ANNUAL REPORT
TO THE NEW JERSEY PINELANDS COMMISSION

ALTERNATE DESIGN TREATMENT SYSTEMS PILOT PROGRAM

August 5, 2011

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.

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.

Significant dates pertaining to the pilot program are as follows:

August 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.
January 10, 2003	Copies of sample ordinances authorizing the use of the advanced treatment technologies were provided to Pinelands Area municipalities.
July 5, 2003	Start of semi-annual reporting requirement for each manufacturer of an alternate technology treatment system to submit to the Executive Director a report which includes the number of systems installed during the previous six months and since the beginning of the pilot program, a discussion of any installation problems and what has been done to address those problems, an analysis and evaluation of the monitoring results to date and a discussion of any operational or maintenance issues, including the number of systems requiring maintenance or repairs and the nature and success of such maintenance and repairs, and the number of times the automatic dialing alarm system was set off and the reasons for each such occurrence.
August 5, 2003	For completed applications received prior to August 5, 2002, last day to obtain design plan approval from a local/county health department for a pressure dosing septic system.
August 5, 2004	Last day to complete the installation of a pressure dosing septic system for those plans approved prior to August 5, 2003.
August 5, 2006	Executive Director conducted an initial review of the pilot program and prepared the first Implementation Report addressing 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.
November 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 system through August 5, 2010. The program extension was recommended to provide an opportunity for additional system installations and the collection of additional effluent monitoring data.
May 21, 2007	Proposed amendments to N.J.A.C. 7:50-10.21 - 10.23 were published in the New Jersey Register based upon recommendations contained in the November 2006 Implementation Report.

August 5, 2007	Pursuant to the original pilot program rule, effective August 5, 2002, the last day to install a Pinelands alternate design wastewater treatment system unless otherwise authorized by the Commission. Systems installed on or prior to this date are subject to a three year wastewater monitoring requirement, through August 5, 2010, and a five year warranty, and five year service contract, through August 5, 2012.
December 3, 2007	Effective date of CMP amendments extending the pilot program through August 5, 2010.
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.
July 15, 2009	Public hearing on proposed amendments (N.J.A.C. 7:50-2.11, 3.39 and 6.85) related to septic system management.
August 14, 2009	Close of public comment period on the septic system management rule proposal.
August 5, 2009	Executive Director began a second review of the pilot program to report on the implementation of the pilot program.
November 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. Pinelands area municipalities had until July 7, 2011 to implement local ordinances to implement the rule but were granted an extension until October 18, 2011. Proposed amendments to N.J.A.C. 7:50-2.11, 6.84, 10.21-10.23 were published in the New Jersey Register to begin the sixty day public comment period. These amendments relate to the Pinelands Pilot Program for Alternate Design Wastewater Treatment Systems. In summary, the amendment proposed to extend the length of the pilot program, add new pre-screened treatment technologies to the pilot program and elevate two existing pilot program technologies to permanent approval status.
July 15, 2010	Date of public hearing on the proposed CMP amendments related to the Pinelands Pilot Program for Alternate Design Wastewater Treatment Systems.
August 5, 2010	Last day to install a Pinelands alternate design wastewater treatment system, pursuant to December 3, 2007 CMP amendments, absent a rule amendment which expressly authorizes such installations beyond this date. Systems installed on or prior to this date will be subject to the three year wastewater monitoring requirement, through August 5, 2013, and a five year warranty, and five year service contract, through August 5, 2015**.**
August 6, 2010	Close of public comment period on the Pinelands Pilot Program for Alternate Design Wastewater Treatment Systems rule proposal.

October 18, 2010	Effective date of CMP amendments published on June 7, 2010 which extended the last date to install a Cromaglass and FAST treatment system through August 5, 2013. The amendment also advanced the Amphidrome and Bioclere technologies out of the pilot program and provided permanent approval status to which no terminal installation date applies. In addition, the amendment enables the Commission to authorize up to four new advanced treatment technologies to be installed through August 5, 2016 (see below).
May 11, 2011	Invitations issued to fourteen NSF/ANSI Standard 245 and USEPA ETV treatment technologies to apply for participation in the Commission's expanded alternate design wastewater treatment systems pilot program.
July 1, 2011	Last day for NSF/ANSI Standard 245 and USEPA ETV treatment technologies pre-screened technologies to apply to participate in expanded pilot program.
July 7, 2011	Date by which Pinelands area municipalities were to implement local ordinances to implement the alternative design wastewater treatment systems management rule. This deadline has been extended until October 18, 2011.
September 29, 2011	Staff recommended to the Pinelands Commission that up to four new prescreened technologies be considered for participation in the pilot program.
October 18, 2011	Date by which Pinelands area municipalities are to adopt local ordinances to implement the alternate design wastewater treatment systems management rule contained in the CMP.
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 ninth annual report is submitted to fulfill the annual reporting requirement.

Before any of the five alternative technology systems could be used within the Pinelands, the manufacturer of the alternate design treatment system had to submit and the Executive Director had to 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.

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 New Jersey Department of Environmental Protection (NJDEP). In May 2009, Commission staff provided 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.

Management Initiative

As noted above, on June 15, 2009, the Commission proposed several amendments to the CMP at N.J.A.C. 7:50-2.11, 3.35, and 6.85 addressing septic system management. Those proposed amendments addressed the management of both traditional/conventional septic systems and advanced wastewater treatment systems. The rule proposal provided for the establishment of institutional/governmental arrangements to ensure the proper long-term operation of all onsite wastewater treatment systems. The proposed modifications to the Commission's septic system management program were developed in harmony with NJDEP's 2008 adoption of amended Water Quality Management Planning Rules. The adopted NJDEP rules include requirements for municipalities to manage all septic systems within their respective jurisdictions.

On June 7, 2010, after receiving extensive public comment opposing that portion of the septic rule proposal related to the management of traditional and/or conventional septic systems, the Commission withdrew the management requirements directed at traditional/conventional septic systems and instead chose to reinstate the existing provisions of the CMP related to traditional septic system management. These existing rules require triennial septic system inspections, pump-outs, and reporting to the local board of health. At the same time, the Commission decided to redirect its efforts toward assisting Pinelands Area municipalities to comply with the NJDEP's 2008 Water Quality Management Plan (WQMP) septic system management requirements. Importantly, the Commission adopted those portions of the septic system management rule proposal which address the minimum institutional and/or governmental arrangements necessary to ensure the proper long-term operation of Pinelands alternate design (advanced denitrifying) treatment systems.

The Commission continues to provide the Pinelands Area municipalities with guidance to assist the municipalities in complying with the NJDEP's WQMP requirement for the management of all septic systems. One particularly useful guidance document is entitled Onsite Wastewater Systems Management Manual for the New Jersey Pinelands, prepared by Stone Environmental, Inc. under contract to the Commission. This manual was developed to provide municipalities and others with a road map to guide the local development and implementation of septic system 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

As noted earlier, 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 the 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.

NJDEP Pre-Approvals

The NJDEP has actively participated in the development of the Commission's pilot program. To expedite the approval of the Pinelands pilot program alternate design septic systems, NJDEP issued a Generic Treatment Works Approval (TWA) Permit which allows the use of the 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. The Commission looks forward to NJDEP's ongoing cooperation in issuing generic TWA's should the Commission take action to authorize additional technologies to participate in an expansion of the pilot program.

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 the review of plans and applications and to provide training of inspectors on the alternative treatment technologies. In addition, staff provides 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 January 31, 2011 Peconic Bay (Long Island) Advanced Wastewater Treatment Systems Water Quality Symposium and the May 2011 Rutgers Onsite Wastewater Treatment Systems Continuing Professional Education Seminar. 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 and an October 2008 presentation at the Central Pine Barrens (Long Island) Joint Planning Commission conference in Brookhaven, NY.

Commission staff has also conducted a number of 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 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]

[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.

2. Amphidrome
3. Bioclere
4. Cromaglass
5. FAST

Two hundred and ten (210) Pinelands alternate design treatment systems have been installed and activated to date, with the first system coming online in April 2004. Eighteen (18) alternate design systems were installed during the current reporting period, August 2010 through May 2011. The following table summarizes annual installations of each technology.

Technology	2004	2005	2006	2007	2008	2009	2010	2011	Total Installed
Amphidrome	7	10	11	29	13	7	5	8	90
Bioclere	-	2	11	9	7	9	6	5	49
Cromaglass	-	5	39	7	4	1	0	-	56
FAST	-	-	-	-	2	5	3	5	15
Total	7	17	61	45	26	22	14	18	210

In accordance with the provisions of the pilot program requirements, 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.

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 is 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 is considering 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 are under consideration because the Cromaglass technology appears to provide no substantive benefit in reducing total nitrogen in comparison to a conventional septic system and thus suggests that there may be 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 is instituting a temporary suspension on the installation of new FAST systems as a result of the technologies inability thus far to meet expected total nitrogen concentrations in treated effluent. During the temporary suspension, no new FAST installations will be permitted and Bio-Microbics will be given the opportunity to trouble shoot and remediate substandard nitrogen removal. Upon remediation of substandard performance, the temporary suspension will be lifted.

The first Pinelands alternative wastewater treatment system was brought online in April 2004. Since then, a total of two hundred and ten (210) Pinelands alternative wastewater treatment systems have been installed and are currently operational. Of these two hundred and ten (210) systems, ninety (90) are Amphidrome systems, fifty-six (56) are Cromaglass systems, forty-nine (49) are Bioclere systems and fifteen (15) 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	Washington	Medford	Tabernacle	Woodland	Evesham	Shamong	Waterford	Chesilhurst	Winslow	Woodbine	Dennis	Upper	Franklin	Monroe	Jackson	Lacey	Manchester	Stafford	Total
Amphidrome		1	6	13	3	4	1	11	1	3	3	2		1	3		9		1		1		9	1	16	1	90
Bioclere	2			16	4	1	2	10			1	2	1			1	6	1		1			1				49
Cromaglass			1	4				22			1						4				1		13		10		56
FAST			1	1			1			1		1					5				2	2	1				15
Total	2	1	8	34	7	5	4	43	1	4	5	5	1	1	3	1	24	1	1	1	4	2	24	1	26	1	210

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.

System Permitting and Local Approvals

The pilot program relies upon the cooperation of local construction code officials, county health officials, alternate system manufacturers, 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 onsite 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 prior to all required documentation being 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 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.

Cromaglass systems were installed exclusively by Mid State Electric, Cromaglass' authorized treatment system installation contractor. There were no new Cromaglass systems installed during the current reporting period. Cromaglass Corporation has not submitted the required operation and maintenance information related to operational problems and alarm events as of the completion date of this annual report. This factor, as well as effluent treatment data will be considered by Commission staff in the development of staff recommendations regarding the future use of the Cromaglass technology in the Pinelands Area.

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.

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 that two treatment units experienced alarm events during the current annual reporting period. In each case, the alarm condition was traced to malfunctioning micro switches and the condition was corrected.

Cost Summary

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

The total cost of an onsite wastewater treatment system consists of at least three separate components. These include the cost of the treatment unit and its 5 year service package, the cost of the soil absorption system, 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 Aquapoint 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 construction takeoffs 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.

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]	54	$ 19,055 [3]	$ 13,378	$ 32,433
Bioclere [2]	39	$ 16,650 [4]	$ 12,911	$ 29,561
Cromaglass	41	$22,345 [5]	$12,920	$ 35,265
FAST	9	$ 17, 859 [6]	$ 11,958	$29,817

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.

(1) Based on last reported cost for the Amphidrome system as provided in Aug. 5, 2010 Annual Report. Price reduction has been reported due to elimination of requirement of laboratory analysis of effluent upon attainment of permanent approval status.

(2) Based on last reported cost for the Bioclere system as provided in Aug. 5, 2010 Annual Report. Price reduction has been reported due to elimination of requirement of laboratory analysis of effluent upon attainment of permanent approval status.

(3) Includes reported cost of the Amphidrome Treatment Unit (through July 2010) 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 July 2010) 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 June 2011)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.

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. In other cases, vendors or their agents have permitted the sampling interval to significantly exceed the 90 day interval. Commission staff continues to stress the importance of substantial compliance with this and all other provisions of the pilot program. If it is determined that a manufacturer or its agent is not adhering to any of the requirements of the pilot program, N.J.A.C. 7:50-10.22(a)5 provides a mechanism for the Commission to make a determination that the proposed future use of a technology raises a substantial issue requiring a hearing pursuant to N.J.A.C. 7:50-4.31 through 4.42. In cases of persistent and substantial non-compliance with the requirements of the pilot program becomes problematic, Commission staff may recommend to the Commission that a "substantial issue" determination be made. Such consideration is underway with respect to the Cromaglass technology which has failed to substantially comply with the sampling and reporting requirement of the pilot program.

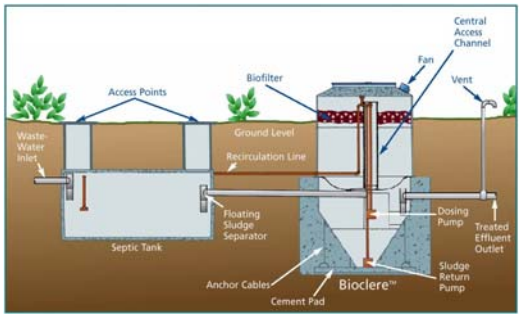
As discussed previously, there are a total of two hundred and ten (210) Pinelands alternate design wastewater treatment systems installed and activated to date. While continuing to accumulate, the laboratory data set is still somewhat limited at this time for at least one of the technologies (FAST) with a total of 80 samples results reported from 15 systems, due in part to the relatively small number of systems representing the FAST treatment technology. Even though the data set for the FAST technology is relatively small, the Commission staff is concerned with the data collected to date which indicates substantial non-attainment of expected total nitrogen levels in treated effluent. It is for that reason that the Executive Director is instituting a temporary suspension on new FAST system installations until such time as improved treatment levels are demonstrated in the currently installed FAST treatment units.

Amphidrome®

Amphidrome Technology

As illustrated in Table 2, sample results were evaluated for sixty-eight (68) Amphidrome systems through July 5, 2010 at which time the Commission began the process to grant permanent approval status to the Amphidrome technology. As of that date, twenty-one (21) systems had at least twelve (12) analyses evaluated, thirty-five (35) systems had at least eleven (11) analyses evaluated, forty (40) systems had at least ten (10) analyses evaluated, forty-two (42) systems had at least nine (9) analyses evaluated, forty-four (44) systems had at least eight (8) analyses evaluated, forty-seven (47) systems had at least seven (7) analyses evaluated, fifty-one (51) systems had at least six (6) analyses evaluated, fifty-five (55) systems had at least five (5) analyses evaluated, fifty-nine (59) systems had at least four (4) analyses evaluated, sixty-four (64) systems had at least three (3) analyses evaluated, sixty-six (66) systems had at least two (2) analyses evaluated and sixty-eight (68) systems had at least one (1) analysis evaluated. A total of six hundred and three (603) samples were used to evaluate these sixty-eight (68) Amphidrome systems. Total reported nitrogen values for each of these Amphidrome systems represents the sum of laboratory values for total kjeldahl nitrogen plus nitrite nitrogen plus nitrate nitrogen. The Amphidrome technology has produce a grand median total nitrogen concentration of 11.9 mg/l, meeting the Commission's 14.0 total nitrogen standard for unsewered residential development on a minimum one acre parcel.

Bioclere

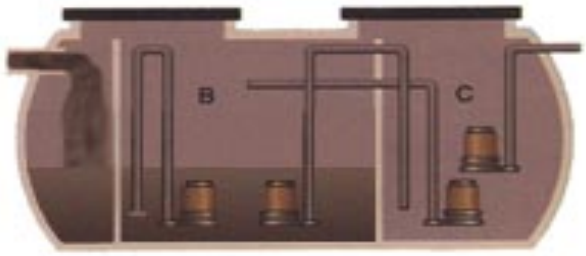


Bioclere Technology

As illustrated in Table 3, sample results were evaluated for thirty-eight (38) Bioclere systems through July 5, 2010 at which time the Commission began the process to grant permanent approval status to the Bioclere technology. As of that date, six (6) systems had at least twelve analyses evaluated, nine (9) systems had at least eleven (11) analyses evaluated, eleven (11) systems had at least ten (10) analyses evaluated, seventeen (17) systems had at least nine (9) analyses evaluated, nineteen (19) systems had at least eight (8) analyses evaluated, twenty-three (23) systems had at least seven (7) analyses evaluated, twenty-four (24) systems had at least six (6) analyses evaluated, twenty-seven (27) systems had at least five (5) analyses evaluated, thirty (30) systems had at least four (4) analyses evaluated, thirty-two (32) systems had at least three (3) analyses evaluated, thirty-two (32) systems had at least two (2) analyses evaluated, and thirty-eight (38) systems had at least one (1) analysis evaluated. A total of two hundred and sixty-eight (268) samples were used to evaluate these thirty-eight (38) Bioclere systems. Total reported nitrogen

values for each of these Bioclere systems represents the sum of laboratory values for total kjeldahl nitrogen plus nitrite nitrogen plus nitrate nitrogen. The Bioclere technology has produce a grand median total nitrogen concentration of 11.2 mg/l, meeting the Commission's 14.0 total nitrogen standard for unsewered residential development on a minimum one acre parcel.

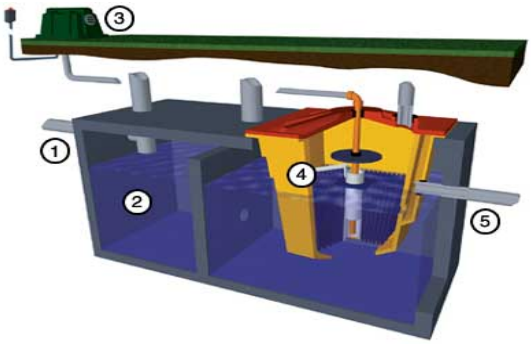
Cromaglass



Cromaglass Technology

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 produce 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.

FAST



FAST Technology

As illustrated in Table 5, sample results have been evaluated for fifteen (15) FAST systems to date. One (1) system had at least eleven (11) analyses evaluated, two (2) systems had at least ten (10) analyses evaluated, two (2) systems had at least nine (9) analyses evaluated, four systems had at least eight (8) analyses evaluated, six (6) systems had at

least seven (7) analyses evaluated, eight (8) systems had at least six (6) analyses evaluated, nine (9) systems had at least five (5) analyses evaluated, ten (10) systems had at least four (4) analyses evaluated, eleven (11) systems had at least three (3) analyses evaluated, twelve (12) systems has at least two (2) analyses evaluated and fifteen (15) systems had at least one (1) analysis evaluated. A total of eighty (80) samples have been used to evaluate these fifteen (15) 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/nitrate nitrogen. The FAST technology has produce a grand median total nitrogen concentration of 26.5 mg/l, failing to meet the Commission's 14.0 total nitrogen standard for unsewered residential development on a minimum one acre parcel.

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 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) have 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 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 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 26.5. mg/l for the FAST system, both significantly greater that the Commission's 14 mg/l target.

In the case of the FAST technology, the median TN value represents a relatively small sample size and a limited number of operating systems. Bio-Microbics had identified a number of possible causes for the technologies inability to meet the expected TN concentration and had taken steps to remediate these possible causes. Nevertheless, the data does not demonstrate satisfactory performance of the FAST technology. Commission staff remains concerned with the overall test data and is instituting a temporary suspension on new FAST system installations until such time as the existing systems can be brought into conformance with the Commission's 14 mg/l TN standard.

The current median value of 31.5 mg/l for the Cromaglass system is consistent with the value reported in the August 2008 report but is higher than the 26.6 mg/l grand median calculated in the August 2009 report. Although Cromaglass reports progress has been achieved in an experimental system installed at a Cromaglass Research and Development facility in Kelly Township, PA , similar progress has not yet been achieved in the Pinelands pilot program systems (see Cromaglass Retrofits below). Moreover, the Cromaglass Corporation has not consistently complied with the Commission's pilot program reporting requirements. The temporary suspension on new Cromaglass installations remains in effect as Cromaglass Corporation reportedly continues to work on improvements. The Commission is considering eliminating the Cromaglass technology from the pilot program altogether due to substandard performance and failure to consistently meet the submission requirements of the pilot program Staff is also considering offering the current owners of the Cromaglass system the option to remove or convert the system to a standard septic system (septic tank and leach field) which would not currently be subject to a mandatory operation and maintenance agreement as is required of the Pinelands alternate design wastewater treatment systems.

See appendix 1 for a discussion of data limitations and editing methods.

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

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

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.)

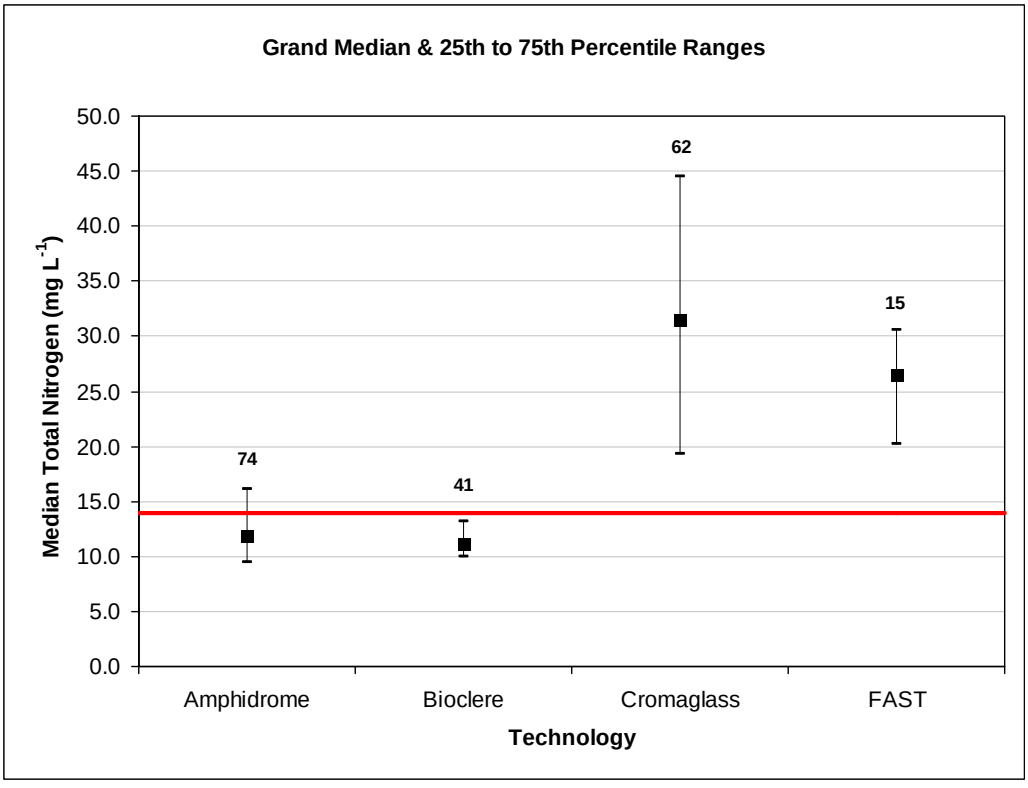
Total Nitrogen Running Median

		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	

Table 5. 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	Grand Median	Percentiles
FAST	1	31.3	45.4	37.9	34.6	37.9	37.5	37.0	34.2	31.3	30.6		35.8	
FAST	2	27.1	25.8	27.1	34.6	27.1	27.7	27.1	27.7	28.2	27.7	27.1	27.1	
FAST	3	39.3	34.5	29.6	31.1								32.8	
FAST	4	32.4	23.0	26.3	20.1	13.8	14.9	15.0	15.5				17.8	
FAST	5	30.1	24.4	30.1	24.9	19.6	20.6	20.7	20.2				22.6	
FAST	6	23.9											23.9	
FAST	7	12.4	16.6	20.7	21.4	20.8	21.4	22.0					20.8	
FAST	8	33.3	30.6	27.8	24.6	21.3	17.1	12.9					24.6	
FAST	9	30.4											30.4	
FAST	10	48.6	40.7	32.7	29.5	29.8	31.0						31.9	
FAST	11	28.1	29.6	28.1	25.7	23.2	25.5						26.9	
FAST	12	29.6	27.2	24.8	27.2	29.6							27.2	
FAST	13	16.5	17.1	17.6									17.1	
FAST	14	21.9	22.0										21.9	
FAST	15	44.5											44.5	
Sample# Median		30.1	26.5	27.8	26.4	23.2	23.4	21.4	23.9	29.8	29.1	27.1	26.5	
25th Percentile		25.5	22.7	25.6	24.6	20.8	19.7	16.4	19.0	29.0	28.4	27.1		20.3
75th Percentile		32.9	31.5	29.9	30.7	29.6	28.5	25.8	29.3	30.5	29.9	27.1		30.6
n	15	15	12	11	10	9	8	6	4	2	2	1		

Figure 1. Box plots showing the 25th percentile, grand median, and 75th percentile of total nitrogen (mg L^{-1}) for each sampling event. Individual graphs are presented for each technology. The red line at 14 mg L^{-1} represents the Pinelands Commission's target for the use of these systems on one acre lots. The number above each box and whisker represents the total number of systems for each technology. (See Appendix 1 for discussion of data editing.)



Note: Treated wastewater must not exceed 14 mg/l (red line) to meet the Pinelands groundwater quality standard of 2 mg/l TN at the boundary of a minimum one acre parcel.

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 has responded by implementing a series of system retrofits characterized by the addition of fixed film media in select systems, 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 earlier 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.

Cromaglass Corporation has sought to identify the cause(s) of inadequate treatment and has implemented corrective measures through a research and development site in Kelly Township, Pennsylvania. Cromaglass Corporation's research to date has included an analysis of the impact of low alkalinity in source water (onsite well water being typically low in alkalinity vs. community water supplies with typically higher alkalinity), the impact of surfactant (detergent) toxicity or inhibition upon nitrifying bacteria in sequencing batch reactors (SBRs) and the impact that erratic or relatively low flows may have on the ability SBRs to nitrify and denitrify. Moreover, Cromaglass reports that they have evaluated the potential benefit from the addition of fixed film media to enhance nitrification and denitrification in the Cromaglass SBR, as well as evaluating modifications to the timing of process cycles in an effort to achieve complete nitrification prior to denitrification. The firm also reports that they have studied the benefit of reducing turbulence from aeration and mixing action and enhanced decanting of effluent to reduce TSS in effluent. Although Cromaglass reports that significant improvement in TN attenuation has been achieved at the Kelly Township R&D facility, the impact of those improvements have not been substantially demonstrated in the Pinelands The Commission continues to monitor Cromaglass' efforts but is becoming increasingly concerned with both the technologies performance and the firms failure to comply with the reporting requirements of the Commission's pilot program. Cromaglass' current but much delayed retrofitting program is underway. Commission staff is awaiting the next round of laboratory results to evaluate the impact of the latest retrofit efforts while simultaneously considering potential future action by the Commission including the complete removal of the Cromaglass technology from the pilot program.

Other Issues in 2011

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. As a result of a recent deadline extension, Pinelands Area municipalities must implement these management requirements by October 18, 2011. The Commission will be working with each of the Pinelands Area municipalities to assist in this effort, importantly by providing a model ordinance to each municipality for local adoption. Details of the rule adoption may be viewed on the Commission's web site at http://www.state.nj.us/pinelands/cmp/amend/042810Septicadoption.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.

The October 18, 21010 rule adoption advanced two of the Pinelands pilot program treatment technologies (Amphidrome and Bioclere) out of the pilot program and authorized their use on a permanent basis, subject to specific safeguards to ensure their proper operation and maintenance. The rule also authorizes an expansion of the pilot program to include up to four new "pre-screened" nitrogen reduction technologies for participation in the pilot program. The Commission invited the vendors of fourteen pre-screened technologies to apply to participate in the expanded pilot program. Four companies submitted applications prior to the closing date of July 1, 2011. Staff is

currently reviewing those applications and is scheduled to make recommendations to the Commission on or before September 29, 2011.

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 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 remains hopeful that changes to NJDEP's Water Quality Management Planning (WQMP) Rules, adopted in 2004 will facilitate the use of such decentralized technologies. The updated WQMP rules 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 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 has not yet submitted monitoring data. As these technologies continue to be used to meet the wastewater treatment needs of small flow (e.g., < 2000gpd, 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 its June 7, 2010 adoption of new CMP septic system management rules applicable to alternative (advanced) onsite wastewater treatment technologies, the Commission has reaffirmed its desire to assist the Pinelands Area municipalities in complying with the new NJDEP Water Quality Management Planning Rules which now 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 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 frequently neglect to perform the maintenance necessary to attain maximum longevity from their wastewater systems. The Commission is also evaluating the potential for Commission staff to directly monitor the status of operation and maintenance contracts for alternative design wastewater treatment systems for Pinelands Area municipalities as an incentive for those 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 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.

Further, in an effort to expand the number of treatment system choices available to Pinelands residential applicants, staff work to expeditiously review and approve eligible treatment technologies which have applied to participate in the Commission's expanded pilot program. A likely benefit of introducing additional proven technologies to the pilot program may be lower system costs resulting from increased competition among the approved technology

vendors.

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 (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.

[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