State of New Jersey
THE PINELANDS COMMISSION
PO BOX 359
NEW LISBON, NJ 08064
(609) 894-7300
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General Information: Info@njpines.state.nj.us
Application Specific Information: AppInfo@njpines.state.nj.us

Chris Christie
Governor

Kim Guadagno
Lt. Governor

Sean W. Earlen
Chairman

Nancy Wittenberg
Executive Director

MEMORANDUM

To: CMP Policy & Implementation Committee

From: Susan R. Grogan
Chief Planner

Date: August 17, 2016

Subject: August 26, 2016 Committee meeting

Enclosed please find the agenda for the Committee's upcoming meeting on August 26, 2016. We have also enclosed the following:

- The minutes from the Committee's July 29, 2016 meeting;
- The 2016 Annual Report on the Alternate Design Treatment Systems Pilot Program; and
- A memorandum regarding the staff's on-going discussions on the Kirkwood/Cohansey aquifer and groundwater withdrawals

/CS15
cc: All Commissioners (agenda and Annual Report only)

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CMP POLICY & IMPLEMENTATION COMMITTEE MEETING

Richard J. Sullivan Center
Terrence D. Moore Room
15 C Springfield Road
New Lisbon, New Jersey

August 26, 2016

9:30 a.m.

Agenda

1. Adoption of minutes from the July 29, 2016 CMP Policy & Implementation Committee meeting

2. Alternate Design Treatment Systems Pilot Program

    - 2016 Annual Report
    - Recommended actions and CMP amendments

3. Plan Review

    - Update on Kirkwood/Cohansey aquifer groundwater withdrawal discussions

4. Public Comment

5. Other Items of Interest

CMP POLICY & IMPLEMENTATION COMMITTEE MEETING
Richard J. Sullivan Center
Terrence D. Moore Room
15 C Springfield Road
New Lisbon, New Jersey
July 29, 2016 - 9:30 a.m.

MINUTES

MEMBERS IN ATTENDANCE: Sean Earlen (Chairman) Candace Ashmun, Robert Barr, Richard Prickett and Joe DiBello (Alternate)

MEMBERS ABSENT: Paul E. Galletta, Ed Lloyd and Ed McGlinchey

STAFF PRESENT: Executive Director Nancy Wittenberg, Larry L. Liggett, Susan R. Grogan, Stacey P. Roth, Robyn Jeney, Joseph Sosik, Brad Lanute, Paul D. Leakan and Betsy Piner. Also present was Mr. Tyler Yingling with the Governor's Authorities Unit.

Chairman Earlen called the meeting of the Policy and Implementation (P&I) Committee to order at 9:35 a.m.

1. Adoption of minutes from the June 24, 2016 CMP Policy & Implementation Committee meeting

Commissioner Prickett moved the adoption of the June 24, 2016 meeting minutes. Commissioner Barr seconded the motion. The minutes were adopted with all Committee members voting in the affirmative.

2. Plan Review

Review of draft rule proposals and CMP amendments

Ms. Wittenberg said that staff continues to work on various Plan Review issues and has developed some draft CMP amendments for the Committee's discussion today. *(Commissioner DiBello arrived at 9:50 a.m. during the following discussion)*

Ms. Grogan made a PowerPoint presentation (*Attachment A to these minutes and posted on the Commission's website at http://www.state.nj.us/pinelands/home/presentations/*) noting that much of the rule language had been developed a few years ago along with some new items. Ms. Grogan described the various issues in the proposal as follows:

Application Fees: The proposal doubles the fees for applications involving violations such as clearing or developing without an application to the Commission. The increased fee reflects the extra work imposed upon staff to resolve violations and staff hopes it will discourage such

violations in the future. Specific fees are added for general development plans, typically those for larger projects for which approvals may span some 10 to 20 years. Under this provision, the applicant will pay half the fee upon initial submission of the application with the remainder due with the review of the subsequent phases of the project. Currently there is no specific fee for the development of solar energy facilities and the application fee is very high as it is based on construction costs. The proposal will establish a flat fee plus a cost per acre, similar to that applied to other land extensive uses like mining. This should reduce the cost of solar project applications considerably and may encourage more solar development. If adopted, it will be about ten years since the fees were last reviewed. The proposal includes a fee of $300.00 for the demolition of a structure more than 50 years old. Based on the periodic review, staff is suggesting an increase of all fees by 50%. The proposal will eliminate the need for a sworn statement regarding cost/construction estimates. This was found to be cumbersome and staff will continue to review the estimates but the removal of this hurdle should expedite the review process.

Procedures and Exemptions The proposal eliminates the requirement for submission of names and addresses of people who "actively participate" on applications at the local Planning Board meetings. This requirement has found not be workable as often that information is not available. Now that there are so many opportunities for interested parties to obtain further information, there is no need for the Commission to actively try to pursue those who testify locally.

Commissioner Ashmun noted that the level of public concern is important. Some individuals may attend local meetings but not the Commission meetings.

Chairman Earlen said staff is looking for content, not the names of individual commenters.

During a brief discussion of the information provided in minutes of local meetings, Ms. Grogan said often those minutes are available on the municipal web sites and it is better to access them there rather than to gather copies for the Commission's files.

A new provision clarifies that the exemption for prescribed burning includes linear clearing of vegetation not to exceed six feet in width and eliminates the exemption for utility distribution lines.

In response to a question from Commissioner Ashmun regarding the homeowner who puts a fire break around his house, Mr. Horner said there is no straightforward answer as the size of the property is a factor. The exemption may apply to a 1-acre lot but not a 100-acre lot.

Definitions and Procedures The proposal changes the definition of "interested person" to "interested party" and clarifies who has the right to participate formally in the Commission's decision-making processes. It also clarifies that the Executive Director's decision is considered rendered three days after mailing, not including the day the decision is mailed. This relates to the timing of appeals and is consistent with the procedure at the Office of Administrative Law.

Notice and Mailing Procedures The proposal will define "mail" to include "email" and eliminate most certified mailing requirements but will allow the Commission to do so if warranted. Also the proposal eliminates requirements for newspaper notices and posting of notices on the subject

property. These are seen as inefficient notification methods and, by requiring the posting of notices on the Commission's website, more people can be made aware of activities

In response to Commissioner Prickett's question if this was now the process State-wide, Ms. Grogan said yes. Also, she said, it is easier to search and get the information from a website rather than flipping through a newspaper where a legal notice would appear on only one particular day.

In response to Commissioner Barr's question regarding those who do not look at the website, Ms. Grogan said the Commission provides a hearing registry and maintains a list of those who are notified automatically.

Chairman Earlen noted that the municipalities have their own notice requirements and Ms. Roth stated that the Commission notifies the municipalities of any pending actions, while Commissioner Prickett added that public libraries have computers available. Ms. Grogan said the Commission already puts all hearing notices online.

Waivers The proposal will place an expiration date (one year from the effective date of these rules) for "old" extraordinary hardship waivers that were issued between 1981 and March 1992, when the "new" waiver rules took effect. At that time, the Commission determined that new waivers should expire after five years but chose not to apply such a deadline to the waivers granted previously. There are now some 200 of these waivers, many of which would no longer qualify or the properties have been sold, consolidated with other lots etc. Staff will attempt to notify all these property owners and explain their options. Some may be eligible to apply for and receive a new waiver approval.

In response to a question from Chairman Earlen if a year was sufficient time for affected landowners to be notified of the pending expiration date and obtain the necessary approvals, Ms. Grogan said that the notification process would start when the Commission proposes the rules, so landowners would actually have approximately two years. The approved waivers are almost all for one dwelling unit.

Another element of the proposal is the shifting of the responsibility from the applicant to the Commission for the advertising of public hearings on compelling public need waivers. This removes the cumbersome relationship between the applicant's obligations to advertise the hearing while the hearing is conducted by the Commission.

Landfills The proposal will clarify the circumstances under which an impermeable cap is not required on closed landfills (no significant public health risk from the plume, as determined by the New Jersey Department of Environmental Protection (NJDEP), and no significant ecological risk to wetlands).

Mr. Wengrowski reminded the Committee that staff had worked with the United States Geological Survey (USGS) whose staff had reviewed archived NJDEP data and developed a model to prioritize Pinelands landfills and determine which needed further investigation. He said staff will work with the landfill owners to monitor any leachate plume and determine which landfills have no practical reason for concern.

In response to a question from Commissioner Prickett, Mr. Wengrowski said staff has been notifying the municipalities of any potential problems and "red light" projects. He said the municipalities are being penalized with high New Jersey Pollutant Discharge Elimination System (NJPDES) permit fees until the landfills are released by the Commission.

In response to Commissioner Prickett's question if NJDEP will evaluate the data and remove landfills from the list, Mr. Wengrowski said the status of the landfills is posted on the Commission's website. NJDEP has been provided with a copy of the USGS fate and transport model and many Pinelands landfills do not rise to a level of action required by NJDEP, but the Commission is looking for non-detectable levels, background levels or levels that are below an applicable regulatory standard in wetlands to protect the ecosystem.

Alternate Design Wastewater Systems Under this proposal, the FAST technology will graduate from the pilot program and be allowed for residential use on lots of at least 1.4 acres. Previously staff had thought the lot size should be 1.5 acres but that was a manifestation of rounding up. The proposal also deletes the mechanism for septic management as currently described in the CMP and instead relies upon NJDEP requirements that are specified in the State's septic system standards. Mr. Wengrowski has been working with NJDEP and the Pinelands counties on this issue. Finally, under the draft rule proposal, advanced nitrogen reducing systems could be used for the expansion of or changes to existing nonresidential uses in the RDA, APA, FA and infill areas which should improve water quality while allowing expansion of permitted uses by 50%.

Commissioner Ashmun asked for clarification that the systems could not be used to allow residential development on smaller lots than currently permitted by zoning. Ms. Grogan said that authorization of the FAST system in no way allows for increases in permitted density or other changes in minimum lot size requirements. Use of the FAST system on 1.4 acre lots can only occur where that lot size is already permitted by a certified municipal zoning plan.

Commissioner Ashmun cautioned against relying solely on NJDEP's rules for management and maintenance of these treatment systems. She said that NJDEP could abandon its oversight of the systems and then the CMP would contain no applicable standards. Ms. Grogan agreed to review the proposed CMP amendments to determine a better approach. She said that the current CMP requirements relating to the management of the pilot program treatment systems, which envisioned municipal tracking and management of the systems, have proved to be unworkable. The staff's focus has shifted to working with Pinelands counties because they are obligated to fulfill these responsibilities under NJDEP regulations.

Mr. Wengrowski said that several businesses that cannot meet water quality by dilution will be able to improve groundwater quality by using one of these systems even as the use is expanded. He said that the Amphidrome system can be configured for commercial use and has attained nitrogen reduction efficiency by 97%.

Commissioner Ashmun said that the Commission had established the pilot program and is now harvesting the results.

In response to Commissioner Prickett's question as to why the expansion is limited to only 50%, Ms. Grogan said that one must be mindful that these uses are in the more conservation oriented management areas, particularly the Forest Area. Some of the existing uses are already quite large.

Mr. Liggett said all management areas have residential intensity standards but there are none for non-residential uses. In the non-sewered area, the intensity of development is controlled by septic dilution.

Ms. Grogan said if this proves to be successful, the Commission may want to permit these systems for new uses in the future.

Signs The proposal will eliminate the CMP standards for on-site signs and rely on the municipalities to regulate them and determine whether on-site signs using digital technology (electronic message display or EMD) should be permitted, regardless of management area. Off-site signs (billboards) in RGA and PT will be allowed to use digital technology subject to certain conditions but non-conforming existing billboards outside RGA and PT will be prohibited from converting to digital technology.

In response to a question from Commissioner Prickett, Ms. Grogan said that the Commission is aware of how many nonconforming billboards exist in the Pinelands but does not track them. If any were converted to EMD, it is likely that someone would report the violation.

Commissioner Prickett said he was concerned that billboards might become more valuable thus less likely to be removed.

Mr. Lanute said the NJ Department of Transportation (DOT) has a regional tracking system for billboards. DOT is aware of Pinelands standards and the tracking system distinguishes between conforming and non-conforming signs. It is a good resource.

Commissioner Barr said, as a fiscal conservative, he was concerned about the fee increases. He said he saw the need for it but New Jersey businesses are already taxed and any time one talks about raising fees, one must be mindful that it will be impactful on small businesses.

Ms. Wittenberg said the proposal retains the existing maximum application fee "caps".

Ms. Grogan said the cap will remain at $50,000 for private development, $25,000 for a public agency, and $500 for a non-profit agency.

In response to a question from Chairman Earlen as to how frequently does a project require the maximum fee, Mr. Liggett said a couple of large solar projects hit that cap which is why staff decided to look at those fees.

In response to a question from Commissioner Prickett, Ms. Wittenberg said even if the 50% fee increase is not approved, staff wants to keep the solar fee decrease.

Ms. Wittenberg described the next steps of the process as the proposal will be reviewed in Trenton and then, if approved, will come back to the CMP P&I Committee for its consideration and recommendation to the full Commission.

In response to Commissioner Ashmun's question about other items from Plan Review, Ms. Grogan said there are more items and staff will continue to work on them.

Commissioner Ashmun offered to reconvene the MOA Policy Committee if it would help the process.

Black Run

Ms. Grogan made a presentation (*Attachment B to these minutes and posted on the Commission's website at http://www.state.nj.us/pinelands/home/presentations/*) on a potential rule proposal to protect the headwaters of the Black Run. She said since the last presentation (*see minutes of June 24, 2016 P&I Committee meeting*), staff had refined the boundaries of the proposed Forest Area by looking closely at existing uses, ownership and pending applications. She displayed a series of new maps, prepared by Mr. Sosik, that clearly show how heavily constrained the majority of vacant lots are due to extensive wetlands and wetlands buffer areas. She reminded the Committee that the rule proposal will first rezone from RDA to FA some 3,650 acres in southern Evesham and Medford townships. This is a slightly smaller area than had been discussed previously, based on staff's more detailed examination of the area. The second step will be the authorization of a pilot program allowing off site clustering in a 175-acre development area in the Southern portion of Evesham adjacent to the heavily developed portion of Voorhees Township. The development area, the newly created Restricted Regional Growth Area, will have the potential for 400 units on lots of no more than 15,000 square feet, served by sanitary sewer. The threatened and endangered species protection standards will be met through the permanent protection of the lands in the Forest Area. She said Evesham will be notifying landowners and is working with the Commission on this project. She said most of the private property owners are in the heavily constrained areas and cannot currently build. The pilot program will give them a chance to retain the value of their land by transferring their development potential. She said that the Committee had seen the draft rules last month and they will next be sent to Trenton for review. Staff will keep the Committee informed.

Chairman Earlen said he understood that the majority landowner was aware of the proposal but he wanted to be sure that all the landowners are notified before the rules are before the full Commission. He said he thought the affected property owners should have an opportunity to make comments on the process.

Ms. Grogan said staff will be working out the details with the Township and will keep the Committee informed.

Continued discussion of enhancements to the Pinelands Development Credit program

Mr. Liggett made a PowerPoint presentation on proposed enhancements to the PDC program (*Attachment C to these minutes and also posted on the Commission's website at http://www.state.nj.us/pinelands/home/presentations/)*.

Mr. Liggett summarized the proposal including implementing the sliding scale requiring fewer PDCs at higher densities, exempting affordable units from a PDC obligation, enhancing flexibility to enable builders to better approach zone capacity, and treating the Pinelands Town Management Area the same as RGA. He said the proposal provides a number of relief mechanisms including requiring only 1 right for projects ≤ 4 units rather than applying the sliding scale and reducing the PDC obligation on lots heavily constrained by wetlands. He said the current iteration will impose no PDC obligation on commercial development but will provide municipalities with the option to shift PDC obligations to commercial development if they choose to do so. He said the current version defers consideration of allocating PDCs to the Forest Area or allowing an *in lieu* financial contribution to the Pinelands Conservation Fund until such time if/when the supply of PDCs warrants such options. He said the farm community had been very concerned about expanding the sending area as more PDCs will depress the price further.

Mr. Liggett said the builders like the sliding scale but object to it being mandatory. He also said they like the enhanced flexibility offered in this proposal and that they want smaller lots because they believe the current demand is for apartments and townhouses, not single-family detached units.

Mr. Liggett reviewed the presentation that had been made by NJBA at the June 24, 2016 Committee meeting, noting that the example had some erroneous calculations due to the confusion between PDCs and rights (1 PDC = 4 rights), failed to reflect of any of the proposed flexibility provisions for constrained lots or recognize that there is no PDC obligation for affordable units. Furthermore, the builders' concern with height restrictions is not applicable in RGA where there are no CMP height restrictions. However, the case study did highlight for staff the need to further consider the relief mechanism for constrained lands.

Mr. Liggett provided some case studies prepared by Mr. Sosik. He said the impacts of the PDC enhancement proposal are not always obvious, noting differences in what the PDC obligation would be for projects under the current PDC program and the proposed enhancements.

Mr. Liggett said that staff had met with the representatives of the New Jersey Farm Bureau (NJFB) on July 26, 2016 and they are generally supportive of the enhancements. NJFB will be sharing the proposal with their constituents and respond to the Commission by September 1, 2016.

Staff met with the NJ Builders Association on July 27, 2016 and they remain opposed to the mandatory use of PDCs and want more flexibility. They are supportive of strengthening the PDC Bank which they believe could be accomplished by moving it out of the Department of Treasury

and under the authority of the Pinelands Commission. Mr. Liggett said it will take legislation to strengthen the Bank.

Mr. Liggett distributed a document prepared by Mr. Creigh Rahenkamp (*Attachment D)* outlining the objections of the building industry and its recommendations to improve the PDC program, including eliminating the upper cap on permitted densities and the use of PDCs, bypassing local zoning district requirements with the use of PDCs, creating the right of appeal to the Commission for any denial by a local planning board, revising the function of the Bank and developing a sliding scale based on the type of housing product. Mr. Liggett noted that staff has been meeting with the builders for years but this was the first time they had been provided something in writing.

Mr. Liggett said the builders would like to see the PDC Bank sell certificates based on a set, established value and that the PDC cost should be based on housing types and location.

Mr. Liggett said staff had felt they were close to having a final proposal ready but this latest meeting with the builders has created somewhat of a setback. He said the Governor's Authorities Unit is aware of the three major stakeholders (municipalities, farmers and builders) and the Commission's goal of trying to work with all of them.

Chairman Earlen said it was good that the industry had provided a written document.

In response to a question posed by Commissioner Ashmun, Ms. Wittenberg said that the document presented by Mr. Rahenkamp had not been voted upon by NJBA. Staff had asked them to present some ideas and this document was their response.

3. Public Comment

Mr. Rich Bizub, with the Pinelands Preservation Alliance (PPA), said he was sorry not to see any proposed amendments related to the Kirkwood Cohansey initiative and hoped they would be forthcoming. Referencing the proposal relating to landfills, PPA felt the language raised some concerns regarding the role of the Commission in protecting wetlands.

Mr. Wengrowski responded that the proposal makes no changes in how one interprets the CMP in protecting water quality; rather the point of compliance is being moved. He said the CMP does not allow the degradation of water quality beyond background levels. If one has a landfill that is emitting constituents at a level equal to or less than background, there is no reason for remediation. For instance, if there is widespread degradation in the area due to an agricultural activity that is adding nitrate to the system and that landfill either dilutes that nitrate level (because there is less nitrate coming out of the landfill) or matches the nitrate concentration, there is no requirement to remediate. But, Mr. Wengrowski said, if the level of nitrate is increasing above background levels as a result of the landfill and the level is above the 2 mg/L standard, not at the monitoring well or the mass of water beneath the landfill, but at a receptor (a stream or wetland), then the CMP requirements kick in for remediation and the same would apply to other constituents in a leachate plume if detected at the receptor. He said a testing laboratory would not report a zero detection level, rather the lab would provide a practical quantitative limit (PQL) , the lowest level at which a

substance can be detected and report the constituent as being below that level if it were not detected. He said the presence of any contaminant that exceeds the PQL at the receptor requires remediation. He noted that the presumptive remedy in the CMP is an impermeable cap on a landfill but such a cap does not always result in remediation if the underlying groundwater reaches up into the refuse field. He said it would stop water percolating from above but contaminants would still be leaching into the ground water. He said in such a case, a cap might meet the CMP obligation but would not remediate the problem. He said if a landfill is found to be leaking contaminants that are reaching receptors, there might be means other than a cap that would be required to remediate the problem and reduce the contaminants to below the background, PQL or the regulatory standard.

Mr. Bizub thanked Mr. Wengrowski for the clarification. He continued and said he felt the landfill rule should reference streams as well as wetlands as receptors. Also, he said he has been a longtime supporter of allowing the alternate design wastewater treatment systems for non-residential uses and believed their use will improve Pinelands water quality. However, he said the challenge would be in determining appropriate uses as these systems might be suitable for a retail clothing store to accommodate the restrooms, but perhaps not for a garage since solvents, paints, greases and other chemicals would not be treated and removed by these systems. Finally, he said he didn't understand the rationale for the provision to expand the use of the alternate design treatment systems to the Military and Federal Installation Area as most have their own sewer systems, except perhaps out in the range or bivouac areas where they might want to expand their bathroom facilities.

Ms. Tiffany Cuviello said she spoke on behalf of Maurice River, Buena Vista and Galloway townships which support allowing the expansion of the alternate design wastewater treatment systems. She said the builders' recommendation allowing the Commission to hear the appeal of a denial by a Planning or Zoning board was a plea the Commission should ignore. She said any appeal of a Planning or Zoning Board decision goes to the courts, and such a recommendation would not meet legal justification. She said Galloway supports the sliding scale PDC obligation in the RGA. Also, as Galloway has projects along the White Horse Pike (in RGA), it wants to have control over those design standards. She said it would be inappropriate for the Commission to set design standards as recommended by the builders. She said she was glad to see that a PDC obligation for non-residential development had been removed from this proposal although she supported allowing municipalities to have flexibility regarding PDCs for commercial projects. She said she wished the process could move faster. Galloway has a 100% affordable housing project and there should be an equity balance; the project should not be subject to a PDC obligation.

Mr. Jason Howell, with PPA, expressed his ongoing concern with the damage caused by off-road vehicles in Wharton State Forest and noted that PPA had recently organized a volunteer cleanup at Apple Pie Hill. Referencing Commissioner Barr's concern with the sacrifice of taxpayers he said what is going on with the off-road vehicles is sacrificing Wharton State Forest.

Mr. Ryan Rebozo, with PPA, asked the Commission to reconsider the implementation of the Best Management Practices for roadside maintenance. He cited locations where he had seen plant species damaged by those who ignore the "no mow" zone, by mowing beyond the 8' buffer from

the pavement, out of season or well below the 6" height limit. He said over the years, the message is not getting through to the supervisors or mowers and the Commission needs to make them aware of these obligations.

Ms. Grogan responded that Ms. Jeney has scheduled meetings with the Counties within the next month or so regarding the Commission's agreements.

Mr. Jay Mounier, a resident of Franklinville, Gloucester County, said he did not speak for the Farm Bureau or for the Department of Agriculture rather as a small farm owner who has long been concerned that the PDC program doesn't work particularly well. He said there have been some years when farmers were able to negotiate decent prices for their PDCs but, for the most part, they have not. He said the current proposal is about ten years old and hasn't gone anywhere due to the interference from government, builders and municipal opposition. He said the only group to support the current proposal is the farmers. He said this is not all that beneficial but better than what is on the books already. He said if the Commission waits to hear what the municipal officials and builders think of the current rule proposal, the wait might be another 35 years. He said this delay is troubling to those whose rights were taken away in 1979 and who haven't been able build anything since.

Ms. Wittenberg said that staff would look at the information provided by the builders and have further discussion to try to move a PDC proposal forward.

Chairman Earlen said it seemed the Commission needed the input from the various parties in order to try to accommodate the needs of all.

There being no other items of interest, the meeting adjourned at 12:04 a.m. (moved by Commissioner Barr and seconded by Commissioner Ashmun.)

Certified as true and correct:

Betsy Piner,
Principal Planning Assistant

Date: August 16, 2016

Application Fees

- Double fees for applications involving violations
- Add specific fees for general development plans
- Add specific fees for solar energy facilities
- Add specific fee for demolition of old structures
- Eliminate need for sworn statements of construction cost estimates
- Increase all fees by 50%

Procedures and Exemptions

- Eliminate requirement for submission of names and addresses of people who "actively participate" on applications at Planning Board meetings
- Clarify exemption for prescribed burning to include linear clearing of vegetation not to exceed 6 feet in width
- Eliminate utility distribution line exemption

Definitions and Procedures

- Change the definition of "interested person" to "interested party" and clarify who has the right to formally participate in the Commission's decision-making processes
- Decisions of the ED are considered rendered three days after mailing. Clarify that such decisions may be emailed and that we don't count the day the decision is mailed when computing the three day period.

Notice and Mailing Procedures

- Define "mail" to include "email"
- Eliminate certified mailing requirements
- Eliminate newspaper notices
- Eliminate requirement to post notices on properties
- Require posting of notices on the Commission's website

Waivers

- Establish an expiration date for "old" extraordinary hardship waivers (1981-March 1992)
- Shift responsibility for advertising public hearings on compelling public need waivers from applicants to the Commission

Landfills

Clarify the circumstances under which an impermeable cap is not required

- No significant public health risk from plume
- No significant ecological risk to wetlands from plume

Alternate Design Wastewater Systems

- "Graduate" the FAST technology from the septic pilot program and allow for residential use on 1.4 acre lots
- Delete septic management requirements for alternate design wastewater treatment systems and rely on DEP requirements
- Allow alternate design systems to be used for the expansion of or changes to existing nonresidential uses in the RDA, APA, FA and infill areas

Signs

Signs

- Eliminate CMP standards for on-site signs; rely on municipalities to regulate
- Give municipalities the ability to determine whether on-site signs using digital technology should be permitted, regardless of management area
- Allow off-site signs (billboards) in RGAs and Towns to use digital technology subject to certain conditions
- Prohibit existing billboards outside RGAs and Towns from converting to digital technology

Black Run Pilot Program

Increase protection for the Black Run headwaters and adjacent areas in southern Evesham Township

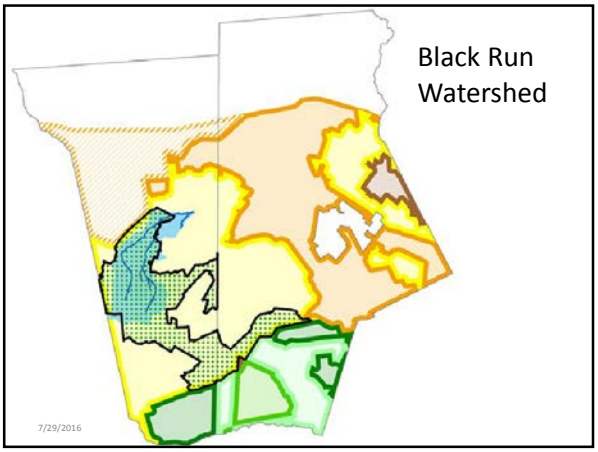
- New Forest Area (3,200 acres)
- Pilot Program
  - Designated development area (175 acres)
  - 400 residential units on sewer
  - Potential protection of 1,600 Forest Area acres

Black Run Rule Proposal

July 29, 2016

CMP Policy & Implementation Committee

7/29/2016

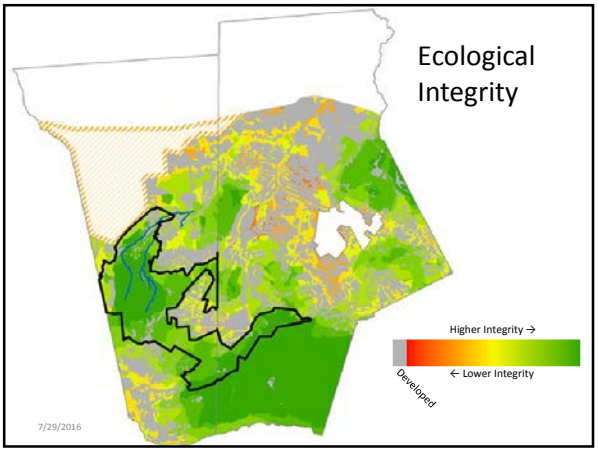


7/29/2016

Step 1: Forest Area Redesignation

- 3,650 acres from RDA to FA
  - 3,200 acres in Evesham
  - 450 acres in Medford
- Includes Black Run, adjacent lands in common ownership and other public and permanently protected lands
- Connects to existing FA in both municipalities

7/29/2016



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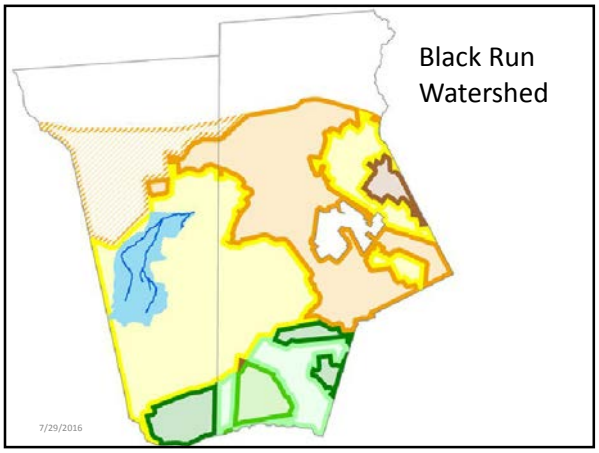

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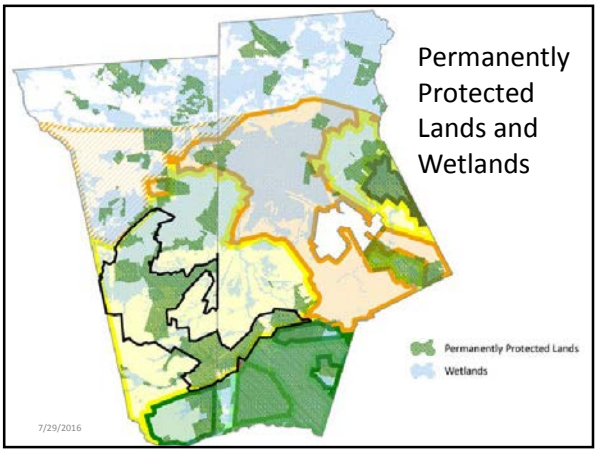
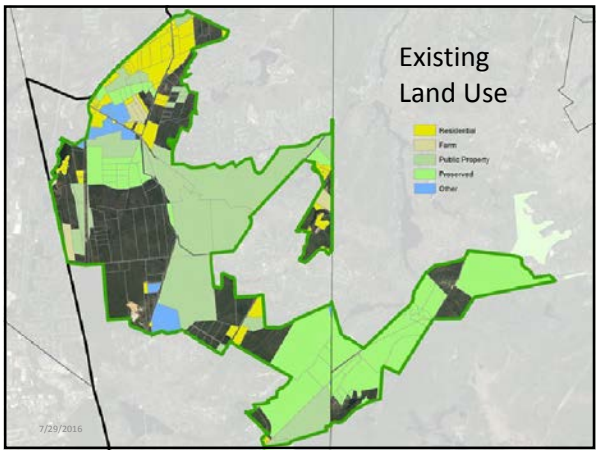


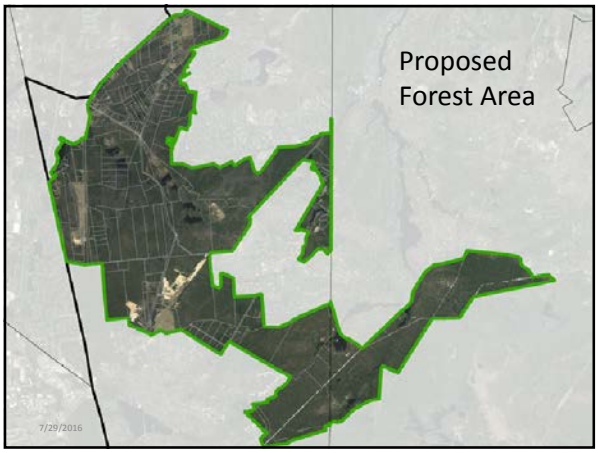
7/29/2016

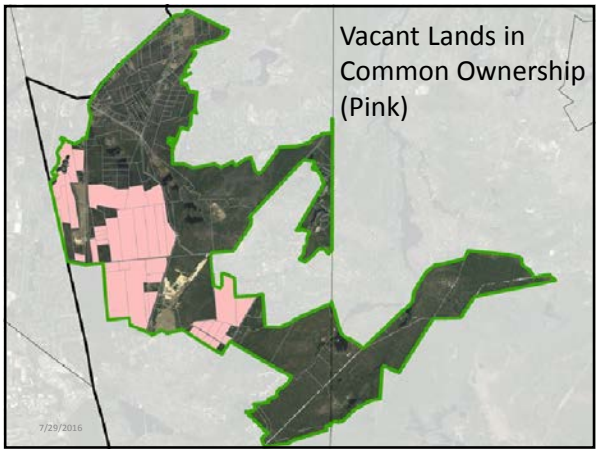
Step 1: Forest Area Redesignation

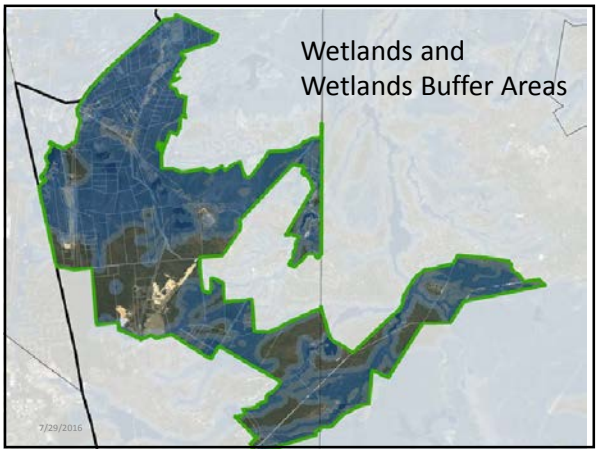
- New Forest Area
  - 3,650 acres total
  - 1,412 vacant acres available for development
- Current RDA designation
  - Permitted density of 1 unit/3.2 acres to 1 unit/6 acres
  - Zoning capacity of 353 units
- New FA designation
  - Maximum density of 1 unit per 25 acres
  - Zoning capacity of 57 units

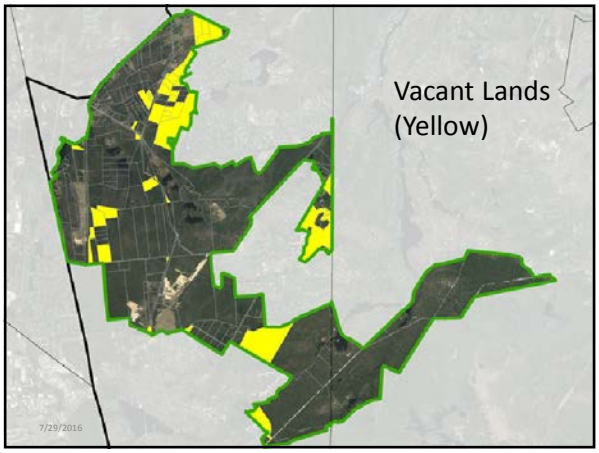
7/29/2016

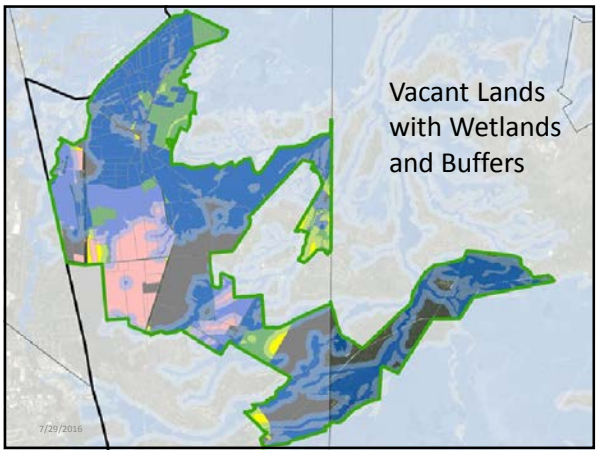












Conservation Area

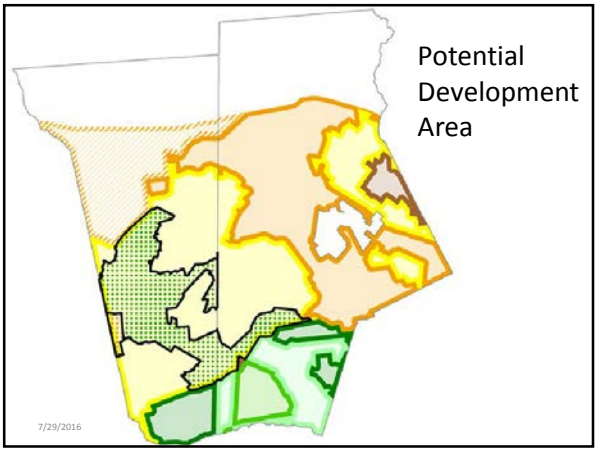
- New Evesham Forest Area
  - 1,400 vacant acres
- Existing Evesham Forest Area
  - 250 vacant acres

7/29/2016

Step 2: Off-Site Clustering Pilot Program

- To encourage the clustering of all residential development potential in Evesham's new and existing Forest Area to a designated development area outside the Black Run
- Every unit constructed in the development area would require protection of 4 acres in the Forest Area
- Use of PDCs permitted only if Forest Area lands are unavailable

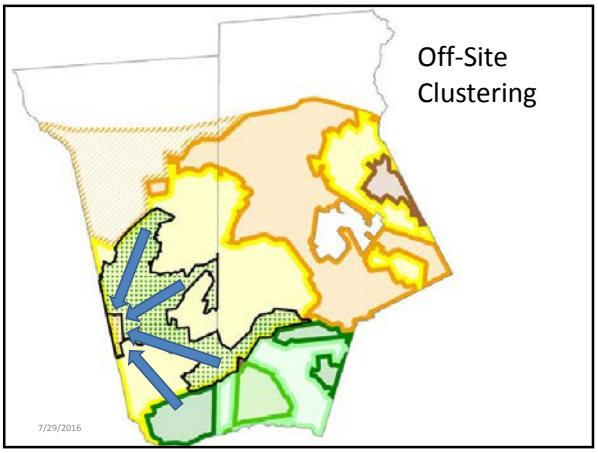
7/29/2016



Development Area

- 175 acres
- 400 units
- Maximum lot size: 15,000 square feet
- Restricted Regional Growth Area
- Sewer service required
- Threatened and endangered species protection standards met through permanent protection of lands in the Forest Area

7/29/2016



PDC Enhancements: Update

P & I Committee
7/29/16

7/29/2016

PC Proposal Summary

- **Residential** :
  - Implement required use of PDCs with a sliding scale of from 5% to 50%
  - Minimize the PDC requirement at high densities to avoid unnecessary burdens for smaller units and affordable housing (5%)
  - Exempt affordable units from the PDC obligation
  - Enhance flexibility to enable builders to better approach zone capacity with:
    - Smaller minimum lot sizes,
    - Use of townhouses and apartments at higher density zones, and
    - Strengthened PC scrutiny on municipal development standards Remove the density cap so that municipalities can work with developers and better address affordable housing and redevelopment.
  - Utilize current zoning, and require no new housing bonus mandate.
  - Treat Pinelands Town Management Areas the same as RGAs.

7/29/2016

Proposal (cont.)

- Relief Mechanisms:
  - Require only 1 right for all minor development (≤ 4 dus) instead of imposing the sliding scale percentage.
  - Relieve lots constrained by substantial wetlands, etc. by reducing the %PDCs by 25%.

7/29/2016

Proposal (cont.)

- **Non-residential:**
  - **Impose no commercial obligation.**
  - **Permit municipalities to shift PDC obligations to non-residential as an option.**
- **Supply Bottleneck:**
  - **Defer action on adding PDCs to the current supply to an unspecified point in the future if and when needed.**
  - **Defer the option to replace PDCs with an equivalent financial contribution to the PCF if PDCs are demonstrated to not be available to an unspecified point in the future if and when needed.**

7/29/2016

NJBA Example (312 apartment units)

- **Under current CMP**
  - **Percentage PDCs: 16%**
  - **Rights: 50**
  - **Cost: $500,000**
- **Using New Sliding scale**
  - **Percentage PDCs: 35%**
  - **Rights: 110**
  - **Cost: $1,100,000**
- **With New Affordable Housing Exemption**
  - **Percentage PDCs: 31%**
  - **Rights: 95**
  - **Cost: $950,000**
- **With New Constrained Lot Reduction**
  - **Percentage PDCs: 26%**
  - **Rights: 71**
  - **Cost: $710,000 (Net over current = $210,000)**

7/29/2016

2. Geneanna Development
App. No. 1995-1176.003

Winslow Township – PR-2 Zone
0.7 du/ac Base, 1.45 du/ac PDC
Proposed 83 SFDetached Units on 64.5 acres
Proposed density is 1.29 du/ac
20% mandatory affordable housing

Current PDC Program

- Of the 83 total units:
  - Base units: 45
  - PDC units: 38

Required PDCs: 9.5 (38 rights)

Proposed PDC Enhancements

- 1.29 du/ac = 50% PDC obligation

Required PDCs: 10.5 (42 rights)

7/29/2016

2. Geneanna Development
App. No. 1995-1176.003

Winslow Township – PR-2 Zone
0.7 du/ac Base, 1.45 du/ac PDC
Proposed 83 SFDetached Units on 64.5 acres
Proposed density is 1.29 du/ac
20% mandatory affordable housing

Current PDC Program
- Of the 83 total units:
  - Base units: 45
  - PDC units: 38

Required PDCs: 9.5 (38 rights)

Proposed PDC Enhancements
- 1.29 du/ac = 50% PDC obligation
- 20% affordable housing (-1.25 PDCs)

Required PDCs: 8.5 (33 rights)

7/29/2016

4. Village Grande at English Mill
App. No. 1983-6164.007

Egg Harbor Township – RG-3 Zone
2.25 du/ac Base, 3.75 du/ac PDC
Proposed 397 Units on 173.7 acres
Proposed density is 2.28 du/ac
20% (minus wetlands and basins) for open space

Current PDC Program
- Of the 397 total units:
  - Base units: 390
  - PDC units: 7

Required PDCs: 1.75 (7 rights)

Proposed PDC Enhancements
- 2.28 du/ac = 45% PDC obligation

Required PDCs: 44.75 (179 rights)

7/29/2016

Hypothetical

Egg Harbor Township – RG-2 Zone
2 du/ac Base, 3 du/ac PDC
Proposed 42 Units on 18.5 acres
Proposed density is 2.27 du/ac
20% for open space

Current PDC Program
- Of the 42 total units:
  - Base units: 37
  - PDC units: 5

Required PDCs: 1.25 (5 rights)

Proposed PDC Enhancements
- 2.27 du/ac = 45% PDC obligation

Required PDCs: 4.75 (19 rights)

7/29/2016

Hypothetical

Egg Harbor Township – RG-2 Zone
2 du/ac Base, 3 du/ac PDC
Proposed 42 Units on 18.5 acres
Proposed density is 2.27 du/ac
20% for open space

Current PDC Program
- Of the 42 total units:
  - Base units: 37
  - PDC units: 5

Required PDCs: 1.25 (5 rights)

Proposed PDC Enhancements
- 2.27 du/ac = 45% PDC obligation
- Constrained lot = 25% PDC reduction (-4 rights)

Required PDCs: 3.75 (15 rights)

7/29/2016

Meeting Summaries

NJ Farm Bureau – July 26th
- Overall, very positive about the Commissions attitude and movements to enhance the PDC program.
- Will review the proposal with growers and provide feedback prior to September 1
- Not too concerned with other interested parties' feelings towards the program but want it to "work"

NJ Builders Assoc. – July 27th
- Still opposed to what amounts to as an "open space tax", i.e. the mandate
- Insistent that higher densities/flexible bulk standards will "fix" the program despite consistent avoidance of building over base densities in past
- Wants to help strengthen the PDC Bank

7/29/2016

NJBA Proposed PDC STRATEGY : Creigh Rahenkamp 7-27-16

- PLAN B: WITHOUT COMPREHENSIVE PLANNING RE-ASSESSMENT
  1. **ELIMINATE THE CAP**: Starting with base densities that currently exist, eliminate the upper cap on the use of PDC's.
     - Initial Comment: very difficult to implement with Municipalities While builders would accept a cap, the current 50% PDC bonus is insufficient for product like townhouses and apartments.
  2. **ADOPT BULK/DESIGN REQUIREMENTS AT THE COMMISSION /PLAN LEVEL FOR USE BY PDC DEVELOPMENTS**: If you buy PDC's you can opt in to the standards
     - Initial Comment: Staff have proposed a local version of this, but it does not go as far enough.

7/29/2016

NJBA Proposed PDC STRATEGY : Creigh Rahenkamp 7-27-16

3. **CREATE A RIGHT OF APPEAL TO COMMISSION**:
   - Initial Comment: conceivable, perhaps through the CMP call-up procedure.

4. **""MEND/ FIX/FUND THE BANK**: . . .to function properly as a "central bank" for the PDC currency
   - Initial Comment: We support legislative changes to the Bank.

5. **FAIR PDC COST**: Develop a sliding scale related to lot size/product type achieved.
   - Initial Comment: The sliding scale using % does something similar assuming product is associated with density (e.g., townshuses are associated with higher densities which require

7/29/2016

- Builders' Example:
  - Actual project currently under construction
  - 312 unit apartment complex
  - Winslow Township, NJ
  - Apartment Project in the PR-4 zone
- Density
  - Base Density = 2.6 du/ac
  - Max permitted Density with PDC's = 5.25 du/ac
  - 12.5 Credits is equal to 50 PDC rights. Each right might cost $10,000 for a total cost of $500,000, or $1600/unit and 1.1% of a unit's cost
  - Currently proposed = 3.1 du/ac
- **Current PDC Program Cost:**
  - Currently requires: 12.5 PDC credits (Actually 50 rights, 16%)
  - Current Cost = $ 10,000 per credit x ~~12.5~~ = ~~$125,000~~ ($500,000)
- **Proposed Mandatory PDC Cost:**
  - 312 unit apartment project on 100.84 acres
  - Density = 3.1 du/acres = Sliding Scale units requiring PDC's = 35% (or 110 rights)
  - Less than 2.3% of a unit's cost and only on the 272market rate units
  - $10,000/right = (35% x $10,000) = $3,500 per unit
  - *80% or 272 market rate units, $952,000
  - Proposed Total Cost = $3,500/unit x ~~312~~ units = ~~$1,092,000.00~~ ($952,000 or 95 rights)
  - $452,000 without taking advantage of any of the relief provisions presented to the builders
- **Difference with mandatory PDC's = ~~$.967,000.00~~ $452,000**
- **Note**: While the builders presentation ignored the relief provisions of the proposed new rule; the constrained parcel relief, for one, would reduce the required PDCs to **26% and 71 rights**. This equates to $2600/unit, less than 1.7% of the unit's cost.

7/29/2016

BRIEF BACKGROUND

- PDC's haven't worked as intended – they haven't raised the money expected, nor produced the density increases anticipated to produce the expected nature of the Growth Area under the CMP. There has been consensus on this point now for over a decade!

- The Building Industry cannot support a mandatory fee system – this is contrary to a core principle.

- Builders are willing to pay for a bonus, but the bonus has to deliver something of value in the market – today's market is for very small lots, townhomes and flats. The market for large lot single family homes is likely flat for a generation. A 50% bonus in 1 or 2-per acre zones won't be relevant.

- The best approach to creating a healthy PDC program is to create a healthy Growth Area. Given the many differences between 1980 and 2016, The Commission should initiate a compressive review of Growth Arca polices: 1) balancing environmental regulations with the purpose of the growth area, 2) setting area-wide and district densities in line with planning theory and demographics, 3) reestablish bulk/design regulations consistent with Growth Arca intent, and 4) create a functional bank.

TOWARD A PLAN B PDC STRATEGY WITHOUT PLANNING RE-ASSESSMENT

1. ELIMINATE THE CAP: Starting with base densities that currently exist, eliminate the upper cap on the use of PDC's. For example, a 1 per acre zone can host greater density with sufficient payment.

2. ADOPT BULK/DESIGN REQUIREMENTS AT THE COMMISSION/PLAN LEVEL FOR USE BY PDC DEVELOPMENTS: If you buy PDC's you can opt in to the standards adopted by the Commission and bypass local zoning district requirements. The PDC ordinance would need to permit 5, 6, 7, 8, 9, 10,000 sf lots, towns with garages, towns without garages, and flats.

3. CREATE A RIGHT OF APPEAL TO COMMISSION: Any applicant that has purchased PDC's has a right to appeal any denial by a local planning board directly to the Commission.

4. ""MEND/FIX/FUND THE BANK: ...to function properly as a "central bank" for the PDC currency. Establish a price that applicants can rely upon for immediate/ direct purchase from the bank.

5. FAIR PDC COST: Develop a sliding scale related to lot size/product type achieved.

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Lt. Governor

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Chairman

Nancy Wittenberg
Executive Director

MEMORANDUM

To: Members of the Pinelands Commission

From: Edward Wengrowski
Environmental Technologies Coordinator

Date: August 5, 2016

Subject: 2016 Annual Report on the Alternate Design Treatment Systems Pilot Program

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Please find attached the fourteenth Annual Report on the Alternate Design Treatment Systems Pilot Program covering the period of July 2015 through June 2016. The report discusses the basis for controlling nitrogen releases to the environmentally sensitive Pinelands ecosystem, provides background information on the development of the pilot program, and includes technical details on each of the pilot program wastewater treatment technologies.

I would like to call your attention to three staff recommendations contained in the current report. The first is the recommended release (page 21) of the FAST treatment technology from pilot program status to permanent approval status for residential use on parcels containing at least 1.4 acres. Second is a recommendation (page 12) to increase the minimum required lot size from 1.0 acre to 1.7 acres for new installations of the BioBarrier and SeptiTech systems based upon the most recent effluent total nitrogen data. Finally, staff is recommending a Comprehensive Management Plan (CMP) amendment (page 33) that would provide an opportunity for pre-existing nonresidential development to expand or change to another conforming use by using an advanced wastewater treatment in non-growth-oriented Pinelands Management Areas. This CMP amendment would provide an opportunity for these preexisting commercial uses to remain viable while achieving water quality improvements.

The pilot program has provided the Commission with the opportunity to evaluate six different nitrogen reducing technologies through the installation of 292 advanced treatment systems in the Pinelands Area. These technologies allow residential development to take place in an environmentally appropriate manner, consistent with densities authorized in the CMP.

The Commission's pilot program has attracted national attention and continues to serve as a model for the control of nitrogen in nutrient sensitive environments.

ANNUAL REPORT
TO THE NEW JERSEY PINELANDS COMMISSION

ALTERNATE DESIGN TREATMENT SYSTEMS
PILOT PROGRAM

August 5, 2016

Background

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

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

The CMP's water quality standards 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 uses 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 two 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 high performance 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 employ 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 research, the Committee recommended the establishment of a pilot program to test five specific onsite wastewater treatment systems. (The pilot program has subsequently been expanded to test an additional four advanced treatment technologies). The Alternative Design Wastewater Treatment Systems Pilot Program detailed 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 reasonably be expected to follow.

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

Aug. 5, 2002	Effective date of the pilot program; residential development applications received after this date for lots less than 3.2 acres that are not served by public sewer are required to use a Pinelands alternate design wastewater treatment system. Completed applications received prior to this date were permitted to use a pressure dosing septic system, provided the installation was completed by August 5, 2004.
Nov. 3, 2006	Executive Director's Implementation Report issued to the Commission (available at: http://www.state.nj.us/pinelands/images/pdf%20files/Final_110306_Pilot_Septic_Implem_Rpt_.pdf.) The report recommended the removal of the Ashco RSFIII system from the 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 various deadlines in the pilot program to allow continued installation of the pilot program systems.
June 15, 2009	Publication of proposed CMP amendments (N.J.A.C. 7:50-2.11, 3.39 and 6.85) addressing septic system management.
Nov. 5, 2009	Executive Director's second Implementation Report issued to the Commission (available at http://www.state.nj.us/pinelands/landuse/waste/Final_Nov%202009_ImplementationReport.pdf). The November 5, 2009 Implementation Report discussed the nitrogen removal efficiencies of the treatment technologies, system maintenance requirements, treatment technology costs and system operational issues. The Report also contained 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 Protection Acts.
June 7, 2010	Effective date of CMP amendments that established requirements for the long-term management of Pinelands alternate design wastewater treatment systems.
Oct. 18, 2010	Effective date of CMP amendments authorizing permanent approval of the Amphidrome and Bioclere technologies. The amendments also authorized the addition of up to four new NSF 245 USEPA ETV certified treatment technologies to the pilot program for installation through August 5, 2016.
Dec. 5, 2011	Notice published in the New Jersey Register announcing acceptance of the four "new" technologies (BioBarrier, Busse Green, Hoot ANR and SeptiTech) for participation in the pilot program.
September 2, 2014	Effective date of CMP amendments to eliminate the Cromaglass technology from the pilot program and to extend until August 5, 2018, the last day to install a FAST,

	BioBarrier, Busse GT, Hoot ANR and SeptiTech treatment technology.
August 5, 2018	Last day to install the FAST, BioBarrier, Busse GT, Hoot ANR and SeptiTech treatment technologies unless the Commission adopts an amendment to the CMP that expressly authorizes such installations beyond this date.

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 of each of the alternate design wastewater treatment technologies. This fourteenth annual report is submitted to fulfill the annual reporting requirement.

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

Use of the high performance alternative onsite wastewater treatment systems is now authorized in each of the Pinelands Area municipalities as a result of amendments to the CMP that 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 aggrieved applicants in those municipalities 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. Such reports must include 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 that the NJDEP provided to the Pinelands Commission. In May 2009, Commission staff satisfied the final grant deliverable by providing the NJDEP, Division of Watershed Management with the Final Report on the "Atlantic Coastal Watershed Region Program Grant: Decentralized Wastewater Management in the Mullica River Basin and Other Pinelands Watersheds". The pilot program is now financed solely by the Pinelands Commission. The Commission posts the findings of the pilot program on its website to further the technology transfer goals of the program and to share relevant information with other entities engaged in protecting ecologically sensitive regions. The Commission also distributes copies of its annual report to the NJDEP and to the seven Pinelands Area county health departments having jurisdiction in the Pinelands Area.

Septic System Management Initiatives

Pinelands Commission [N.J.A.C 7:50] Pinelands Comprehensive Management Plan

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

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

In April 2013, Commission staff organized, hosted and led an interagency meeting between Commission staff, NJDEP and representatives of the seven Pinelands Area Health Departments to review the septic system management provisions of the Pinelands CMP and the NJDEP's Standards for Individual Subsurface Sewage Disposal Systems. NJDEP amended its standards on April 2, 2012. The NJDEP's septic system management requirements are codified at N.J.A.C 7:9A-12.3. This meeting was instrumental in clarifying the applicable rules and in raising awareness of the management obligations of the participating regulatory entities.

In May and June 2016, the Commission has continued its efforts to ensure that the county health departments are meeting their obligations under N.J.A.C 7:9A-7:9A-8.3(e) and N.J.A.C 7:9A-12.3 to ensure that advanced treatment systems are properly operated and maintained. To this end, Commission staff met individually with environmental health officials from each of the Pinelands Area Health Departments to update them on the Commission's development of a service contract tracking database. Commission staff will use the database to track operation and maintenance contract expirations and will share that information with the health officials for follow-up with the system owners. Pilot program systems that are not covered by a service contract with an authorized service provider are deemed by NJDEP's rules to be non-compliant systems. The county health officials are charged with enforcing these NJDEP's regulations.

The Commission is also working with the alternative treatment system service providers to facilitate their compliance with N.J.A.C. 7:9A-12.3(d), which requires the service providers to send written notification to the county health departments of the non-renewal of an alternative treatment system service contract within 30 days of the contract expiration.

NJDEP [N.J.A.C. 7:15] Water Quality Management Plan

The 2009 CMP septic management proposal for alternative septic systems was developed in harmony with NJDEP's Water Quality Management Planning (WQMP) rules (N.J.A.C 7:15-5.25(e)), adopted in 2008. These state-wide rules require that municipalities must demonstrate that areas served by septic systems are subject to a mandatory maintenance program to ensure that all septic systems are functioning properly. The NJDEP rule specifies that management programs must include requirements for periodic pump out and maintenance, as needed. The applicability of this NJDEP rule was discussed during the April 2013 interagency management meeting.

NJDEP [N.JAC. 7:9A] Standards for Individual Subsurface Sewage Disposal Systems

In April 2012, the NJDEP readopted state-wide Standards for Individual Subsurface Sewage Disposal Systems (Standards) (N.J.A.C 7:9A). These rules require that local/county health departments provide operation and maintenance information triennially to septic system owners whose systems were approved after January 1, 1990. The comprehensive notices must include:

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

The NJDEP Standards, as amended on April 2, 2012, for the first time, authorize the state-wide use of advanced onsite wastewater treatment systems for new construction without first requiring a Department-issued TWA permit, provided the technology is not being used to meet a state or federal water quality standard. The NJDEP Standards require that local or county health departments maintain records on each advanced treatment system in their jurisdiction and provide annual reports to the NJDEP with respect to the following:

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

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

The NJDEP Standards related to the installation and use of advanced treatment systems apply state-wide to all advanced treatment systems governed by the NJDEP Standards, including Pinelands alternate design pilot program wastewater treatment systems.

The county health departments have reported that since April 2012, they have approved a significant number of advanced treatment systems for use outside of the Pinelands pilot program. These advanced systems are often proposed to reduce the size and perhaps most commonly the height of disposal field installations by taking advantage of a 2.5 foot reduction in the minimum vertical separation distance required to the seasonal high water table. As a result, the county health departments must ensure proper operation and maintenance is conducted on all advanced treatment systems, not only those authorized for use through the Pinelands pilot program.

Commission staff and NJDEP staff from the Bureau of Nonpoint Pollution Control continue to work to ensure that the Pinelands Area health departments, Pinelands alternate design treatment system manufacturers and service providers are aware of the NJDEP's April 2, 2012 rule adoption, particularly with respect to the NJDEP's operation and maintenance contract requirements and health department enforcement provisions.

Educational Resources

The Commission staff continues to provide assistance to Pinelands Area municipalities and health departments to help them achieve compliance with the NJDEP's (N.J.A.C. 7:15 and N.J.A.C. 7:9A) septic system management requirements. The Commission has produced a number of useful educational documents for use by residents and public health officials.

Municipalities and health departments are encouraged to consult the *Onsite Wastewater Systems Management Manual for the New Jersey Pinelands*, (prepared by Stone Environmental, Inc. under contract to the Commission) http://www.state.nj.us/pinelands/landuse/current/septic/WW%20Mgt%20Manual_2008.09.05.pdf for guidance on the establishment of septic system management programs. This 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. In addition, municipalities and health departments are also encouraged to consult the report entitled *Legal Basis and Regulatory Framework of Onsite Wastewater Management in the New Jersey Pinelands* (also prepared by Stone Environmental, Inc. under contract to the Commission). http://www.state.nj.us/pinelands/landuse/current/septic/Pinelands_OWTS_Legal_Framework_Final.pdf These reports, as well as other related materials, including an informative septic system maintenance guidance document directed at homeowners, are posted on the Commission's website at www.nj.gov/pinelands. In addition, Commission staff produces and distributes training materials at the Rutgers Onsite Wastewater Treatment Systems seminars offered each year through Rutgers University's Office of Continuing Professional Education.

Pilot Program Amendments

Since the original adoption of the pilot program in August 2002, several pilot program-related amendments to the CMP have been adopted. These include:

1. A remedy for land owners in municipalities that had not yet adopted ordinances to implement the pilot program;

2. Removal of one technology (ASHCO RFS III) from the pilot program due to the manufacturer's inability to provide its technology to Pinelands residents;

3. Providing for management of pilot program treatment systems beyond the original five year mandatory maintenance contract period;

4. Extending the period of the pilot program to better evaluate both existing and new treatment technologies;

5. Granting permanent approval status to two of the pilot program technologies (Bioclere and Amphidrome),

6. Eliminating Cromaglass from the pilot program due to its inability to meet Pinelands water quality standards;

7. Authorizing the Commission to approve up to four new pre-screened NSF International / 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. The Commission has approved the BioBarrier, SeptiTech, Hoot ANR and Busse Green GT systems to participate in the pilot program;

8. Requiring 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; and

9. Extending the duration of the pilot program until August 5, 2018.

10. An additional amendment is currently being developed prior to its official proposal. This amendment would permanently approve the FAST technology for residential use on minimum 1.4 acre parcels based upon the effluent testing data generated through the pilot program.

NJDEP Treatment Works Approvals

The NJDEP has provided welcome assistance to the Commission throughout the development and implementation of the pilot program. As noted above, the NJDEP reissued a Generic TWA to expedite local health department approvals of all of the Pinelands pilot program systems. The TWA permit allows the use of the Pinelands pilot program systems without individual applicants being subject to the standard $850 NJDEP permit fee or the standard 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.

Importantly, the generic TWA applies only to residential development that proposes to use a pilot program treatment system. Commercial development that proposes to use an advanced wastewater treatment system in order to meet Pinelands water quality standards must attain an individual TWA from NJDEP.

Local and Regional Training and Technology Transfer

During the fourteen year duration of the pilot program, Commission staff has participated in a number of local, regional, and national educational conferences to share the Commission's experiences. Staff has developed targeted training sessions for each of the Pinelands Area Health Departments to review Pinelands and NJDEP septic system regulations, fundamentals of biological nutrient removal, and design, operation and maintenance requirements for advanced onsite treatment technologies. Representative regional training sessions include a USEPA conference in Mt. Kisco, NY, a New Jersey Environmental Health Association conference in Atlantic City, NJ, a National Environmental Health Association conference in Atlantic City, NJ, a Massachusetts Health Officers Association conference in Springfield, MA, a New England Interstate Water Pollution Control Commission conference in Groton, CT, a National Environmental Health Association conference in Tucson, AZ, a Central Pine Barrens (Long Island) Joint Planning Commission conference in Brookhaven, NY, a Peconic Bay (Long Island) Advanced Wastewater Treatment Systems Water Quality Symposium in Hauppauge, NY, and a keynote address at the Onsite Water Protection Conference at North Carolina State University in Raleigh, N.C.

Commission staff has met with each of the Pinelands Area health departments to facilitate implementation of the pilot program and to assist the health departments in their review of plans and applications and to train inspectors on the alternative treatment technologies. In addition, Commission staff presents annually at the Rutgers / NJDEP Onsite Wastewater Treatment Systems Seminars held in in New Brunswick and Bordentown, NJ. The Rutgers/ NJDEP program provides classroom training to professionals engaged in the onsite wastewater industry including state, local and regional public health professionals, septic system design engineers, system installers and other onsite system service providers. In addition, staff assists Pinelands Area residents by responding to questions related to the care and use of onsite wastewater systems. Moreover, Commission staff has conducted numerous evening workshops throughout the Pinelands Area to enhance awareness of the connection between septic system maintenance and clean water, and property values and public health. Lastly, commission staff regularly provides telephone assistance to homeowners, builders, developers and consulting engineers in complying with the requirements of the pilot program.

Treatment Technologies Installation Summary

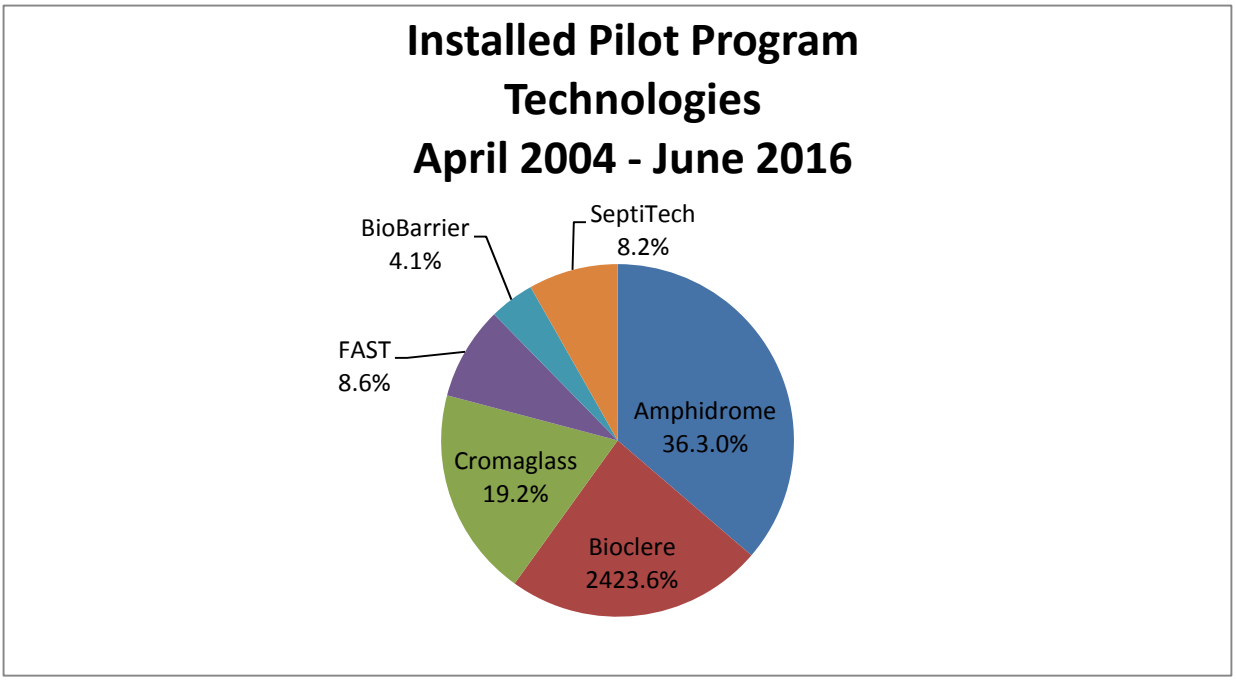
The Alternate Design Treatment Systems Pilot Program was adopted through an August 5, 2002 amendment to the CMP. The pilot program originally included the first five technologies listed below. It has since been expanded to include four additional NSF International, Standard 245 and USEPA ETV advanced treatment technologies. These include:

1. ~~Ashco RFS III~~ [1]
2. Amphidrome
3. Bioclere
4. ~~Cromaglass~~[2]
5. FAST
6. BioBarrier
7. Hoot ANR
8. Busse GT
9. SeptiTech

Two hundred and ninety-two Pinelands alternate design treatment systems have been installed and activated through June 5, 2016. The first pilot program system came online in April 2004. Eighteen alternate design systems were installed during the current reporting period (July 2015 through June 2016). The following tables and figures summarize annual installations of each technology and their location.

[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 Amendments to the CMP, effective September 2, 2014, removed the Cromaglass technology from the pilot program due to the technology's inability to meet Pinelands water quality standards and to otherwise demonstrate the ability or intention for future participation in the program.



Annual Installations of Pilot Program Technologies

Technology	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total Installed
Amphidrome	7	10	11	29	13	7	5	8	4	6	1	1	4	106
Bioclere	0	2	11	9	7	9	6	5	3	5	6	4	2	69
Cromaglass	0	5	39	7	4	1	0	0	0	0	0	0	0	56
FAST	0	0	0	0	2	5	3	3	3	5	2	2	0	25
SeptiTech	Admitted into pilot program in 2013										3	9	12	24
BioBarrier	Admitted into pilot program in 2013										5	7	0	12
Total	7	17	61	45	26	22	14	16	10	16	17	23	18	292

Note: There have been no new installations of the Cromaglass technology since 2009 as a result of a temporary suspension instituted by the Commission on November 15, 2006. Twelve applicants with prior construction approvals were permitted to install the Cromaglass system after the imposition of the temporary suspension.

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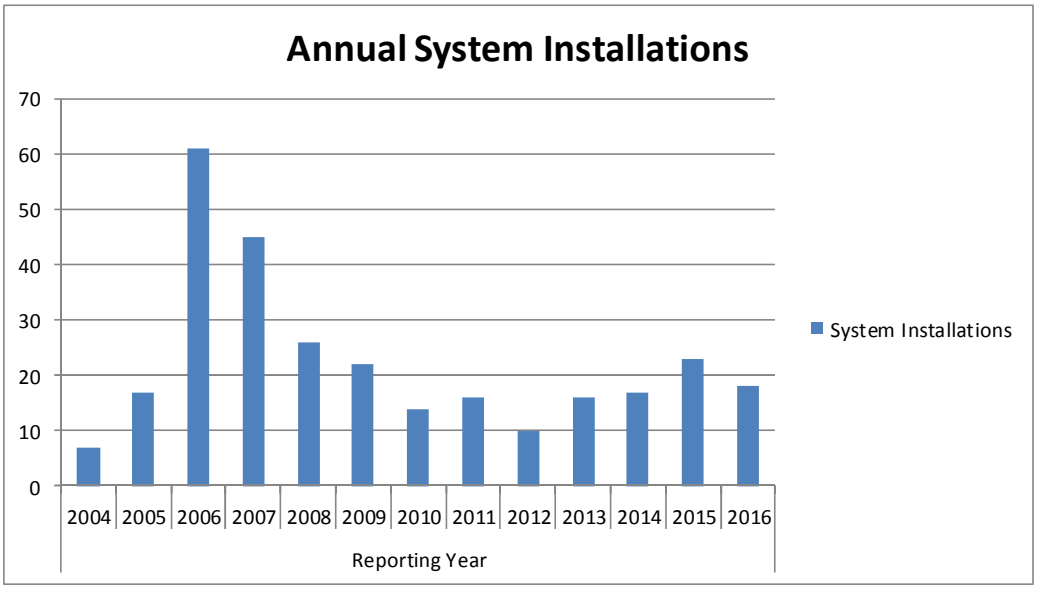


Installed Pilot Program Technologies by Location
April 2004 – June 2016

		Technology						
	Municipality	**Amphidrome**	**Bioclere**	**Cromaglass**	**FAST**	**SeptiTech**	**BioBarrier**	**Total**
Atlantic County	Egg Harbor Twp	2	3		1			**6**
	Estell Manor		3					**3**
	Folsom	6	2	1	1			**10**
	Galloway	1	1		1			**3**
	Hamilton	14	20	4	1			**39**
	Hammonton	5	1					**6**
	Mullica	3	6					**9**
	Port Republic				1			**1**
Burlington County	Evesham		1					**1**
	Medford	3			2	4		**9**
	Pemberton	12	11	22				**45**
	Shamong	2						**2**
	Tabernacle	3	4	1			1	**9**
	Washington	1	1					**2**
	Woodland	2	2		3	1		**8**
	Bass River		1					**1**
Camden County	Chesilhurst		1					**1**
	Waterford	3						**3**
	Winslow	10	6	4	6	8		**34**
Cape May County	Dennis	1						**1**
	Upper	1	1					**2**
	Woodbine		1					**1**
Gloucester County	Franklin	1		1	3			**5**
	Monroe				2			**2**
Ocean County	Jackson	16	2	13	4	11	11	**57**
	Lacey	1						**1**
	Manchester	18	2	10				**30**
	Stafford	1						**1**
	Total	**106**	**69**	**56**	**25**	**24**	**12**	**292**

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

Administrative Approval of Technologies

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

Technology Approvals – First Round

Ashco-A-Corporation provided the required documentation and based upon a detailed review by Commission staff, the Executive Director approved the **Ashco RFS ^{III} system** effective May 15, 2003. However, as noted above, the Ashco RFS ^{III} was subsequently 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 **1.0 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 **1.0 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 originally required 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 was placed under a temporary suspension in November 2006 as a result of the technology's inability to meet expected total nitrogen concentrations in treated effluent. That suspension prohibited future installations of the Cromaglass technology. Effective September 2, 2014, the Cromaglass technology was removed from the pilot program due to the technology's inability to meet Pinelands water quality standards and the manufacture's failure to comply with the requirements of the pilot program. Homeowners in the Pinelands Area that currently use a Cromaglass system will not be required to replace it. They will have the option to continue to use the systems in a manner consistent with the operation and maintenance provisions of the CMP or, if they choose, they may replace the Cromaglass treatment tank with a conventional septic tank meeting the current requirements of N.J.A.C 7:9A, the NJDEP's Standards for Individual

Subsurface Sewage Disposal Systems.

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 provided that each FAST system could be located on a parcel containing at least one acre for each dwelling unit that will be served by the system. Based upon a current comprehensive analysis of all effluent monitoring data collected to date, the FAST system has produced a grand median total nitrogen concentration of 18.5 mg/l. Application of the Pinelands Septic Dilution Model indicates that the FAST system can be expected to meet the Commission's 2 mg/l total nitrogen standard when it is used to serve residential development on a minimum 1.4 **acre** parcel. As a result, Commission staff is recommending that the FAST system be released from the pilot program and granted permanent approval status to serve residential development on minimum 1.4 acre parcels. An amendment to the CMP will be required to implement this recommendation. Once such an amendment has been adopted, the FAST technology would no longer be required to submit monitoring and operational data to the Commission. The FAST technology nevertheless would still need to 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. In the interim, local approvals involving the use of the FAST technology on parcels of less than 1.4 acres in size are subject to the Commission's "call up" process, including a public hearing pursuant to N.J.A.C. 7:50-10.22(a)3 and (a)5, and will be released only if additional contiguous lands are included in the application to achieve a 1.4 acre parcel size.

Technology Approvals – Second Round

Hoot Systems, LLC, the manufacturer of the **Hoot ANR system**, provided the required documentation (including the NSF Standard 245 certification report) and, based upon a detailed review by Commission staff, the Executive Director approved the single family Hoot ANR system effective September 14, 2011. Based upon the Pinelands Septic Dilution Model, each Hoot ANR system must be located on a parcel containing at least **1.0 acre** for each dwelling unit that will be served by the system.

SeptiTech, LLC, the manufacturer of the **SeptiTech system,** provided the required documentation (including the NSF Standard 245 certification report) and, based upon a detailed review by Commission staff, the Executive Director approved the single family SeptiTech system effective September 14, 2011. As originally approved, based upon the Pinelands Septic Dilution Model and NSF testing data, each SeptiTech system needed to be located on a parcel containing at least one acre for each dwelling unit that will be served by the system. As discussed in more detail below, based upon current effluent monitoring data, Commission staff is recommending that future uses of the SeptiTech technology be limited to a minimum parcel size of 1.7 acres.

Bio-Microbics, Inc., the manufacturer of the **BioBarrier system**, provided the required documentation (including the NSF Standard 245 certification report) and, based upon a detailed review by Commission staff, the Executive Director approved the single family BioBarrier system effective September 14, 2011. As originally approved, based upon the Pinelands Septic Dilution Model and NSF testing data, each BioBarrier system needed be located on a parcel containing at least one acre for each dwelling unit that will be served by the system. As discussed in more detail below, based upon current effluent monitoring data, Commission staff is recommending that future uses of the BioBarrier technology be limited to a minimum parcel size of 1.7 acres.

Busse Green Technologies, Inc., the manufacturer of the **Busse Green MBR system**, provided the required documentation (including the NSF Standard 245 certification report) and, based upon a detailed review by Commission staff, the Executive Director approved the single family Busse Green MBR system effective September 14, 2011. Based upon the Pinelands Septic Dilution Model, each Busse Green MBR system must be located on a parcel containing at least **1.0 acre** for each dwelling unit that will be served by the system.

New installations of the Amphidrome, Bioclere, Fast, SeptiTech and BioBarrier technologies occurred during the current reporting period. To date, there have been no installations of the Hoot ANR and Busse GT technology systems.

System Permitting and Local Approvals

The pilot program relies upon the cooperation of local construction code officials, county health officials, treatment system manufacturers, system installers, certifying engineers and Pinelands staff to coordinate the approval of wastewater system engineering plans, the issuance of building permits, the approval of wastewater system installations and the issuance of certificates to occupy residences served by the alternative treatment technologies. Prior to any Pinelands alternative treatment system being issued a final operational approval, the Pinelands Area health departments and the Pinelands Commission are to receive an executed five year maintenance contract, five year warranty, three year wastewater sample and analysis protocol, deed notice, as-built plan and construction certification from the technology manufacturer and the NJ licensed engineer of record. While these documents have been received in the majority of cases, there are occasional instances of certificates of occupancy being issued before all required documentation was received by the health departments and the Pinelands Commission. In these cases, Pinelands staff has 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 adopted in October 2010 to specifically require that local boards of health withhold certificates of compliance or similar authorizations which would permit the occupancy of a building served by an alternative design wastewater treatment system until such time as the Pinelands Commission provides written authorization to the local board of health that such a system may be authorized for use.

Operation and 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 through its authorized service provider, Site Specific Design, Inc.

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

During the period of 2005-2009, Cromaglass systems were installed and serviced exclusively by Mid State Electric, Cromaglass' authorized treatment system installation and servicing contractor. Cromaglass Corporation discontinued using Mid-State as its serving agent and until going out of business, was servicing the units directly. Cromaglass is reportedly no longer servicing its treatment units. Pursuant to the CMP, owners of existing Cromaglass units may contract with service providers that hold a NJDEP public wastewater treatment system operator's license at the S2 level or higher. Alternately, these homeowners may elect to replace the Cromaglass treatment tank with a conventional septic tank that meets the requirements of N.J.A.C 7:9A-8.2.

Bio-Microbics, the manufacturer of the FAST and Bio Barrier systems, has designated Site Specific Design, Inc. as its authorized service agent for the servicing of the FAST Bio Barrier technologies. Site Specific Design reports no alarm related events during the current reporting period. The firm has previously repaired or replaced airlifts on eleven previously installed systems and extended recycling troughs on five systems to enhance the return of nitrified wastewater to the unit's anoxic chambers. Subsequent to these system repairs, the firm has addresses airlift issues during eight subsequent system installations. After system modifications, the Bio-Microbics FAST system has achieved an overall median total nitrogen concentration of 18.5 mg/l in treated effluent. In addition, Bio-Microbics will now be expected to trouble shoot the operation of existing BioBarrier systems to achieve no greater than 14.0 mg/l TN in treated effluent.

SeptiTech, the manufacturer of the SeptiTech technology has designated both Site Specific Design, Inc. and South Jersey Engineers as authorized service agents providing operation and maintenance service on the SeptiTech system.

SeptiTech will now be expected to trouble shoot the operation of existing systems to achieve no greater than 14.0 mg/l TN in treated effluent.

In addition to the servicing agents that are authorized by the technology manufacturers, both the Commission's and NJDEP's rules authorize individuals that possess a S2 or higher NJ Wastewater Treatment Plant Operator's License to provide operation and maintenance services on the Pinelands pilot program systems. In an effort to facilitate consumer choice and competition, Commission staff continues to work with the New Jersey Water Environment Association (the professional association representing NJ's licensed wastewater operators) to expand the number of licensed individuals that offer operation and maintenance services on the pilot program systems.

Cost Summary

The pilot program provides for the collection and reporting of cost data for each treatment technology. To facilitate monitoring of treatment system costs, the CMP requires the technology vendors to 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 components. These include the cost of the treatment unit and its 5 year service package, the cost of the soil absorption system (e.g., replacement soil, stone and pipe), and the cost of engineering, surveying, and other installation services. The treatment unit manufacturers can readily provide the Commission with information on the cost of their equipment and related support services, which in the case of the Pinelands pilot program includes a five year maintenance contract, five year warranty, and three years of quarterly effluent analysis. The vendors, 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 vendor who in turn supplies it to the Commission.

Table 1 on the following page summarizes average treatment system costs based upon information provided to the Commission by the system vendors, as supplemented by the homeowner or builder. Actual treatment unit costs, including equipment, five year operation and maintenance service contracts, five year warranties and the three year sampling program have remained relatively stable or have declined since the inception of the pilot program. Both FR Mahony and Aqua Point report that they have lowered the cost for their equipment since having attained permanent approval status and the discontinuation of required wastewater effluent sampling and reporting to the Commission. The average cost of each of the treatment technologies has remained virtually unchanged from the 2013 reported levels.

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 that vary on a system by system basis. Rarely are two individual system designs and material quantities identical. Variability is in the cost and quantity of replacement soil, (select fill) stone aggregate, pipe, geo-textiles, labor, excavation, trucking, engineering, etc.) is common on a system by system basis. As a rule, larger and deeper systems typically cost more to construct than smaller, shallower systems. Average overall costs will be higher in a year in which a greater number of larger systems were installed than in a year when a greater number of smaller systems were built.

In time, the overall construction cost of advanced treatment systems is expected to decline as system designers take advantage of disposal field size reductions that are now incorporated in the NJDEP's April 2012 revisions to N.J.A.C. 7:9A. The allowable size reductions are granted as a result of the relatively high quality effluent quality (e.g. reduced BOD and TSS levels) produced by advanced onsite treatment technologies. It is likely that additional cost savings may also 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 into potential cost savings through extended disposal field longevity.

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

Name of Treatment System Technology	No. of Systems included in this cost analysis	Average Reported Cost per Treatment Unit and 5 year service package	Average Reported Cost for Engineering, Soil Absorption Field Installation, Electrical Connections, etc. [7]	Average Reported Total Cost of the Advanced Onsite Treatment Systems
Amphidrome [1]	68	$19,434 [3]	$12,680	$32,114
Bioclere [2]	57	$17,466 [4]	$10,169	$27,635
Cromaglass	41	$22,553 [5]	$12,712	$ 35,265
FAST	25	$17,892 [6]	$11,616	$29,508
BioBarrier	11	$18,708 [8]	$10,075	$28,783
SeptiTech	24	$19,218 [9]	$9,484	$28,702
Busse Green	N/A	$24,000 [10]	N/A	N/A
Hoot ANR	N/A	$14,500 [10]	N/A	N/A

1) Based on last reported cost for the Amphidrome system as provided in Aug. 5, 2015 Annual Report, and supplemented by installations in the current reporting period of July 2015 through June 2016.
2) Based on last reported cost for the Bioclere system as provided in Aug. 5, 2015 Annual Report and supplemented by installations in the current reporting period of July 2015 through June 2016
3) Includes reported cost of the Amphidrome Treatment Unit (through June 2016) including hardware and equipment, 5 year annual maintenance contract, 5 year warranty, 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 June 2016) including hardware and equipment, 5 year annual maintenance contract, 5 year warranty, 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) 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 period.
6) Includes reported cost of the FAST treatment unit (through June 2015) 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 engineering and construction costs including soil and site suitability investigations (soil logs and "perc"/permeability tests), preparation of engineering plans, completion of NJDEP standard application forms, excavation for soil absorption system and tank placement, soil absorption system materials (suitable "K4" replacement soil, stone filter materials and lateral piping, or gravel free chambers, geotextile fabric), installation of all components, electrical connections, surveyor services, as-built plans, engineering construction observation and engineering certifications.
8) Includes reported cost for the BioBarrier treatment unit, (through June 2016), 5 year warranty, 5 year O&M contract and 3 year effluent sampling program and delivery of equipment to the job site.
9) Includes reported cost for the SeptiTech treatment unit, (through June 2016), 5 year warranty, 5 year O&M contract and 3 year effluent sampling program and delivery to the job site.
10) Cost for treatment unit, 5 year warranty, 5 year O&M contract and 3 year effluent sampling program as reported by the equipment manufacturers in their application to participate in the pilot program. No Busse Green or Hoot ANR systems were installed during the current reporting period.

Treatment System Nitrogen Attenuation Summary

The pilot program requires that the technology suppliers arrange for samples of treated effluent to be collected from each system on at least a quarterly basis [approximately every ninety (90) days] for at least three years, yielding a total of at least 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 with updates through April 2011) of the NJDEP Field Sampling Procedures Manual. The laboratory analysis of effluent samples must be performed by laboratories certified by the NJDEP employing analytical methodologies accepted by NJDEP. To permit the establishment of microbial cultures necessary for the treatment process to develop and stabilize, no samples are required during the first ninety days from system start-up. In most instances, technology vendors have adjusted sampling schedules to provide for more efficient, synchronized sample collection from multiple systems.

As discussed previously, a total of 292 Pinelands alternate design wastewater treatment systems have been installed and activated in the Pinelands Area thus far.

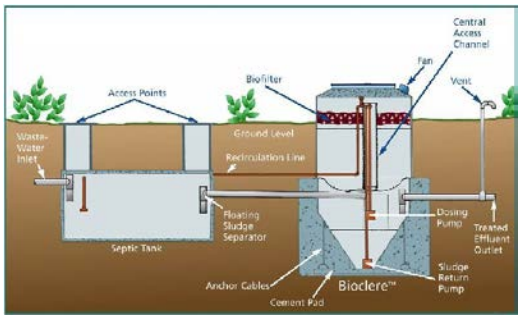
Amphidrome®

Amphidrome Technology

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

The Amphidrome technology is no longer subject to effluent TN concentration analysis and reporting as a result of its release from the pilot program. It is now authorized for permanent use subject to the provisions of N.J.A.C 7:50-6.84(a)5iv(3). Table 2 provides the running median and grand median values for total nitrogen concentrations (mg/l) from 74 monitored Amphidrome units. The Amphidrome technology produced a grand median total nitrogen concentration of **11.9 mg/l,** satisfying the Commission's 14.0 total nitrogen standards for use on minimum one-acre parcels.

Bioclere

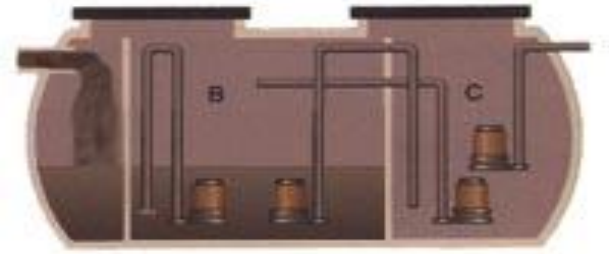


Bioclere Technology

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

The Bioclere technology is no longer subject to effluent TN concentration analysis and reporting as a result of its release from the pilot program. It is now authorized for permanent use subject to the provisions of N.J.A.C 7:50-6.84(a)5iv(3). Table 3 provides the running median and grand median values for total nitrogen concentrations (mg/l) from 41 monitored Bioclere units. The Bioclere technology produced a grand median total nitrogen concentration of **11.2 mg/l**, satisfying the Commission's 14.0 total nitrogen standards for use on minimum one-acre parcels.

Cromaglass



Cromaglass Technology

In August 2013, the Executive Director recommended that the Cromaglass technology be removed from the Pilot Program entirely, with no further installations permitted. A temporary suspension barring new installations of the Cromaglass technology has been in place since November 15, 2006. This suspension was imposed as a result of the Commission's prior finding that the Cromaglass technology had not met CMP groundwater quality standards. The Cromaglass technology produced a grand median total nitrogen concentration of 31.5 mg/l, failing to meet the CMP's 14.0 mg/l total nitrogen standard for unsewered residential development on a minimum one acre parcel.

The Alternate Design Treatment Systems Pilot Program requires technology manufacturers to troubleshoot and remediate substandard treatment system performance. At the Commission's direction, Cromaglass undertook studies to determine the cause of inadequate nitrogen attenuation and recommended a number of remedial measures to improve nitrogen attenuation in its existing Pinelands treatment units. After reviewing Cromaglass' findings and recommendations, the Commission issued correspondence in 2011 requiring that Cromaglass implement a two-phase remediation program. Phase I was to include the retrofitting of 28 systems by March 1, 2012. Effluent sampling of the Phase I retrofit systems was to commence within two months of the completion of the Phase I retrofits and was to continue every two months for a total of six samples per system.

Cromaglass completed the Phase I retrofits by the March 1, 2012 deadline but has not complied with the system sampling requirements. The first round samples were collected on May 2, 2012 and produced a grand median total nitrogen value of 18.0 mg/l. The second round samples were collected five months later included only 20 systems and resulted in a grand median total nitrogen value of 19.2 mg/l. Nearly two years have elapsed since Cromaglass' last sampling event. In summary, Cromaglass has been delinquent in sampling the retrofitted systems and has failed to demonstrate the Cromaglass technology's capability to meet CMP water quality standards.

The Commission afforded the Cromaglass Corporation multiple opportunities to improve the technology's nitrogen attenuation. However, Cromaglass Corporation's inconsistent compliance with the pilot program's sampling and reporting requirements remained problematic. Further, the company failed to fully comply with the Commission's sampling and reporting requirements applicable to retrofitted Cromaglass units. The Commission therefore had no choice but to find that the Cromaglass Corporation's participation in the pilot program was not in substantial compliance with the sampling and reporting requirements of the CMP. Further the Cromaglass technology had not made satisfactory progress in attaining compliance with CMP water quality standards. **As a result, the Executive Director recommended and the Pinelands Commission approved the discontinuation of the Cromaglass technology's participation in the pilot program.**

The Executive Director's recommendations were discussed at three public meetings of the CMP Policy & Implementation Committee in November 2012, February 2013 and August 2013. All of the input that the Committee received at these public meetings was in support of the Pilot Program, its further extension and the removal of the Cromaglass technology. The Commission then proceeded to adopt amendments to the CMP in June of 2014 to implement the Executive Director's recommendations. Specifically, N.J.A.C. 7:50-2.11 was amended to remove the

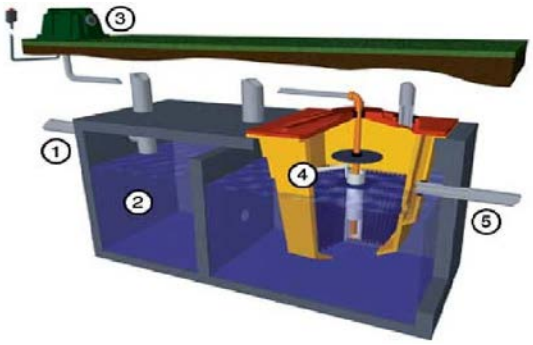
Cromaglass technology from the definition of "alternate design pilot program treatment system". Similarly, N.J.A.C. 7:50-10.21(c) and 10.22(a)3 were amended to reflect the removal of the Cromaglass technology from the pilot program. N.J.A.C. 7:50-10.22(a)4 and 10.23(i) were also amended to remove the Cromaglass technology.

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

Table 4 presents sample results for 62 Cromaglass systems through July 5, 2010. 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 produced a grand median total nitrogen concentration of **31.5 mg/l**, failing to meet the Commission's 14.0 total nitrogen standard for unsewered residential development on a minimum one acre parcel.

The Executive Director recommended and the Pinelands Commission approved a policy that provides for homeowners who are presently using the Cromaglass technology to be given the option to continue to use it in a manner that is consistent with the operation and maintenance provisions of the CMP or if they so choose, to convert the system to function as a septic tank or to otherwise replace it with a conventional septic tank meeting the current requirements of N.J.A.C 7:9A, the NJDEP's Standards for Individual Subsurface Sewage Disposal Systems.

FAST



FAST Technology

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

As illustrated in Table 5, sample results have been evaluated for 25 FAST systems to date. A total of 427 samples have been used to evaluate these 25 FAST systems. Total reported nitrogen values for each of these systems represents the sum of reported laboratory values of reported laboratory values for total Kjeldahl nitrogen plus total nitrite and nitrate nitrogen. The FAST technology has produced a grand median total nitrogen concentration of **18.5 mg/l** based upon all samples to date, demonstrating the technology's ability to meet Pinelands water quality standards when used to serve residential development on minimum 1.4 acre parcels but not on one acre parcels as originally expected. A technology must produce a grand median total nitrogen concentration of 14.0 mg/l in order to meet Pinelands water quality standards when used to serve residential development on a minimum one acre parcel.

As noted, Commission staff recommends that the FAST system be released from the pilot program and be granted permanent approval status to serve residential development on minimum 1.4 acre lots. An amendment to the CMP will be required to implement this recommendation. Once such an amendment has been adopted, the FAST technology would no longer be required to submit monitoring and operational data to the Commission. The FAST technology nevertheless would still need to 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. In the interim, local approvals involving the use of the FAST technology on parcels of less than 1.4 acres in size will be subject to the Commission's "call up" process, including a public hearing pursuant to N.J.A.C. 7:50-10.22(a)3 and (a)5, and will be released only if additional contiguous lands are included in the application to achieve a 1.4 acre parcel size.

The CMP currently authorizes the FAST technology to be installed until August 5, 2018 unless extended by amendment to the CMP.

BioBarrier

BioBarrier Technology

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

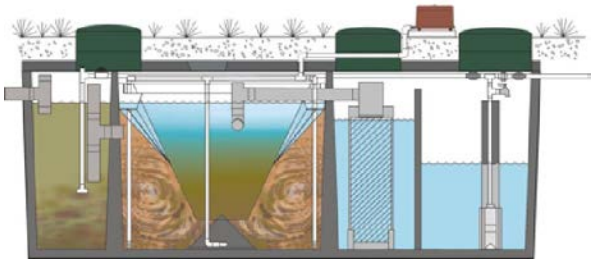
The system consists of a tank with three compartments. The first compartment provides primary treatment – sedimentation and separation of floatables and solids, and is equipped with a proprietary outlet screening device. A solid wall separates the first compartment from the second, in which the system's nitrogen reduction capabilities may be enhanced under anoxic conditions. The third compartment, the "aeration/membrane zone", is separated from the anoxic zone by a baffle wall with openings between the two zones. The BioBarrier® Membrane module is located in the third compartment. Aeration is provided to the third compartment by a blower which serves two functions. First, the blower provides mixing of the wastewater and biomass to allow complete contact between the bacteria and organic material in the wastewater, while supplying oxygen that is critical to the process. Second, the positioning of the aeration under the membrane sheets helps to remove solids that collect on the surface of the sheets. The membranes sheets, having microscopic pore size openings, separate the water from the solids in the aeration zone. An effluent pump provides a slight negative pressure on the "clean" side of the membrane, pulling filtered water through the membrane. The solids that are sloughed by aeration and membrane cleaning are retained in the aeration compartment.

As illustrated in Table 6, sample results have been evaluated from twelve BioBarrier systems to date. A total of 64 samples have been used to evaluate these twelve BioBarrier systems. Total nitrogen (TN) values for each of the BioBarrier systems represents the sum of reported laboratory values for total Kjeldahl nitrogen plus nitrite nitrogen and nitrate nitrogen. The BioBarrier technology has produced a grand median total nitrogen concentration of **21.9 mg/l** based upon all samples to date. This grand median total nitrogen value is higher than the 19.7 mg/l TN concentration presented in the Commission's 2015 annual report. As previously noted, the technology must attain a grand median total nitrogen concentration no greater than 14.0 mg/l in order to meet Pinelands water quality standards when used to serve residential development on a minimum one acre parcel.

Because the BioBarrier technology has not yet been demonstrated to meet the 14.0 mg/l TN concentration as required for use on one acre parcels, Commission staff is recommending that future uses of the BioBarrier system be limited to parcels containing at least 1.7 acres, (subject to increase or decrease based upon additional sampling data), as determined by the Pinelands Septic Dilution Model. Future use of the

BioBarrier technology will be limited to parcels containing at least 1.7 acres until such time as retrofits or other improvements to the BioBarrier technology demonstrate that the system is capable of meeting Pinelands water quality standards on lots that are smaller than 1.7 acres. An exception to the minimum 1.7 acre parcel size will be granted only in those instances where an applicant can demonstrate a financial commitment has been made toward the purchase of the technology (e.g., engineering design or equipment acquisition) prior to August 5, 2016.

HOOT

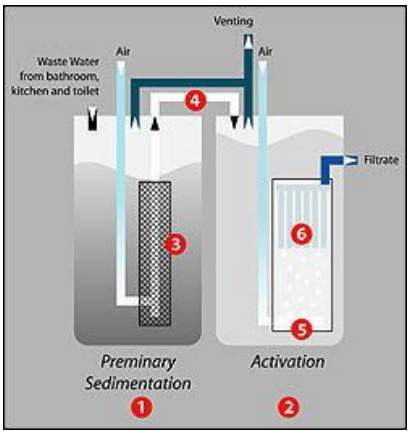


Hoot ANR Technology

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

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

Busse Green MBR



Busse Green MBR Technology

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

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

SeptiTech

SeptiTech Technology

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

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

Wastewater from the primary tank flows by gravity to the processor reservoir section, located below the filter media. The second and third pumps are used to return wastewater and solids from the reservoir back to the primary tank. The forth pump is used to discharge treated wastewater to the disposal location.

As illustrated in Table 7, sample results have been evaluated from fourteen SeptiTech systems to date. A total of 62 samples have been used to evaluate these fourteen SeptiTech systems. Total nitrogen (TN) values for each of the SeptiTech systems represents the sum of reported laboratory values for total Kjeldahl nitrogen plus nitrite nitrogen and nitrate nitrogen. The SeptiTech technology has produced a grand median total nitrogen concentration of **21.2 mg/l** based upon all samples to date. This value is higher than the 18.5 mg/l TN concentration presented in the Commission's 2015 annual report. As previously noted, the technology must attain a grand median total nitrogen concentration no greater than 14.0 mg/l in order to meet Pinelands water quality standards when used to serve residential development on a minimum one acre parcel.

Because the SeptiTech technology has not yet been demonstrated to meet the 14.0 mg/l TN concentration as required for use on one acre parcels, Commission staff is recommending that future uses of the SeptiTech system be limited to parcels containing at least 1.7 acres, (subject to increase or decrease based upon additional sampling data), as determined by the Pinelands Septic Dilution Model. Future use of the SeptiTech technology will be limited to parcels containing at least 1.7 acres until such time as retrofits or other improvements to the SeptiTech technology demonstrate that the system is capable of meeting Pinelands water quality standards on lots that are smaller than 1.7 acres. An exception to the minimum 1.7 acre parcel size will be granted only in those instances where an applicant can demonstrate a financial commitment has been made toward the purchase of the technology (e.g., engineering design or equipment acquisition) prior to August 5, 2016.

Household Variability and Concentration vs. Mass Loading

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

At the outset of the pilot program, four of the five original treatment technologies (Amphidrome, Bioclere, Cromaglass and FAST) were assigned an estimated total nitrogen removal efficiency of 65%. The fifth technology (Ashco RSFIII) was assigned an estimated total nitrogen removal efficiency of 50%. The four new technologies added to the pilot program in 2013 (BioBarrier, Busse GT, Hoot ANR and SeptiTech) each have an assumed nitrogen removal efficiency of 65%. Based upon these estimates, 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 a 50% reduction would result in a concentration of 20 ppm). These effluent concentrations would be reduced to 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 65% removal efficiency would result in effluent concentrations of 28 ppm. By monitoring only the effluent concentration and determining that it meets the required 14 ppm, the pilot program is able to ensure compliance with the Commission's 2 ppm standard at the parcel boundary without regard to influent concentrations.

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 that provide critical information to the owners of the alternative treatment systems. In addition, several vendors have developed and provided system owners with questionnaires that are aimed at identifying laundry and cleaning product usage and any other condition that might lead to non-compliant sample results. Staff encourages all of the technology vendors to 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, 5, 6 and 7 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, FAST, BioBarrier and SeptiTech wastewater treatment systems respectively. The Commission does not yet have effluent monitoring data for the Busse GT and Hoot wastewater systems. 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

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

upon the Pinelands septic dilution model and an influent concentration of approximately 40 mg/l. These technologies have been granted permanent approval status for residential use on minimum 1 acre parcels 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 as a result of this value and Cromaglass Corporation's failure to comply with the requirements of the pilot program, new installations of the Cromaglass technology are no longer permitted in the Pinelands Area. The TN grand median concentration for the FAST system is 18.5 mg/l. While not meeting the Commission's required TN concentration for residential use on one-acre parcels, the FAST system has been demonstrated to meet the Commission's water quality standard if used on minimum 1.4 acre parcels. As noted, the Executive Director is recommending that the FAST system be advanced from the pilot program and, subject to Commission approval, approved for residential use on minimum 1.4 acre parcels. The BioBarrier and SeptiTech systems are relatively new to the pilot program and have produced TN grand median concentrations of 21.9 mg/l and 21.2 mg/l respectively. As a result, Commission staff is recommending that future use of these technologies be limited to a minimum parcel size of 1.7 acres until such time as the technology manufactures can improve performance and achieve a TN concentration in treated effluent that is equal to or less than 14.0 mg/l.

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

Total Nitrogen Running Median

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

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

Total Nitrogen Running Median

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

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

Total Nitrogen Running Median

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

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.)

Total Nitrogen Running Median

		Number of Sampling Events																									
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Grand Median
FAST	1	31.3	45.4	37.9	34.6	37.9	37.4	37.0	34.1	31.3	30.7	30.0	28.4	26.8	28.4	26.8	25.7	24.6	23.9	23.1	21.8	23.1	21.8	20.5	20.5	20.6		28.4
FAST	2	27.1	25.8	27.1	34.6	27.1	27.7	27.1	27.7	28.2	27.7	27.1	26.1	25.0	24.8	24.5	24.1	24.1	23.4	23.1	22.1	20.7	19.3	18.1	17.8	18.2	18.1	24.9
FAST	3	39.3	34.5	29.6	29.6	29.6	27.2	29.6	29.6	29.6	29.6	29.6	28.5	29.6	28.5	27.4	26.1	24.8	24.5	24.2	24.1	24.0	23.2	22.4	21.3			28.5
FAST	4	32.4	23.0	23.9	25.1	23.9	18.9	15.9	15.5	15.9	15.5	15.0	15.5	15.9	17.5	15.9	15.5	15.0	14.4	13.8	13.7	13.8	13.7	13.6	13.5			15.5
FAST	5	30.1	24.4	30.1	24.9	19.6	20.6	20.7	20.2	19.6	19.2	18.7	19.2	18.7	18.5	18.2	18.0	17.7	17.6	17.5	17.3	17.1	17.3	17.1				18.7
FAST	6	12.4	16.6	20.7	21.4	20.8	21.4	22.0	22.3	22.0	22.2	22.4	22.5	22.4	22.2	22.0	21.4	20.8	20.8	20.8	20.8	20.7	20.3	19.8	18.0			21.1
FAST	7	33.3	30.6	27.8	24.6	21.3	17.1	12.9	11.9	12.2	12.6	12.9	13.4	12.9	13.4	13.9	13.4	13.9	15.0	16.1	16.0	15.9	14.9					14.4
FAST	8	48.6	40.7	32.7	29.5	29.8	31.0	29.8	29.4	29.8	31.0	32.2	31.0	29.8	29.4	28.9	27.6	26.2	26.2	26.1	20.9	15.6	15.5	15.4				29.5
FAST	9	28.1	29.6	28.1	25.7	23.2	25.5	23.2	21.4	19.6	19.0	18.3	16.9	17.0	17.7	17.0	16.3	15.5	16.3	15.5	15.1	14.7						18.3
FAST	10	16.5	17.1	17.6	24.7	17.6	17.1	17.6	17.1	16.5	16.5	16.5	16.5	16.5	16.5	16.5	17.1	16.5	16.5									16.5
FAST	11	21.9	22.0	21.9	20.4	21.9	20.4	18.8	18.7	18.6	17.5	16.3	15.4	14.5	13.4	12.3	11.9	11.4										18.6
FAST	12	44.5	27.4	13.1	19.9	25.2	19.2	15.4	20.3	22.1	18.8	22.1	18.8	15.4	18.8	20.7												19.9
FAST	13	23.2	19.3	23.0	23.1	23.2	23.1	23.0	19.2	15.4	15.0	15.4	19.2	15.4	15.0	15.4												19.2
FAST	14	13.5	11.0	13.5	18.0	15.9	14.7	13.5	14.7	13.5	11.0	13.5	14.0	14.5	14.0	14.5												14.0
FAST	15	14.2	14.2	14.2	13.1	14.2	13.7	14.2	14.3	14.4	14.6	14.7	16.0	16.8	17.0	16.8												14.3
FAST	16	28.6	17.5	28.6	31.3	30.9	29.8	28.6	29.8	28.6	21.8	15.0	14.5															28.6
FAST	17	29.2	32.6	29.2	22.7	17.8	17.8	17.8	17.9	17.8	17.9	17.8	17.8	17.7														17.8
FAST	18	25.2	16.4	13.7	19.5	13.7	12.2	11.1	12.4	11.1	12.4	13.7	12.4															13.1
FAST	19	29.6	20.3	10.9	10.9	10.9	11.0	10.9	11.0	10.9	10.9	10.8	10.8	10.8														10.9
FAST	20	20.8	21.0	21.1	22.8	21.1	21.0	20.8	18.8	16.8	13.9	11.0	13.9															20.8
FAST	21	23.9	20.3	22.6	23.3	22.6	21.5	20.3	18.5	17.4	17.2	16.9																20.3
FAST	22	26.3	35.0	26.3	19.2	18.5	15.3	18.5	15.3	12.2	12.1	12.2																18.5
FAST	23	18.7	13.5	8.2	8.1	8.0	8.1	8.2	9.7	11.1	10.4	11.1																9.7
FAST	24	6.5	7.5	8.4	14.5	8.4	8.6	8.7	14.4	9.4	9.5	9.4	9.5															9.1
FAST	25	17.1	13.6	17.1	19.2	17.1	13.6	14.4	15.8	14.4	14.3	14.2	14.3															14.4
Sample# Median		26.3	21.0	22.6	22.8	21.1	19.2	18.5	18.5	16.8	16.5	15.4	16.2	16.8	17.7	17.0	18.0	17.7	19.2	20.8	20.8	17.1	18.3	18.1	18.0	19.4	18.1	**18.5**
25th Percentile		18.7	16.6	14.2	19.2	17.1	14.7	14.2	14.7	13.5	12.6	13.5	14.1	15.4	15.7	15.7	15.9	15.3	16.3	16.1	16.0	15.6	15.4	16.3	17.8	18.8	18.1	
75th Percentile		30.1	29.6	28.1	25.1	23.9	23.1	23.0	21.4	22.0	19.2	18.7	19.2	22.4	23.5	23.3	24.9	24.4	23.8	23.1	21.8	20.7	20.6	20.1	20.5	20.0	18.1	
n		25	25	25	25	25	25	25	25	25	25	25	22	17	15	15	11	11	10	9	9	9	8	7	5	2	1	

Table 6. **BioBarrier** 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	Grand Median
BioBarrier	1	14.1	20.6	14.9	21.0	27.1	29.0	30.8	21.0
BioBarrier	2	13.8	12.1	12.6	13.2	12.6	11.5	12.6	12.6
BioBarrier	3	19.9	15.9	19.9	31.3	19.9	30.3		19.9
BioBarrier	4	20.4	21.9	23.4	25.8	23.4	25.8		23.4
BioBarrier	5	20.8	21.8	22.8	22.9	22.9	22.9		22.8
BioBarrier	6	18.9	28.4	32.0	27.5	32.0	32.8		30.2
BioBarrier	7	28.4	36.4	40.8	34.6	28.4	28.4		31.5
BioBarrier	8	13.3	25.8	38.3	25.8	13.3			25.8
BioBarrier	9	13.6	14.3	15.0	14.4	15.0			14.4
BioBarrier	10	11.8	10.0	8.1	8.9				9.4
BioBarrier	11	28.4	16.7	10.8					16.7
BioBarrier	12	33.1	19.6	33.1					33.1
Sample# Median		19.4	20.1	21.4	24.3	22.9	28.4	21.7	**21.9**
25th Percentile		13.8	15.5	14.3	16.1	15.0	24.3	17.2	
75th Percentile		22.7	22.9	32.3	27.0	27.1	29.6	26.3	
n		12	12	12	10	9	7	2	

Table 7. **SeptiTech** 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	Grand Median
SeptiTech	1	8.7	8.8	8.7	8.7	8.7	8.8	8.7	8.7	8.7
SeptiTech	2	33.4	31.1	28.8	26.7	28.8	26.7	24.5		28.8
SeptiTech	3	24.6	19.0	15.2	15.2	15.2	15.2	10.2		15.2
SeptiTech	4	19.9	17.9	19.9	20.7	19.9				19.9
SeptiTech	5	18.5	20.1	18.5	13.9					18.5
SeptiTech	6	17.2	22.4	27.6	22.4					22.4
SeptiTech	7	33.5	34.8	33.5	30.7					33.5
SeptiTech	8	32.8	24.9	17.0						24.9
SeptiTech	9	4.1	5.4							4.7
SeptiTech	10	30.9	26.8							28.9
SeptiTech	11	25.2	31.4							28.3
SeptiTech	12	10.7	16.0	21.3	16.0	10.7	12.0			14.0
SeptiTech	13	13.1	15.0	13.2	7.8	7.7	5.7			10.5
SeptiTech	14	33.3	23.8							28.6
Sample# Median		22.3	21.3	19.2	16.0	12.9	12.0	10.2	8.7	**21.2**
25th Percentile		14.1	16.5	15.7	13.9	9.2	8.8	9.5	8.7	
75th Percentile		32.3	26.3	26.0	22.4	18.7	15.2	17.4	8.7	
n		14	14	10	9	6	5	3	1	

Other Issues in 2016

Existing Residential Program

Ensuring that homeowners maintain their advanced wastewater treatment systems remains a priority in 2016. Periodic maintenance is not only critical to the effective removal of nitrogen, it is also important in extending the longevity of the treatment system and maintaining adequate hydraulic conductivity in receiving soils. It is for these reasons that both the Pinelands program and the latest NJDEP regulations require that operation and maintenance contracts remain in place throughout the life of each advanced treatment system. By developing a database to track the status of maintenance contracts and sharing the database with the county health departments, the Commission hopes to facilitate local enforcement of NJDEP's advanced treatment system maintenance regulations.

Commission staff was successful in working with the NJDEP to secure generic treatment works approvals (TWA) for the four new NSF Standard 245 advanced treatment systems that have been authorized to participate in the Commission's pilot program. The revised TWA authorizes local administrative authorities (generally County Health Departments) to approve the use of those advanced treatment technologies that are authorized for participation in the Commission's pilot program and requires that the systems be periodically serviced by qualified personnel. The Commission appreciates the cooperation it continues to receive from NJDEP in all aspects of administering the pilot program.

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 ensuring that all advanced wastewater treatment systems (those subject of the Pinelands Alternate Design Wastewater Treatment Systems Pilot Program) are covered under an approved operation and maintenance agreement. Details of the Commission's rule adoption may be viewed on the Commission's web site at http://www.state.nj.us/pinelands/cmp/amend/042810Septicadoption.pdf.

On April 2, 2012, the NJDEP adopted amendments to N.J.A.C 7:9A, the statewide Standards for Individual Subsurface Sewage Disposal Systems. The amendments require perpetual professional management of advanced wastewater pretreatment components, including the Pinelands Alternate Design Wastewater Treatment Systems. Details of the DEP's rule adoption may be viewed on the DEP's web site at http://www.nj.gov/dep/dwq/pdf/njac79a.pdf.

There are now three separate New Jersey Administrative Code provisions requiring mandatory septic system management. The third is the New Jersey Water Quality Management Planning (WQMP) rules adopted by the NJDEP at N.J.A.C 7:15-5.25(e).

The Commission remains committed to working with each of the Pinelands Area municipalities and the Pinelands Area County Health Departments to assist them in complying with these requirements.

As noted above, the Commission's most recent CMP amendments relating to the Pinelands alternate design wastewater treatment systems pilot program took effect in September 2014. These amendments extend the participation of the FAST system and new NSF Standard 245/ USEPA ETV Program certified technologies in the pilot program until August 5, 2018 and permanently eliminate the Cromaglass technology from the pilot program.

Of particular importance to the success of the pilot program and to Pinelands water quality protections in general is the strict adherence to the requirement for the advanced wastewater treatment systems to be regularly inspected and serviced by qualified service providers. Of paramount importance is the timely renewal of requisite operation and maintenance contracts by system owners. The NJDEP's rules provide the county health departments with a variety of administrative tools to ensure compliance with this requirement. N.J.A.C 7:9A-12.3(b) provides that system owners that fail possess a valid service contract are in violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.). Further, N.J.A.C 7:9A-8.3(e) provides that administrative authorities (health departments) shall track and manage all advanced wastewater treatment systems with respect to the type and location of system, the date of system startup and the inspection and maintenance calls conducted on each system. The rule further requires that this information be reported to the NJDEP annually.

Non-Residential Activities

The existing pilot program is limited to residential development because the Pinelands Ad Hoc Septic System Committee determined that insufficient data were available to establish specific nitrogen removal efficiencies for the highly variable characteristics of non-residential (commercial and institutional) wastewater. The CMP allows non-residential applicants to propose to use an advanced treatment system (in lieu of dilution based upon parcel size) only on a case by case basis. Many Pinelands Towns and Villages without sewer systems could benefit from the use of pre-approved alternative treatment technologies by commercial establishments. The Commission staff remains ready to assist municipalities explore the use of "community" systems to serve multiple residential and commercial buildings, and is pleased that a 2012 Memorandum of Understanding (MOU) between the NJDEP and the Commission now addresses this issue which results from NJDEP's WQMP rules, adopted in 2004. The updated WQMP rules and the subsequent MOU have the potential to 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.

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 (three retail establishments) as a means to meet ground water quality standards in unsewered Regional Growth Areas and Pinelands Towns. Monitoring of the two Amphidrome systems confirms that the Pinelands water quality standards are being achieved. The third system is not in use. The two monitored systems continue to meet stringent Pinelands total nitrogen standards.

In July 2016, Commission staff presented the Commission's Policy and Implementation Committee with a set of draft CMP amendments, including an amendment that would provide an opportunity for pre-existing nonresidential uses in certain Pinelands Management Areas to use advanced wastewater treatment systems as a means to meet Pinelands water quality standards. Under current CMP provisions, advanced wastewater treatment systems can be

used by nonresidential development only in the growth-oriented areas of the Pinelands. Under the draft rule proposal, pre-existing commercial facilities located in the (non-growth-oriented) Pinelands Forest, Agricultural Production and Rural Development Areas would be permitted to expand by up to 50% of the existing floor area or up to 50% of the existing capacity provided use of an advanced treatment system would result in the facility meeting Pinelands water quality standards. In addition, these pre-existing uses could change to another permitted use, provided an advanced wastewater treatment system would result in the facility meeting Pinelands water quality standards, where such a change would otherwise not meet water quality standards by dilution alone. On the basis of the successful performance of commercially used advanced treatment systems, the Commission staff believes that this CMP amendment will result in improved water quality and a greater likelihood that pre-existing uses will remain viable.

Cooperation with Local Government and Health Departments

Through its June 7, 2010 adoption of new septic system management rules applicable to alternative (advanced) onsite wastewater treatment technologies, the Commission continues to reaffirm its desire to assist the Pinelands Area municipalities in complying with the new NJDEP WQMP rules and the NJDEP Standards for Individual Subsurface Sewage Disposal Systems. These rules require all New Jersey municipalities to implement septic system management programs, for both traditional/conventional septic systems as well as advanced treatment technologies. Locally administered management programs help to ensure proper operation and maintenance of alternative treatment technologies as well as conventional or traditional septic systems. In the absence of septic system management programs, homeowners and businesses may neglect to perform the maintenance necessary to attain maximum longevity of their wastewater systems.

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.

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.

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**.**

In assessing onsite wastewater treatment technologies, the Pinelands pilot program's methodology necessarily includes multiple uncontrolled variables. These include unique residential occupancies and personal practices, multiple private laboratories conducting effluent analyses, various operation/maintenance firms, and eight different wastewater technology vendors. These variables represent real world conditions and reflect standard industry and marketplace practices. Some of these practices are regulated, such as laboratory certifications and analytical methods, while others are not. As a result of these real world circumstances, 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. Specific examples of variables that were not controlled in the pilot program assessment 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 analyses (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 that 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

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Chris Christie
Governor

Kim Guadagno
Lt. Governor

Sean W. Earlen
Chairman

Nancy Wittenberg
Executive Director

MEMORANDUM

To: Members Policy and Implementation Committee

From: Larry L. Liggett
Director, Land Use & Technology Programs

Date: August 17, 2016

Subject: Briefing on on-going discussions with experts regarding the Kirkwood/Cohansey aquifer

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I will be briefing the Committee on recent staff discussions with experts at the August 26th meeting.

To facilitate understanding of the material, I am attaching a briefing memo put together by Joe Sosik, Ed Wengrowski and myself that was distributed to the various experts contacted. The memo was compiled to put everyone on the same page and I hope it does the same for the Committee members as the subject is complicated and you will benefit by preparation before the briefing.

It covers information on measures to better manage regional and local impacts than current approaches, as well as what basins size we should be measuring impacts against and can impacts be mitigated by recharge.

DRAFT

New Jersey Pinelands Commission
Kirkwood-Cohansey Aquifer
Groundwater Withdrawal Policy/Rule Development

April 8, 2016

Introduction

In 2001, the New Jersey Legislature directed the Pinelands Commission to prepare an assessment of the key hydrologic and ecological information needed to determine how the current and future water-supply needs within the Pinelands area may be met while protecting the Kirkwood-Cohansey aquifer (K/C) system and avoiding any adverse ecological impact on the Pinelands Area. A work plan was finalized in 2003 and addressed two major research questions:

1. What are the probable hydrologic effects of groundwater diversions from the Kirkwood-Cohansey aquifer on stream flows and wetland water levels?

2. What are the probable ecological effects of induced stream-flow and groundwater-level changes on aquatic and wetland communities?

Project cooperators included the New Jersey Pinelands Commission, the New Jersey Department of Environmental Protection, Rutgers University, the United States Fish and Wildlife Service, and the United States Geological Survey. All scientific studies are complete and links to the final reports are on the Commissions webpage (http://nj.gov/pinelands/science/current/kc/index.html).

Pinelands Commission staff has been working to integrate the research findings of the Kirkwood-Cohansey Aquifer study into the development of new water-supply policies for the Pinelands Area. These entail:

1. Evaluating **regional** impacts by estimating the effect of proposed aquifer withdrawals on stream flows at an appropriate watershed basin size/scale.

2. Evaluating **local** impacts by estimating the effect of aquifer withdrawals on wetlands that are proximate to the proposed wellhead.

To date, neither individual impact thresholds nor a specific evaluation process has been finalized. Each are still being evaluated and discussed. We are pleased that you have agreed to share your insight and expertise and help formulate the Commission's future water-supply policy.

Current Approach to Water Management

Currently, the Commission reviews applications for new wells and increases in diversions from existing wells pursuant to N.J.A.C. 7:50-6.86 of the Pinelands Comprehensive Management Plan. These rules require:

1. All wells and all increases in diversion from existing wells which require water allocation permits from the NJDEP are required to be designed and located so as to minimize impacts on wetlands and surface waters. Hydrologic analyses are conducted by the New Jersey Geologic Survey (NJGS) in accordance with the NJDEP's Environmental Guidelines for Water Allocation Permits. (Note: In practice, this regulation is generally considered to address local impacts).

2. Applications for wells or system expansions must enact measures to increase water conservation and decrease water loss.

3. All new water diversions in excess of 100,000 gallons/day that use the K/C aquifer may be permitted provided that no viable alternatives are available or that the diversion will not result in adverse ecological impacts in the Pinelands Area. . (Note: In practice, this regulation is generally considered to address regional impacts).

Local Impacts

The Pinelands Commission currently addresses *local impacts* by minimizing drawdown at nearby wetlands. Current NJGS methods can estimate drawdown with accuracy on the order of one foot (30.5 cm). Drawdown which would exceed one foot in wetlands is currently not permitted by the Pinelands Commission.

Regional Impacts

The Pinelands Commission currently addresses *regional impacts* by analyzing cumulative reductions in basin recharge. Currently, withdrawals in excess of 10% of basin recharge are not permitted. (Agricultural and individual domestic wells are excluded from this calculation). The potential for a proposed well to affect groundwater from adjacent watersheds is not considered in this calculation

Results from the Kirkwood-Cohansey Aquifer Study

The K/C study resulted in a better understanding of how groundwater withdrawals impact Pinelands ponds, wetlands, and streams. The Commission seeks to apply the results of this study to better protect these resources. Several policy approaches have been identified that could accomplish this goal at regional and local scales.

Approaches to Address Regional Impacts

The graphs in Figure 1 show the relationship between hypothetical withdrawals for three different modeled watersheds as a percent of recharge and streamflow reductions under best-case (deep well installed far from wetlands) and worst-case (shallow well installed near wetlands) well placement scenarios (Charles and Nicholson, 2012). Under the best-case scenario, the relationship is nearly 1-to-1. Because Commission policy would require best-case placement of

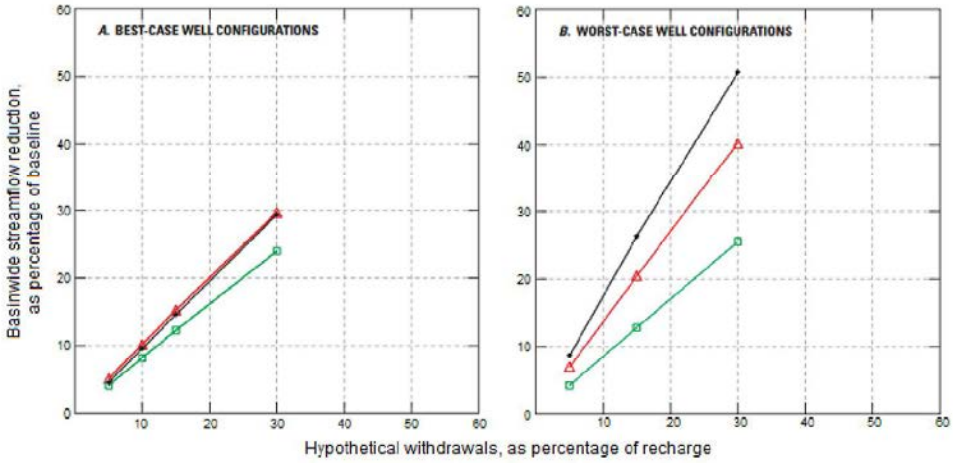

Figure 1. Relation between hypothetical withdrawal rate and simulated streamflow reduction assuming best-case (left) and worst-case (right) well configurations. (Charles and Nicholson, 2012)

wells (to the extent feasible), it is a reasonable assumption that the amount of withdrawal from groundwater pumping in the Pinelands is equal to the basin-wide reduction to stream flow and evapotranspiration. Albertson watershed showed the same results regardless of well placement

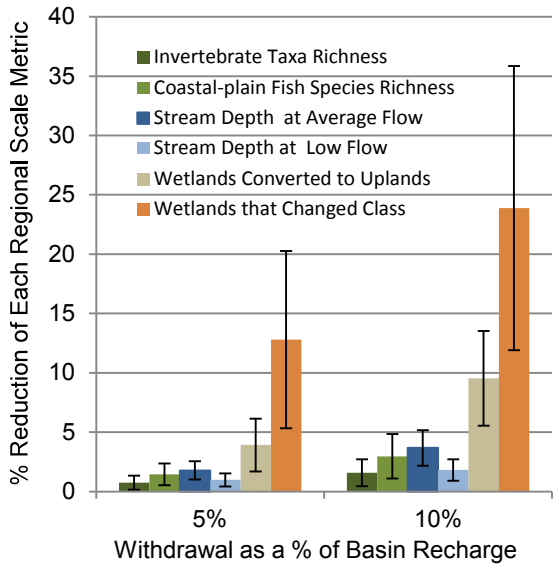

Figure 2. The expected (regional scale) reductions in biological and physical regional metrics with selected reductions to recharge. Multiple sources at : http://nj.gov/pinelands/science/current/kc/index.htmlx.html

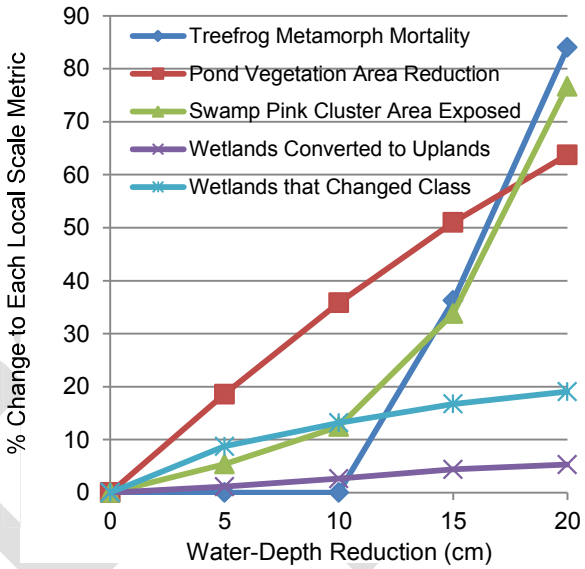

Figure 3. Environmental (local scale) impacts based on water-depth reduction scenarios. Multiple sources at: http://nj.gov/pinelands/science/current/kc/index.html

Data from the USGS (2011) shows that 25% of the low-flow margin is slightly greater than 5% of average annual flow. A subsequent study (see: http://nj.gov/pinelands/science/current/kc/index.html shows that 5% withdrawal of basin recharge would result in approximately 13% of the wetlands in the basin changing class (e.g. wet pine lowland to dry pine lowland). An assertion here is that the reduction in recharge is approximately equal to a subsequent reduction in average annual stream flow. As impacts start to climb rapidly above 5%, perhaps suggesting that no more that 25% of the low-flow margin should be diverted.

Additional studies (see: http://nj.gov/pinelands/science/current/kc/index.html) found that two of the three metrics display a marked increase at 15 cm; the other three show an immediate and steady increase. More specifically, Figure 3 shows that the loss of swamp pink habitat and increased Pine Barrens tree frog mortality occurs with water depth reductions of between 10 cm and 15 cm.

Regional impacts will be evaluated at the watershed level. At this level, cumulative impacts to average annual stream flows, episodic low-flow periods, and cumulative withdrawals within the basin will be evaluated. The designation of impact thresholds will be based upon components of wetland-landscape models, stream flow models, and simulated changes to stream habitat and ecology. All USGS modeling in the K/C study is based on average-annual flow.

Low-Flow Margin Approach

The low-flow margin, shown in Figure 4, is the difference between a watershed's September median flow and the 7-day, 10-year low-flow statistic (7Q10). A portion of this margin is determined to be available for withdrawal based upon an assessment of biological and physical metrics. The low-flow margin method is reportedly being considered for state-wide use by the NJDEP and is already in use by the New Jersey Highlands Council.

It's been unofficially suggested that the NJDEP might permit the withdrawal of 25%[1] of the low flow margin in HUC 11 watersheds. In the Highlands, the Regional Master Plan uses HUC-14 watersheds with withdrawal thresholds of 20%, 10%, and 5% depending on the capability zone.

A Pinelands low-flow margin approach to regulating withdrawals might use HUC-11 basins. The HUC-14 basins would provide insufficient water from basins of this size. Because a primary goal of the CMP is to manage growth (as opposed to stopping it completely), there is a need to ensure that some amount of water is available to serve existing and future development. One approach to identifying appropriate watershed size would be to use the hybrid-sized basins utilized in the Commission's *Environmental Integrity Assessment*, however costs associated with acquiring streamflow statistics for these hybrid-sized basins make their use less feasible (see page 4 for further discussion).

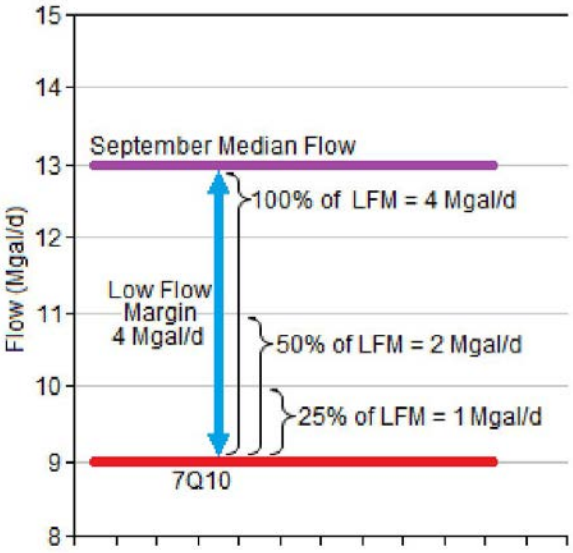

Figure 4. The low-flow margin.

In recognition of the sensitivity of Pinelands, the low-flow margin thresholds would need to be set at a level that minimizes adverse impacts. As implemented in the Highlands, low-flow margin thresholds could be established based upon Pinelands Management Areas. For example, a well might be prohibited in the Preservation Area District, whereas a 5% low-flow margin threshold might be applied to the Forest Area. Similarly, a 20% low-flow margin threshold might be applied in the Regional Growth Area. Because basin and Pinelands Management Area boundaries are not coincident, some uncertainty remains as to what thresholds should be applied and to what extent the Pinelands Management Area would dictate the permissible low-flow margin threshold.

Alternative Regional Approaches

In addition to the low-flow margin, staff also considered using a percent of drought recharge limit in determining water supply availability. The percent of drought recharge limit is an approach that was reviewed by by Dan Van Abs et al. in conjunction with New Jersey Future (2014). As opposed to limiting withdrawals to a percentage of the low-flow margin, this approach would limit withdrawals by a percentage of annual average drought recharge since long-term recharge is a good proxy for stream flow in a region where most annual stream flow is derived from groundwater. For example, Table 1, below, compares 5% of drought recharge to various low-flow margins. In this particular watershed, approximately 0.2 million gallons per day would be available for withdrawal based upon 5 % of recharge occurring during the selected drought period. This approach would minimize impacts to the environment in times of drought; however the approach is may be ruled out because its limitations are similar to using the low-flow margin method in HUC-14 basins. Limited water supply availability is likely depending on the drought period selected and the maximum drought recharge percentage determined to be available. Possible drought periods include the 10-year average, drought of record, etc. This approach would likely provide insufficient

Subwatershed	Low-Flow Margin Approaches			Comparison to Recharge
	LFM (Mgal/d)	5% LFM (Mgal/d)	20% LFM (Mgal/d)	5% Drought GWR (Mgal/d)
Haynes Creek	2.01	0.10	.040	0.199

Table 1. Example of a watershed's available water using low-flow margin and percentage of drought recharge. (Van Abs et al, 2014)

[1] For more information on NJDEP's selection of a low-flow margin threshold, see:
Hoffman, J. L., & Rancan, H. L.L.2009. The Hydroecological Integrity Assessment Process in New Jersey (New Jersey Department of Environmental Protection, New Jersey Geological Survey).http://www.state.nj.us/dep/njgs/pricelst/tmemo/tm09-3.pdf

For more information on the low-flow margin, see:
Domber, S., I. Snook, & J.L. Hoffman. 2013. Using the Stream Low Flow Margin Method to Assess Water Availability in New Jersey's Water-Table-Aquifer Systems. (New Jersey Department of Environmental Protection, New Jersey Geological Survey.
http://www.state.nj.us/dep/njgs/pricelst/tmemo/tm13-3.pdf

water to meet the requirements of designated Pinelands growth areas.

Another alternative is to use the Gompertz wetland vulnerability index which was also evaluated by the USGS as part of the K/C study. The USGS examined methods to estimate wetlands drawdown impacts from new wells in the Kirkwood-Cohansey study (Charles and Nicholson, 2012). Differences among the three study basins in the simulated percentage of basin wetlands affected by drawdown were found to be related to the proximity of wetlands to streams, the proximity of wetlands to pumped wells, and the vertical conductance of the aquifer system. These factors formed the basis for an index of wetland vulnerability (WVI) to drawdown. The WVI of a basin, along with the withdrawal rate from specified wells, serve as inputs into an empirically-derived model based on the Gompertz function. The Gompertz equation can be applied to quantify the area of wetlands that would be impacted by drawdown. Using this approach allows analysis for differing levels on impact. For example, the equation can be modified to estimate the extent of the area affected from a 5 cm drop in water level, a 10 cm drop in water level, etc. This was shown to be an effective means for evaluating potential drawdown in wetlands at a basin scale throughout the Pinelands. The Gompertz approach may be ruled out because of the challenge in setting a limit for the amount of basin-wide cumulative drawdown. Because basin size and the amount of wetlands it contains vary greatly, there is no clear direction for selecting a standard.

Discussion on Watershed Size

Basin size plays a substantial role in how the low-flow margin approach is used to regulate groundwater withdrawals. Determination of water availability based upon the low flow margin in a basin that is too small may preclude groundwater withdrawals, adversely impacting areas where the CMP purposefully directs growth .Conversely, using the low-flow margin method to determine water availability in larger basins may allow withdrawals, but in the process may harm smaller, more sensitive basins or specific areas within the larger basins.

Based upon these concerns, staff calculated the minimum average basin size that would be necessary to supply one million gallons per day while not exceeding the allowable impact threshold to stream flow. Table 2 shows that a basin size on the order of 21 square miles is necessary to allow for a withdrawal of one million gallons per day per day while not exceeding a 5% reduction in stream flow.

Basins that were developed as part of the Commission's Ecological Integrity Assessment project were established by aggregating sub-basins to form 92 intermediate, hybrid-sized basins with an average size of approximately 21 square miles.

Withdrawal Rate		Impact Threshold Streamflow Reduction Values				
MGD →	CFS	**5%**	**10%**	**15%**	**20%**	**30%**
1.50	2.32	31.2	16.2	11.3	8.8	6.3
1.00	1.54	*21.1*	11.2	7.9	6.3	4.6
0.50	0.77	11.3	6.3	4.6	3.8	3.0

Table 2. Necessary watershed size (mi^2) needed to accommodate a specified withdrawal rate and avoid stream flow reductions greater than the listed impact thresholds.

Because these hybrid-basins were defined by the Commission, basin-specific flow data is not available. The Commission would likely need to retain the USGS or other consulting group to develop supporting stream flow data. The initial cost to develop this data is estimated to be on the order of $200,000. The Commission currently lacks the basis to pursue this option as low-flow margin data are available for each of the HUC-11's and the financial commitment necessary to develop data for the hybrid-sized basins may not be commensurate with the benefit. Moreover, periodic updates to the hybrid-sized basin stream flow data would likely require a long term financial commitment. .

Due to the financial considerations noted above, the Commission is leaning towards using HUC-11 basins as the basis for a low-flow margin approach. The HUC-11 sized basins are also being considered over the smaller HUC-14 basins because they are much more likely to meet the demand for providing a percentage of the low-flow margin of at least one million gallons per day. To minimize adverse impacts in the upper reaches of basins, well placement would likely be prohibited in the basin's headwaters and any approval would need to consider the cumulative effects of multiple wells in calculating low-flow margins.

Approaches to Address Local Impacts

Local impacts will be evaluated through the assessment of cumulative localized impacts relative to discrete water table declines and provide a preliminary screening of a proposed withdrawal. Studies performed by Pinelands Commission scientists show that substantial impacts to flora and fauna are predicted to occur with increasing wetland water level reductions, as seen in Figure 3. Accordingly, Commission policy will likely preclude groundwater diversions where modeling indicates local wetland water levels will decline by more than 15 cm.

Thiem Image-Well Approach

A simplified alternative to the MODFLOW ground water model was developed by USGS as part of the K/C study. Identified as the Thiem image-well approach, this method provides a two-dimensional distribution of a 15 cm draw-down (as an aerial view of the Zone of Influence/Cone of Depression) resulting from groundwater diversions in an unconfined aquifer system. USGS notes the applicability of the Thiem image well approach in the K/C due to the dominance of surface-water boundary effects that are characteristic of the K/C. The Thiem image-well approach provides an estimate of the long term average drawdown resulting from ground water diversions. Average drawdown is of interest because average water level is the key hydrologic determinant in models of wetland vegetation occurrence in the Pinelands as described by Laidig et al (2010). Similarly, median water level is the key hydrologic determinant in models of intermittent pond vegetation models described by Laidig (2010). The two parameters used in the Thiem image-well approach were optimized by using results of detailed MODFLOW simulations of drawdown in three Pinelands study areas (Figure 5). The relative accuracy of the Thiem image-well approach was evaluated by comparing results obtained with results of equivalent simulations of single-well withdrawals that used the calibrated MODFLOW models.

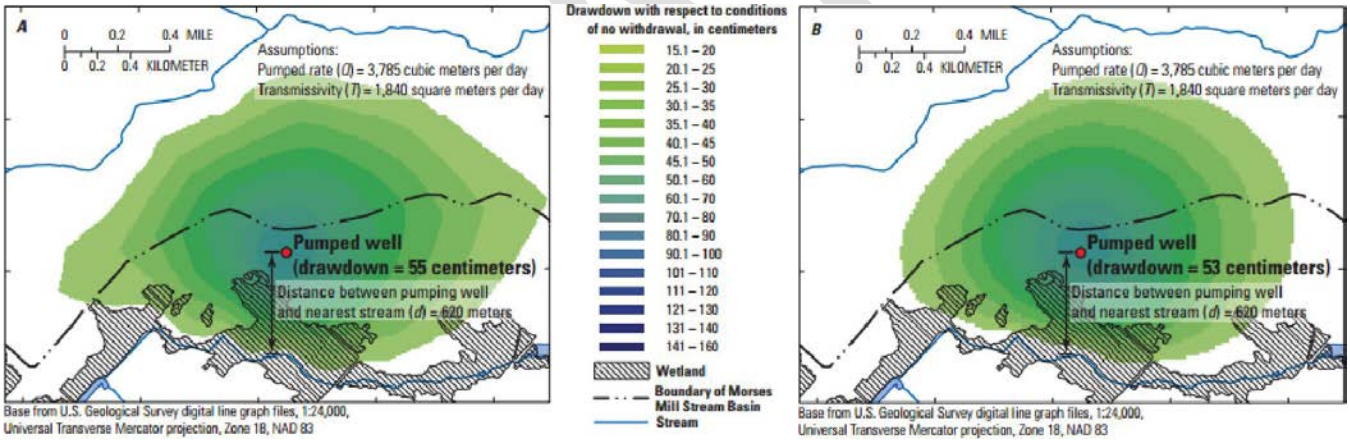

Figure 5. Drawdown distribution simulated by using A, Thiem image-well technique with damping factor and results adjusted by using scaling factor, and B detailed MODFLOW model. Where drawdown is greater than or equal to 15 cm, the R^2 is 0.98. (Charles and Nicholson, 2012)

When compared with the 15 cm drawdown zone of influence generated using the MODFLOW models, 9 of 12 Thiem image-well approach models matched relatively well. Of the 3 that did not match, all were in the same watershed and none had drawdowns at or exceeding 15 cm and therefore could not be compared. Two of these, matched fairly well at 5 cm drawdown, but not at 10 cm drawdown. It was determined that the one model that did not match at all was affected by aquifer heterogeneity which is not accounted for by the Thiem image-well model.

Charles and Nicholson (2012) note that there are limitations to the Thiem image-well approach. In particular, best coincidence with MODFLOW model results was achieved at the 15 cm and greater drawdown threshold. Lesser coincidence was noted at less than a 15 cm drawdown. In addition, the approach cannot predict drawdown on the opposite side of a boundary stream and it only accounts for the boundary effects of the closest stream. The presence of small ephemeral streams will introduce error in the model output.

The Thiem image-well approach could be used to assess local impacts of water withdrawal in the Pinelands. Notwithstanding model limitations, wells would not be permitted if the 5 cm or greater zone of influence intersected with a Pinelands pond. Due to the inability of the Thiem image-well approach to accurately predict drawdown of less than 15 cm, a no-well zone buffer around ponds (yet to be determined) or a management area prohibition would be used to minimize the likelihood of groundwater drawdown in excess of 5 cm in these critical areas.

As previously discussed, significant impacts to wetlands occur when drawdown approaches 15 cm. Accordingly, a 15 cm wetland water level drawdown limit would apply in areas where wells would be permitted in the Pinelands. Due to the presence of innumerable ponds, Commission staff is inclined to recommend that no wells be permitted in the Preservation Area District and the Forest Area.

Water diversion applicant's that are not satisfied with the results of the Thiem image-well modeling results would have the option to conduct MODFLOW analyses of the proposed diversion.

Alternative Local Approaches

There are two possible alternatives to the use of the Thiem Well-Image approach for assessing local impacts from groundwater withdrawal. The first alternative is to require a MODFLOW analysis for all well applications. This approach, while expensive and data intensive, is ideal for determining impacts at, and below, the 15 cm threshold. In fact, because of the impacts that occur with even a 10 cm reduction in water levels, a policy requiring a MODFLOW would use a 10 cm threshold.

Another possible approach is to use the Gompertz wetland vulnerability index (as summarized above), at the HUC-14 scale. The smaller HUC-14 watershed would likely provide an accurate estimate of drawdown in close proximity to the well. However concerns exist with using the Gompertz wetland vulnerability index to predict water level reductions at a regional scale. In addition, the Gompertz wetland vulnerability approach does not provide the geographic analysis that is provided by the Thiem.

Sources Available At:

http://nj.gov/pinelands/science/current/kc/index.html