ANNUAL REPORT
TO THE NEW JERSEY PINELANDS COMMISSION

ALTERNATE DESIGN TREATMENT SYSTEMS PILOT PROGRAM

August 5, 2012

Background

The Federal and New Jersey Pinelands statutes call for the preservation, protection and enhancement of the unique Pinelands ecosystem and its land and water resources. The exceptional quality of Pinelands water resources is protected and maintained through the control of development and other land uses and through close cooperation and coordination between local, state and federal agencies. To safeguard Pinelands water resources, the water quality provisions of the Pinelands Comprehensive Management Plan (CMP), (available for download at http://www.state.nj.us/pinelands/cmp/) focus on controlling the amount of nitrogen that enters the environment. Nitrogen is a significant point and nonpoint source pollutant due to its role in the eutrophication of surface water bodies. It is a useful indicator of overall Pinelands water quality and ecosystem health because it is naturally present in very low concentrations in the Pinelands environment. In recent years, there has been much attention focused on the role that excessive nitrogen has played in the decline of the Barnegat Bay ecosystem. The Pinelands Area accounts for fully 33% of Barnegat Bay's Watershed and efforts to control nitrogen releases in the Pinelands Area can have a significant impact on both the Pinelands and Barnegat Bay ecosystems. The Pinelands CMP has always recognized the importance of controlling nitrogen on both local and regional scales and provides for the establishment of land use policies and engineering solutions to protect the regions sensitive ecology.

The Commission's land use program discourages development in important ecological and agricultural areas while directing growth towards more suitable areas. While some of the designated growth areas are served by central sewer systems, others are not. In these unsewered growth areas, municipalities may zone for residential development on lots as small as one acre. One acre lots are also permitted in non-growth areas if certain cultural housing and grandfathered ownership conditions are met. In very limited instances, waivers of strict compliance allow for development of unsewered dwellings on lots as small as 20,000 square feet.

The water quality standards of the CMP permit the use of on-site septic systems (individual subsurface sewage disposal systems) provided that the design of the system and the size of the parcel on which the system is located will ensure that the concentration of nitrogen in the ground water exiting the parcel or entering a surface water body will meet the Commission's water quality standard of two parts per million (ppm). The CMP utilizes the Pinelands Septic Dilution Model to calculate nitrogen loading to groundwater from septic systems and to confirm that proposed loadings do not exceed the assimilative capacity of the environment. When standard values for home occupancy, wastewater volume, wastewater strength and rainfall infiltration are used in solving the model, the model calculates that a minimum 3.2 acre parcel is required to dilute nitrogen to the required 2 part per million (ppm) concentration when conventional septic system technology is used. Conventional septic system technology, typically consisting of a septic tank and effluent dispersal field (and sometimes a pump and dosing tank) is ineffective at removing or attenuating nitrogen levels in wastewater. Thus, unsewered residential development using standard (conventional) septic system technology is permitted only on minimum 3.2 acre parcels.

In order to comply with the Pinelands water quality standard, unsewered residential development on parcels smaller than 3.2 acres requires the use of advanced onsite denitrifying wastewater treatment technology. If the mass of nitrogen contained in the wastewater discharged from an on-site septic system is sufficiently reduced through the use of an advanced treatment system, the CMP allows the minimum lot size required to meet the 2 ppm property line concentration to be reduced from 3.2 acres down to a minimum of 1.0 acre.

The basic principles of biological nitrogen reduction in wastewater are well documented in the engineering literature. In fact, biological nitrification and denitrification is now routinely employed at large centralized sewage treatment plants, especially those that discharge treated effluent to environmentally sensitive receiving waters. These large scale treatment facilities utilize professionally trained and licensed operators and have the ability to enhance nitrogen removal through the use of chemical feed equipment and to make real time process modifications in response to changing influent wastewater characteristics.

The use of biological denitrification technologies at the much smaller scale of individual onsite systems is a relatively recent development. The US EPA as well as number of individual states and regions have developed and are currently administering programs to study the effectiveness of onsite wastewater denitrification treatment technologies. The Ad Hoc Committee On Alternative Septic Systems, convened by the Pinelands Commission in

March 2000, conducted a thorough review of this ongoing work to evaluate alternate treatment technologies nationwide, consulted with officials from other state and university programs involved with advanced on-site septic system technologies and management strategies, retained a consultant to assess the technical performance of selected technologies, met with treatment system manufacturers and county health officials, and coordinated research efforts with the New Jersey Department of Environmental Protection (NJDEP). After completing this extensive research, the Committee recommended the establishment of a pilot program to test five specific onsite wastewater treatment systems. The Alternative Design Wastewater Treatment Systems Pilot Program contained in the CMP at N.J.A.C. 7:50-10.21 is authorized as a means to test whether these systems can be operated and maintained so as to meet the Pinelands water quality standards, with maintenance requirements that a homeowner can be reasonably be expected to follow.

Abridged timeline for the Pinelands Alternate Design Wastewater Treatment Systems Pilot Program:

Aug. 5, 2002	Effective date of the pilot program; residential development applications received after this date for lots less than 3.2 acres that are not served by public sewer are required to use a Pinelands alternate design wastewater treatment system. Completed applications received prior to this date were permitted to use a pressure dosing septic system provided the installation was completed by August 5, 2004.
Aug. 5, 2003	Last day to obtain design plan approval from a local/county health department for a pressure dosing septic system on less than 3.2acre parcel for completed applications received prior to August 5, 2002.
Aug. 5, 2004	Last day to complete the installation of a pressure dosing septic system for those plans approved prior to August 5, 2003.
Nov. 3, 2006	Executive Director's Implementation Report issued to the Commission (available at: http://www.state.nj.us/pinelands/images/pdf%20files/Final_110306_Pilot_Septic_Implem_Rpt_.pdf.) The report recommended the removal of the Ashco RSFIII system from the Alternate Design Treatment Systems Pilot Program due to its commercial unavailability, imposition of a temporary suspension of new Cromaglass installations based upon non-attainment of effluent total nitrogen targets. and an extension of the Alternate Design Treatment Systems Pilot Program to allow continued installation of the pilot program systems.
June 15, 2009	Publication of proposed CMP amendments (N.J.A.C. 7:50-2.11, 3.39 and 6.85) addressing septic system management.
Nov. 5, 2009	Executive Director's second Implementation Report issued to the Commission (available at http://www.state.nj.us/pinelands/landuse/waste/Final_Nov%202009_ImplementationReport.pdf). The November 5, 2009 Implementation Report addressed nitrogen removal efficiencies of the treatment technologies, maintenance requirements, cost, frequency of system problems, an evaluation of the number of systems installed and a determination as to the adequacy of that number to render a final determination on the effectiveness of the treatment technologies in meeting the purposes and objectives of the State and Federal Pinelands Acts.
June 7, 2010	Effective date of CMP amendments which established requirements for the long-term management of Pinelands alternate design wastewater treatment systems.
Oct. 18, 2010	Effective date of the permanent approval of the Amphidrome and Bioclere technologies. Amendment authorizing the addition of up to four new NSF 245 USEPA ETV certified treatment technologies to the pilot program for installation through August 5, 2016.
Dec. 5, 2011	Notice published in the New Jersey Register announcing acceptance of the four "new"

	technologies: BioBarrier, Busse Green, Hoot ANR and SeptiTech for participation in the Commission's pilot program (subject to approval of requisite documents).
May 8, 2012	Pinelands staff approval of standard documentation (deed notices, O&M contracts, warranties, sampling protocols, homeowner manuals, engineering drawings) for the new pilot program technologies. Approved record documents provided to NJDEP for TWA approval.
August 5, 2013	Last day to install a Cromaglass and FAST treatment system unless a rule is adopted which expressly authorizes such installations beyond this date (pursuant to the June 7, 2010 proposed CMP pilot program amendment).
August 5, 2016	Last day to install a new advanced treatment technology provided such technology is authorized for use by the Commission absent a rule amendment which expressly authorizes such installations beyond this date (pursuant to the June 7, 2010 proposed CMP pilot program amendment).

Introduction

Amendments to the CMP establishing the Pinelands Alternate Design Wastewater Treatment System Pilot Program became effective on August 5, 2002. The rule requires that the Executive Director submit an annual report to the Commission describing activity to date on the installation, maintenance and performance data for each alternate design wastewater treatment technology. This tenth annual report is submitted to fulfill the annual reporting requirement.

Before any of the approved technologies can be used within the Pinelands Area, the manufacturer of the treatment system must first submit and the Executive Director must first approve detailed engineering design plans and system specifications, details on the automatic alarm dialing system, a wastewater sampling protocol, an operation and maintenance manual, a sample five year warranty, a sample five year operation and maintenance contract, and a sample deed notice. In addition, the New Jersey Department of Environmental Protection (NJDEP) must first issue a Treatment Works Approval (TWA) authorizing local/county health departments to approve such systems pursuant to N.J.A.C 7:9A Standards for Individual Subsurface Sewage Disposal Systems (7:9A-3.9(a)4).

Use of the alternative onsite wastewater treatment systems is now authorized in each of the Pinelands Area municipalities as a result of amendments to the CMP which became effective on December 3, 2007. Prior to that amendment, the pilot program technologies were only authorized for use in municipalities that had adopted an ordinance to implement the pilot program. Although most municipalities had adopted the requisite ordinance (34 of 40) the Commission found that applicants in the non-adopting municipalities were subjected to considerable hardship. The December 3, 2007 amendments have proven to be effective in providing those aggrieved applicants with needed relief. Details of this amendment are discussed below.

The CMP also requires that each technology manufacturer or its agent submit a semi-annual report to the Executive Director which includes information on the number of systems installed, a discussion on the installation of systems, an analysis and evaluation of wastewater monitoring results to date, and a discussion of any operational or maintenance issues experienced.

Summary of Program Activity

The Pinelands Alternate Design Wastewater Treatment Systems Pilot Program was originally made possible as a result of grant funding provided to the Pinelands Commission from the NJDEP. In May 2009, Commission staff satisfied the final grant deliverable by providing the NJDEP, Division of Watershed Management with the Final Report on the "Atlantic Coastal Watershed Region Program Grant: Decentralized Wastewater Management in the Mullica River Basin and Other Pinelands Watersheds". The Commission continues to provide the NJDEP with copies of its Annual Report on the Alternate Design Wastewater Treatment Systems Pilot Program to keep the Department apprised of the pilot programs technology performance data and to further the technology transfer goals of the pilot program.

Septic System Management Initiatives

Pinelands Commission [N.J.A.C 7:50] Pinelands Comprehensive Management Plan
Since 1980 the Pinelands Commission has recognized the environmental benefits of periodic septic system maintenance. From its beginnings, the CMP has required that septic systems in the Pinelands be inspected and pumped at least once every three years and that written proof of maintenance be submitted to the local boards of health. In June 2009, the Commission proposed several amendments to the CMP at N.J.A.C. 7:50-2.11, 3.35, and 6.85 to further address septic system management. Those proposed amendments were related to the management of both conventional septic systems as well as advanced pilot program treatment systems. The rule proposal aimed to establish a framework for institutional or governmental programs to ensure the proper long-term operation and maintenance of all onsite wastewater systems in the Pinelands.

The Commission received extensive public comment on the septic system management rule proposal. A great number of the comments were opposed to the management of conventional septic systems. Responding to public opposition the Commission withdrew the section of the rule related to conventional septic systems and retained the rules that require long term management of the advanced pilot program technologies. This action resulted in the continuation of the existing CMP rule related to the triennial inspection and pumping of conventional septic systems.

NJDEP [N.J.A.C. 7:15] Water Quality Management Plan
The 2009 CMP septic management proposal for alternative septics was developed in harmony with NJDEP's Water Quality Management Planning (WQMP) rules (N.J.A.C 7:15-5.25(e) adopted in 2008. These state-wide rules require that municipalities must demonstrate that areas served by septic systems are subject to a mandatory maintenance program to ensure that all septic systems are functioning properly. The NJDEP rule specifies that management programs must include requirements for periodic pump out and maintenance, as needed.

NJDEP [N.JAC. 7:9A] Standards for Individual Subsurface Sewage Disposal Systems
In April 2012, NJDEP readopted state-wide Standards for Individual Subsurface Sewage Disposal Systems (Standards) (N.J.A.C 7:9A). These rules require that local/county health departments provide written notice triennially to septic system owners on the proper operation and maintenance of septic systems. The comprehensive notices must include:

1. A general outline of how septic systems work and the potential impact of improper operation on ground and surface water quality and public health;
2. The recommended frequency of septic tank and grease trap pumping and instructions on how to determine when pumping is necessary;
3. A list of materials containing toxic substances that are prohibited from being disposed of into a septic system;
4. A list of inert or non-biodegradable substances that should not be disposed of into a septic system;
5. Proper practices for maintaining the area of the septic leach field;
6. Negative impacts to a septic system resulting from excessive water use; and
7. Warning signs for poor system performance or malfunctions and recommended or required corrective actions.

The NJDEP Standards for the first time authorized the state-wide use of advanced onsite wastewater treatment systems for new construction without first requiring a Department issued TWA permit. The Standards require that local or county health departments maintain records on each advanced treatment system in their jurisdiction and provide annual reports to the NJDEP with respect to the following:

i. The type of advanced wastewater treatment device installed;
ii. The location of each installed device;
iii. The type of use (e.g., residential or commercial);
iv. The type of disposal area (e.g., bed, trench, drip dispersal);
v. The date of installation and startup; and
vi. The date of each inspection and maintenance call.

The Standards are similar to the Commission's pilot program requirements. For example, the owner of each advanced treatment system must have a service contract in place throughout the live of the system with an authorized service provider. The DEP Standards require system owners to provide the local or county health department with a copy of the service contract prior to the health department's initial approval of the system. In the event that a property owner enters into a contract with a different service provider upon expiration of an existing contract, the homeowner must provide the health department with the new contract within 14 days of making the change. Importantly, if a property owner fails to renew a service contract, the previously authorized service provider is required to provide written notice to the health department within 30 days of the contract expiration. Authorized service providers must provide copies of system inspection forms to the health department within 30 days of the inspection. Pursuant to the NJDEP Standards, the failure by a property owner to maintain a service contract on an advanced treatment system constitutes a violation of the Water Pollution Control Act , N.J.S.A. 58:10A-1 et seq. and constitutes a noncompliance violation of N.J.A.C 7:9A.

The NJDEP Standards related to the installation and use of advanced treatment systems apply state-wide to all advanced treatment systems governed by the DEP Standards, including Pinelands alternate design pilot program wastewater treatment systems. Commission staff is taking steps to ensure that all of the Pinelands Area health departments, Pinelands alternate design treatment system manufacturers and service providers, and owners of Pinelands alternate design treatment systems are aware of NJDEP's April 2, 2012 rule adoption, particularly with respect to the DEP's newly adopted enforcement provisions.

Production of Educational Materials

The Commission staff offers assistance to the Pinelands Area municipalities and Pinelands Area health departments in achieving compliance with the NJDEP's N.J.A.C. 7:15 and NJAC 7:9A septic system management requirements. The Commission has produced a number of useful educational documents for use by residents and public health officials. Municipalities and Health Departments are encouraged to consult the Onsite Wastewater Systems Management Manual for the New Jersey Pinelands, (prepared by Stone Environmental, Inc. under contract to the Commission) for guidance on the establishment of mandatory management programs. The manual explores several management models for municipalities and others to consider and provides flexibility in the selection of any single model or any combination of model elements that are locally appropriate. This manual, as well as other related materials, including an informative septic system maintenance guidance document directed at homeowners is posted on the Commission's website at www.nj.gov/pinelands

Pilot Program Amendments

The Commission enacted several amendments to the Alternate Design Treatment System Pilot Program provisions of the Pinelands Comprehensive Management Plan (CMP) during the period of August 2007 through October 2010. Amendments were adopted to: (1) address situations where municipalities had not yet adopted ordinances to implement the pilot program, (2) address one manufacturer's (ASHCO) inability to provide it's technology to Pinelands residents, (3) provide for management of pilot program treatment systems beyond the original five year mandatory maintenance contract period, and (4) extend the period of the pilot program to better evaluate both existing and new treatment technologies. The latest amendment extended the duration of the pilot program, granted permanent approval status to two of the pilot program technologies (Bioclere and Amphidrome) and authorized the Commission to approve up to four new pre-screened National Sanitation Foundation (NSF) / American National Standards Institute (ANSI) Standard 245 and/or United States Environmental Protection Agency - Environmental Technology Verification (USEPA ETV) certified technologies to participate in the pilot program. As noted, in the current reporting period (June 5, 2011 through June 5, 2012), Commission staff has approved the BioBarrier, SeptiTech, Hoot ANR and Busse Green MBR systems for participation in the pilot program, subject to NJDEP issuance of a TWA.

NJDEP Pre-Approvals

The NJDEP has provided welcome assistance to the Commission in the development of the pilot program. To expedite the local health department approvals of the Pinelands pilot program systems, NJDEP issued a Generic TWA Permit which allows the use of the original five Pinelands pilot program systems without individual applicants being subject to the standard $850 NJDEP permit fee or 90 day review period. The expedited NJDEP Generic TWA Permit has been well received by both the regulatory and development community. It has proven to be an effective instrument by allowing individual applications to be approved directly by the Pinelands county health departments resulting in significant time and expense savings to the applicants. NJDEP is currently reviewing the BioBarrier, SeptiTech, Hoot ANR and Busse Green MBR for issuance of a generic TWA.

Local and Regional Training and Technology Transfer

Commission staff has met with each of the Pinelands Area health departments to facilitate implementation of the pilot program and to assist the health departments in their review of plans and applications and to train inspectors on the alternative treatment technologies. In addition, Commission staff is invited to provide classroom training during the annual Onsite Wastewater Treatment Systems continuing professional education course sponsored by NJDEP and Rutgers University. This course is well attended every year by state, local and regional public health professionals, septic system design engineers, system installers and other onsite system service providers. In addition, staff regularly provides homeowner education related to the use of onsite wastewater systems.

During the duration of the pilot program, Commission staff has participated in several local, regional, and national educational conferences to share the Commissions experiences gained through the pilot program. During the current reporting period, Commission staff presented at the October 11-13, 2011 Onsite Water Protection Conference at North Carolina State University in Raleigh, N.C and the May 2012 Rutgers Onsite Wastewater Treatment Systems Continuing Professional Education Seminar. In addition, the Commission sponsored a one day training seminar at the Richard Stockton College of New Jersey on March 30, 2012 to provide training to Pinelands Area health departments on the four new pilot program technologies. Previous presentation highlights include a January 2004 presentation at a USEPA conference in Mt. Kisco, NY, a March 2004 presentation at the New Jersey Environmental Health Association conference in Atlantic City, NJ, a June 2007 presentation at the National Environmental Health Association conference in Atlantic City, NJ, an October 2007 presentation at the Massachusetts Health Officers Association conference in Springfield, MA, a March 2008 presentation at the New England Interstate Water Pollution Control Commission conference in Groton, CT, a June 2008 presentation at the National Environmental Health Association conference in Tucson, AZ, a October 2008 presentation at the Central Pine Barrens (Long Island) Joint Planning Commission conference in Brookhaven, NY., and a January 31, 2011 Peconic Bay (Long Island) Advanced Wastewater Treatment Systems Water Quality Symposium.

In 2010, the Commission staff has also conducted thirteen evening workshops throughout the Pinelands Area to enhance awareness of the connection between septic system maintenance and clean water, property values and quality of life. In addition, commission staff regularly provides telephone assistance to homeowners, builders, developers and consulting engineers in complying with the requirements of the pilot program.

Treatment Technologies Installation Summary

Under the original (August 5, 2002) CMP amendment to adopt the Alternate Design Treatment Systems Pilot Program, the five Pinelands alternate design pilot program technologies were:

1. Ashco RFS III [1]
2. Amphidrome
3. Bioclere
4. Cromaglass
5. FAST

Two hundred and twenty (220) Pinelands alternate design treatment systems have been installed and activated to date, with the first system coming online in April 2004. Ten (10) alternate design systems were installed during the current reporting period, June 2010 through June 2012. The following table summarizes annual installations of each technology.

[1] Amendments to the CMP, effective December 3, 2007 removed the Ashco RFS III from the pilot program due to the manufacturer's failure to make the system commercially available in the Pinelands during the initial five year period of the pilot program and to otherwise demonstrate the ability or intention for future participation in the program.

Technology	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total Installed
Amphidrome	7	10	11	29	13	7	5	8	4	94
Bioclere	-	2	11	9	7	9	6	5	3	52
Cromaglass	-	5	39	7	4	1	0	-	-	56
FAST	-	-	-	-	2	5	3	5	3	18
Total	7	17	61	45	26	22	14	18	10	220

Of the two hundred and twenty (220) operational systems, ninety-four (94) are Amphidrome systems, fifty-two (52) are Bioclere systems, fifty-six (56) are Cromaglass systems, and eighteen (18) are FAST systems. Technology type and location are summarized in the table below.

	Atlantic County							Burlington County							Camden Co.			Cape May Co.			Gloucester Co.		Ocean County				
TECHNOLOGY	Estell Manor	Galloway	Folsom	Hamilton	Mullica	Hammonton	Egg Harbor	Pemberton	Washingtom	Medford	Tabernacle	Woodland	Evesham	Shamong	Waterford	Chesilhurst	Winslow	Woodbine	Dennis	Upper	Franklin	Monroe	Jackson	Lacey	Manchester	Stafford	Total
Amphidrome		1	6	13	3	5	2	12	1	3	3	2		1	3		9		1		1		10	1	16	1	94
Bioclere	2			16	5	1	2	11			2	2	1			1	6	1		1			1				52
Cromaglass			1	4				22			1						4				1		13		10		56
FAST			1	1			1			2		1					6				2	3	1				18
Total	2	1	8	34	8	6	5	45	1	5	6	5	1	1	3	1	25	1	1	1	4	3	25	1	26	1	220

The majority of systems installed in Pemberton Township are located in the Presidential Lakes subdivision which was created under a prior Commission Approval which required the use of pressure dosing septic systems. Pinelands alternate design treatment systems were not required but were used voluntarily by the developer in response to local water quality concerns.

Administrative Approval of Technologies

In accordance with the provisions of the pilot program, prior to being certified for use, the manufacturer of each alternate design treatment system had to submit specific documents to the Executive Director for review and approval. These documents include detailed engineering plans and specification, a Homeowners Manual on the proper use and operation of the system, a service provider's Operation and Maintenance Manual, a sample 5 year warranty, a sample 5 year operation and maintenance service contract, wastewater sampling and analysis protocols, and a sample deed notice to be filed with the County Clerk prior to the operation of each system to alert future property owners of the need to maintain the pilot program system.

Technology Approvals – First Round

Ashco-A-Corporation provided the required documentation and based upon a detailed review by Commission staff, the Executive Director approved the Ashco RFS III Gravity system effective May 15, 2003. However, as noted above, the Ashco RFS III has been eliminated from the pilot program due to the firm's inability to supply treatment units to the region.

F.R Mahony & Associates, the manufacturer of the Amphidrome system provided the required documentation and, based upon a detailed review by Commission staff, the Executive Director approved the single family Amphidrome system effective July 24, 2003. Based upon the Pinelands Septic Dilution Model, each Amphidrome system must be located on a parcel containing at least one acre for each dwelling unit that will be served by the system. As noted above, the Amphidrome treatment technology has been released from the pilot program and granted permanent approval status in the CMP for residential use on minimum one acre parcels. As a result, F.R. Mahony & Associates is no longer required to submit monitoring and operational data to the Commission. The Amphidrome technology nevertheless must be designed to accommodate effluent sampling, certified prior to and after construction by the manufacturer or agent and by a NJ licensed professional engineer to be properly designed and operational, equipped with local and remote alarm functionality, sold with a five-year warranty and covered under a renewable operation and maintenance contract for as long as the system is in active use.

Aquapoint, Inc., the manufacturer of the Bioclere system provided the required documentation and, based upon a detailed review by Commission staff, the Executive Director approved the single family Bioclere system effective November 18, 2003. Based upon the Pinelands Septic Dilution Model, each Bioclere system must be located on a parcel containing at least one acre for each dwelling unit that will be served by the system. As noted above, the Bioclere treatment technology has been released from the pilot program and granted permanent approval status in the CMP for residential use on minimum one acre parcels. As a result, Aquapoint is no longer required to submit monitoring and operational data to the Commission. The Bioclere technology nevertheless must be designed to accommodate effluent sampling, certified prior to and after construction by the manufacturer or agent and by a NJ licensed professional engineer to be properly designed and operational, equipped with local and remote alarm functionality, sold with a five-year warranty and covered under a renewable operation and maintenance contract for as long as the system is in active use.

Cromaglass, Inc., the manufacturer of the Cromaglass system provided the required documentation and, based upon a detailed review by Commission staff, the Executive Director approved the Cromaglass system effective December 29, 2004. Based upon the Pinelands Septic Dilution Model, the pilot program provides that each Cromaglass system be located on a parcel containing at least one acre for each dwelling unit that will be served by the system. As discussed herein, the Cromaglass technology remains under a temporary suspension as a result of the technology's inability to meet expected total nitrogen concentrations in treated effluent. The current suspension prohibits new installations of the Cromaglass technology. Staff had been considering recommending to the Commission that the Cromaglass technology be eliminated from the pilot program however, because the Cromaglass Corporation is currently engaged in long-delayed system retrofits, staff is willing to evaluate the impact of those retrofits before initiating action to potentially de-list the Cromaglass technology. In addition staff had previously considered further recommending that owners of the Cromaglass technology be provided with the option to remove or convert the Cromaglass technology to a conventional septic system. These options were under consideration because the Cromaglass technology previously appeared to provide no substantive benefit in reducing total nitrogen in comparison to a conventional septic system and thus suggested that there may have been no justification to burden owners of the Cromaglass system with the expense of maintaining an ongoing operation and maintenance contract for an ineffective technology.

Bio-Microbics, Inc., the manufacturer of the FAST system provided the required documentation and, based upon a detailed review by Commission staff, the Executive Director approved the FAST system effective June 9, 2005. Based upon the Pinelands Septic Dilution Model, the pilot program provides that each FAST system be located on a parcel containing at least one acre for each dwelling unit that will be served by the system. As further discussed herein, the Executive Director had considered instituting a temporary suspension on the installation of new FAST systems as a result of the technology's inability to meet expected total nitrogen concentrations in treated effluent. Commission staff is now recommending that the FAST system be permitted to continue to participate in the pilot program based upon recently improved test data which appear to be the result of system retrofits. The post retrofit data are provided in Table 7.

Technology Approvals – Second Round

Hoot Systems, LLC., the manufacturer of the Hoot ANR system provided the required documentation (including the NSF Standard 245 certification report) and, based upon a detailed review by Commission staff, the Executive Director approved the single family Hoot ANR system effective September 14, 2011. Based upon the Pinelands Septic Dilution Model, each Hoot ANR system must be located on a parcel containing at least one acre for each dwelling unit that will be served by the system.

SeptiTech, LLC., the manufacturer of the SeptiTech system provided the required documentation (including the NSF Standard 245 certification report) and, based upon a detailed review by Commission staff, the Executive Director approved the single family SeptiTech system effective September 14, 2011. Based upon the Pinelands Septic Dilution Model, each SeptiTech system must be located on a parcel containing at least one acre for each dwelling unit that will be served by the system.

Bio-Microbics, Inc., the manufacturer of the BioBarrier system provided the required documentation (including the NSF Standard 245 certification report) and, based upon a detailed review by Commission staff, the Executive Director approved the single family BioBarrier system effective September 14, 2011. Based upon the Pinelands Septic Dilution Model, each BioBarrier system must be located on a parcel containing at least one acre for each dwelling unit that will be served by the system.

Busse Green Technologies, Inc., the manufacturer of the Busse Green MBR system provided the required documentation (including the NSF Standard 245 certification report) and, based upon a detailed review by Commission staff, the Executive Director approved the single family Busse Green MBR_system effective September 14, 2011. Based upon the Pinelands Septic Dilution Model, each Busse Green MBR system must be located on a parcel containing at least one acre for each dwelling unit that will be served by the system.

None of the four new pilot program technologies have yet been installed during the current reporting period.

System Permitting and Local Approvals

The pilot program relies upon the cooperation of local construction code officials, county health officials, treatment system manufacturers, system installers, certifying engineers and Pinelands staff to coordinate the approval of wastewater system engineering plans, the issuance of building permits, the approval of wastewater system installations and the issuance of certificates to occupy residences served by the alternative treatment technologies. Prior to any Pinelands alternative treatment system being issued a final operational approval, the Pinelands area health departments and the Pinelands Commission are to receive an executed five year maintenance contract, five year warranty, three year wastewater sample and analysis protocol, deed notice, as-built plan and construction certification from the technology manufacturer and the NJ licensed engineer of record. While these documents have been received in the majority of cases, there have been instances of certificates of occupancy being issued before all required documentation was received by the health departments and the Pinelands Commission. In these cases, Pinelands staff has had to work with the technology vendors, homeowners and agency officials to obtain the needed documentation after the fact, often a difficult and time consuming task. Pinelands staff continues to work with the local agencies to educate them on the importance of assuring that all necessary documents are on file before issuing local approvals for home occupancy. To further help address this issue, amendments to the CMP were instituted in October 2010 which now specifically require that local boards of health withhold certificates of compliance or similar authorizations which would permit the occupancy of a building served by an alternative design wastewater treatment system until such time as the Pinelands Commission provides written authorization to the local board of health that such a system may be authorized for use.

Maintenance Summary

The manufacturer of the Amphidrome system, F.R. Mahony Associates, has instituted an effective program to assist contractors and engineers on the proper installation of the technology. The firm offers installer training with each system delivered and provides ongoing technical support to address contractor inquiries.

Aqua Point, the manufacturer of the Bioclere system has also instituted an effective program to assist contractors and engineers on the proper installation of the technology and has utilized the services of Advanced Nitrate Solutions in the local sale, installation and operation of the Bioclere technology.

During the period of 2005-2009, Cromaglass systems were installed and serviced exclusively by Mid State Electric, Cromaglass' authorized treatment system installation and servicing contractor. Cromaglass Corporation has discontinued using Mid-State as its serving agent and is now servicing the units directly. There were no new Cromaglass systems installed during 2010, 2011 and 2012. During the current reporting period, the Commission authorized the Cromaglass Corporation to retrofit one half of the existing systems (28 system retrofits from a total of 56 systems) in an effort to improve system performance. As a condition of retrofit and retesting authorization, Cromaglass agreed to extend operation and maintenance service contracts on all of the exiting Cromaglass units during the retrofit and retest period. The details of the retrofit program are presented below. The soil absorption field serving one Cromaglass system was reported to have experienced complete hydraulic failure, reportedly due to solids carryover from the Sequencing Batch Reactor (SBR) unit. Cromaglass Corporation agreed to reimburse the homeowners for the complete replacement of the failed leach field. The work was completed in 2012 to the satisfaction to the homeowner.

Bio-Microbics, the manufacturer of the FAST system, has designated Site Specific Design, Inc. as the local authorized service agent for the FAST technology. Site Specific Design reports the repair of a unit control panel as a result of an alarm condition during the current reporting period. In addition, Bio-Microbics has addressed a reoccurring problem related to damaged airlifts on several systems and has modified recycling troughs to enhance the return of nitrified wastewater to the anoxic chamber on two treatment units.

Cost Summary

The pilot program provides for the collection and reporting of cost data for each treatment technology. To facilitate monitoring of treatment system costs, the CMP requires technology manufacturers to report to the Commission the cost of each individual treatment system installation.

The total cost of an onsite wastewater treatment system consists of at least three components. These include the cost of the treatment unit and its 5 year service package, the cost of the soil absorption system (e.g., replacement soil, stone and pipe) , and the cost of engineering, surveying, and other installation services. The treatment unit manufacturers can readily provide the Commission with information on the cost of their equipment and related support services, which in the case of the Pinelands pilot program includes a five year maintenance contract, five year warranty, and three years of quarterly effluent analysis. The manufacturers, however, do not have direct knowledge of the cost of the soil absorption field installation, other installation and labor costs, or the cost for engineering (soil testing, system design, as-built plans, etc.) of the system. This site specific information is typically supplied by the homeowner or builder to the treatment system manufacturer who in turn supplies it to the Commission.

Table 1, below summarizes average treatment system costs based upon information provided to the Commission by the system manufacturers, as supplemented by the local homeowner or builder. Actual treatment unit costs, including equipment costs, five year operation and maintenance service contracts, five year warranties and three year sampling program costs have remained stabile or have declined since the inception of the pilot program. Aqua Point reports that it reduced the cost for the Bioclere systems by 6 % in early 2009. Bio-Microbics reports that it lowered its price for the FAST system by approximately 18.5 % in 2009. FR Mahony Associates reports that it has held the cost of the Amphidrome system steady since its first Pinelands installation in 2004. More recently, both FR Mahony and Aqua Point report that they have lowered the cost for their equipment as a result of recently attaining permanent approval status and the discontinuation of wastewater effluent sampling and reporting to the Commission.

Annual fluctuations in the average total system installation cost, (including construction related expenses) have occurred since the inception of the pilot program. This variability is generally attributable to differences in the cost of non-treatment unit components, including material quantities and labor which vary on a system by system basis. Rarely are two individual system designs and material quantities identical. Variability is in the cost and quantity of replacement soil, (select fill) stone aggregate, pipe, geo-textiles, labor, excavation, trucking, engineering, etc) is common on a system by system basis. As a rule, larger and deeper systems typically cost more to construct than smaller, shallower systems. Average overall costs will be higher in a year in which a greater number of larger systems were installed than in a year when a greater number of smaller systems were built.

In time, the overall construction cost of advanced treatment systems is expected to decline as NJDEP incorporates disposal field size reductions in revisions to the Department's septic system design standards and guidance documents. Many states have incorporated disposal field size reductions for advanced treatment units and NJDEP has recently proposed to include such reductions in the currently proposed revisions to the State's septic design standards (N.J.A.C. 7:9A). The reductions can be provided as a result of the relatively high quality effluent quality (e.g. reduced BOD and TSS) produced by advanced treatment systems. In addition, over time, additional cost savings may result from the use of these advanced treatment technologies due to the significantly "cleaner" effluent that these systems produce. Cleaner effluent reduces the likelihood of premature hydraulic soil absorption field failure which translates to potential cost savings through extended disposal field longevity.

Table 1. Average Total Cost of Pinelands Alternate Design Wastewater Treatment Systems
Note: Cost information is derived from a variety of sources and should be considered to represent approximate cost estimates.

Name of Treatment System Technology	**No. of Systems included in this cost analysis**	**Average Reported Cost per Treatment Unit and 5 year service package**	**Average Reported Cost for Engineering, Soil Absorption Field Installation, Electrical Connections, etc.** (7)	**Average Reported Total Cost of the Advanced Onsite Treatment Systems**
Amphidrome (1)	58	$ 19,017 (3)	$ 12,805	$ 31,822
Bioclere (2)	42	$ 17,688 (4)	$ 11,538	$ 29,226
Cromaglass	41	$22,345 (5)	$12,920	$ 35,265
FAST	12	$ 17, 957 (6)	$ 12,122	$30,079
BioBarrier	N/A	$ 15,000(8)	N/A	N/A
Busse Green	N/A	$ 24,000(8)	N/A	N/A
SeptiTech	N/A	$ 16,700(8)	N/A	N/A
Hoot ANR	N/A	$ 14,500(8)	N/A	N/A

(1) Based on last reported cost for the Amphidrome system as provided in Aug. 5, 2010 Annual Report, and supplemented by installations in the current reporting period of June 2011 through May 2012. Price reduction was reported due to elimination of requirement for laboratory analysis of effluent due to permanent approval status.

(2) Based on last reported cost for the Bioclere system as provided in Aug. 5, 2010 Annual Report and supplemented by installations in the current reporting period of June 2011 through May 2012. Price reduction was reported due to elimination of requirement for laboratory analysis of effluent due to permanent approval status.

(3) Includes reported cost of the Amphidrome Treatment Unit (through May 2012) as sold by F.R. Mahony, Associates including hardware and equipment, 5 year annual maintenance contract, 5 year warranty, 3 years quarterly effluent analysis, pumping of 2000 gallon anoxic tank as necessary for 5 years, and delivery of equipment to job plus the average cost of concrete tankage (2000 gal. concrete anoxic tank, concrete reactor vessel and 1000 gal. concrete clearwell), purchased separately from local suppliers, including delivery to the job site. Tank cost varies depending on precast supplier and distance to shipping location.

(4) Includes reported cost of the Bioclere treatment unit (through May 2012) as sold by Aqua Point, including hardware and equipment, 5 year annual maintenance contract, 5 year warranty, 3 years quarterly effluent analysis, pumping of 2000 gallon anoxic tank for 5 years, as needed, and delivery of equipment to job site.

(5) Includes reported cost of the Cromaglass treatment unit (through July 2010) as sold by Cromaglass Corp., including hardware and equipment, 5 year annual maintenance contract, 5 year warranty, 3 years quarterly effluent analysis, pumping of anoxic tank for 5 years, as needed, and delivery of equipment to job site and electrical hookup of unit by Cromaglass mandatory mechanicals installer. There were no Cromaglass units installed in the current reporting year.

(6) Includes reported cost of the FAST treatment unit (through May 2012)as sold by Bio-Microbics., including hardware equipment, 5 year annual maintenance contract, 5 year warranty, 3 years quarterly effluent analysis, pumping of residuals for 5 years, as needed, and delivery of equipment to job site.

(7) Reported costs include soil and site suitability investigations (soil logs and “perc”/permeability tests), preparation of engineering plans, completion of NJDEP standard application forms, excavation for soil absorption system and tank

placement, soil absorption system materials (suitable “K4" replacement soil, stone filter materials and lateral piping, or gravel free chambers, geotextile fabric), installation of all components, electrical connections, surveyor services, as-built plans, engineering construction observation and engineering certifications.

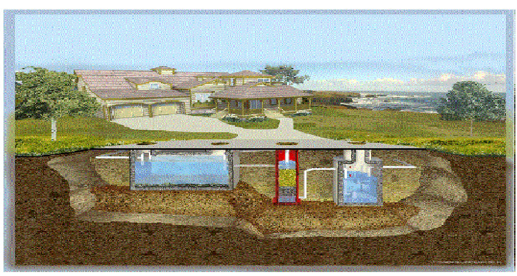
(8) Cost for treatment unit, 5 year warranty, 5 year O&M contract and 3 year effluent sampling program as reported by the equipment manufacturers in their application to participate in the pilot program. No systems were installed during the current reporting period.

Treatment System Nitrogen Attenuation Summary

The pilot program requires that the technology suppliers arrange for samples of treated effluent to be collected from each system on at least a quarterly basis [approximately every ninety (90) days] for at least three (3) years yielding a total of at least twelve (12) samples per system. Pursuant to the pilot program sampling and testing protocols, samples of treated effluent are collected from a sample collection port located between the treatment unit and the soil dispersal field. Sample procurement is to comply with the latest version (currently Aug. 2005) of the NJDEP Field Sampling Procedures Manual. The laboratory analysis of effluent samples must be performed by laboratories certified by the NJDEP employing analytical methodologies accepted by NJDEP. To permit the establishment of microbial cultures necessary for the treatment process to develop and stabilize, no samples are required during the first ninety days from system start-up. In most instances, technology vendors have adjusted sampling schedules to provide for more efficient, synchronized sample collection from multiple systems.

As discussed previously, there are a total of two hundred and twenty (220) Pinelands alternate design wastewater treatment systems installed and activated to date.

Amphidrome®

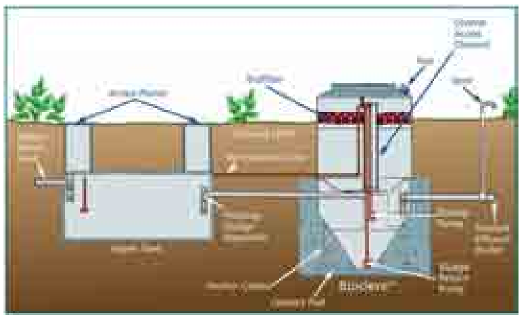


Amphidrome Technology

The Amphidrome process is an advanced biological treatment that utilizes an attached growth treatment concept and is an example of a biologically aerated filter system. This is a patented treatment system. The system is pre-engineered and designed for the removal of soluble organic nitrogen, and for the nitrification and denitrification processes to occur simultaneously in a single reactor. The process begins operating in an aerobic mode and gradually progresses to an anoxic mode. The cyclical action is created by allowing a batch of wastewater to pass from the anoxic/equalization tank through the granular biological filter into the clear well. The batch of wastewater is then pumped back from the clear well up through the filter, where it overflows into a trough that carries it back to the anoxic/equalization tank. These cycles are repeated multiple times, while the treatment is allowed to progress from aerobic to anoxic conditions within the filter. Once sufficient cycles have been repeated to insure the degree of treatment required, a batch of effluent is discharged. A control system operates the system based on predetermined settings. The Amphidrome reactor consists of: an underdrain, support gravel, filter media, and backwash trough. The underdrain is located at the bottom of the reactor and provides support for the media and distribution of liquid into the reactor during a reverse flow or backwash. It is also designed as a manifold to distribute air evenly over the entire filter bottom during the aerobic portion of the cycle. On top of the underdrain is approximately 18” of gravel. Several layers of different size gravel are used. Above the gravel is a deep bed of coarse, round silica sand. The deep bed filter design employed in this manner significantly reduces suspended solids and allows for adequate growth of microorganisms for treating wastewater. In order to achieve the necessary degree of nitrogen reduction under a wide range of conditions, this system is equipped with chemical addition pumps that allow the addition of alkalinity for nitrification and/or methanol for denitrification, when necessary.

The Amphidrome technology is no longer subject to effluent TN concentration analysis and reporting as a result of having been granted permanent approval status serving residential development on minimum one-acre parcels. While enrolled in the pilot program Amphidrome produced a grand median total nitrogen concentration of **11.9 mg/l,** more than meeting the Commission's 14.0 total nitrogen standard.

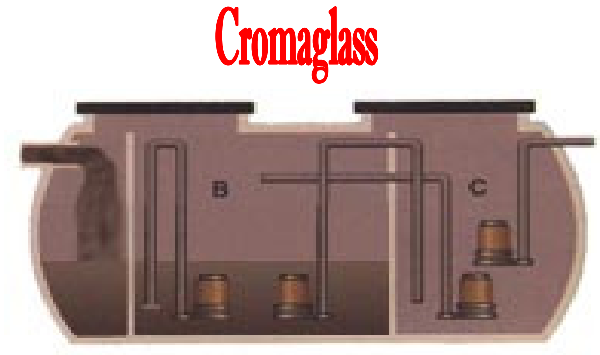
Bioclere



Bioclere Technology

The Bioclere system utilizes an attached growth trickling filter concept for wastewater treatment for residential or commercial facilities. A trickling filter typically consists of a bed of highly permeable media to which microorganisms are attached and through which wastewater is percolated. The Bioclere unit utilizes a patented plastic media in a randomly packed configuration. The incoming wastewater is passed from the primary settling tank to a baffled area in the sump of the Bioclere in which a dosing pump is located. The dosing pump doses the trickling filter at a predetermined frequency. A forced draught ventilation system provides adequate airflow for maintaining aerobic conditions in the trickling filter. In the tricking filter unit, the organic material present in the wastewater is degraded by microorganisms attached to the filter media. Organic material from the wastewater is converted into bio-mass or a slime layer. As the organisms grow, the thickness of slime layer increases and diffused oxygen is consumed before it can penetrate the full depth of the slime layer. Thus, an anaerobic condition is developed near the surface of the media and the microorganisms near the surface of the media enter into an endogenous phase of their growth and lose their ability to cling to the media. Eventually, the wastewater washes the slime off the media while a new slime layer starts establishing and the process continues. The excess bio-mass or the slime would settle in the bottom and the sludge return pump would pump it back to the primary settling tank. The return of the sludge also enables the nitrates to be combined with a carbon source in the primary tank, allowing denitrification and achieving reduction in total nitrogen concentration.

The Bioclere technology is no longer subject to effluent TN concentration analysis and reporting as a result of having been granted permanent approval status serving residential development on minimum one-acre parcels. While enrolled in the pilot program, Bioclere produced a grand median total nitrogen concentration of **11.2 mg/l,** more than meeting the Commission's 14.0 total nitrogen standard.



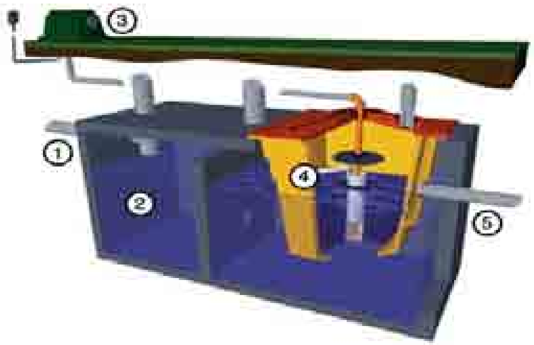
Cromaglass Technology

The Cromaglass system is a SBR (Sequencing Batch Reactor) that is designed as a continuously fed activated sludge process with clarifiers that are operated on a batch basis. Treatment is achieved by turbulent aeration of incoming wastewater, and batch treatment of bio-mass (sludge) in a separate aeration and quiescent settling chamber within a single vessel. Cromaglass systems are capable of achieving denitrification with the addition of an anoxic cycle following aeration. Air and mixing are provided by submersible pumps with venturi aspirators that receive air through a pipe intake from the atmosphere. Anoxic conditions are created by closing the air intakes of aeration pumps with electric valves, thus stopping aeration but the system continues mixing. Per-batch cycling time is 120 to 240 minutes and there are five cycles to and discharge. The system is operated using a programmable logical control (PLC) that can store a record of all operational functions, thus providing information on each function of each cycle to the operator. Such information can indicate if service or maintenance is needed.

As illustrated in Table 4, sample results have been evaluated for sixty-two (62) Cromaglass systems through July 5, 2010. No new data has been analyzed since that date due to Cromaglass' failure to comply with the sampling and reporting requirements of the pilot program. Eleven (11) systems had at least twelve (12) analyses evaluated, twenty-six (26) systems had at least eleven (11) analyses evaluated, forty-four (44) systems had at least ten (10) analyses evaluated, forty-eight (48) systems had at least nine (9) analyses evaluated, forty-nine (49) systems had at least eight (8) analyses evaluated, fifty (50) systems had at least seven (7) analyses evaluated, fifty (50) systems had at least six (6) analyses evaluated, fifty-one (51) systems had at least five (5) analyses evaluated, fifty-five (55) systems had at least four (4) analyses evaluated, fifty-six (56) systems had at least three (3) analyses evaluated, fifty-seven (57) systems had at least two (2) analyses evaluated and sixty-two (62) systems had at least one (1) analysis evaluated. A total of five hundred and fifty-nine (559) samples have been used to evaluate these sixty-two (62) Cromaglass systems. Total reported nitrogen values for each of these Cromaglass systems represents the sum of reported laboratory values for total kjeldahl nitrogen plus nitrite nitrogen plus nitrate nitrogen. The Cromaglass technology has produced a grand median total nitrogen concentration of 31.5 mg/l, failing to meet the Commission's 14.0 total nitrogen standard for unsewered residential development on a minimum one acre parcel. However, recent system retrofits made to twenty eight operating Cromaglass units has produced a much improved grand median TN of 18.0 mg/l.

The CMP authorizes the Cromaglass technology to be installed until August 5, 2013. The Executive Director will issue an Implementation Report in November 2012 with recommendations concerning Cromaglass' continued participation in the pilot program. Possible outcomes include the permanent approval of the technology at a minimum parcel size that is equal to or greater than one acre, based upon the Pinelands septic dilution model, (e.g., 19 mg/l TN would qualify for use on a 1.5 acre parcel), extending the technology's participation in the pilot program at the one acre minimum parcel size threshold based upon data trends, or removal of the technology from the pilot program.

FAST



FAST Technology

The FAST (Fixed Activated Sludge Treatment) system is a pre-engineered modular system designed to treat wastewater from a single home, a group of homes, or commercial facilities. FAST is a fixed film, aerated system utilizing a combination of attached and suspended growth treatment principles capable of achieving nitrification and denitrification in a single tank. This combination offers the stability of fixed film media and the effectiveness of activated sludge treatment principles. A typical FAST system provides adequate volume for microorganisms in the aerated media chamber to treat wastewater. The attached growth system functioning on and around the plastic media assures that microorganisms remain inside the system instead of being flushed out, even during the peak hydraulic flow conditions. During the times of low flow, the large volume of thriving microorganisms prevent a dying-off of the system, making the system well suited to intermittent use applications.

As illustrated in Table 5, sample results have been evaluated for eighteen (18) FAST systems to date. One (1) system had at least sixteen (16) analyses evaluated, four (4) systems had at least fourteen(14) analyses evaluated, five (5) systems had at least thirteen (13) analyses evaluated, seven (7) systems had at least twelve (12) analyses evaluated, eight (8) systems had at least eleven (11) analyses evaluated, nine (9) systems had at least ten (10) analyses evaluated, nine (9) systems had at least nine (9) analyses evaluated, nine (9) systems had at least eight (8) analyses evaluated, eleven (11) systems had at least seven (7) analyses evaluated, eleven (11) systems has at least six (6) analyses evaluated, fourteen (14) systems has at least five (5) analyses evaluated, fourteen (14) systems has at least four (4) analyses evaluated, sixteen (16) systems has at least three (3) analyses evaluated, sixteen (16) systems has at least two (2) analyses evaluated and eighteen (18) systems had at least one (1) analysis evaluated. A total of one hundred and fifty-two (152) samples have been used to evaluate these eighteen (18) FAST systems. Total reported nitrogen values for each of these FAST systems represents the sum of reported laboratory values of reported laboratory values for total kjeldahl nitrogen plus total nitrite and nitrate nitrogen. The FAST technology has produced a grand median total nitrogen concentration of 23.1 based upon all samples to date showing some improvement over the grand median concentration of 26.5 mg/l as reported by the Commission is August 2011. Most importantly, retrofitted systems have produced a grand median TN concentration of 15.9 mg/l. While still failing to meet the Commission's 14.0 total nitrogen standard for unsewered residential development on a minimum one acre parcel, the technology is trending toward significantly better performance, evidently as a result of recent system retrofits.

The CMP authorizes the FAST technology to be installed until August 5, 2013. The Executive Director will issue an implementation report in November 2012 with recommendations concerning the FAST system's continued participation in the pilot program. Possible outcomes include the permanent approval of the technology at a minimum parcel size that is equal to or greater than one acre, based upon the Pinelands septic dilution model, (e.g., 19 mg/l TN would qualify for use on a 1.5 acre parcel), extending the technology's participation in the pilot program at the one acre minimum parcel size threshold based upon data trends, or removal of the technology from the pilot program.

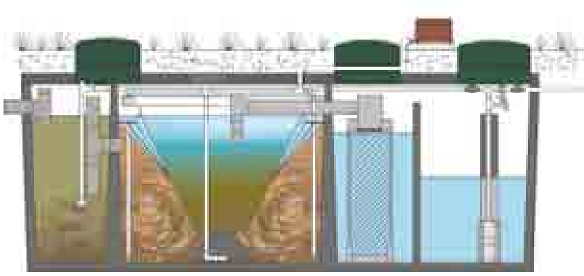
BioBarrier

BioBarrier Technology

The BioBarrier® MBR is a membrane bioreactor that combines activated sludge treatment processes with solids separation via membrane filter technology. The system employs flat sheet membranes with pore sizes ranging between of 0.02 to 1.4 µm. The membranes are housed in an aerated membrane cartridge which is submerged in the wastewater. The membranes provide a barrier that retains wastewater microorganisms within the treatment unit. The large mass of retained microbes provides an effective buffer against shock loadings to the system. The long microbial residence time in the treatment system allows the microorganisms to undergo endogenous respiration, reducing the total amount of solids produced by the treatment process.

The system consists of a tank with three compartments. The first compartment provides primary treatment – sedimentation and separation of floatables and solids, and is equipped with a proprietary outlet screening device. A solid wall separates the first compartment from the second, in which the system's nitrogen reduction capabilities may be enhanced under anoxic conditions. The third compartment, the "aeration/membrane zone", is separated from the anoxic zone by a baffle wall with openings between the two zones. The BioBarrier® Membrane module is located in the third compartment. Aeration is provided to the third compartment by a blower which serves two functions. First, the blower provides mixing of the wastewater and biomass to allow complete contact between the bacteria and organic material in the wastewater, while supplying oxygen that is critical to the process. Second, the positioning of the aeration under the membrane sheets helps to remove solids that collect on the surface of the sheets. The membranes sheets, having microscopic pore size openings, separate the water from the solids in the aeration zone. An effluent pump provides a slight negative pressure on the "clean" side of the membrane, pulling filtered water through the membrane. The solids that are sloughed by aeration and membrane cleaning are retained in the aeration compartment. This technology is new to the pilot program therefore the Commission has no performance data to report at this time.

HOOT

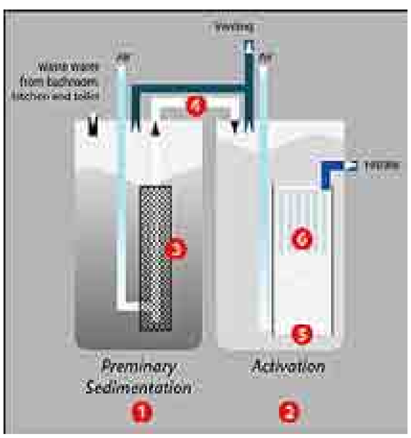


Hoot ANR Technology

The Hoot ANR treatment system is an extended aeration/activated sludge treatment process coupled with anaerobic denitrification. The unit is comprised of five principal components, a Pretreatment Tank, Aeration Chamber, Clarifier, Media Tank and Final Clarifier/Pump Tank.

The Pre-Treatment tank provides separation and anaerobic digestion of influent solids and functions much like a septic tank by reducing up to 50% Total Settable Solids (TSS) and approximately 25% of Biochemical Oxygen Demand (BOD5). Liquid waste flows out of the pretreatment tank through a baffled outlet and into the aeration chamber. The activated sludge treatment process occurs in the aeration chamber through the introduction of oxygen into the mixed liquor to enable the conversion of soluble material into biomass. In addition, oxygen enables nitrifying bacteria to convert ammonia-nitrogen to nitrate-nitrogen. Wastewater then flow to a clarifier for additional solids settling. From the clarifier, wastewater is transferred to a media tank where an attached growth treatment process occurs. Here, a proprietary carbon source is added. In the presence of the supplemental carbon source, denitrifying bacteria release free nitrogen to the atmosphere. A final clarifier/pump tank constitutes the last treatment component before discharge to the soil absorption field. A portion of the daily flow of the system is recirculated from this chamber to the pre-treatment tank where it is reprocessed through the system. This technology is new to the pilot program therefore the Commission has no performance data to report at this time.

Busse Green MBR



Busse Green MBR Technology

The Busse Innovative Wastewater Treatment System is a small scale membrane bioreactor. The Busse system provides treatment in a 3-stage, 4 tank process. Wastewater enters an intermittently aerated first tank and is then transferred by an airlift through a mesh filter to an identical second tank. Wastewater in the second tank is divided evenly between two membrane tanks, again with a screened airlift transfer. The membrane bioreactor tanks house 24 Kubota flat sheet membranes. The Kubota membranes units are comprised of two sections: the lower section contains the air piping and the upper section contains the membrane panels. The membrane units are submerged in activated sludge within the reactor tanks. The tanks are aerated by coarse and fine bubbles that provide a cross flow of liquid over the surface of the membrane panels. Cross flow circulation reduces membrane fouling and provides oxygen for microbial degradation of wastewater organics. The liquid head above the membrane drives permeate from the wastewater mixture through the membrane, where it flows via a manifold through the tank wall and is discharged. A return sludge airlift is activated by a programmable logic controller and is controlled by level sensors located in tanks two through four. A third air pump provides aeration to the airlifts in the first two tanks.

The bioreactor provides an aerobic environment where microorganisms present in the wastewater remove soluble contaminants, using them as a source of energy for growth and production of new microorganisms. The organisms flocculate and form aggregations that further physically entrap particulate organic matter. The organic matter is attacked by extracellular enzymes that solubilize the solids to make them available to the microorganisms as a food source. The conversion of the organic matter from soluble to biological solids allows for removal of the organic matter by settling and filtration of the solids in the treatment process. This technology is new to the pilot program therefore the Commission has no performance data to report at this time

SeptiTech

SeptiTech Technology

The SeptiTech® wastewater treatment system is a two stage treatment technology, based on a fixed film trickling filter, using a patented highly permeable hydrophobic media. The first stag of treatment occurs in the primary tank in which the solids are settled and partially digested. The second stage of the system is a processor that provides secondary wastewater treatment. Microorganisms present in the wastewater grow within the media, using nutrients and organic materials provided by the constant supply of fresh wastewater to form new cell mass. Air is drawn into the system via an air intake pipe at the top of the SeptiTech® System. Venturis located in the sprinkler head distribution piping aerate the wastewater sprayed onto the media. The system operates without a fan or compressor.

The SeptiTech® System is designed to remove total nitrogen from wastewater by nitrification and denitrification. Nitrification occurs in the second stage of the system, where ammonia –nitrogen is converted to nitrite and nitrate (predominately nitrate), while denitrification occurs in the anaerobic/anoxic primary tank. Denitrification also occurs in a stacked media module which floats in the reservoir below the aerobic media.

Wastewater from the primary tank flows by gravity to the processor reservoir section, located below the filter media. The second and third pumps are used to return wastewater and solids from the reservoir back to the primary tank. The forth pump is used to discharge treated wastewater to the disposal location. This technology is new to the pilot program therefore the Commission has no performance data to report at this time.

Household Variability and Concentration vs. Mass Loading

When evaluating data from single family wastewater treatment systems, it is important to recognize that home occupancy, water use, pharmaceutical use and cleaning and laundry product usage may vary greatly from one residence to another. These and other variables can markedly impact the concentration of nitrogen in wastewater and can adversely affect the ability of a treatment system to meet established discharge limits. The number of individuals occupying a dwelling can result in abnormally high or low levels of nitrogen in wastewater given that each person contributes approximately 9 lbs. of nitrogen to the system annually. Water conservation, while certainly desirable, has the potential to result in higher concentrations of pollutants in the wastewater (but not greater mass loading) because less water is available to dilute the pollutants. As a result of significant advances in water conservation, including the use of water conserving fixtures and appliances as well as behavior modifications, assumed values for total nitrogen concentration in domestic effluent, established during the 1960's and 1970's at 40 ppm, may under-estimate actual concentrations present in domestic wastewater streams. It is important to note however, that estimates of the total mass of nitrogen excreted by humans remain constant at approximately 9 lbs per year. It is evident from wastewater analyses conducted for the pilot program that there is a wide range in the concentration of total nitrogen in septic tank effluent. However, even if concentrations of nitrogen in domestic wastewater frequently exceed 40 ppm, the total mass of nitrogen in the effluent is likely consistent with estimated values utilized in the Pinelands septic dilution model due to the use of less water. As a result, even where effluent values exceed assumed post treatment concentrations, system discharges may still be meeting total nitrogen mass loading targets, even if the observed concentrations do not.

Each of the four certified treatment technologies that are currently operational in the Pinelands (Amphidrome, Bioclere, Cromaglass and FAST) has an assumed nitrogen removal efficiency of 65%. If the total nitrogen contained in the raw influent is 40 ppm, a 65% reduction would result in a concentration of 14 ppm in the treated effluent (and 2 ppm at the parcel line of a one acre lot based upon the Pinelands septic dilution model). Similarly, if influent nitrogen levels range up to 80 ppm, the same "successful" 65% removal efficiency would result in effluent concentrations of 28 ppm. It is noteworthy that the pilot program does not provide for the sampling and analysis of raw influent; therefore the percent removal efficiency of the alternate technology systems cannot be calculated at this time. Commission staff continues to explore the potential to develop a practical means to characterize actual present day influent total nitrogen concentrations from domestic sources.

Excessive use of certain cleaning and laundry products as well as the use of certain medications can stress the bacteria that provide biological nitrification and denitrification. Because of this, education of system users is an important component of any wastewater management program.

In recognition of these factors, all of the alternative treatment system vendors have developed homeowner user manuals which provide critical information to the owners of the alternative treatment systems. In addition, several vendors have developed questionnaires which they've provided to system users which are aimed at identifying laundry and cleaning product usage and any other condition which might lead to non-compliant sample results. Staff encourages all of the technology vendors collect and analyze this type of information to better understand user characteristics and to enhance compliance with effluent discharge limits.

Effluent Monitoring Data

Effluent sampling data submitted to date have been analyzed and presented in this report. Tables 2, 3, 4, and 5 provide the running median and grand median values for total nitrogen concentrations (mg/l)[1] and the number of regular samples taken for the Amphidrome, Bioclere, Cromaglass, and FAST wastewater treatment systems respectively. The analysis indicates a grand median of 11.9 mg/l for the Amphidrome system and 11.2 mg/l for the Bioclere system. Both of these grand median concentrations are below the 14 mg/l target which is based upon the Pinelands septic dilution model and an influent concentration of 40 mg/l/ and these technologies have been granted permanent approval status and are no longer subject to required effluent TN analysis and reporting. The TN grand median concentration for the Cromaglass system is 31.5mg/l, and 23.7. mg/l for the FAST system, both higher than the Commission's 14 mg/l target. Both systems however have produced significantly better results since retrofits were made to existing units.

In the case of the FAST technology, the median TN value represents a significant sample size from a relatively small number of operating systems. Bio-Microbics, the manufacturer of FAST had identified a number of possible causes for the technology's inability to meet the expected TN concentration and had taken steps to remediate these possible causes. While trending in the right direction, especially in consideration of post retrofit sample results, the overall data does yet meet the Commission's standard for use on a one acre parcel. Commission staff is currently evaluating the impact of system retrofits and will report more fully on the future participation of the FAST technology in the upcoming November 2012 Implementation report.

The median value of 31.5 mg/l for the Cromaglass system represents system performance prior to recent system retrofits. Through its research and development effort at the Kelly Township (PA) Wastewater Treatment Plant, Cromaglass has identified fourteen engineering and operational problems that are believed responsible for poor system performance. (see Cromaglass Retrofits below). Corrective measures have been employed on one half of the existing Pinelands Area Cromaglass units. Post retrofit effluent analyses has produced a grand median TN value of 18.0 mg/l after one sample collection round indicating the potential for a marked improvement in system

[1] One (1) mg/l = one (1) ppm

performance. The temporary suspension on new Cromaglass installations remains in effect. Commission staff is currently evaluating the impact of system retrofits and will report on the future participation of the Cromaglass technology in the upcoming November 2012 implementation report.

Table 2. Amphidrome running median of total nitrogen (mg L^{-1}) by number of sampling events for each wastewater treatment system. The grand median, 25th percentile, 75th percentile, and number of systems sampled (N) per event are provided. (See Appendix 1 for discussion of data editing.)

Total Nitrogen Running Median

		Number of Sampling Events													
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12	13	Grand Median
Amphidrome	1	18.5	25.3	32.1	25.3	20.7	19.6	18.5	17.7	16.9	16.0	16.9			18.5
Amphidrome	2	9.5	9.1	9.4	9.5	9.5	9.7	9.5	9.5	9.4	9.4	9.4	9.5	9.5	9.5
Amphidrome	3	18.4	12.1	18.4	50.4	18.4	14.9	12.6	12.0	11.5		12.0	12.6	12.9	12.7
Amphidrome	4	35.2	29.2	23.2	16.4	9.7	8.4	7.8	7.5	7.2	7.5	7.8	7.6		8.1
Amphidrome	5	10.0	42.3	51.3	31.8	12.3	31.8	17.8	16.0	15.8	16.8	15.8	16.2	15.8	16.2
Amphidrome	6	6.0	33.8	6.9	9.8	12.7	14.8	12.7	11.1	9.5	11.1	12.1	10.8		11.1
Amphidrome	7	12.7	11.8	11.0	9.2	8.5	9.6	9.5	10.1	10.7	10.8	10.7	10.1		10.4
Amphidrome	8	15.2	19.3	15.2	12.1	9.1	9.5	9.1	9.0	8.9	9.0	8.9	8.7		9.1
Amphidrome	9	143.9	79.5	15.1	12.5	9.8	10.1	10.3	10.1	9.8	10.1	10.3	10.1	10.3	10.3
Amphidrome	10	5.8	4.9	5.8	6.6	7.0	6.7	7.0	7.1	7.0	7.2	7.3			7.0
Amphidrome	11	14.9	10.1	6.0	8.4	10.8	12.2	10.8	9.8	10.0	9.5	8.9	8.4		9.9
Amphidrome	12	18.8	27.6	36.4	33.6	36.4	38.3	36.4	33.6	30.8	24.8	30.8			33.6
Amphidrome	13	4.7	5.4	4.7	5.2	5.7	5.2	5.3	5.5	5.7	5.8	5.7	5.8		5.4
Amphidrome	14	24.5	17.2	9.8	9.7	9.5	9.4	9.4	9.4	9.5	9.4				9.5
Amphidrome	15	4.0	6.3	5.3	5.4	5.3	5.4	5.5	5.4	5.5	5.7	5.9			5.4
Amphidrome	16	11.7	16.7	11.7	11.4	11.2	11.4	11.7	12.5	13.3	12.5	11.7	11.8		11.7
Amphidrome	17	27.0	47.2	58.2	56.5	54.8	54.5	54.2	54.0	53.8	53.1	52.3			54.0
Amphidrome	18	11.1	12.9	11.1	10.3	9.4	10.3	11.1	11.8	12.3	12.4	12.3	12.1	11.9	11.8
Amphidrome	20	16.0	13.4	16.0	14.9	16.0	14.9	16.0	14.9	13.9	14.9	16.0			14.9
Amphidrome	21	7.5	8.1	8.8	10.3	11.9	13.0	11.9	10.6	11.9	13.0	14.0			11.9
Amphidrome	22	36.8	49.3	55.0	45.9	36.8	28.1	19.5	19.4	19.5	23.0	26.6			28.1
Amphidrome	23	25.4	16.2	11.0	10.3	11.0	11.3	11.6	11.9	12.3	11.9	11.6	11.5	11.5	11.6
Amphidrome	24	7.3	5.7	6.5	6.9	6.5	6.2	6.5	6.9	7.3	6.9				6.7
Amphidrome	25	11.6	13.5	15.3	15.7	15.9	16.0	16.1	16.4	16.1	16.4	16.8	16.4	16.8	16.1
Amphidrome	26	14.2	19.1	23.9											19.1
Amphidrome	28	23.9	32.6	41.4	32.6	23.9	23.3	23.9	23.3						23.9
Amphidrome	29	7.6	17.6	7.6	9.1	7.6	7.5	7.6	7.5	7.4	6.8	6.3			7.6
Amphidrome	30	97.1	53.2	9.3	9.0	9.3	9.9	9.3	9.0	9.3	9.9	9.3	9.0	9.3	9.3
Amphidrome	31	11.8	13.5	12.3	12.9	13.5	12.9	12.3	12.6	12.3	12.3	12.3	12.1		12.3
Amphidrome	32	7.4	7.7	8.0	11.3	8.0	9.8	8.0	7.7	7.4	7.7				7.8
Amphidrome	33	6.4	5.0	6.4	6.0	6.4	6.3	6.1	6.3	6.4	6.5	6.6			6.4
Amphidrome	34	13.9	20.0	13.9	18.3	18.3	16.1	18.3	20.5	22.7	20.5	18.3			18.3
Amphidrome	35	9.0	11.5	13.9	16.0	13.9	12.8	13.9	16.0	13.9	16.0	18.1			13.9
Amphidrome	36	11.7	12.9	13.6	12.9	13.6	13.8	14.1	14.1	14.1	14.1	14.1	13.8		13.8
Amphidrome	37	9.9	9.5	9.9	10.8	11.7	11.2	10.6	11.2	11.7	11.3	11.7	11.8	11.7	11.2
Amphidrome	38	17.3	13.9	10.5	13.2	10.5	9.1	7.7	7.0	7.7					10.5
Amphidrome	41	27.4	26.7	25.9	26.7	25.9	22.0	19.1	18.6	19.1	19.1				24.0
Amphidrome	43	17.2	17.5	17.2	17.5	17.8	19.0	20.1	19.0	17.9	18.1	18.3	18.5	18.7	18.1
Amphidrome	44	11.9	13.6	15.3	15.9	16.5	15.9	15.3	15.1	15.0	13.4	13.7	14.3		15.1
Amphidrome	45	26.6	16.7	20.4	22.9	20.4	14.9	15.4	12.4	9.5	9.5	9.6	10.2	10.9	14.9
Amphidrome	46	9.0	9.7	10.4	10.9	10.4	10.4	10.4	10.4	10.4	10.8	10.4			10.4
Amphidrome	47	15.2	16.2	15.2	13.5	11.8	13.5	11.8	11.8	11.8	11.8	11.8			11.8
Amphidrome	48	37.6	28.3	24.2	23.8	24.2	23.8	23.4	23.8	24.2	23.8				24.0
Amphidrome	49	12.0	21.5	14.7	15.0	15.2	16.8	15.2							15.2
Amphidrome	50	22.9	19.0	22.9	25.1	27.3	25.6	23.9	25.6	23.9	23.4				23.9
Amphidrome	51	82.0	75.1	68.2	39.1	22.5	17.0	12.6							39.1
Amphidrome	53	12.0	13.9	12.6	12.3	12.0	10.0	12.0	10.1						12.0
Amphidrome	54	9.8	9.5	9.3	9.5	9.3	9.5	9.8							9.5
Amphidrome	55	23.2	18.6	16.6	15.3	14.0	14.0								15.9
Amphidrome	56	18.3	28.7	20.9	27.8	20.9	27.8								24.4
Amphidrome	57	56.0	50.7	56.0	52.5	49.0									52.5
Amphidrome	58	31.8	38.3	31.8	22.0	15.1									31.8
Amphidrome	59	28.1	30.6	33.0	32.6	32.3									32.3
Amphidrome	60	18.1	15.6	14.2	16.1	18.1	16.1								16.1
Amphidrome	61	6.7	7.9	7.2	8.2	8.2	8.1								8.0
Amphidrome	62	3.7	9.7	12.6	9.5										9.6
Amphidrome	63	5.9	6.0	6.0	8.6										6.0
Amphidrome	64	8.3	8.7	9.1	8.7										8.7
Amphidrome	65	48.0	27.3	47.5	29.2	34.4									34.4
Amphidrome	66	13.1	41.4	51.4	37.3										39.4
Amphidrome	67	18.8	15.8	16.1											16.1
Amphidrome	68	10.0	9.4	10.0											10.0
Amphidrome	69	52.1	30.5												41.3
Amphidrome	70	25.5													25.5
Amphidrome	71	5.8	7.7	6.3											6.3
Amphidrome	72	36.0	38.8												37.4
Amphidrome	73	24.2	22.4	20.5											22.4
Amphidrome	74	7.2													7.2
Sample # Median		14.6	16.5	14.0	13.2	12.7	12.9	11.9	11.8	11.7	11.8	11.8	11.5	11.7	**11.9**
25th Percentile		9.4	9.8	9.4	9.6	9.5	9.6	9.5	9.3	9.3	9.4	9.3	9.5	10.6	9.5
75th Percentile		24.7	28.1	23.0	24.4	19.4	16.4	16.0	16.1	15.6	16.1	15.9	12.6	14.3	16.1
n		68	66	64	59	55	51	47	44	42	40	35	21	11	

Table 3. Bioclere running median of total nitrogen (mg L^{-1}) by number of sampling events for each wastewater treatment system. The grand median, 25th percentile, 75th percentile, and number of systems sampled (N) per event are provided. (See Appendix 1 for discussion of data editing.)

Total Nitrogen Running Median

		Number of Sampling Events												
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12	Grand Median
Bioclere	1	22.3	13.4	8.8	8.9	8.8	7.8	8.8	7.8	7.8				8.8
Bioclere	2	10.7	9.8	8.9	9.8	8.9	9.8	10.7	10.8	10.7				9.8
Bioclere	6	17.0	11.4	17.0	12.7	14.4	13.3	12.2	10.3					13.0
Bioclere	7	10.4	14.9	10.4	10.2	10.4	10.8	10.4	10.2	10.1	10.2	10.4	10.8	10.4
Bioclere	8	11.2	9.6	10.5	9.3	8.6	9.6	10.5	9.6	10.4				9.6
Bioclere	9	8.6	8.4	8.6	9.5	10.4	10.7	10.4	9.5	10.4				9.5
Bioclere	10	8.4	8.4	8.4	9.9	9.2	9.7	10.1	9.8	9.6	9.5	9.4	9.5	9.5
Bioclere	11	25.0	17.8	15.4	13.2	15.4	13.2	13.8	14.6	13.8	12.4	10.9		13.8
Bioclere	12	52.8	55.5	52.8	33.0	13.1	12.3	13.1	12.3	13.1	12.3	13.1	13.5	13.1
Bioclere	13	14.2	14.2	14.2	11.4	11.9	11.1	11.9	11.5	11.1	11.2			11.7
Bioclere	14	16.2	24.7	16.2	17.1	16.2	14.5	12.9	12.2	11.4	11.0	10.7	11.0	13.7
Bioclere	15	5.2	13.2	10.6	13.0	10.6	13.0	15.3	13.8	15.3	13.8			13.1
Bioclere	16	28.1	25.0	22.0	18.5	15.1	18.5	15.1	14.3	13.4	14.3	13.4	14.3	15.1
Bioclere	17	79.8	48.0	16.2	16.2	16.2	16.1	16.0	14.4	12.8	12.9	12.785		16.1
Bioclere	18	13.2	10.5	10.3	9.3	10.3	9.7	9.2	9.3	9.4	9.8	9.5	9.9	9.8
Bioclere	19	29.4	30.2	29.4	19.6	9.8	12.5	11.9	13.6	11.9				13.6
Bioclere	20	52.8	42.2	31.6	26.4	21.2	26.4	21.2	17.8	14.5				26.4
Bioclere	21	10.2	10.2	10.3	11.7	10.3	10.2	10.2	9.6					10.2
Bioclere	22	9.7	9.8	10.0	10.1	10.0	9.8	9.7	9.8	10.0	10.1	10.1		10.0
Bioclere	23	27.3	18.2	9.1	11.1	9.1	8.8	9.1						9.1
Bioclere	24	2.4	2.5	2.5										2.5
Bioclere	25	25.9	16.7	9.7	11.3	9.7	11.3	12.8						11.3
Bioclere	26	1.9	18.9	4.9	8.5	12.1	8.5	10.3						8.5
Bioclere	27	34.6	23.9	13.2	13.1	13.1	12.7	12.3						13.1
Bioclere	28	24.8	17.3	11.6	10.7	9.7	10.7							11.2
Bioclere	29	10.3	13.1	11.0	12.2	12.0								12.0
Bioclere	30	24.9	21.5	18.0	14.1	13.3								18.0
Bioclere	31	4.5	23.1	5.8	9.2									7.5
Bioclere	32	47.0	42.1	37.3	26.5									39.7
Bioclere	33	48.1	31.2	14.3	13.2	13.1								14.3
Bioclere	34	20.8	17.7	14.6	13.8									16.1
Bioclere	35	7.3	19.0	18.2										18.2
Bioclere	36	5.1												5.1
Bioclere	37	12.0												12.0
Bioclere	38	13.8												13.8
Bioclere	39	8.5												8.5
Bioclere	40	11.9												11.9
Bioclere	41	12.3												12.3
Sample # Median		13.5	17.5	11.3	12.0	10.6	11.0	11.9	10.8	11.1	11.2	10.7	10.9	**11.2**
25th Percentile		9.8	11.2	9.6	9.9	9.8	9.8	10.2	9.7	10.1	10.1	10.1	10.1	10.0
75th Percentile		25.7	24.1	16.4	14.0	13.2	13.0	13.0	13.7	13.1	12.6	12.8	12.9	13.1
n		38	32	32	30	27	24	23	19	17	11	9	6	

Table 4. Cromaglass running median of total nitrogen (mg L^{-1}) by number of sampling events for each wastewater treatment system. The grand median, 25th percentile, 75th percentile, and number of systems sampled (N) per event are provided. (See Appendix 1 for discussion of data editing.)

Total Nitrogen Running Median

		Number of Sampling Events												
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12	Grand Median
Cromaglass	1	140.1	78.6	17.1	32.2	26.3	36.9	43.6	41.0	38.5	35.5	32.5		36.9
Cromaglass	2	49.0	45.0	49.0	45.0	49.0	45.0	41.0	43.8	44.9	43.0	44.9	43.0	45.0
Cromaglass	3	76.5	58.2	50.4	45.2	50.4	47.6	50.4	55.9	50.4	47.6	44.9		50.4
Cromaglass	4	77.2	55.7	77.2	64.4	77.2	83.6	78.8	78.0	77.2	69.1	61.0		77.2
Cromaglass	5	110.6	99.0	87.4	71.8	56.2	45.7	35.1	30.3	25.5	26.5	25.5		45.7
Cromaglass	6	61.6	44.7	47.3	39.0	47.3	50.0	52.7	50.0	47.3	47.3	47.3	47.7	47.3
Cromaglass	7	67.5	52.3	37.1	50.1	42.6	47.8	46.8	49.9	53.0	49.9	51.3		49.9
Cromaglass	8	85.5	61.9	38.3	37.0	38.3	39.9	40.7	41.1	40.7	41.1			40.7
Cromaglass	9	19.7	39.7	19.7	19.6	19.7	19.6	19.5	18.5	19.5	18.5	17.6		19.6
Cromaglass	10	58.5	61.3	58.5	42.2	25.9	23.0	20.1	18.1	20.1	18.1	20.1	18.634	21.5
Cromaglass	11	35.1	47.2	35.1	34.3	35.1	34.3	35.1	37.4	39.8	40.1	40.5		35.1
Cromaglass	12	30.6	26.5	22.5	19.5	22.5	26.5	22.5	19.5	16.5	15.0	13.6		22.5
Cromaglass	13	17.4	10.8	12.4	14.9	17.4	16.0	14.6	14.0	13.5	14.0	13.5	14.0	14.0
Cromaglass	14	31.7	28.7	31.7	30.9	30.0	29.9	29.7	27.7	25.8	26.6			29.8
Cromaglass	15	18.0	64.0	32.1	38.3	32.1	30.1	28.2	30.1	32.1	30.1	28.2		30.1
Cromaglass	16	25.5	17.1	14.4	17.2	14.4	14.3	14.2	14.3	14.2	13.3			14.4
Cromaglass	17	43.5	56.7	43.5	32.4	43.5	41.6	43.5	52.9	62.3	66.2			43.5
Cromaglass	18	104.4	85.3	66.1	57.6	66.1	60.6	56.3	55.7	55.2	52.1	49.0	40.9	56.9
Cromaglass	19	67.5	71.7	67.5	42.8	67.5	62.8	58.1	39.6	21.1	39.6	31.1	26.1	50.4
Cromaglass	20	46.3	32.5	18.6	15.2	18.6	28.8	39.0	31.2	23.4	27.3			28.1
Cromaglass	21	45.9	64.2	45.9	38.4	30.9	21.8	14.7	22.8	14.7	15.6	14.7	14.0	22.3
Cromaglass	22	57.6	49.7	41.7	31.0	41.7	40.2	41.7	40.2	38.7	38.2	37.8		40.2
Cromaglass	23	37.4	73.3	37.4	32.7	28.1	32.7	37.4	32.7	37.4	43.7	37.4	32.7	37.4
Cromaglass	24	31.8	32.6	33.5	32.6	31.8	31.2	30.6	28.0	25.5	19.5	24.8	19.2	30.9
Cromaglass	25	52.8	42.8	32.8	35.0	37.3	42.6	47.9	50.3	52.8	53.1			45.3
Cromaglass	26	74.3	68.7	63.2	43.5	23.7	20.2	16.8	16.5	16.8				23.7
Cromaglass	27	90.3	73.2	56.1	70.7	56.1	54.9	56.1	57.7	59.3	60.4			58.5
Cromaglass	28	86.7	56.8	29.6	29.1	28.6	27.8	28.6	29.1	29.6	38.0			29.3
Cromaglass	29	23.5	20.7	23.5	21.1	18.7	18.4	18.7	18.4	18.0	18.4	18.7		18.7
Cromaglass	30	103.3	64.6	25.9	29.6	25.9	29.6	33.4	32.2	31.0	32.2	33.4	32.2	32.2
Cromaglass	31	7.4	34.6	61.9	37.3	32.4	38.5	44.7	44.8	44.7	41.8			40.2
Cromaglass	32	78.3	63.0	50.6	49.1	47.7	34.5	25.3	23.3	21.3	23.3			41.1
Cromaglass	33	76.1	48.0	31.6	25.8	31.6	31.7	31.7	31.7	31.6				31.7
Cromaglass	34	49.5	114.9	49.5	47.8	49.5	51.6	53.8	61.0	68.3	74.1			52.7
Cromaglass	35	43.0	42.9	43.0	47.4	43.0	43.8	44.6	43.8	44.6	43.8			43.8
Cromaglass	36	100.1	90.1	80.1	78.9	77.8	78.9	77.8	63.7	77.8	76.3	74.8		77.8
Cromaglass	37	24.1	21.7	19.3	18.7	18.0	18.7	18.0	18.0	18.0	17.3	16.7		18.0
Cromaglass	38	61.3	49.0	36.8	35.1	33.4	24.5	15.7	16.0	16.3				33.4
Cromaglass	39	11.3	26.3	24.9	26.3	27.7	28.0	28.4	34.8	31.6	30.0	31.6		28.0
Cromaglass	40	17.2	13.5	17.2	18.9	17.2	18.9	17.2	15.5	17.2	17.9			17.2
Cromaglass	41	35.8	23.3	35.8	23.3	15.1	13.1	11.2	12.9	11.2	12.9			14.1
Cromaglass	42	48.2	29.2	10.2	11.6	10.2	11.6	13.1	11.6	10.2	11.6			11.6
Cromaglass	43	79.2	46.9	79.2	47.2	31.4	23.3	15.2	14.9	15.2				31.4
Cromaglass	44	8.3	11.5	14.6	14.6	14.6	14.6	14.5	12.6	10.6	9.8	9.1	9.9	12.0
Cromaglass	45	69.1	46.2	30.6	27.0	23.3	16.8	23.3	27.0	23.3	16.8	23.3		23.3
Cromaglass	46	29.1	24.0	29.1	29.7	29.1	29.7	30.3	31.8	33.4	38.4			29.7
Cromaglass	47	75.1	56.7	38.3	33.7	32.6	35.4	38.3	45.5	52.7	53.7			41.9
Cromaglass	48	30.1	48.0	65.9	48.0	52.7	59.3	52.7	54.6	56.5	60.6			53.7
Cromaglass	49	46.6	26.7	6.8	21.0	28.3	22.7	17.2	22.7					22.7
Cromaglass	50	18.0	22.0	18.0	21.1									19.5
Cromaglass	51	51.6	36.3	21.0	23.0	25.1	23.0	21.0						23.0
Cromaglass	52	18.1	16.6	18.1	29.0									18.1
Cromaglass	53	8.9	8.3	8.9	15.2									8.9
Cromaglass	54	21.2												21.2
Cromaglass	55	22.0	22.3											22.1
Cromaglass	56	21.5												21.5
Cromaglass	57	11.7	17.3	11.9	17.3									14.6
Cromaglass	58	7.1	16.6	26.1										16.6
Cromaglass	59	9.0												9.0
Cromaglass	60	41.5												41.5
Cromaglass	61	39.1												39.1
Cromaglass	62	18.4	18.1	18.4	18.3	18.4								18.4
Sample # Median		43.2	45.0	33.1	32.4	31.4	30.7	31.1	31.7	31.3	36.7	31.3	26.1	**31.5**
25th Percentile		21.6	24.0	19.6	21.1	23.5	22.8	18.9	18.5	18.0	18.3	19.0	16.3	19.3
75th Percentile		68.7	61.3	49.1	43.1	43.2	43.5	44.3	44.8	45.5	47.4	43.8	36.8	44.6
n		62	57	56	55	51	50	50	49	48	44	26	11	

Cromaglass Retrofits

As discussed above, the Commission instituted a temporary suspension on new Cromaglass systems in November 2006, pending satisfactory reductions in effluent total nitrogen concentrations. Cromaglass Corporation initially responded by implementing a series of system retrofits characterized by the addition of fixed film media to the otherwise suspended growth technology, reprogramming aerobic/anoxic cycles of select systems, combined fixed film and reprogrammed cycles in select systems and combined fixed film, reprogrammed cycles and new floats and float levels in select systems. The impact of these initial retrofits was minor at best and the TN grand median value of 31.5 mg/l confirms that Cromaglass technology has not yet been able to meet the Pinelands pilot program standard of 14 mg/l TN standard required for systems to be authorized for use on one acre parcels. The temporary suspension on new Cromaglass installations remains in effect.

In its ongoing attempt to improve system performance, Cromaglass Corporation undertook a research and development (R&D) effort at the Kelly Township (PA) Municipal Utility Authority Wastewater Treatment Plant during the period of February 2010 through November 2010. The R&D effort identified fourteen engineering and operational problems that are reported to have directly or indirectly adversely affected the Cromaglass units participating in the Pinelands pilot program. Each of these fourteen deficiencies were addressed in the Kelly Township program leading to total nitrogen effluent levels that met the Pinelands standard of 14 mg/.l. In September 2011, Cromaglass requested that the Commission permit the firm to implement these retrofits throughout the Pinelands. The Commission authorized the retrofits to be performed on one half (28) of the existing Pinelands systems provided that Cromaglass continue to provide operation and maintenance services on all Pinelands Cromaglass units at no additional cost to homeowners, that the retrofit and laboratory analyses be performed at no additional cost to the homeowners, and that the retrofits be performed on the worst performing units to the maximum extent possible. Retrofits on the first 28 systems were completed prior to a May 1, 2012 deadline. The first round of post retrofit sampling was completed on May 2, 2012. The results of the first round of post retrofit system samples are provided in Table 5. The grand median TN value of 18.0 mg/l from this initial sampling round, while not fully meeting the Commission standard of 14 mg/l, represents a significant improvement over pre-retrofit sampling results (see Table 4). Pending continued improvement, the Commission anticipates the remaining 28 systems will also undergo identical retrofitting.

Table 5. Cromaglass post retrofit TN (mgL-1) sample results. The grand median , 25th percentile, 75 percentile, and number of systems sampled (n) are provided. (See appendix 1 for data editing)

System ID	Technology	Sample Date	Total N	
3	Cromaglass	5/1/12	9.2	
5	Cromaglass	5/1/12	10.1	
6	Cromaglass	5/1/12	36.0	
7	Cromaglass	5/1/12	77.0	
8	Cromaglass	5/1/12	11.3	
11	Cromaglass	5/1/12	7.5	
13	Cromaglass	5/1/12	72.1	
16	Cromaglass	5/2/12	21.8	
17	Cromaglass	5/1/12	16.5	
19	Cromaglass	5/2/12	8.3	
20	Cromaglass	5/2/12	74.5	
21	Cromaglass	5/2/12	10.7	
22	Cromaglass	5/2/12	30.7	
23	Cromaglass	5/2/12	14.4	
25	Cromaglass	5/2/12	76.3	
26	Cromaglass	5/2/12	11.6	
28	Cromaglass	5/1/12	28.3	
30	Cromaglass	4/30/12	19.1	
31	Cromaglass	5/1/12	10.8	
36	Cromaglass	5/2/12	5.1	
38	Cromaglass	5/1/12	42.3	
39	Cromaglass	4/30/12	20.3	
41	Cromaglass	5/1/12	16.5	
43	Cromaglass	5/2/12	22.1	
46	Cromaglass	5/1/12	31.6	
47	Cromaglass	5/1/12	16.1	
48	Cromaglass	5/1/12	16.9	
49	Cromaglass	5/1/12	34.2	
	Median Value		18.0	
25th Percentile				11.2
75th Percentile				32.2
n				28

Table 6. FAST running median of total nitrogen (mg L^{-1}) by number of sampling events for each wastewater treatment system. The grand median, 25th percentile, 75th percentile, and number of systems sampled (N) per event are provided. (See Appendix 1 for discussion of data editing.)

		Number of Sampling Events																	
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Grand Median	Percentile
FAST	1	31.3	45.4	37.9	34.6	37.9	37.4	37.0	34.1	31.3	30.7	30.0	28.4	26.8	28.4			32.7	
FAST	2	27.1	25.8	27.1	34.6	27.1	27.7	27.1	27.7	28.2	27.7	27.1	26.1	25.0	24.8	24.5	24.1	27.1	
FAST	3	39.3	34.5	29.6	29.6	29.6	27.2	29.6	29.6	29.6	29.6	29.6	28.5	29.6	28.5			29.6	
FAST	4	32.4	23.0	23.9	25.1	23.9	18.9	15.9	15.5	15.9	15.5	15.0	15.5	15.9	17.5			16.7	
FAST	5	30.1	24.4	30.1	24.9	19.6	20.6	20.7	20.2	19.6	19.2	18.7	19.2	18.7				20.2	
FAST	6	12.4	16.6	20.7	21.4	20.8	21.4	22.0	22.3	22.0	22.2	22.4	22.5					21.7	
FAST	7	33.3	30.6	27.8	24.6	21.3	17.1	12.9	11.9	12.2	12.6	12.9	13.4					15.3	
FAST	8	48.6	40.7	32.7	29.5	29.8	31.0	29.8	29.4	29.8	31.0	32.2						31.0	
FAST	9	28.1	29.6	28.1	25.7	23.2	25.5	23.2	21.4	19.6	19.0							24.3	
FAST	10	16.5	17.1	17.6	24.7	17.6	17.1	17.6										17.6	
FAST	11	21.9	22.0	21.9	20.4	21.9	20.4	18.8										21.9	
FAST	12	44.5	27.4	13.1	19.9	25.2												25.2	
FAST	13	23.2	19.3	23.0	23.1	23.2												23.1	
FAST	14	13.5	11.0	13.5	18.0	15.9												13.5	
FAST	15	14.2	14.2	14.2														14.2	
FAST	16	28.6																28.6	
FAST	17	29.2	32.6	29.2														28.6	
FAST	18	25.2																25.2	
Sample# Median		28.6	25.1	25.5	24.8	23.2	21.4	22.0	22.3	22.0	22.2	24.8	22.5	25.0	26.6	24.5	24.1	23.7	
25th Percentile		21.9	18.7	19.9	21.8	20.9	19.6	18.2	20.2	19.6	19.0	17.8	17.3	18.7	22.9	24.5	24.1		18.2
75th Percentile		32.4	31.1	29.3	28.5	26.6	27.4	28.4	29.4	29.6	29.6	29.7	27.2	26.8	28.4	24.5	24.1		28.2
n	18	18	16	16	14	14	11	11	9	9	9	8	7	5	4	1	1		

FAST Retrofits

Bio-Microbics evaluated each of its operating FAST systems seeking to identify the cause for inadequate attenuation of total nitrogen in final effluent. This work resulted in the discovery of a significant number of units with airlift and /or recycle trough deficiencies. Retrofits to correct the deficiencies were made to existing units and modification were made during the installation of newly installed units. Subsequent to the correction of these problems, sample results from post retrofit systems were analyzed. The results of this analysis indicate significant improvement in system performance. . The results of the post retrofit system samples are provided in Table 6. The grand median TN value of 15.9 mg/l from this analysis, while not fully meeting the Commission standard of 14 mg/l, represents a significant improvement over pre-retrofit sampling results (see Table 5). Staff will continue to monitor progress and report on its recommendation in the November 2012 Implementation Report.

Table 7. FAST post retrofit TN (mgL-1) sample results. The grand median , 25th percentile, 75 percentile, and number of systems sampled (n) are provided. (See appendix 1 for data editing

		Number of Sampling Events													
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12	Grand Median	Percentile
FAST	1	37.5												37.5	
FAST	2	12.0	13.0	14.0	16.0	17.9								14.0	
FAST	3	27.4	25.8	27.4	25.8									26.6	
FAST	4	9.2	12.6	14.9	15.4	14.9	17.8	14.9	17.3	15.9				14.9	
FAST	5	11.7	16.6	20.7	19.5	18.2	17.7	17.5	17.5	17.5				17.5	
FAST	7	8.2	18.0	21.3	15.1	12.8	10.8	8.8	8.8	8.8	10.5	12.2	12.5	11.5	
FAST	9	19.6	16.9	14.2	14.9									15.9	
FAST	10	16.4	17.0	17.6	24.7	17.6	17.0	17.6	17.0					17.3	
FAST	11	16.3	15.4											15.9	
FAST	12	10.2	11.7	13.1	13.1	13.1								13.1	
FAST	13	23.3	19.4	23.0	23.2	23.3								23.2	
FAST	14	13.6	11.1	13.6	18.0	15.9								13.6	
FAST	15	11.9												11.9	
FAST	17	29.2	32.6	29.2										11.9	
FAST	18	25.2												25.2	
Sample No. Median		16.3	16.8	17.6	17.0	16.8	17.3	16.2	17.2	15.9	10.5	12.2	12.5	15.9	
25th Percentile		11.8	12.9	14.1	15.1	14.5	15.5	13.4	15.0	12.4	10.5	12.2	12.5		12.3
75th Percentile		24.3	18.3	22.2	22.2	18.0	17.7	17.5	17.4	16.7	10.5	12.2	12.5		19.3
n		15	12	11	10	8	4	4	4	3	1	1	1		

Other Issues in 2012

On June 7, 2010, CMP amendments related to the *management* of Pinelands pilot program wastewater treatment systems took effect. These rules require Pinelands Area municipalities to implement management programs which ensure that all advanced wastewater treatment systems (those subject of the Pinelands Alternate Design Wastewater Treatment Systems Pilot Program) be covered under an approved operation and maintenance agreement. Similar mandatory septic system management regulations for all systems were adopted by NJDEP (N.J.A.C 7:15-5.25(e) and N.J.A.C 7:9A-12.3). The Commission will be working with each of the Pinelands Area municipalities to assist them in complying with these requirements by providing a model ordinance to each municipality for local adoption. Details of the Commission's rule adoption may be viewed on the Commission's web site at http://www.state.nj.us/pinelands/cmp/amend/042810Septicadoption.pdf. Details of the DEP's rule adoption may be viewed on the DEP's web site at http://www.nj.gov/dep/dwq/pdf/njac79a.pdf

As noted above, the Commission adopted amendments to the CMP relating to the Pinelands alternate design wastewater treatment systems pilot program effective October 18, 2010. The amended rule extends the pilot program until August 5, 2013 for the FAST and Cromaglass technologies and until August 5, 2016 for new technologies which the Commission may authorize for future use. An implementation report on the FAST and Cromaglass systems will be issued in November 2012.

The existing pilot program is limited to residential development because the Pinelands Ad Hoc Septic System Committee determined that insufficient data were available to establish specific nitrogen removal efficiencies for the highly variable characteristics of non-residential (commercial and institutional) wastewater. The CMP allows non-residential applicants to propose to use an advanced treatment system (in lieu of dilution based upon parcel size) only on a case by case basis. Many Pinelands Towns and Villages without sewer systems could benefit from the use of pre-approved alternative treatment technologies by commercial establishments. The Commission staff remains ready to assist municipalities explore the use of "community" systems to serve multiple residential and commercial buildings, and is pleased that a 2012 MOU between the NJDEP and the Commission now addresses this issue which results from NJDEP's Water Quality Management Planning (WQMP) Rules, adopted in 2004. The updated WQMP rules and the subsequent MOA have the potential minimize the use of multiple individual septic systems (which provide no nutrient reduction) in sewer service areas and increase the use of nutrient reducing advanced treatment systems through Treatment Works and New Jersey Pollutant Discharge Elimination System (NJPDES) permitting. The Commission may wish at some future point to authorize pre-approved specific advanced treatment technologies for commercial or clustering uses as part of a closely monitored pilot program.

To date the Commission has approved three advanced onsite wastewater treatment systems (two Amphidrome Plus systems and one non-proprietary generic system) for use by commercial operations (retail pharmacies and a retail food establishment) as a means to meet ground water quality standards in unsewered Regional Growth and Pinelands Town management areas. Monitoring of two of those systems has indicated that achieved treatment levels have been consistent with conditions established at time of approval. The third system will be required to submit monitoring data in the coming months. As these technologies continue to be used to meet the wastewater treatment needs of small flow (e.g., < 2000gpd, (roughly 20,000 sq. ft.) non-NJPDES) commercial development within unsewered Pinelands Regional Growth Areas, Towns and Villages, a critical component of their use remains the implementation of management programs to ensure their proper long term operation and maintenance.

In a related matter, all of the parties to a community wastewater treatment system feasibility study Memorandum of Understanding (MOU) terminated the agreement in 2012. The MOU had been entered into by the Atlantic County Municipal Utilities Authority, Buena Vista Township and the Pinelands Commission to help fund a feasibility study for a decentralized advanced wastewater treatment system (advanced community septic system) which was intended to serve commercial businesses in the Richland Village section of the Township. The MOU and associated grant funding was terminated at the request of the municipal officials who expressed a desire to terminate the project.

In its June 7, 2010 adoption of new CMP septic system management rules applicable to alternative (advanced) onsite wastewater treatment technologies, the Commission reaffirmed its desire to assist the Pinelands Area municipalities in complying with the new NJDEP Water Quality Management Planning Rules and the NJDEP Standards for Individual Subsurface Sewage Disposal Systems which require all New Jersey municipalities to implement septic system management programs, for both traditional/conventional septic systems as well as advanced treatment technologies. Locally administered management programs help to ensure proper operation and maintenance of alternative treatment technologies as well as conventional or traditional septic systems. In the absence of septic system management programs, homeowners and businesses may neglect to perform the maintenance necessary to attain maximum longevity of their wastewater systems. The Commission is also evaluating the potential for Commission staff to assist health departments and/or municipalities monitor the status of operation and maintenance contracts for alternative design wastewater treatment systems for Pinelands Area municipalities. Assistance in this effort on the part of the Commission may act as an incentive for those health departments and municipalities to aggressively move to meet NJDEP's septic system management rules.

To advance the transfer of information acquired through the Pinelands alternate design treatment systems pilot program, Commission staff continues to share data with NJDEP and posts data from the annual reports on the Commission's web site.

Future Steps

Commission staff is working with the NJDEP to secure generic treatment works approvals for the four new NSF Standard 245 advanced treatment systems which have been authorized to participate in the Commission's pilot program.

Commission staff will continue to work with the local government officials, especially the Pinelands Area health officials and construction code officials, to achieve the objectives of the pilot program and assure required documentation is received prior to the issuance of construction approvals and certificates of occupancy. In addition, Commission staff will continue to work with the alternate design treatment systems technology vendors and their agents to assure adherence to the requisite sampling, analysis and reporting requirements of the pilot program. The staff will also work with the Pinelands municipalities on the adoption of septic system management ordiances.

Questions related to the Pinelands Alternate Design Treatment Systems Pilot Program should be directed to Ed Wengrowski, Environmental Technologies Coordinator, at ed.wengrowski@njpines.state.nj.us or 609-894-7300.

Appendix 1

Data Editing

Total nitrogen (TN) is reported herein as the sum of kjeldahl nitrogen plus nitrate nitrogen plus nitrite nitrogen. It should be noted that the retained data set includes instances where analyses for multiple parameters (from a single sampling event) were performed by different (DEP certified) laboratories under subcontract, i.e. nitrate and nitrite by one lab and total kjeldahl nitrogen by another lab, and where different (NJDEP approved) methodologies were used on various sampling dates from a single system location. In all of these instances, both the laboratories and analytical methods utilized were DEP approved and/or certified. In some instances, these state certified laboratories reported kjeldahl nitrogen values (sum on ammonia nitrogen plus organic nitrogen) at higher levels than ammonia values. Laboratory managers consistently reported that such variation is consistent with standard laboratory reporting protocols and does not constitute lab error. Nevertheless, where such reporting occurred, the data was not included in this analysis. Where laboratories reported analyte values as "Not Detected" the Commission's analysis assigned a concentration of one-half the laboratory reporting limit to that parameter when computing the total nitrogen mass in the sample.

Prior to conducting the data analysis, data were edited, sorted and evaluated by Commission staff. Where obvious errors in the data were evident, i.e. exceeding a maximum sample holding time or a lab reporting error, such data were discarded. When values for the various nitrogen parameters, (e.g. nitrate, nitrate, total kjeldahl nitrogen) were not collected during a single sampling event, the results of the individual parameters were not used in computing total nitrogen concentrations. After discarding such data and consulting with NJDEP's Office of Quality Assurance and Division of Water Quality, Bureau of Nonpoint Pollution Control, more than 85 % of the submitted laboratory results were retained for analysis. The

Commission continues to see improved conformance by analytical laboratories with regard to data reporting.

Data Accuracy

It is typical for a regulatory pilot program of this nature to generate data that would not meet the rigorous standards required of a peer reviewed research project. Because of the uncontrolled variables associated with such a pilot program, the reader should understand that a pilot program of this nature is not research. Uncontrolled variables are significant and numerous where treatment technologies are operating under real world conditions. Apart from these real world pilot programs, a number of technology test centers (National Sanitation Foundation (NSF), US Environmental Protection Agency Environmental Technology Verification (ETV)) routinely conduct benchmark tests to determine what a treatment system is capable of doing. Such trials are conducted under rigidly controlled conditions. While these benchmark studies measure what a technology is capable of achieving, they do not assess what a technology actually achieves in widely ranging real world applications. Moreover, while standard assessment protocols are well developed for test center benchmark trials, there are currently no similar standard assessment protocols for evaluating actual field performance of treatment technologies. As recently as September 2006, the NSF's Joint Wastewater Committee formed a Field Performance Task Group to address this issue and the group hopes to develop a draft field performance protocol by September 2007. In December 1999, New Jersey, Massachusetts and Pennsylvania, acting under a Memorandum of Understanding (MOU) originally entered into in June 1996, agreed to work on the development of a standard protocol for approving innovative and alternate onsite wastewater treatment technologies. In its September 2005 report, released as a result of that MOU, this multi-state consortium acknowledged the dearth of third-party peer-reviewed, replicable data related to field trials of onsite wastewater systems. The group advises however, that even in the absence of "pure" data, regulators should exercise caution before throwing out "imperfect" data while assessing onsite system performance. The consortium instead recommends that regulators rank data on the basis of a hierarchy of strength, and to not to allow the perfect to be the enemy of the good. The consortium produced a report for the New England Interstate Water Pollution Control Commission, entitled *Variability and Reliability of Test Center and Field Data: Definition of Proven Technology From a Regulatory Program Viewpoint.* In its report, the consortium concludes that all non-fraudulent field performance data on alternate design wastewater treatment systems is valuable in regulatory decision making, even if that data is not gathered in a completely controlled study.[2]

On April 16, 2007, the NJDEP, Division of Watershed Management, Bureau of Environmental Analysis and Restoration issued a technical report entitled Nitrate as a Surrogate of Assessing Impact of Development Using Individual Subsurface Sewage Disposal Systems on Ground Water Quality. In that report, NJDEP relied upon datasets from the USGS National Water Information System (NWIS) and the New Jersey Ambient Ground Water Quality Monitoring Network (AGWQMN) to establish an ambient nitrate concentration of 2 mg/L in NJ groundwater. In that analysis, DEP acknowledges retaining data with questionable precision, rather than abandoning data, to conduct its analysis.

The Pinelands pilot program involved multiple uncontrolled variables including homeowners, private laboratories, operation/maintenance companies, and wastewater technology vendors, all engaging in standard industry and marketplace practices. Some of these practices are regulated, such as laboratory certifications, while others are not. As a result of these real world conditions, it should be emphasized that the monitoring provisions of this pilot program do not rise to the level of peer-reviewed, journal-published research, but instead are intended to provide a statistically sound measure of the field performance of the pilot program systems. Variables that were not controlled in the pilot program include variability in the make up of households serviced by the systems, variability of wastewater flow and strength characteristics, variability in individuals involved in sample collection, variability in laboratories performing the analysis

[2] Groves. T.W., F. Bowers, E. Corriveau, J. Higgens, J. Heltshe, and M. Hoover. 2005. Variability and Reliability of Test Center and Field Data: Definition of Proven Technology From a Regulatory Program Viewpoint. Project No. WU-HT-03-35. Prepared for the National Decentralized Water Resources Capacity Development Project, Washington University, St. Louis, MO, by the New England Interstate Water Pollution Control Commission

(including subcontracting between laboratories), and variability in laboratory personnel, equipment and analytical methods. Additionally, all samples were collected as grab samples (as opposed to composite samples) and are thus greatly affected by wastewater usage conditions which prevailed just prior to the sampling event and do not necessarily characterize long term effluent characteristics.