SUFFOLK COUNTY COMPREHENSIVE WATER RESOURCES MANAGEMENT PLAN

Appendices

Appendix A

List of Acronyms and Glossary

Glossary

Cluster (Decentralized) Wastewater Systems – are subsurface sanitary systems (such as Cromaglass, Nitrex, BESST, Bioclere, and Aerotor) that service more than one dwelling unit and qualify for a reduced separation distance (75' to habitable buildings and/or property line) under Appendix A (Table A2) of the "commercial standards" promulgated under the Suffolk County Sanitary Code; they can be used for flows of 1,000 to 15,000 gallons per day, and are being considered for flows as high as 30,000 gpd, which would require amending the SCSC.

Contaminant Candidate List 3 (CCL 3) – was published in final form by the USEPA in the Federal Register of October 8, 2009 and is comprised of 116 unregulated contaminants that were selected from an initial list of about 7,500 candidates through a data-driven process that considered adverse health effects (potency and severity) and occurrence (prevalence and magnitude). It includes chemicals used in commerce (such as 1,4-dioxane), pesticides, waterborne pathogens, disinfection byproducts, and biological toxins that have the potential to present health risks through drinking water exposure, see: http://water.epa.gov/scitech/drinkingwater/dws/ccl/ccl3.cfm

Harmful Algal Blooms (HABs) – Algal blooms in themselves are a natural and normal part of any healthy ecosystem, providing a primary level of food for the other organisms that live there. However, these blooms are considered "harmful" when they are dominated by phytoplankton species that create conditions detrimental to the other biota in the system and/or to humans. Brown tides *(Aureococcus anophagefferens)* in the Peconics and Great South Bay, red tides *(Alexandrium fundyense* and *Cochlodinium polykrikoides)* in Huntington and Shinnecock Bays, and the Peconic Estuary, *Dinophysis acuminate* in Northport Harbor and Meetinghouse Creek, and cyanobacteria (multiple species, which can affect fresh and salt water) are the primary examples. They can have severe economic consequences through their impacts on habitat, shellfish populations, and fisheries; some can even have serious human health impacts. And while HABs appear to be occurring in areas with high nitrogen loadings from surrounding land areas, a cause and effect relationship has not yet been firmly established.

Hyporheic Zone – is the area below and adjacent to freshwater rivers and streams in which groundwater and surface waters mix; this region can be the site of chemical and biological activity (e.g., conversion of nitrate to nitrogen gas) that can affect the surface water ecosystem.

Public Water System (PWS) Improvements – in Suffolk County include the consolidation of pressure zones and the replacement of manual gate valves with remotely-activated control valves, which make the balancing of well usage over a larger geographical area easier, and make large-scale transport of water from one region to another through the existing system of water mains more feasible and economic.

Suffolk County Shellfish Aquaculture Lease Program – was adopted in 2009 to provide secure access to publicly owned underwater lands in Peconic Bay and Gardiners Bay for the purpose of shellfish cultivation; it is designed to minimize environmental impacts and user conflicts, while supporting the growth of the shellfish industry, see: http://www.suffolkcountyny.gov/aquaculture

Transit-Oriented Development (TOD) – is a concept similar to Smart Growth in that it includes higher-density mixed-use residential and commercial activities centered around transportation facilities like train stations or bus stops, with a goal of encouraging transit ridership while easing congestion on local roads, and preserving open space and maintaining lower densities in surrounding areas.

Unregulated Contaminants Monitoring Rule 3 (UCMR3) – was published by the USEPA on May 2, 2012 and includes 30 new unregulated contaminants from the CCL 3, including 1,4-dioxane (using EPA Method 522) and hexavalent chromium, that must be monitored by public water systems (PWSs) during 2013-2015, see:
http://water.epa.gov/lawsregs/rulesregs/sdwa/ucmr/ucmr3/upload/UCMR3_FactSheet_General.pdf

WaterSense – is a partnership program run by the USEPA that seeks to protect the future of the nation's water supply by offering simple ways to reduce water use, including the labeling of plumbing and other products that have been certified by licensed third parties to be at least 20% more efficient without sacrificing performance or quality. On November 3, 2011, the USEPA released a final specification for weather-based irrigation controllers, which use local weather and landscape conditions to tailor watering schedules to actual on-site conditions (rather than using a clock with a preset schedule); 67 products are now certified, and their estimated savings are 8,800 gallons per year for the average home, see:
http://www.epa.gov/WaterSense/products/controltech.html

Xeriscaping – is a term used to describe gardening techniques that severely reduce or eliminate the need for irrigation (also called xerogardening); it is often used in relation to lawns, particularly in regards to alternatives turf that requires high levels of irrigation, such as Kentucky bluegrass.

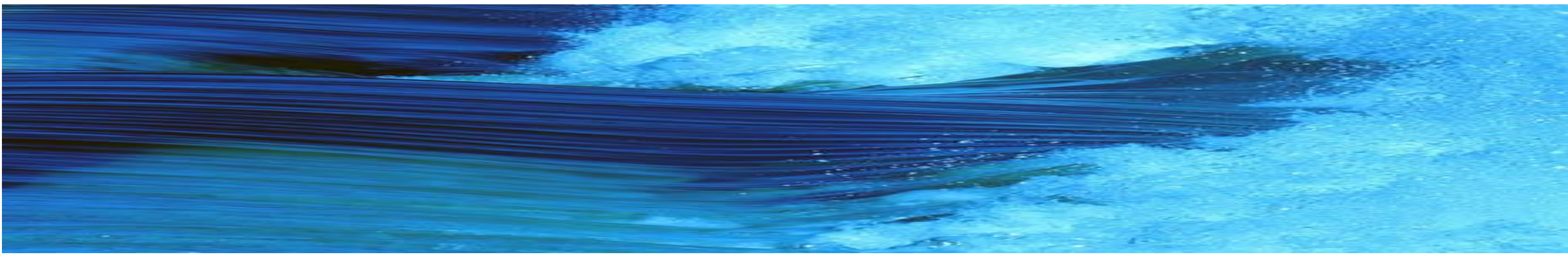
Abbreviations

gpd	gallons per day
µg/L	micrograms per liter (equivalent to parts per billion (ppb))
mg/L	milligrams per liter (equivalent to parts per million (ppm))
D.U./acre	dwelling units per acre

Acronyms

AIA	American Institute of Architects
AWWA	American Water Works Association
BMPs	Best Management Practices
CCE	Cornell Cooperative Extension
CCL 3	Contaminant Candidate List 3 (see Glossary)
CLEARS	Cornell Laboratory for Environmental Applications of Remote Sensing
CLUP	(Central Pine Barrens) Comprehensive Land Use Plan
DEIS	Draft Environmental Impact Statement (under SEQRA)
DEQ	(SCDHS) Division of Environmental Quality
FDA	Federal Drug Administration
FEMA	Federal Emergency Management Agency
GAC	Granular Activated Carbon
GEIS	Generic Environmental Impact Statement (under SEQRA)
GIS	Geographic Information System
GMZ	Groundwater Management Zone (under SCSC Article 6)
HMGP	Habitat Management Grant Program
I/A OWTS	Innovative/Alternative On-Site Wastewater Treatment Systems
IMA	Inter-Municipal Agreement
LCV	League of Conservation Voters
LIRPB	Long Island Regional Planning Board
LIREDC	Long Island Regional Economic Development Council
LIRPC	Long Island Regional Planning Commission
LISS	Long Island Sound Study
MCL	Maximum Contaminant Level (Federal & State Drinking Water Standard)
MCLG	Maximum Contaminant Level Goal (under Federal Safe Drinking Water Act)
MTBE	Methyl Tertiary Butyl Ether (gasoline additive)
NFWF	National Fish and Wildlife Federation
NOAA	National Oceanic and Atmospheric Administration
NRCS	National Resources Conservation Service
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health

NYSDOS	New York State Department of State
NYSEFC	New York State Environmental Facilities Corporation
PCE	Perchloroethylene (tetrachloroethylene or Perc – dry cleaning solvent)
PEP	Peconic Estuary Program
PPCPs	Pharmaceuticals and Personal Care Products
PWS	Public Water System (both Community and Non-community)
RFP	Request for Proposals
SCDEDP	Suffolk County Department of Economic Development and Planning
SCDHS	Suffolk County Department of Health Services
SCDOIT	Suffolk County Department of Information Technology
SCDPW	Suffolk County Department of Public Works
SCSC	Suffolk County Sanitary Code
SCSWCD	Suffolk County Soil and Water Conservation District
SCWA	Suffolk County Water Authority
SEQRA	(NYS) State Environmental Quality Review Act
SGPA	Special Groundwater Protection Area
SCLD	Suffolk County Law Department
SPDES	(NY) State Pollution Discharge Elimination System
SSER	South Shore Estuary Reserve
STP	Sewage Treatment Plant
SWAP	(Federal) Source Water Assessment Program
SWSD	(Suffolk County) Southwest Sewer District
TCA	Trichloroethane (solvent)
TCE	Trichloroethylene (solvent)
TDR	Transfer of Development Rights
TNC	The Nature Conservancy
TOD	Transit-Oriented Development (similar to Smart Growth)
UCMR3	Unregulated Contaminants Monitoring Rule 3 (see Glossary)
USACOE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	Volatile Organic Chemical
ZBA	Zoning Board of Appeals



Appendix B

Evaluation of Nitrates in Suffolk County, New York Public Water Supply Wells, April 2014

Suffolk County
Department of Health Services

Steven Bellone, Suffolk County Executive
James L. Tomarken, MD, MPH, MBA, FRCPC, FACP, Commissioner
Barry S. Paul, Deputy Commissioner

Evaluation of Nitrates in Suffolk County, New York Public Water Supply Wells

April 2014

Division of Environmental Quality
Walter Dawydiak, Jr., PE, JD, Director

Office of Water Resources
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Abstract

In order to properly benchmark trends in water quality it is important to compare data from the same set of wells, e.g., comparing apples to apples. The 1987 to 2005 comparison of water quality data in the draft Comprehensive Water Resources Management Plan, prepared by CDM, has been reevaluated and expanded to include 2013 data that shows generally a linear trend of increasing average nitrate concentrations in the glacial and magothy aquifer public water supply wells continuing through 2013. The nitrate concentrations in the same subset of 173 glacial aquifer wells rose over 41% from an average concentration of 2.54 milligrams per liter (mg/L) in 1987 to 3.58 mg/L in 2013. The annual rate of increasing nitrate concentrations in the same subset of wells appears to have been relatively steady between 1987 and 2013 at approximately 0.04 mg/L per year.

Nitrate concentrations nearly doubled at an increase of 93.2% in a subset of the same 190 magothy aquifer wells between 1987 and 2013. The average concentration of nitrates in the magothy subset in 1987 was 0.91 mg/L and in 2013 the average concentration was 1.76 mg/L. The calculated rate of increasing nitrate concentrations appears to have increased since 2005 in the same subset of magothy wells. The annual rate of increasing nitrate concentrations between 1987 and 2005 was 0.03 mg/L per year and grew to nearly 0.04 mg/L per year between 2005 and 2013. Similar increasing trends were observed in the glacial and magothy aquifers in an analysis of all public water supply well nitrate data.

Background

There are approximately 1,000 public water supply wells in Suffolk County, New York serving an estimated 1.4 million residents. As of March 2014, there were 38 community water suppliers, approximately 200 non-community public water suppliers, and an estimated 45,000 private wells that rely on Suffolk County's sole source aquifer for potable water supply. Numerous contamination sources including VOCs, pesticides and nitrates threaten the quality of our groundwater and surface waters on Long Island. To assess the current status and trends, Suffolk County contracted with CDM in the mid-2000's to evaluate contamination levels in our aquifers. To assess nitrate contamination, CDM compared analytical results from public water supply wells using data compiled by the Suffolk County Department of Health Services (SCDHS) and the Suffolk County Water Authority (SCWA) for 1987 and 2000 to 2005. CDM presented their analysis in Section 3, Table 3-1 of the draft Comprehensive Water Resources Management Plan (Comp Plan) for Suffolk County. SCDHS, in consultation with CDM, has since revisited and updated this evaluation to include recent data from 2013.

The drinking water standard for nitrates is currently 10 mg/L in New York State based on the potential to cause methemoglobinemia, a.k.a. blue baby syndrome. Several public water supply wells in Suffolk County are approaching or exceeding the nitrate drinking water standard and must blend or treat to reduce concentrations. Public water suppliers on Long Island can spend an estimated $3.5 million in capital expenses for a nitrate removal system at a typical pump station and can spend an additional $125,000 per year in operating costs for electricity, disposal of waste streams, etc.

Findings

In order to properly benchmark trends in water quality it is important to compare data from the same set of wells, e.g., comparing apples to apples. The 1987 to 2005 comparison of nitrate levels in the same set of wells presented in the Comp Plan has been reevaluated and updated to include 2013 data. The data generally shows a linear trend of increasing average nitrate concentrations in the glacial and magothy public water supply wells continuing through 2013. Nitrate data from public water supply wells installed in the Lloyd aquifer was limited and consequently was not included as part of this evaluation. In 2013 there were a total of 5 public supply wells in Suffolk County installed in the Lloyd aquifer, only one of which was sampled in 1987, 2005 and 2013.

The nitrate concentrations in the same subset of 173 glacial aquifer wells rose over 41% from an average concentration of 2.54 milligrams per liter (mg/L) in 1987 to 3.58 mg/L in 2013 (see Figures 1 & 2). The annual rate of increasing nitrate concentrations calculated for the same subset of glacial wells appears to have been relatively steady between 1987 and 2013 at approximately 0.04 mg/L per year.

Nitrate concentrations nearly doubled at an increase of 93.2% in a subset of the same 190 magothy aquifer wells between 1987 and 2013. The average concentration of nitrates in the magothy in 1987 was 0.91 mg/L and in 2013 the average concentration was 1.76 mg/L (see Figures 1 & 3). The calculated rate of increasing nitrate concentrations appears to have increased since 2005 in the same subset of magothy wells. The annual rate of increasing nitrate concentrations between 1987 and 2005 was 0.03 mg/L per year and grew to nearly 0.04 mg/L per year between 2005 and 2013.

Because 2013 analytical results were not available to characterize all of the wells included in the 1987 to 2005 Comp Plan comparison, the number of wells included in the updated 1987, 2005 and 2013 comparison has been reduced. A total of 247 glacial and 227 magothy wells were evaluated for the 1987 and 2005 comparison in the Comp Plan. As non-community water suppliers connect to community water supplies and older community supply wells are retired and replaced, public water supply wells are removed from service and are no longer sampled. As a result, the total number of glacial wells that were sampled in 1987, 2005 and 2013 was reduced to 173, and the total number of magothy wells that were sampled in 1987, 2005 and 2013 was reduced to 190. However, as shown in Figure 4, the average nitrate concentration trends for the 1987 and 2005 are closely aligned between the two data sets. The number of wells in the same well comparison is expected to continue to decrease as non-community water suppliers connect to community water supplies and older community public supply wells are retired and replaced, or otherwise abandoned and relocated.

Similar increasing trends of nitrate concentrations were observed in the glacial and magothy aquifers in an analysis of all public water supply well nitrate data (see Figure 5). The most likely explanation for the "same wells" comparison showing more degradation than the "all wells" comparison is that older community water supply wells with poorer water quality were taken off-line and newer wells were sited in areas with better water quality in the glacial aquifer or installed deeper into the magothy aquifer. Shallow, non-community water supply wells were also abandoned as many of these small supplies connected to community water suppliers that generally have much deeper wells and better raw water quality.

Methods

Careful examination of the previously presented comparison of nitrate levels from all wells sampled in 1987 and from 2000 to 2005 in the draft Comp Plan has resulted in some changes in the reported average nitrate concentrations. Because some wells in the data sets were sampled once, and other wells were sampled over 30 times by SCWA between 2000 and 2005, nitrate levels from the frequently sampled wells had been given more weight than the results from those wells that were infrequently sampled. An updated evaluation of the data more properly assigns equal weight to the results from each well. As shown in the attached table (Table 1), an updated evaluation of the Comp Plan data still shows an increasing trend of nitrates in the glacial and magothy aquifers.

In performing the most recent analysis, nitrate analytical data for 1987 was again obtained from the SCDHS's Henco database and the 2005 and 2013 analytical results were obtained from the SCDHS's Blacksmith database. Both community and non-community public water supply results were used in the evaluation. Although analytical results for SCWA wells were included in the SCDHS databases, SCWA's self-monitoring nitrate results from the SCWA database were not included in the most recent assessment in order to simplify the analysis. Despite using slightly different data sets, SCDHS data for 1987 and 2005 closely aligned with the 1987 and 2005 average nitrate concentrations presented in the updated Comp Study as shown in the attached table (Table 1).

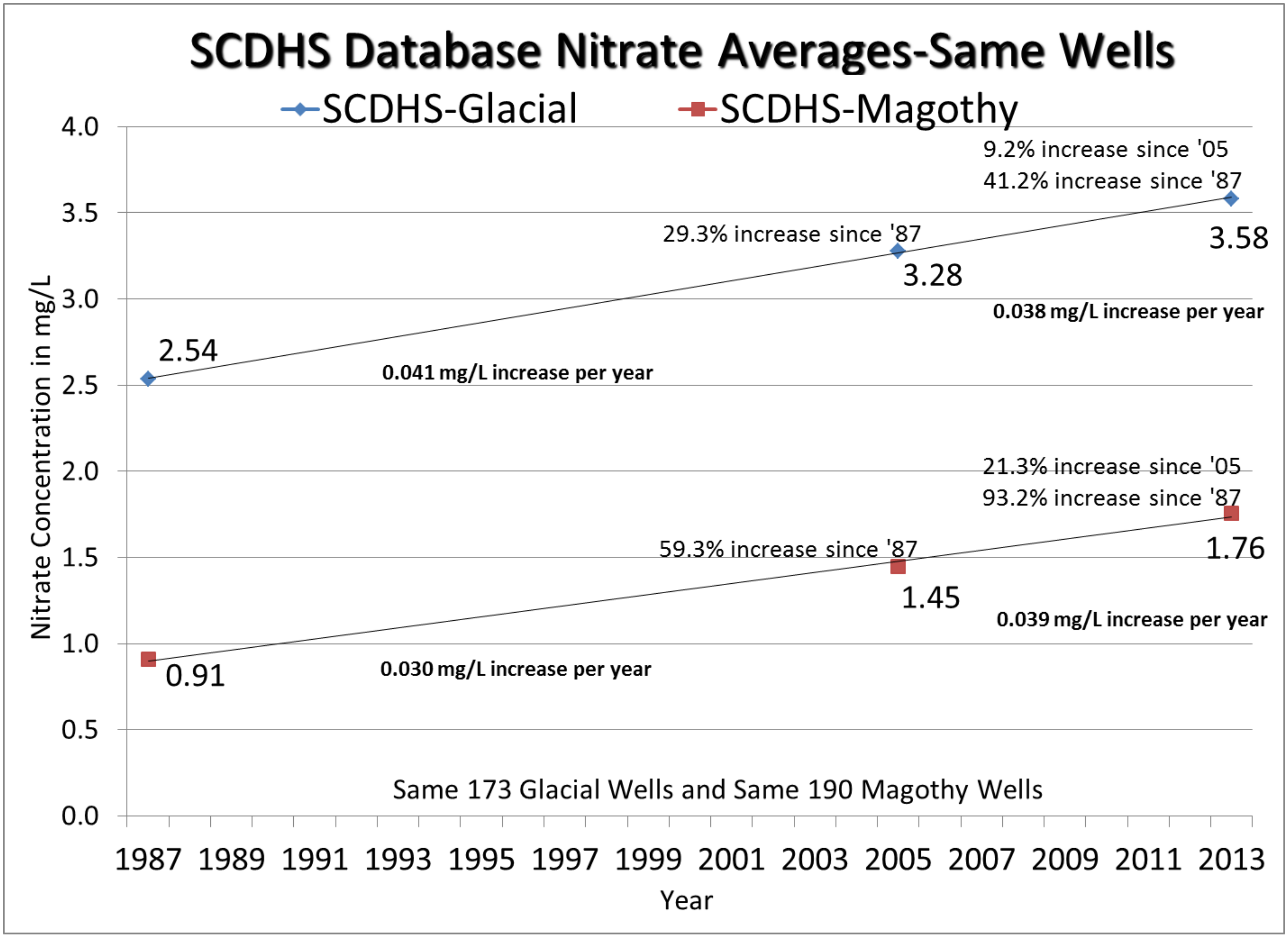
Community water supply wells with multiple nitrate samples in the same year were averaged together to produce an average nitrate concentration for each well. Nitrate results for non-community water supply sites with multiple wells or multiple samples were averaged together to represent the average nitrate concentration for the site. The average nitrate concentration for each respective year was an unweighted average of all of the averages from each well or site. It was assumed that all non-community public supply wells were screened in the glacial aquifer, with the exception of the two known magothy aquifer wells at Captree State Park. Results were excluded from the analysis if the treatment status at the collection point was a known nitrate removal or reduction technique (i.e. reverse osmosis, ion exchange, blending with water from other wells). Results were not excluded from the analysis based on treatment status at the sample point for other forms of treatment (i.e. greensand filtration, granular activated carbon, air stripper, chlorine, etc.). It was assumed that any effect on the average nitrate concentration due to treatment from other than known nitrate removal and reduction techniques would be negligible based on the number of samples collected from the effluent of treatment systems and the large number of total data points. Where nitrate results were "non-detect" the concentration was assumed to be equal to one-half of the reported detection limit. This is comparable to the methodology used by CDM to produce the updated Comp Plan results.

Conclusion

There is currently a wealth of data available from public supply wells to aid in characterizing nitrate levels throughout Suffolk County's aquifer system. While use of all available data helps to provide resource managers with a complete picture of conditions, it does not provide a good indication of temporal trends. Comparison of nitrate levels measured at the same set of wells over time provides the most reliable assessment of how nitrate levels in the aquifer are changing. As public supply wells continue to be abandoned or replaced, the pool of available data from the same subset of wells will continue to decrease resulting in a very limited assessment of overall quality in the aquifers. Public water supply wells are also generally installed in areas with better water quality, which may be biasing the data in an overall assessment of the aquifer. Alternative methods for compiling a database of consistent and reliable sampling points should be considered (e.g. monitoring well network).

SCDHS has evaluated multiple public supply well data sets; the conclusions of each evaluation have been consistent in documenting a continued upward trend in nitrate levels in both the glacial and magothy aquifers. While nitrate levels generally remain well below the drinking water standard in the vast majority of public supply wells, the increasing trend continues to be of concern. It should be noted that elevated levels of nitrates in groundwater discharging to downgradient surface waters are one of the contributing factors of harmful algal blooms which may result in shellfishing closures, beach closures, and fishing restrictions.

Figure 1


SCDHS Database Nitrate Averages-Same Wells
SCDHS-Glacial
SCDHS-Magothy
Nitrate Concentration in mg/L
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.2% increase since '05
41.2% increase since '87
29.3% increase since '87
3.58
3.28
0.038 mg/L increase per year
2.54
0.041 mg/L increase per year
21.3% increase since '05
93.2% increase since '87
59.3% increase since '87
1.76
1.45
0.039 mg/L increase per year
0.91
0.030 mg/L increase per year
Same 173 Glacial Wells and Same 190 Magothy Wells
1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013
Year

SCDHS Database Same Well Nitrate Average Concentrations by Aquifer

Figure 2

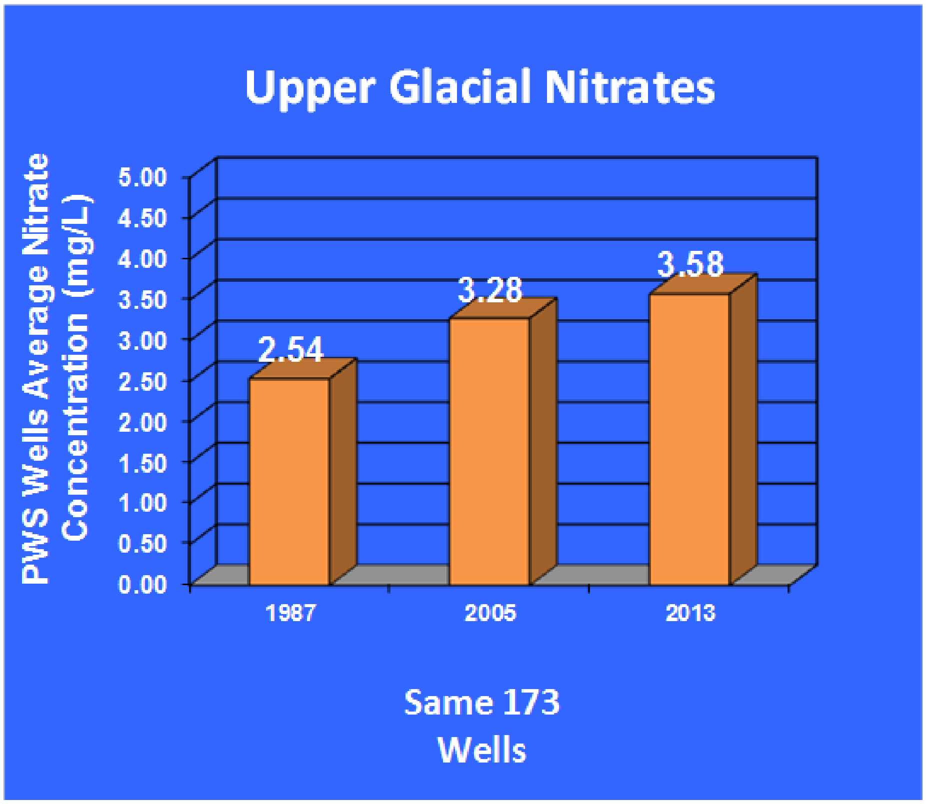


Figure 3

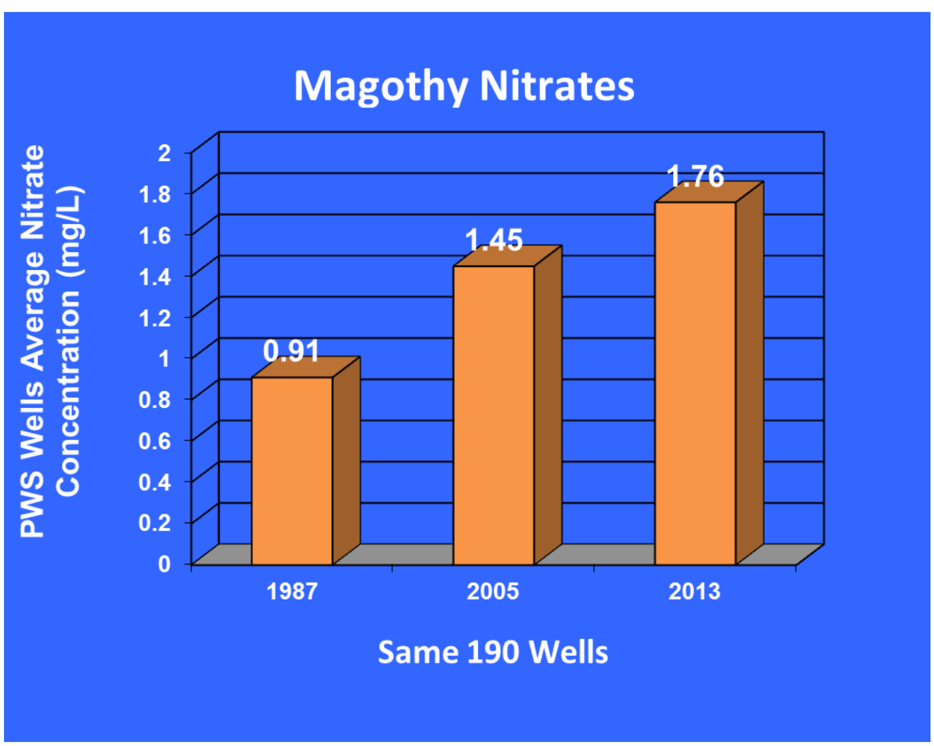


Figure 4

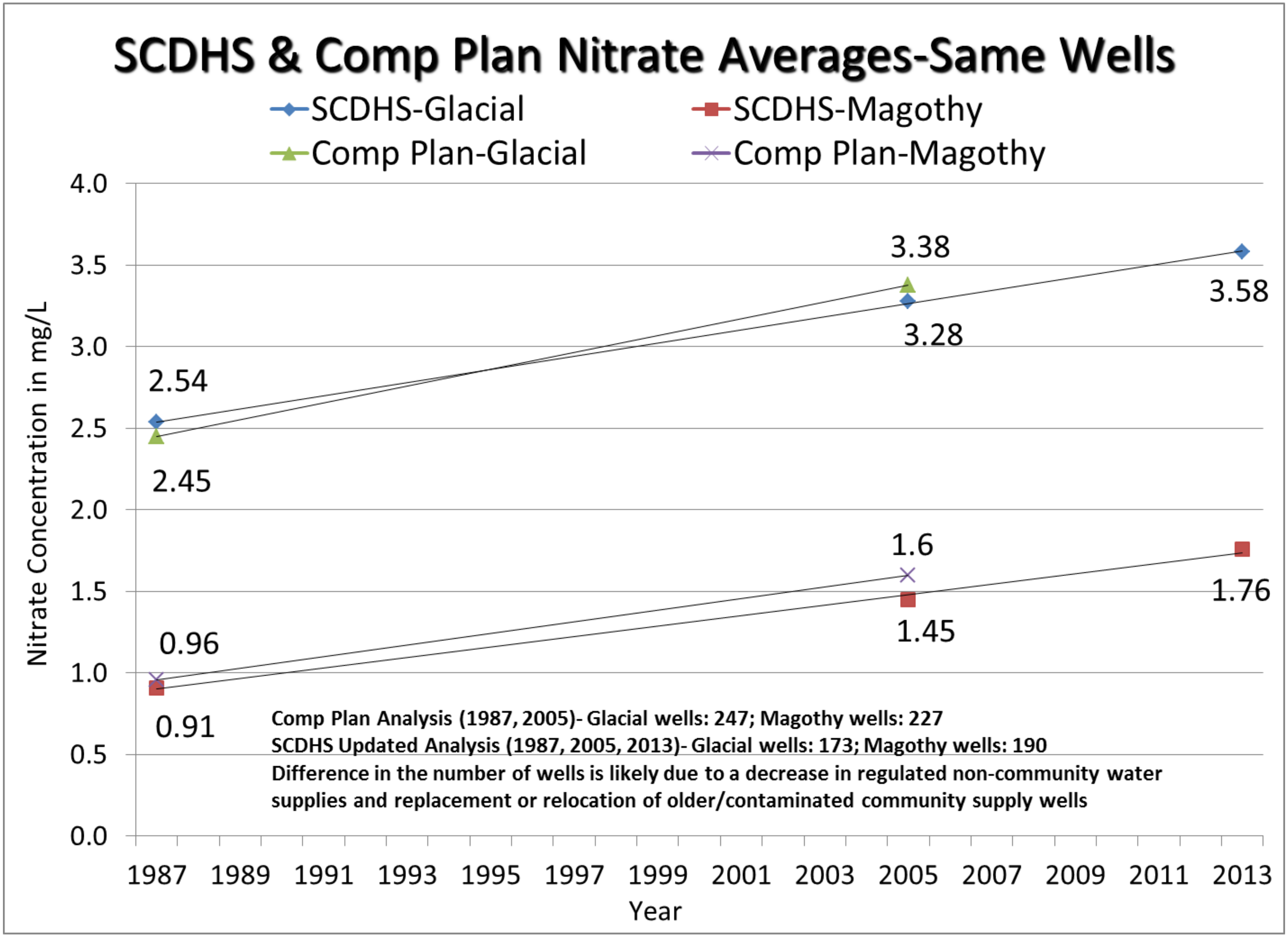

SCDHS & Comp Plan Nitrate Averages-Same Wells
SCDHS-Glacial
SCDHS-Magothy
Comp Plan-Glacial
Comp Plan-Magothy
Nitrate Concentration in mg/L
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3.38
3.58
3.28
2.54
2.45
1.6
1.76
1.45
0.96
0.91
Comp Plan Analysis (1987, 2005)- Glacial wells: 247; Magothy wells: 227
SCDHS Updated Analysis (1987, 2005, 2013)- Glacial wells: 173; Magothy wells: 190
Difference in the number of wells is likely due to a decrease in regulated non-community water supplies and replacement or relocation of older/contaminated community supply wells
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
Year

Figure 5

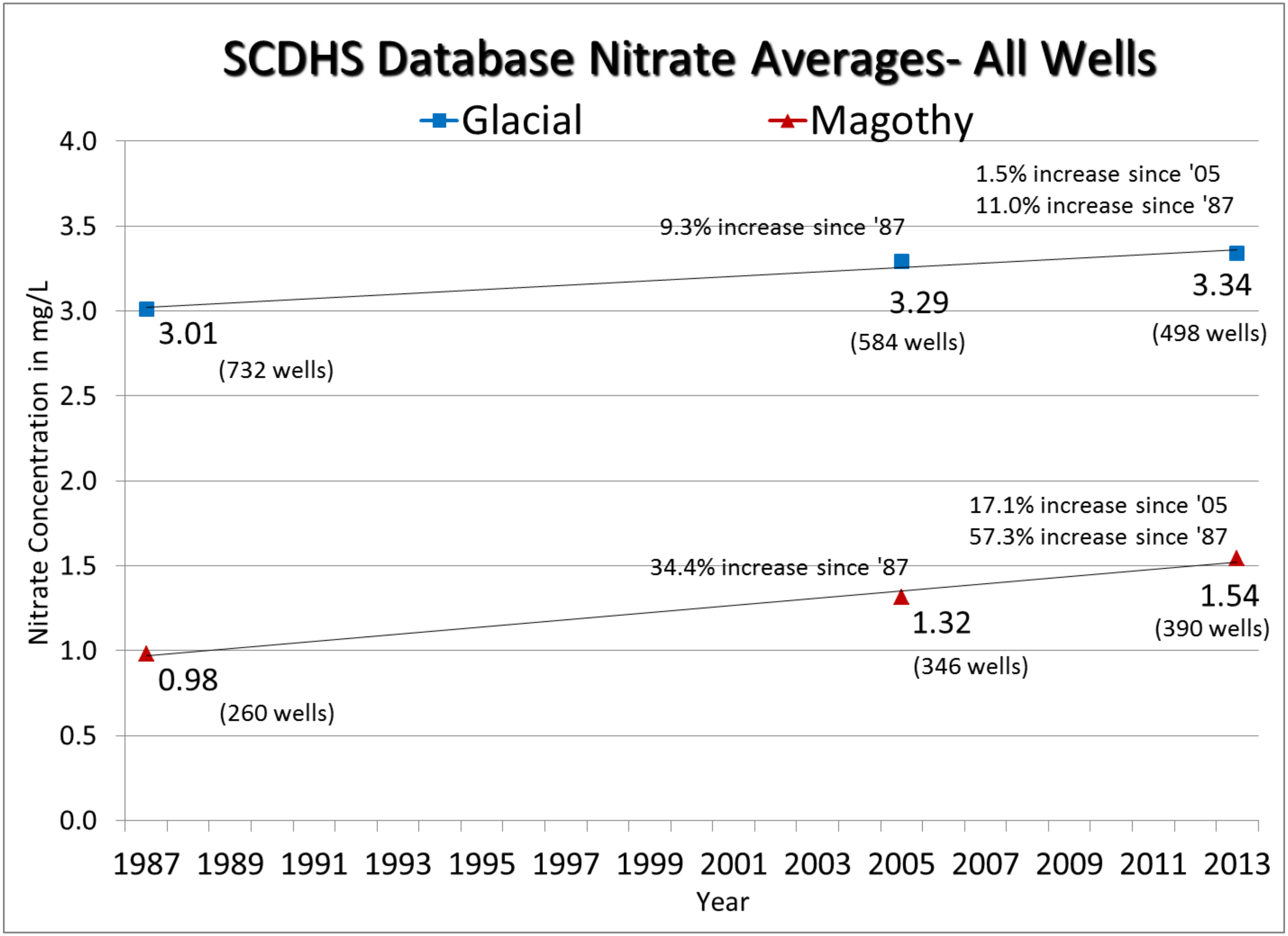

SCDHS Database Nitrate Averages- All Wells
Glacial
Magothy
Nitrate Concentration in mg/L
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1.5% increase since '05
11.0% increase since '87
9.3% increase since '87
3.01
(732 wells)
3.29
(584 wells)
3.34
(498 wells)
17.1% increase since '05
57.3% increase since '87
34.4% increase since '87
0.98
(260 wells)
1.32
(346 wells)
1.54
(390 wells)
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
Year

Table 1. Nitrate Concentrations from All Community and Non-Community Supply Wells

	Nitrate (mg/L)								
	1987			2005			2013		
	Draft Comp Plan	Revised Comp Plan*	SCDHS Data Only	Draft Comp Plan	Revised Comp Plan*	SCDHS Data Only	Draft Comp Plan	Revised Comp Plan*	SCDHS Data Only
Upper Glacial Aquifer									
n (wells)	714	714	732	575	575	584	N/A	N/A	498
Average	3.12	3.05	3.01	4.34	3.29	3.29	N/A	N/A	3.34
Magothy Aquifer									
n (wells)	281	281	260	376	376	346	N/A	N/A	390
Average	1.14	1.07	0.98	3.43	1.38	1.32	N/A	N/A	1.54

Notes:

The Comp Plan statistics were based on data from the SCDHS Henco and Blacksmith databases as well as data received from the SCWA.

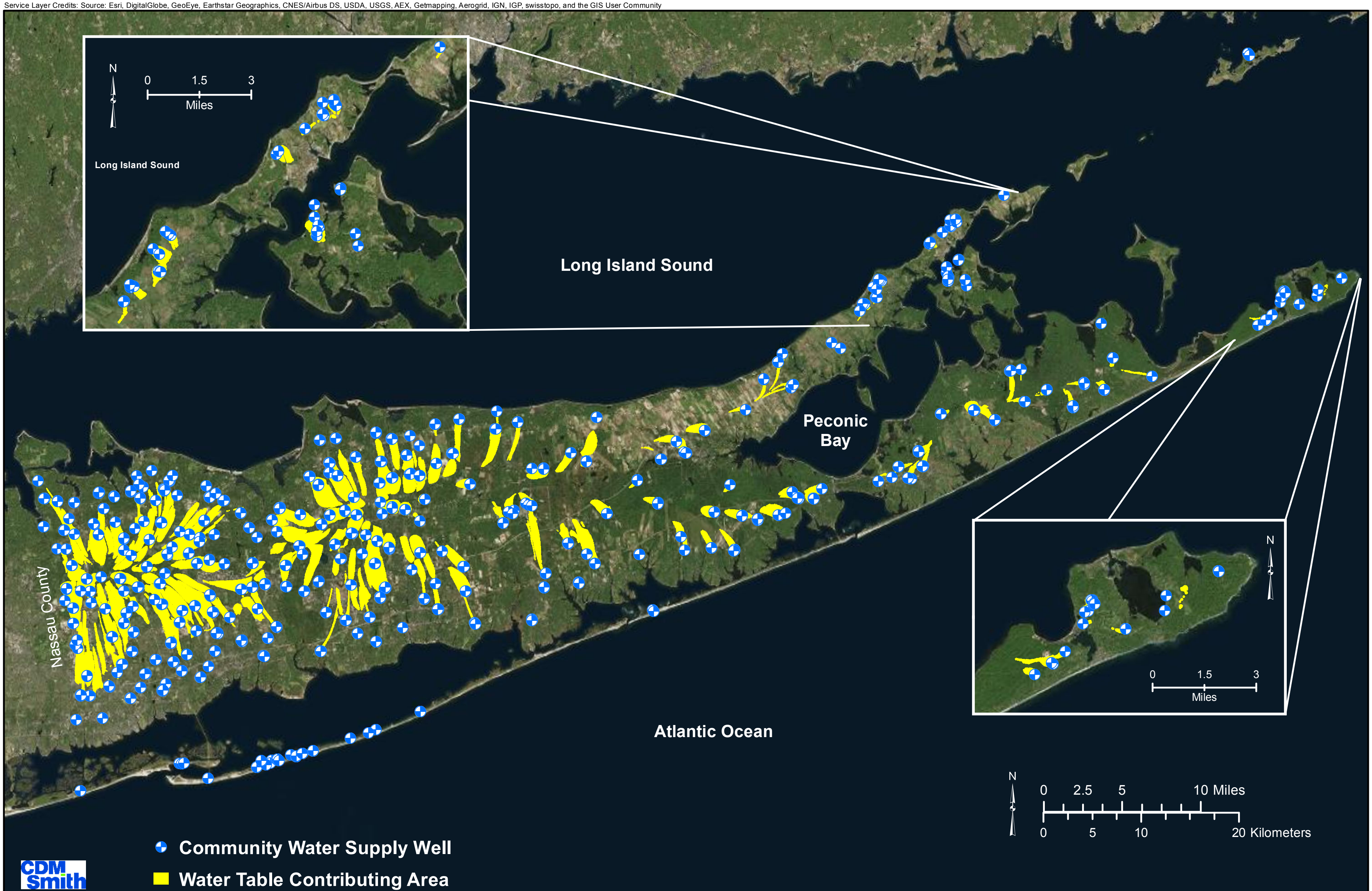
The SCDHS statistics were based solely on data from the SCDHS Henco and Blacksmith databases.

SCDHS databases typically include results from an annual sample collected by SCDHS at all well sources only, whereas the SCWA database includes several results from each well where there is an increased monitoring frequency due to elevated nitrate concentrations.

* Initial Draft Comp Plan analysis aggregated all well data (biased towards more frequent samples at impacted wells), while the Revised Comp Plan used average data for each well in a given year.

Appendix C

SWAP Map



Simulated Water Table Contributing Areas to Community Public Supply Wells
100 Year Contributing Areas (2010 Analysis)*

Suffolk County Comprehensive Water Resources Management Plan

Figure A-X

* Will be updated in 2015, with a goal of updating every one to two years thereafter

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Appendix D

VOC Action Plan

VOC Action Plan

Summary

DEQ proposes to enhance Pollution Control resources to reverse the trend of increasing volatile organic compounds (VOCs) in the environment. The Comprehensive Water Resources Management (COMP) Plan (draft Dec. 2010) shows an increasing trend in the detection of VOCs in public supply wells. The VOC Action Plan will enhance resources in the Division of Environmental Quality in two phases. The first phase will immediately add five staff members to increase inspections and enforcement at high risk facilities. The second phase, which will enhance oversight of the thousands of commercial and industrial facilities in Suffolk County, will be addressed by the Reducing Toxics Study. The goal is to ensure the long-term reduction of VOC's in the environment.

Background

VOC's represent the greatest threats to Suffolk County's groundwater and drinking water resources and must be the mainstay of environmental protection efforts. Ironically, the progressive County programs enacted to combat VOC contamination and the success they have enjoyed have pushed this issue into the background and obscured its importance. Renewed vigilance is required to protect the long-term environmental and economic health of Suffolk County.

- Environmental Impact Significance
  - The COMP Plan shows an increasing trend in the detection of VOCs in public supply wells.
    - Perchloroethylene (PCE) was detected in four times as many wells in 2005 as in 1987.
    - Trichloroethene (TCE) concentrations from the same upper glacial and Magothy wells doubled from 1987 to 2005.

- Threat Assessment
  - Over 19,000 facilities in Suffolk County have the potential to use, store and discharge hazardous materials.
    - Only facilities with permitted storage (3200 sites) are routinely inspected by the Office of Pollution Control (OPC).
    - OPC has insufficient resources to inspect the other 16,000 commercial and industrial facilities.
    - 5% - 10% of these sites are estimated to be improperly/unlawfully storing and disposing of hazardous materials.
  - No routine inspection of dry cleaners, historically responsible for numerous significant PCE groundwater plumes.
  - Underground gasoline storage facilities, the other major groundwater threat, can only be inspected every 3 years.
  - As fewer sites are inspected, environmental cleanups have dropped from 300 per year to 150 per year.

- Superfund/Brownfields
  - Current Superfund/Brownfield sites in Suffolk County have been identified and remediated because Suffolk County has historically been inspecting these sites and uncovering contamination and illicit discharges.
  - Thousands of other remediations occur under SCDHS guidance before there is significant environmental harm.
  - Without sufficient inspection and sampling resources,
    - Small spills will progress into larger Superfund type sites, with potential for significant impact to groundwater.
    - Larger spills will go unchecked and have the potential to impact the environment in a devastating manner.

There are clear environmental, public health and economic consequences for failure to rigorously regulate the storage, handling and disposal of toxic and hazardous materials. As pollution proliferates throughout the county, it could tarnish Suffolk's appeal as an attractive location to vacation, raise their families and set up businesses.

Action Plan

Phase I will be implemented immediately and will focus on high risk facilities.

- This phase will allow for annual inspections of underground gasoline storage facilities and dry cleaners.
- This phase will increase sampling capacity from 120 per year to 1000 to allow for detection of contaminants and enhanced remediations.
- This phase calls for hiring
  - One Public Health Sanitarian (PHS) Trainee to inspect up to 400 dry cleaning facilities per year.
  - One PHS Trainee to inspect up to 500 additional gasoline stations per year.
  - One PHS Trainee to process the additional enforcement actions resulting from increased inspections.
  - One Asst. Public Health Engineer Trainee to review the additional hazardous material storage facility plan submittals that will result from facilities that upgrades tanks to meet code requirements.
  - One Chemist I to analyze the additional samples that will result for the increases/enhanced inspections.

Phase II will focus on all commercial/industrial facilities in the County and long-term solutions to VOCs in the environment.

- The "Reducing Toxics" study will review OPC spill records from some of the 16,000 commercial/industrial facilities that are not routinely inspected but still pose a threat to the environment due toxic or hazardous material spills and discharges.
- The study will examine the best strategies to control contaminants based on the threats posed by specific industries.

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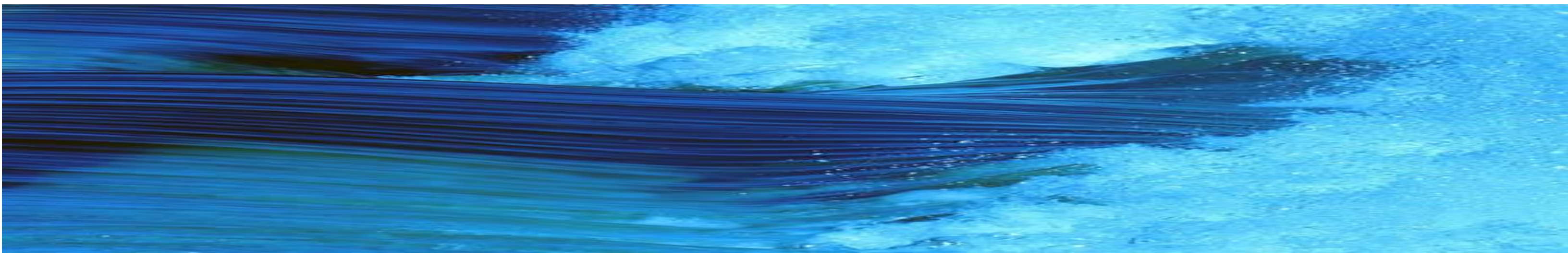

Appendix E

Summary and Basis of Water Quality Parameters Analyzed by the Suffolk County Department of Health Services Public & Environmental Health Laboratory as Compared with Those Regulated in Drinking Water & Analyzed by Other Agencies (March 2015)

(Currently under Agency Review)

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Appendix F
DRAFT Monitoring Well Network Map

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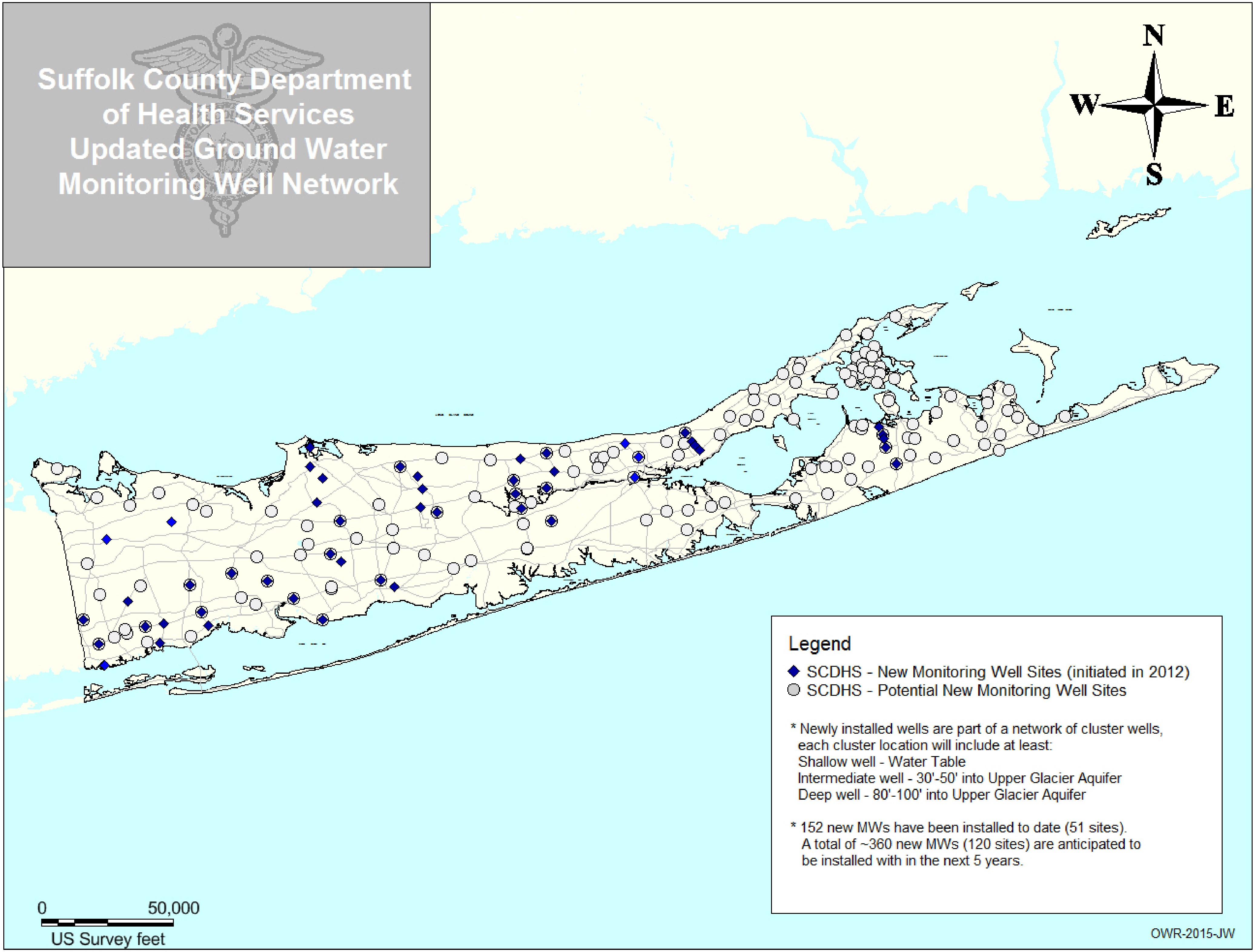
Suffolk County Department of Health Services Updated Ground Water Monitoring Well Network
N
W
E
S
Legend
SCDHS - New Monitoring Well Sites (initiated in 2012)
SCDHS - Potential New Monitoring Well Sites
* Newly installed wells are part of a network of cluster wells, each cluster location will include at least:
Shallow well - Water Table
Intermediate well - 30'-50' into Upper Glacier Aquifer
Deep well - 80'-100' into Upper Glacier Aquifer
* 152 new MWs have been installed to date (51 sites). A total of ~360 new MWs (120 sites) are anticipated to be installed with in the next 5 years.
0
50,000
US Survey feet
OWR-2015-JW

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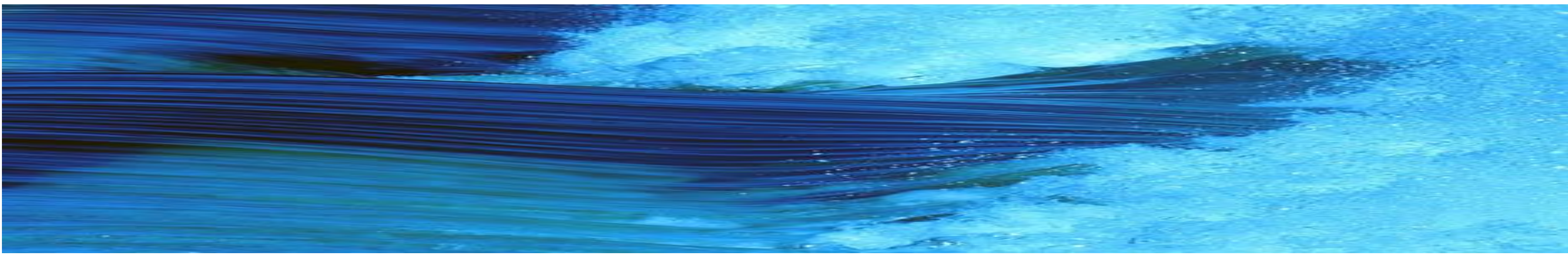

Appendix G
Contaminant Fact Sheets

(Currently under Agency Review)

Appendix H

Suffolk County Community Water Supplies

List of Suffolk County Community Public Water Supply Systems

As of March 19, 2015

No.	Community Water Supply Name	Approximate Population	Location
1	Suffolk County Water Authority	1.1 Million	-
2	South Huntington Water District	81,000	Huntington
3	Greenlawn Water District	42,000	Huntington
4	Riverhead Water District	35,000	Riverhead
5	Dix Hills Water District	34,000	Huntington
6	Smithtown Water District	20,500	Smithtown
7	Hampton Bays Water District	14,400	Southampton
8	St. James Water District	11,200	Saint James
9	East Farmingdale Water District*	7,500	Babylon
10	Brentwood Water District*	6,498	Islip
11	Stony Brook Water District*	4,950	Brookhaven
12	Ocean Beach Water District	4,500	Fire Island
13	Fair Harbor Water District*	4,884	Fire Island
14	Brookhaven National Laboratory	3,300	Upton
15	Fishers Island Water Works	2,500	Fishers Island
16	Village of Greenport	2,100	Southold
17	Saltaire Water District	2,000	Fire Island
18	Northport Veterans Affairs Hospital	2,000	Northport
19	Riverside Water District*	1,800	Riverhead
20	Seaview Water District	1,400	Fire island
21	Calverton Hills Homeowners Association	700	Riverhead
22	Shelter Island Heights Property Owners Corporation	500	Shelter Island
23	West Gilgo Beach Homeowners Association	300	Fire Island
24	West Neck Water District	202	Shelter Island
25	Robert Moses State Park	100	Fire Island
26	Dering Harbor Water District	72	Shelter Island
27	Peconic River Mobile Home Park	66	Riverhead
28	Peconic View Mobile Home Park	60	Riverhead
29	McCrodden Water Company	54	Fire Island
30	Maidstone Park Cottages	34	East Hampton
31	Dougherty Water Company	34	Fire Island
32	McCarren Water Company	30	Fire Island
33	Shelter Island Chalets	17	Shelter Island
34	Bridgeford Colony	16	Montauk
35	Aliperti Cottages	12	Sag Harbor
36	Wolfies' Tavern	10	East Hampton
37	Kings Cabins	7	Shelter Island

*****Operated and maintained by the SCWA

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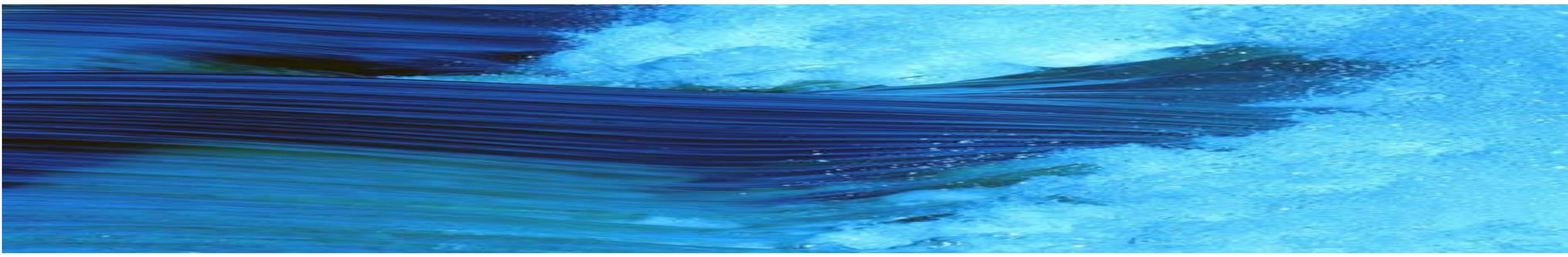


Appendix I

Suffolk County Sewage Treatment Plants

Table 1 - Suffolk County Sewage Treatment Plants (2014)

No.	Sewage Treatment Name	Sewage Treatment Type	Tertiary or Secondary	NYS SPDES Design Flow (MGD)	Discharge Location
1	Artist Lake	Extended aeration denite filter	Tertiary	0.025	Inland
2	Avery Village	SBR	Tertiary	0.025	Inland
3	Bellhaven Nursing Home	SBR	Tertiary	0.04	Inland
4	Birchwood @ Spring Lake	Extended aeration denite filter	Tertiary	0.25	Inland
5	Birchwood Glen	Extended aeration denite filter	Tertiary	0.1	Inland
6	Birchwood Nursing Home	SBR	Tertiary	0.02	Inland
7	Birchwood On The Green	Extended aeration denite filter	Tertiary	0.087	Inland
8	Blue Ridge	SBR	Tertiary	0.25	Inland
9	Bretton Woods	SBR	Tertiary	0.343	Inland
10	Bristal East Northport	Cromaglass	Tertiary	0.015	Inland
11	Bristal @ Lake Grove	Cromaglass	Tertiary	0.015	Inland
12	Encore Atl Shores Bristal Est.	SBR	Tertiary	0.04	Inland
13	Broadway Knolls	SBR	Tertiary	0.066	Inland
14	Broadway West	Cromaglass	Tertiary	0.015	Inland
15	Brookhaven Hospital	SBR	Tertiary	0.15	Inland
16	Brookhaven National Lab	Modular Aeration	Tertiary	1.2	Inland
17	Brookhaven SD #2	BESST	Tertiary	0.2	Inland
18	Brookhaven Town Hall	Extended areation denite filter	Secondary	0.026	Inland
19	Brookwood on the Lake	Bio disc denite filter	Tertiary	0.045	Inland
20	Browning Hotel Marriott Courtyard	SBR	Tertiary	0.056	Inland
21	Cabrini Gardens	Cromaglass	Tertiary	0.0071	Inland
22	Calverton Enterprise Park	Extended aeration	Secondary	0.078	Surface Waters
23	Calverton Hills	Extended aeration	Secondary	0.03	Inland
24	Cedar Lodge	Extended aeration	Secondary	0.03	Inland
25	Cenacle Manor	SBR	Tertiary	0.036	Inland
26	Chatham Holts RI Holt Hotel	SBR	Tertiary	0.02606	Inland
27	Chelmsford Weald Condo	Cromaglass	Tertiary	0.0099	Inland
28	Country Pointe	SBR	Tertiary	0.07	Inland
29	Country View Estates	SBR	Tertiary	0.0156	Inland
30	Country View @ Holtsville	BESST	Tertiary	0.015	Inland
31	Country View @ Smithtown	Cromaglass	Tertiary	0.063	Inland
32	Courtyard at Southampton	Cromaglass	Tertiary	0.015	Inland
33	Crescent Club	Extended Aeration	Secondary	0.03	Inland
34	Dowling	RBC denite filter	Tertiary	0.07	Inland
35	Eagles walk	Cromaglass	Tertiary	0.0428	Inland
36	East Port Meadows	Cromaglass	Tertiary	0.0081	Inland
37	Emanon Group	Cromaglass	Tertiary	0.00344	Inland
38	Emerald Greens	SBR	Tertiary	0.0186	Inland
39	Exit 63 Development	SBR	Tertiary	0.057	Inland
40	Fairfield at Mastic	Cromaglass	Tertiary	0.015	Inland
41	Fairfield at Selden	SBR	Tertiary	0.101	Inland
42	Fairfield Inn by Marriott	Cromaglass	Tertiary	0.015	Inland
43	Fairfield Lk Ronk	Cromaglass	Tertiary	0.015	Inland
44	Fairfield Village (Groton)	MBR	Tertiary	0.025	Inland
45	Fairhaven Apts. @ Nesconset	Extended aeration	Secondary	0.03	Inland
46	Fairway Manor	Extended aeration denite filter	Tertiary	0.0725	Inland
47	Fox Meadows	Extended aeration denite filter	Tertiary	0.034	Inland

Table 1 - Suffolk County Sewage Treatment Plants (2014)

2014 Suffolk County Sewage Treatment Plants (Continued Page 2)					
No.	Sewage Treatment Name	Sewage Treatment Type	Tertiary or Secondary	NYS SPDES Design Flow (MGD)	Discharge Location
48	Greenport Village	SBR	Tertiary	0.65	Surface Waters
49	Greens @ Half Hollow	SBR	Tertiary	0.3	Inland
50	Greenview Commons	SBR	Tertiary	0.03	Inland
51	Greenview Court	Cromaglass	Tertiary	0.0105	Inland
52	Greenwood @ Oakdale	Extended aeration denite filter	Tertiary	0.03712	Inland
53	Greenwood Village	Extended aeration denite filter	Tertiary	0.066	Inland
54	Gurwin Jewish Assisted Living	SBR	Tertiary	0.04	Inland
55	Gurwin Jewish Geriatric Center	SBR	Tertiary	0.045	Inland
56	Hampton Rehab Center	SBR	Tertiary	0.045	Inland
57	Hawthorne (Concord) Village	MBR	Tertiary	0.127	Inland
58	Heatherwood @ Holbrook	BESST	Tertiary	0.03	Inland
59	Heatherwood @Lakeland	Extended aeration denite filter	Tertiary	0.03	Inland
60	Heatherwood House @ Lake Ronk	Extended aeration	Secondary	0.03	Inland
61	Heritage Gardens at Brentwood	BESST	Tertiary	0.03	Inland
62	Hidden Ponds	Extended aeration denite filter	Tertiary	0.08	Inland
63	Hilton Gardens	SBR	Tertiary	0.022	Inland
64	HoIiday Inn Express	Cromaglass	Tertiary	0.015	Inland
65	Holiday Inn	Extended aeration denite filter	Tertiary	0.04	Inland
66	Homestead Village	Extended aeration Susp. growth denite	Tertiary	0.115	Inland
67	Huntington Town	SBR	Tertiary	2.5	Surface Waters
68	Inn @ East Winds	Cromaglass	Tertiary	0.015	Inland
69	IRS	SBR	Tertiary	0.085	Inland
70	Island View	SBR	Tertiary	0.0554	Inland
71	Islandia Center	Extended aeration denite filter	Tertiary	0.055	Inland
72	Kensington Gardens st jamess NH	Extended aeration denite filter	Tertiary	0.075	Inland
73	LA fitness	BESST	Tertiary	0.0135	Inland
74	La Quinta	Cromaglass	Tertiary	0.015	Inland
75	Lake Grove Apqartments	SBR	Tertiary	0.08	Inland
76	Lake Pointe	Extended aeration denite filter	Tertiary	0.117	Inland
77	Lakes @ Setauket	Biodisc denite filter	Tertiary	0.0861	Inland
78	Lakeview Woods Bayport	Cromaglass	Tertiary	0.015	Inland
79	Larkfield Gardens Atria	SBR	Tertiary	0.016	Inland
80	Lexington Village	Extended aeration	Secondary	0.03	Inland
81	DSW Plaza Loehmans Plaza	RBC denite filter	Tertiary	0.0428	Inland
82	Mac Arthur Plaza	Extended aeration denite filter	Tertiary	0.015	Inland
83	Medford multicare center for living	SBR	Tertiary	0.05	Inland
84	Medford NH	SBR	Tertiary	0.05	Inland
85	Medford Ponds	BESST	Tertiary	0.0545	Inland
86	Melville Mall	Biodisc denite filter	Tertiary	0.04	Inland
87	Memorial Sloan Kettering	Cromaglass	Tertiary	0.005	Inland
88	Middle Island Co-op	Extended aeration	Secondary	0.015	Inland
89	Mill Pond Estates	BESST	Tertiary	0.05	Inland
90	Montauk Manor	Oxidation ditch	Tertiary (Seasonal)	0.03	Inland
91	Nesconset NH	Extended aeration denite filter	Tertiary	0.042	Inland
92	Newsday	Aerotor/MBR	Tertiary	0.045	Inland
93	North Isle Village	Extended aeration denite filter	Tertiary	0.11	Inland
94	Northport VA	Extended Aeration w/ Suspended Growth De	Tertiary	0.35	Inland
95	Northport Village	Extended aeration denite filter	Tertiary	0.45	Surface Waters

Table 1 - Suffolk County Sewage Treatment Plants (2014)

2014 Suffolk County Sewage Treatment Plants (Continued Page 3)					
No.	**Sewage Treatment Name**	**Sewage Treatment Type**	**Tertiary or Secondary**	**NYS SPDES Design Flow (MGD)**	**Discharge Location**
96	Oak Creek Commons	Cromaglass	Tertiary	0.0048	Inland
97	Oak Hollow NH	Extended aeration upflow denite filter	Tertiary	0.035	Inland
98	Oak Ridge Hollow	Cromaglass	Tertiary	0.015	Inland
99	Oakwood Care Center Affinity	SBR	Tertiary	0.042	Inland
100	Ocean Beach	Chemical Carbon Filter	Secondary	0.5	Surface Waters
101	Orchard @ Bulls Head Inn	Cromaglass	Tertiary	0.085	Inland
102	Patchogue NH	Extended aeration upflow denite filter	Tertiary	0.02	Inland
103	Patch Senior Conifer 16128	SBR	Tertiary	0.04	Inland
104	Patchogue Village	Aerotor/MBR	Tertiary	0.5	Surface Waters
105	Paumanok Village	SBR	Tertiary	0.0427	Inland
106	Petite Fleur	Extended aeration denite filter	Tertiary	0.027	Inland
107	Pine Hills S Mirror Ponds	SBR	Tertiary	0.0225	Inland
108	Pinewood Gardens	Cromaglass	Tertiary	0.0036	Inland
109	Plum Island	Extended aeration	Secondary	0.05	Surface Waters
110	Ponds @ Southampton Village	BESST	Tertiary	0.027	Inland
111	Preserves @ Connetquote	Cromaglass	Tertiary	0.01236	Inland
112	Quail Run	SBR	Tertiary	0.087	Inland
113	Radisson Hotel Best Western	Extended aeration denite filter	Tertiary	0.027	Inland
114	Residence Inn	Cromaglass	Tertiary	0.015	Inland
115	Riverhead Town	SBR	Secondary	1.3	Surface Waters
116	Rocky Point Apts.	Extended aeration	Secondary	0.03	Inland
117	Ross Health Care	BESST	Tertiary	0.015	Inland
118	Rough Riders Landing	Oxidation ditch	Tertiary (Seasonal)	0.032	Inland
119	Saddle Brook	Cromaglass	Tertiary	0.01485	Inland
120	Sag Harbor	SBR	Tertiary	0.25	Surface Waters
121	Sagamore Hills	SBR	Tertiary	0.08	Inland
122	Sayville Commons	SBR	Tertiary	0.1	Inland
123	SCC Riverhead	SBR	Tertiary	0.012	Inland
124	SCC Selden	Extended aeration denite filter	Tertiary	0.151	Inland
125	SD # 1 Port Jefferson	SBR	Tertiary	1.15	Surface Waters
126	SD # 12 Birchwood	SBR	Tertiary	0.12	Inland
127	SD # 13 Wind Watch	Extended aeration denite filter	Tertiary	0.4	Inland
128	SD # 14 Parkland	SBR	Tertiary	1.25	Inland
129	SD # 15 Nob Hill	Extended aeration Susp. Growth denite	Tertiary	0.09	Inland
130	SD # 18 Hauppauge Industrial Park	SBR	Tertiary	1.85	Inland
131	SD # 2 Tallmadge	SBR	Tertiary	0.4	Inland
132	SD # 20W Leisure Village	SBR	Tertiary	0.3	Inland
133	SD # 21 SUNY Stony Brook	Oxidation ditch	Tertiary	2.5	Surface Waters
134	SD # 22 Hauppauge County Center	Cannabal	Tertiary	0.202	Inland
135	SD # 23 Coventry Manor	Bio disc denite filter	Tertiary	0.07	Inland
136	SD # 28 Fairfield@St James	Extended aeration denite filter	Tertiary	0.07	Inland
137	SD # 3 Bergen Point	Aeration	Secondary	30	Surface Waters
138	SD # 5 Strathmore Huntington	SBR	Tertiary	0.236	Inland
139	SD # 6 Kings Park	SBR	Tertiary	1.2	Surface Waters
140	SD # 7 Twelve Pines	Extended aeration susp. Growth denite	Tertiary	0.65	Inland
141	SD # 7 Woodside	Extended aeration denite filter	Tertiary	0.4	Inland
142	SD # 9 College Park	Extended aeration susp. Growth denite	Tertiary	0.045	Inland
143	SD #11 Selden	SBR	Tertiary	1.757	Inland
144	SD 20E Ridgehaven	Extended Aeration denite filter	Tertiary	0.083	Inland
145	SD Gabreski Airport	SBR	Tertiary	0.1	Inland
146	SD Yaphank County Center	Bio disc denite filter	Tertiary	0.25	Inland
147	Setauket Meadows	SBR	Tertiary	0.03	Inland

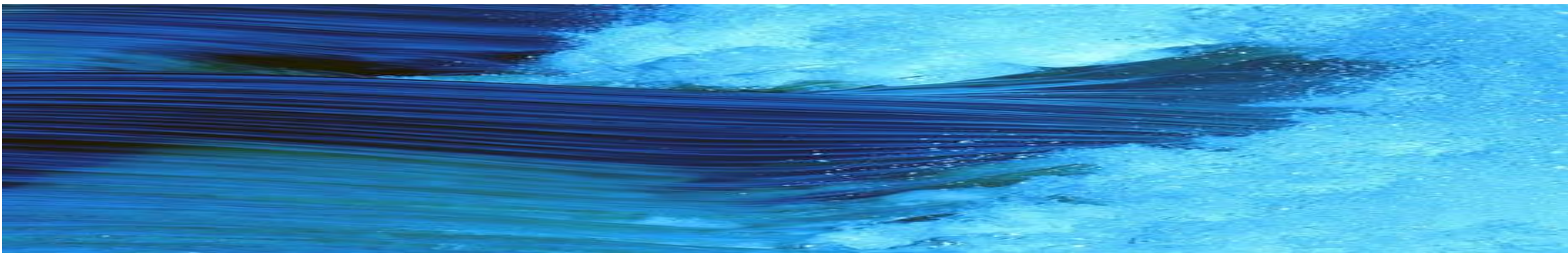
Table 1 - Suffolk County Sewage Treatment Plants (2014)

2014 Suffolk County Sewage Treatment Plants (Continued Page 4)					
No.	**Sewage Treatment Name**	**Sewage Treatment Type**	**Tertiary or Secondary**	**NYS SPDES Design Flow (MGD)**	**Discharge Location**
148	Shelter Island Heights	SBR	Secondary	0.028	Surface Waters
149	Silver Ponds	RBC denite filter	Tertiary	0.0917	Inland
150	Smithaven Mall	SBR	Tertiary	0.125	Inland
151	Smithtown Galleria	SBR	Tertiary	0.17	Inland
152	Somerset Woods	Extended aeration	Secondary	0.03	Inland
153	Southern Meadows	SBR	Tertiary	0.118	Inland
154	Southampton Commons	SBR	Tertiary	0.04	Inland
155	Southampton Hospital	Bio disc denite filter	Tertiary	0.104	Inland
156	Springhorn @ Blue Point	Cromaglass	Tertiary	0.011	Inland
157	Spruce Ponds Garden Apts	SBR	Tertiary	0.008	Inland
158	St Annes Gardens	Cromaglass	Tertiary	0.015	Inland
159	Stone Ridge at Dix Hills	Cromaglass	Tertiary	0.015	Inland
160	Stonehurst III	SBR	Tertiary	0.21	Inland
161	Stonington @ Port Jeff	SBR	Tertiary	0.05	Inland
162	Stony Hollow	SBR	Tertiary	0.1	Inland
163	Stratford Green	MBR	Tertiary	0.152	Inland
164	Stratmore on the Green	Extended aeration denite filter	Tertiary	0.0615	Inland
165	Sunrise assited living Smithtown	Cromaglass	Tertiary	0.0105	Inland
166	Sunrise Dix Hills	Cromaglass	Tertiary	0.012	Inland
167	Sunrise E. Setauket	Cromaglass	Tertiary	0.011	Inland
168	Sunrise Garden Apts.	BESST	Tertiary	0.03	Inland
169	Sunrise Holbrook	Cromaglass	Tertiary	0.011	Inland
170	Sunrise Village	SBR	Tertiary	0.0229	Inland
171	Tall Oaks	Extended aeration	Tertiary	0.03	Inland
172	Timber Ridge @ Westhampton	Cromaglass	Tertiary	0.015	Inland
173	Towne House Village South	Extended aeration	Tertiary	0.03	Inland
174	Valley Forge	SBR	Tertiary	0.0746	Inland
175	Victorian Gardens	SBR	Tertiary	0.09	Inland
176	Victorian Homes @ Medford	SBR	Tertiary	0.01125	Inland
177	Village in the Woods 00130	Extended aeration denite filter	Tertiary	0.0878	Inland
178	Villages @ Lake Grove	SBR	Tertiary	0.065	Inland
179	Fairfield Villas @ Medford	Cromaglass	Tertiary	0.01485	Inland
180	Villas @ Pine Hills	Extended Aeration denite filter	Tertiary	0.181	Inland
181	Vinyards @ E. Morriches	Cromaglass	Tertiary	0.0065	Inland
182	Walden Ponds	SBR	Tertiary	0.056	Inland
183	Waterways @ Blue Point	Extended aeration denite filter	Tertiary	0.09	Inland
184	Waverly Park	SBR	Tertiary	0.03	Inland
185	West Hampton NH	Extended aeration denite filter	Tertiary	0.027	Inland
186	Westhampton Pines	SBR	Tertiary	0.031	Inland
187	Westhampton Senior Living	Cromaglass	tertiary	0.015	Inland
188	Whispering Pines	Extended aeration denite filter	Tertiary	0.105	Inland
189	Willow Ponds	SBR	Tertiary	0.07	Inland
190	Windbrooke Homes	SBR	Tertiary	0.065	Inland
191	Woodbridge @ Hampton Bays	Cromaglass	Tertiary	0.00485	Inland
192	Woodcrest Estates	SBR	Tertiary	0.04	Inland
193	Woodhaven Manor	Extended aeration	Secondary	0.015	Inland
194	Woodhull Garden Apartments	SBR	Tertiary	0.0335	Inland
195	Yardarm	Bio disc denite filter	Tertiary (Seasonal)	0.046	Inland

Table 2
Sewage Treatment Plants Discharging to Surface Waters

Sewage Treatment Name	Design Flow (MGD)	Discharge Location (Estuary)	Has Consistently Attained Nitrogen Discharge Limit (Y/N)
Greenport Village	0.65	Long Island Sound	Y
Huntington Town	2.5	Huntington Bay (LIS)	Y
Northport Village	0.45	Northport Harbor (LIS)	Y
S.C.S.D. #6 Kings Park	1.2	Nissequogue River (LIS)	Y
S.C.S.D. #1 Port Jefferson	1.15	Port Jefferson Harbor (LIS)	Y
S.C.S.D. #21 SUNY SBU	2.5	Port Jefferson Harbor(LIS)	Y
Calverton Enterprise Park	0.078	Peconic River (PE)	Y
Riverhead Town	1.3	Peconic River (PE)	Y
Sag Harbor	0.25	Sag Harbor (PE)	Y
Shelter Island Heights	0.028	Greenport Harbor (PE)	Y
Plum Island	0.05	Gardiners Bay (PE)	Y
Ocean Beach	0.5	Great South Bay	Y
Patchogue Village	0.5	Patchogue River (GSB)	Y
S.C.S.D. #3 Bergen Point	30	Atlantic Ocean	Y

Note: Long Island Sound = LIS, Peconic Estuary = PE, and Great South Bay = GSB



Appendix J

Advanced Wastewater & Transfer of Development Rights Tour Summary

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:
Glynis Berry, Peconic Green Growth
Christopher Clapp, Nature Conservancy
Dorian Dale, Chief Recovery Officer and Director of Sustainability, Suffolk County
Walter Dawydiak, P.E., Director of Environmental Quality, Department of Health Services, Suffolk County
Suffolk County Legislator Kara Hahn
Kristina Heinemann, Agricultural and Decentralized Wastewater Management Coordinator, US EPA, Region 2
Walter Hilbert, P.E., Department of Health Services, Suffolk County
Paul Johnson, NYS Environmental Facilities Corporation
Sarah Lansdale, AICP, Director of Planning, Suffolk County
Chris Lubicich, P.E., Department of Health Services, Suffolk County
Boris Rukovets, Department of Public Works, Suffolk County
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Robert Sammons, P.E., NYS Environmental Facilities Corporation

Report prepared by:
John Sohngen, P.E.

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.

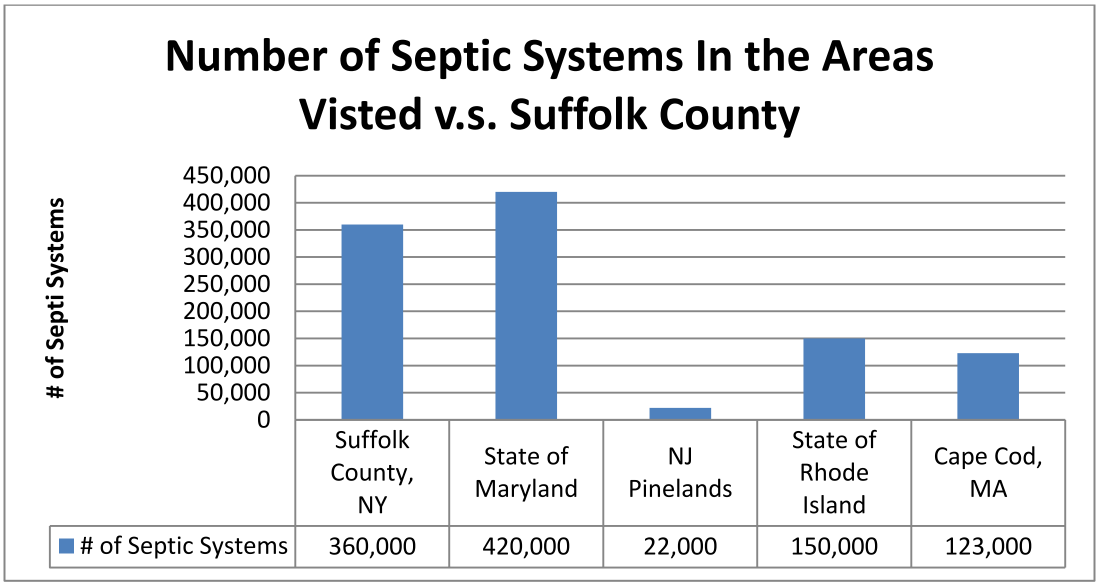

Figure 3: Number of Septic Systems in Jurisdictions Visited Compared to Suffolk County [Note: The NJ Pinelands is a small area within NJ]

<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

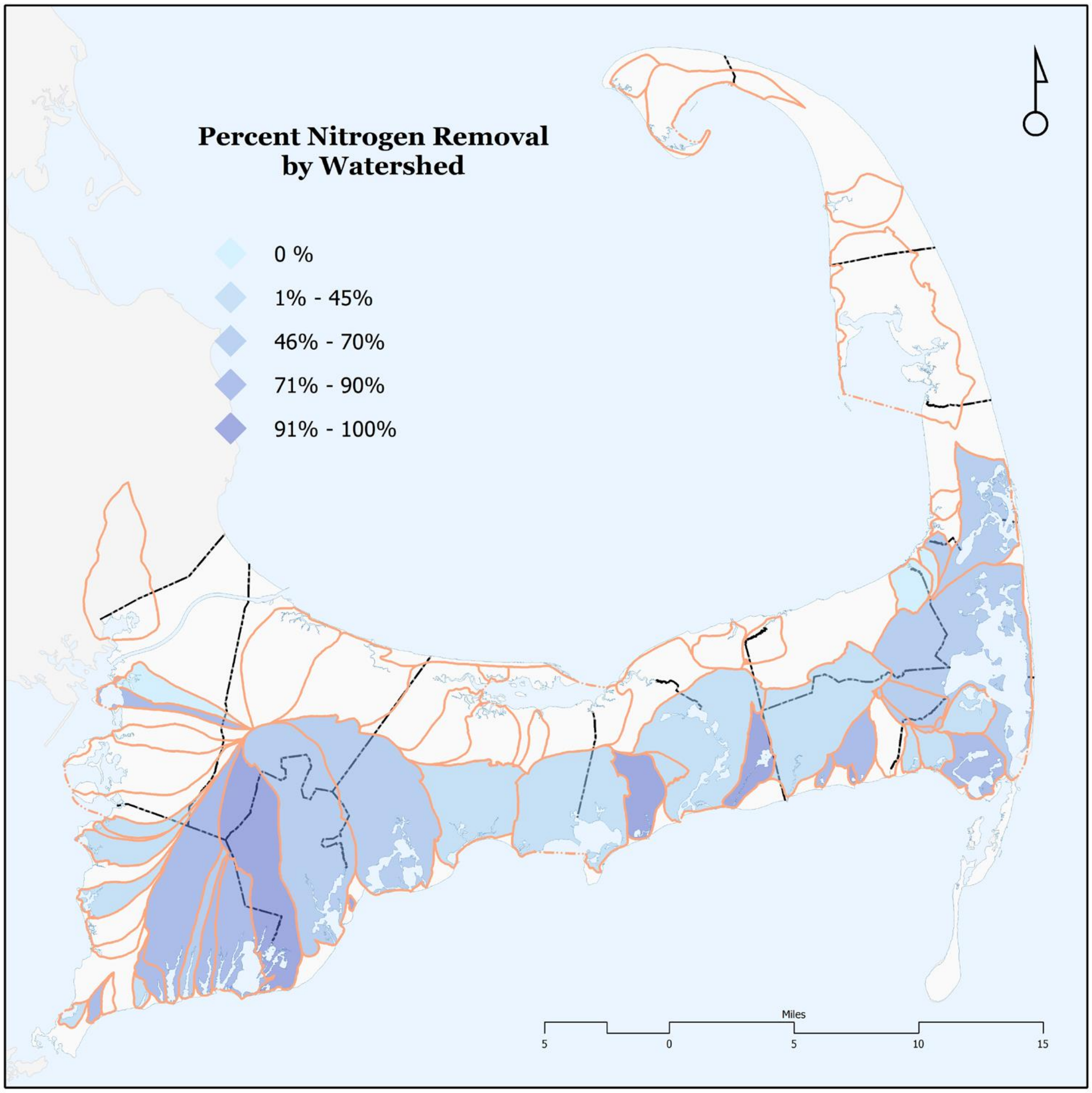

Figure 4: Cape Cod Commission Regional Wastewater Management Plan Model depicting percent nitrogen removal required to meet TMDL's

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.

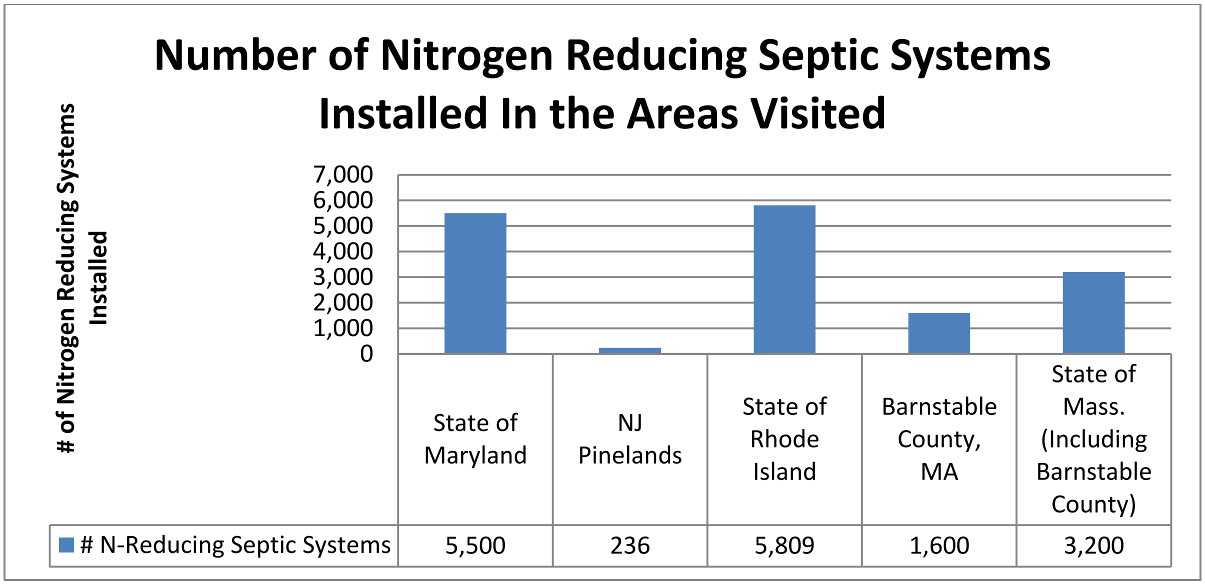

Figure 6: Number of Nitrogen Reducing Septic Systems Installed

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.

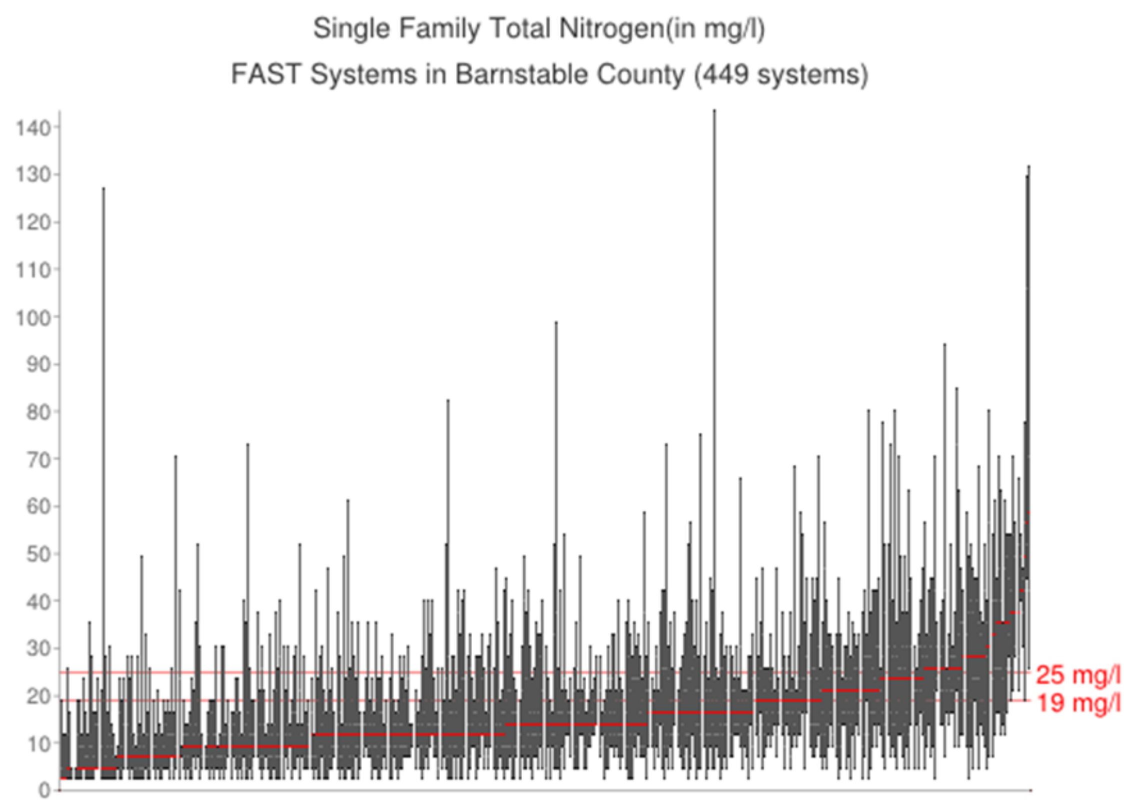

Figure 14: Barnstable County BioMicrobics FAST Total Nitrogen Effluent Data Graph

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

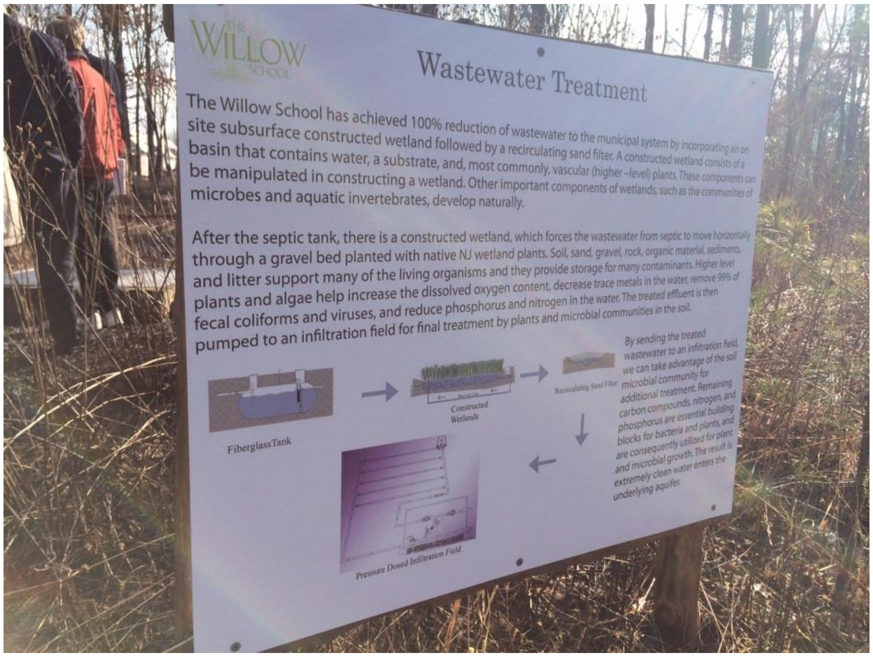

Figure 15: Willow Wood System Treatment Plan Sign and Description of Process Posted at Site

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.

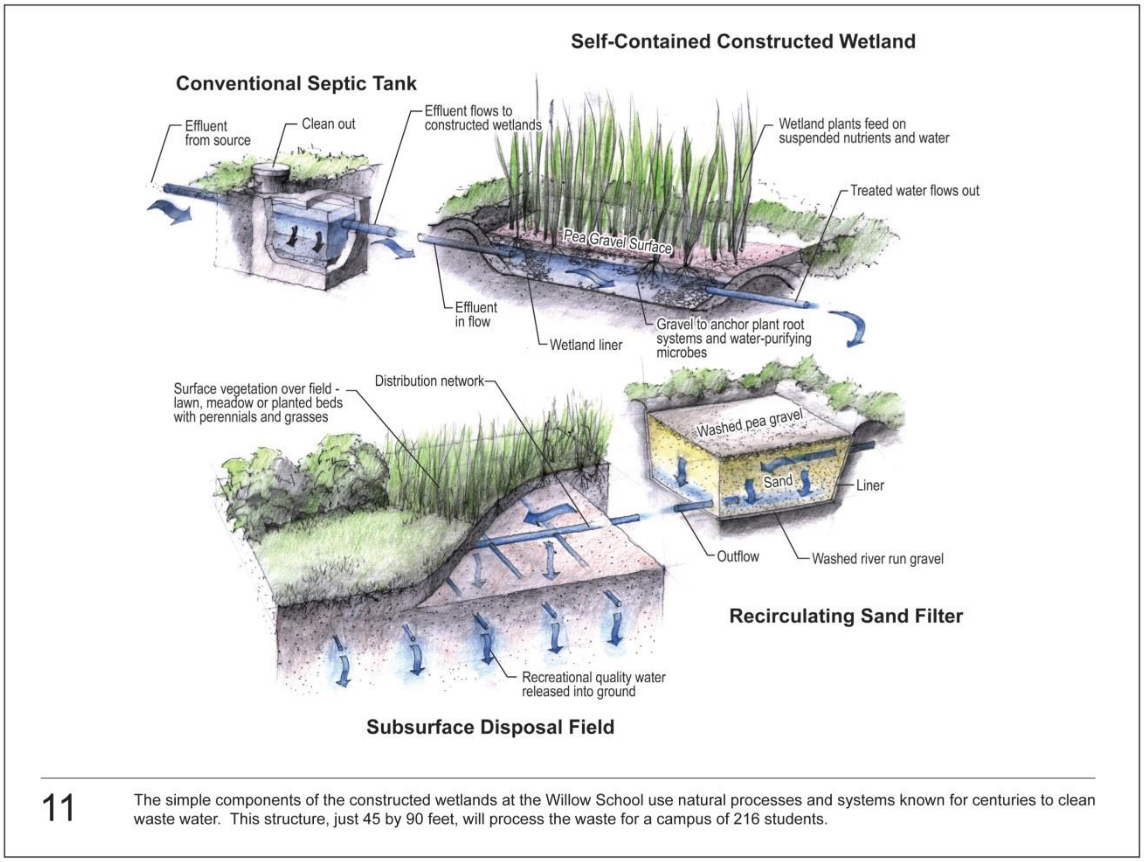

Figure 16: Diagram of Constructed Wetlands Treatment Unit Installed at the Willow School

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.

Appendix A: 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.

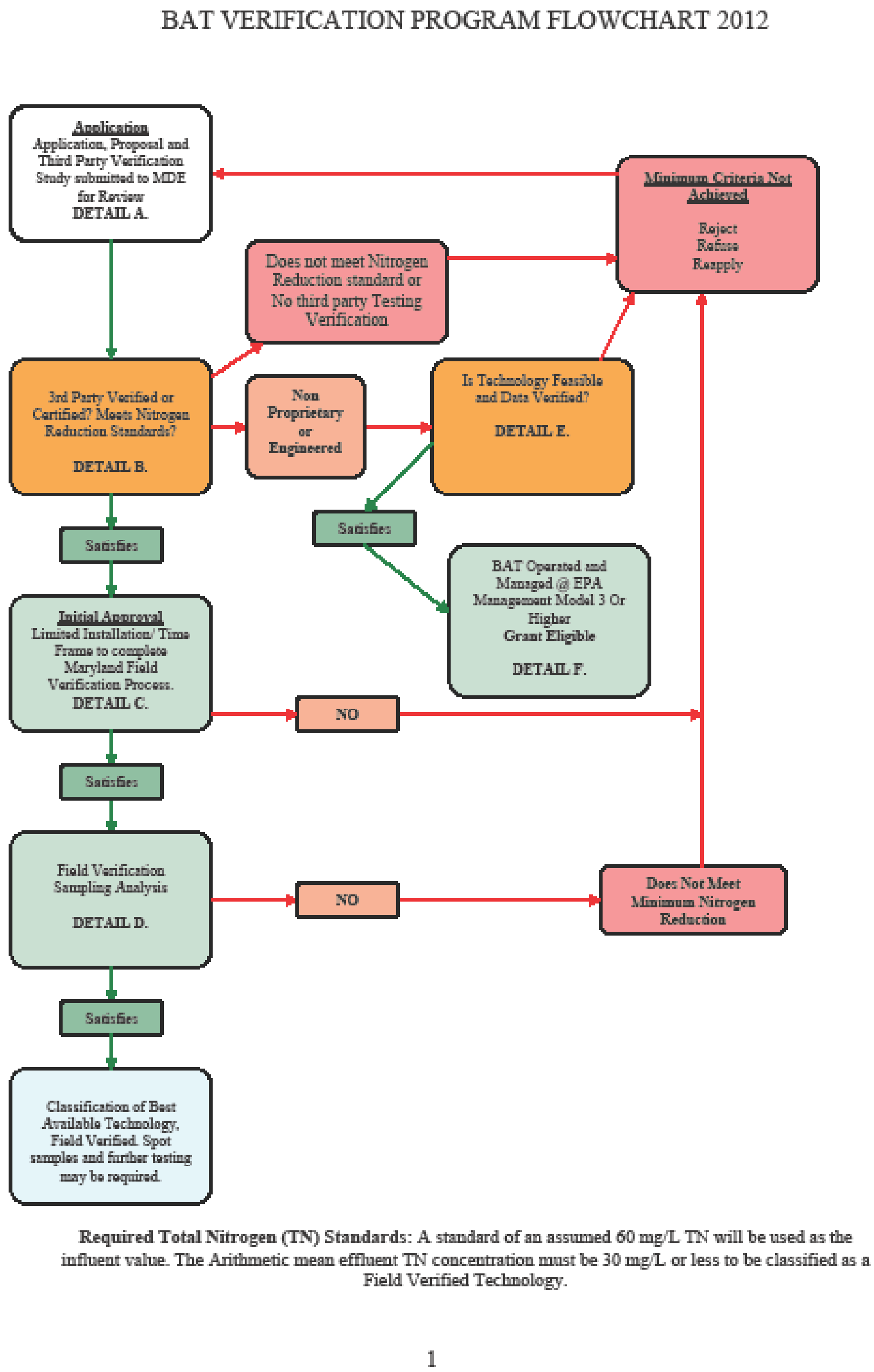

Figure 17: Flow Chart of MD Dept. of Environment BAT Verification Process Page 1

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.

<u>Appendix D:</u> 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.

Appendix K

Key Performance Indicators

(Under Development)

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