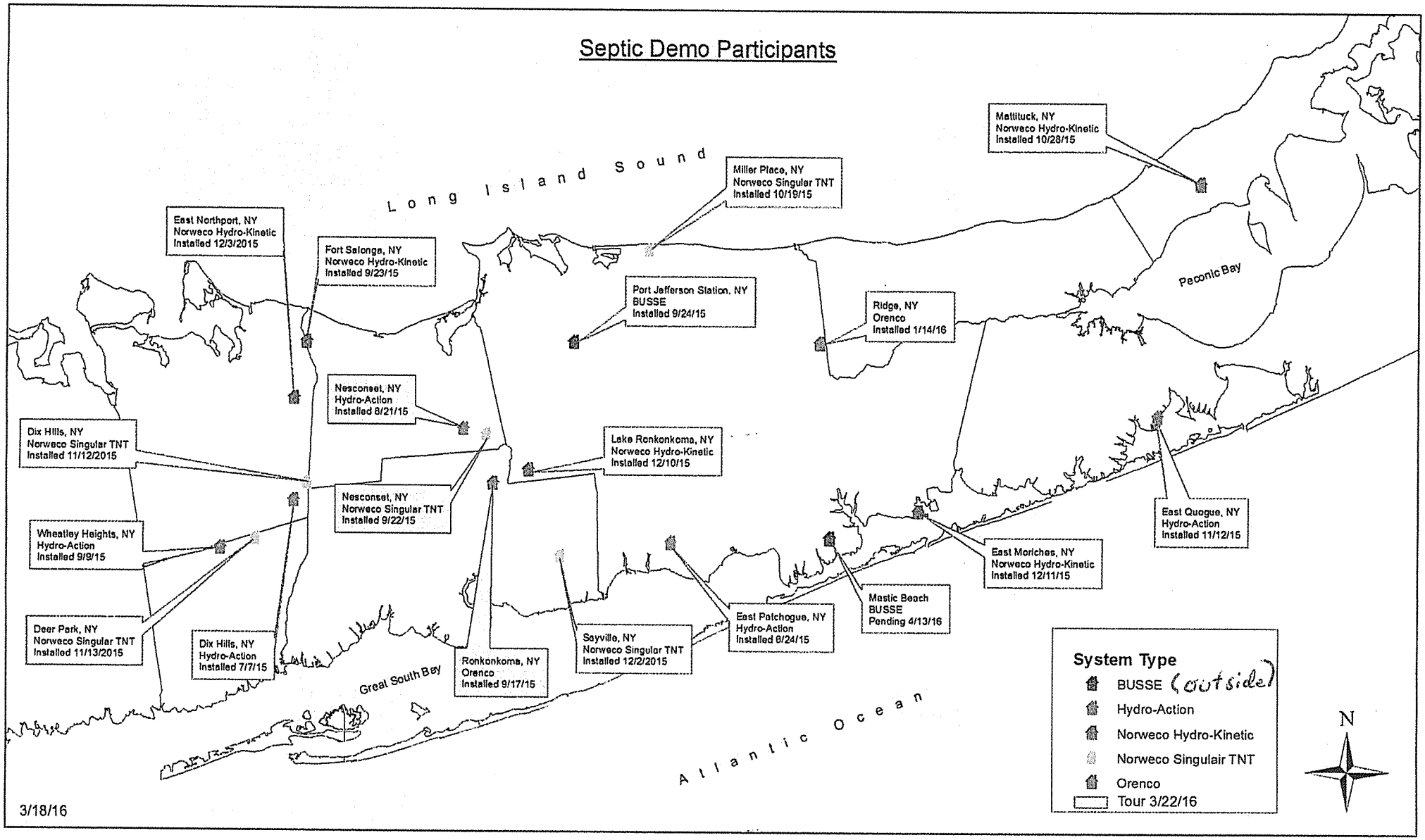
## 4. HYDRO-ACTION AN SERIES



# Septic Demonstration Current Sampling Results Summary as of March 18, 2016

| System | Number of Systems Installed | Sampling Phase | Month of Composite Sampling Start | Anticipated End of Composite Sampling |
|---|---|---|---|---|
| Hydro-Action | 5 | Composite | Feb 2016 & Mar 2016 | July 2016 |
| BUSSE GT | 1 (2nd site pending Install) | Composite | Mar 2016 (2nd anticipated July 2016) | Dec 2016 |
| Orenco Advantex AX20-RT | 1 | Composite | Mar 2016 | Aug 2016 |
| Orenco AX20 | 1 | Grab | Anticipate May 2016 | Oct 2016 |
| Norweeco Singulair TNT | 5 | Grab/composite | Mar 2016 | Aug 2016 |
| Norweco Hydro-Kinetic | 5 | Grab | Anticipate Apr 2016 | Sept 2016 |

# Septic Demo Participants



# Overview of County's Draft Approval Process for I/A OWTS

**Experimental Systems:** Systems designed to reduce Total Nitrogen (TN) to a minimum of 19 mg/L that are not yet certified by ETV or National Sanitation Foundation (NSF) 245 testing, or do not have NSF 40 certification and are not approved for 19 mg/l TN in a minimum of three (3) other jurisdictions with similar climate conditions may be permitted to be install in Suffolk County as an Experimental I/A OWTS.

- The vendor shall submit an engineer report prepared by a licensed professional engineer in the State of New York completely describing the system with process design calculations and product design drawings.
- May be approved by Office of Wastewater Management without need for Board of Review

Vendors receiving Department approval to install their unit in Suffolk County as an Experimental I/A OWTS must install a minimum of (3) units and no more than (5) units within Suffolk County as experimental units. Experimental I/A OWTS may be approved for Piloting if at least 75% of the sites perform at the expected level of treatment for 12 months

* *Monthly Monitoring; treatment standard of 19 mg/L TN on a 6 month rolling average*

**Piloting:** The Suffolk County Department of Health Services (SCDHS) will allowing piloting of I/A OWTS that have attained verification and/or certification status through:

- The USEPA Environmental Technology Verification Program (ETV); or
- National Sanitation Foundation/American National Standards Institute NSF/ANSI) Standard 245; or
- NSF/ANSI Standard 40 AND have current approval for 19 mg/l of Total Nitrogen (TN) in a minimum of three (3) other jurisdictions in similar climate conditions to Suffolk County; or
- Approved under SCDHS Experimental System Provision

Minimum of (5) and maximum of (15) systems per manufacturer and technology must be successfully piloted prior to proceeding to provisional approval. Piloting must be done for at least 12 months after reaching steady state and result in a full technical reporting of results in a format acceptable to Suffolk County Department of Health Services. Piloting is considered successful if at least 75% of the pilot sites perform at the expected level of treatment for 12 months (after reaching steady state).

* *Monthly Monitoring; treatment standard of 19 mg/L TN on a 6 month rolling average*

**Provisional Use Approval:** I/A OWTS that have passed the piloting stage that are allowed to be installed on a temporary basis and will be subject to continued sampling and monitoring. Provisional use is considered successful if at least 90% of the installations have demonstrated at least 18 months of performance providing a level of environmental protection at least equivalent to a conventional septic system and a reduced effluent nitrogen concentration to 19mg/l or less.

Under Provisional Use Approval, a minimum of 25 systems (including pilot systems and/or experimental) must be installed and evaluated prior to a technology becoming eligible for general use approval. There is no cap on the number of systems allowed under Provisional Use Approval

* *Quarterly Monitoring required during the Provisional Use period*

**General Use Approval:**

When an I/A OWTS Technology has successfully completed the Provisional Use state, it receives Certification for General Use. I/A OWTS technology certified for General Use can be installed at any site where a conventional septic system in compliance with Article 6 of the Suffolk County Sanitary Code could be approved. General use I/A OWTS Technologies shall be sampled at a minimum of every 36 months.

# OVERVIEW OF SANITARY CODE & STANDARDS CHANGES CURRENTLY UNDERWAY

SANITARY CODE

Article 19: Management of Innovative Alternative Onsite Wastewater Treatment Systems

1. Under this Article SCDHS is allowed to function as a Management Entity for I/A OWTS

2. Defines the specific management roles of SCDHS:
   a. Require operation and maintenance
   b. Require operation and maintenance contracts and / or operating permits
   c. Require sampling and performance monitoring
   d. Provide technical and administrative assistance to Property Owners
   e. Develop a database of all OWTS in Suffolk County
   f. Require service provider reporting of all O&M activities
   g. Ability to Require Inventory and Inspection of all OWTS in Suffolk County
   h. Enforcement of all Management Requirements

Critical Dates Sanitary Code:

| Task | Critical Dates for Sanitary Code Updates | Deadline |
|---|---|---|
| 1 | Draft Article 19 | March 7th 2016 |
| 2 | Initial Stake Holder Input | March 29th 2016 |
| 3 | Draft BOH Briefing Materials | April 1st 2016 |
| 4 | Stake Holder / Public Input prior to BOH * | April 11th 2015 |
| 5 | Circulate asssociate Residential Standards for review | April 19th 2016 |
| 6 | Board of Health Initial Presentation | April 20th 2016 |
| 7 | Board of Health Full Presentation | May 18th 2016 |
| 8 | Board of Health Hearing and Potential Vote | June 15th 2016 |

* Expand Stakeholders to design and real-estate professionals

RESIDENTIAL STANDARDS AMENDMENTS – Draft Timeline

**For July 2016**

1. Rewrite Definitions Section
2. Rewrite Septic Tank Section to allow for 2 Compartment, Concrete, Fiberglass, and Poly Tanks & Pump Tanks
3. Add Construction Standards for I/A OWTS
4. Address Condos and Residential Cluster Systems
5. Codify Approval Process for Experimental, Pilot, Provisional, and General Use

Critical Dates Residential Standards:

| Task | Critical Dates for Residential Standards | Deadline |
|---|---|---|
| 1 | Draft Approval Process for I/A OWTS | March 11th 2016 |
| 2 | Identify Necessary Changes to Standards | March 18th 2016 |
| 3 | Assign Tasks / Sections to Staff | March 25th 2016 |
| 4 | Working Draft for Internal Review | April 8th 2016 |
| 5 | Initial Stake Holder Input | April 13th 2016 |
| 6 | Final Draft | April 31st 2016 |
| 7 | Stake Holder / Public Input | May 1st 2016 |
| 8 | Commissioner Review / Approval | June 1st 2016 |

Next Steps:

**For December 2016**

1. Add Section on Pressurized Shallow Drainfields (following I/A OWTS)
    a. Conventional drainfields already permitted
2. Address Commercial Standards (flow less than 1,000 gpd)
3. Wastewater GEIS due March 2017
    a. Appendix A Flows & Separation distances
    b. Policy for requiring I/A OWTS
    c. Draft early action recommendations due September 2016.