

20. Proprietary Systems

Description
 A proprietary system is a manufactured device which treats stormwater before discharge to another BMP or to the receiving water. This is a broad category of BMPs with a variety of pollutant removal mechanisms and varying pollutant removal efficiencies.

<p>Regulatory Credits <i>Pollutant Removal varies with the type of device and its sizing.</i></p> <ul style="list-style-type: none"> varies Total Suspended Solids varies Total Nitrogen varies Total Phosphorus <p><i>Water Quantity effect varies with the type of device and its sizing.</i></p> <ul style="list-style-type: none"> varies Peak Attenuation varies Volume Capture 	<p>Feasibility Considerations</p> <table style="width: 100%; border: none;"> <tr> <td style="padding-right: 20px;">Small</td> <td>Land Requirement</td> </tr> <tr> <td>Med</td> <td>Cost of Construction</td> </tr> <tr> <td>Med-High</td> <td>Maintenance Burden</td> </tr> <tr> <td>Small-Med</td> <td>Treatable Drainage Basin Size</td> </tr> <tr> <td>Med</td> <td>Possible Site Constraints</td> </tr> <tr> <td>Med</td> <td>Community Acceptance</td> </tr> </table>	Small	Land Requirement	Med	Cost of Construction	Med-High	Maintenance Burden	Small-Med	Treatable Drainage Basin Size	Med	Possible Site Constraints	Med	Community Acceptance
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<p>Advantages</p> <ul style="list-style-type: none"> - Can be cheaper than traditional technologies for stormwater treatment. - Typically requires less land surface than traditional technologies. - May be engineered to target specific pollutants. - May find applications where available land is extremely limited. - May allow dual use of the land surface, since some systems are underground. 	<p>Disadvantages</p> <ul style="list-style-type: none"> - Generally, performance in North Carolina installations is not yet well documented. - Underground installations are not readily inspected, and typically lack provisions to warn of impending failure. - Because of reduced size compared to traditional technologies, maintenance actions may be more frequent. - The additional monitoring requirements placed on proprietary systems can discourage some potential owners. - Projects featuring proprietary BMPs may take longer to review and approve.
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Major Design Elements

<p>Required by the NC Administrative Rules of the Environmental Management Commission. Other specifications may be necessary to meet the target pollutant removal requirements.</p>	
1	<p>Sizing shall take into account all runoff at ultimate build-out including off-site drainage. BMP shall be located in a recorded drainage easement with a recorded access easement to a public ROW.</p>
2	<p>"Innovative systems" (per 15A NCAC 2H .1008(b)) BMPs may not be located within one mile of and draining to waters classified as HQW; including waters classified as ORW, WS-I, WS-II, SA, and Primary Nursery Areas (PNA). BMP technology successfully completing DWQ's PEP program will be treated as "Alternative Design Criteria" systems per 15A NCAC 2H .1008(h), and may be installed without <u>additional</u> receiving water classification constraints: however, in all cases all water classification constraints required within the rules governing the applicable program continue to remain in effect.</p>
3	<p>DWQ may require monitoring to verify the installed performance of the proprietary BMP.</p>
4	<p>Alternative stormwater treatment measures must be available and must be installed, upon DWQ's determination that the proprietary BMP has failed.</p>
5	<p>An operation and maintenance plan is required.</p>
6	<p>The system must be designed by a professional licensed in North Carolina. The design professional must also certify that he inspected the system during construction; that the installation conformed to the approved plans and specs; and that the system meets the requirements of the rules.</p>
<p>Required by DWQ policy. These are based on available research, and represent what DWQ considers necessary to achieve the target removal efficiencies.</p>	
7	<p>Additional design, performance, and monitoring requirements will be developed on a case-by-case basis by DWQ.</p>

20.1 General Characteristics and Purpose

Many different proprietary devices, or manufactured BMPs, are available for the treatment of stormwater. Many, although not all, proprietary BMPs can be classified into two major groups: separation devices and filtration devices. Separation devices can be further subdivided into two types: chambered and hydrodynamic. In chambered BMPs, runoff passes through several chambers where settling of sediment particles and flotation of hydrocarbons takes place. Hydrodynamic devices typically impart a swirling motion to the incoming flow that aids in settling of sediment particles. Filtration BMPs typically pass runoff through filter cartridges or filter media, thereby removing some fraction of the solid pollutants from the stormwater.

In order to prevent re-suspension and subsequent discharge of sediment, many proprietary BMP systems have provisions to allow bypassing of large storm events that are in excess of the design storm.

Regular inspection, maintenance, and clean out of proprietary systems is required for best performance. As with all BMPs, proprietary systems should be inspected after large storm events.

Proprietary devices may be designed as stand-alone BMPs, achieving complete stormwater treatment and control as required by the regulatory program or jurisdiction governing the installation of the unit. Or, they may also be designed as part of a stormwater treatment and control train, in combination with other BMPs.

20.2 Meeting Regulatory Requirements

To obtain a permit for a project that includes the installation of a proprietary stormwater treatment system in North Carolina, the proprietary system must meet all of the Major Design Elements listed in the beginning of this section. Since individual proprietary systems are extremely variable in design details, design concepts, and pollutant removal mechanisms, it is not currently possible to provide a category-wide set of detailed design parameters for proprietary systems. DWQ typically approaches permitting requirements on a case-by-case basis, and determines additional requirements in accordance with the receiving water classification, site conditions, the specifics of the device, the target pollutants, and the identified pollutant removal requirements for the governing regulatory program.

20.3 The Preliminary Evaluation Period Program (PEP)

In 1997 DWQ established the Preliminary Evaluation Period (PEP) program. The PEP program is designed to allow DWQ to evaluate the performance of proprietary devices with the goal of subsequently being able to qualify successful candidate technologies as permissible on a statewide basis.

The PEP program requires installation of the candidate technology at a small, limited number of North Carolina permitted sites. For each candidate technology, DWQ will develop the PEP requirements applicable to the technology. Further, DWQ requires a device-specific project plan, a monitoring plan, and an interpretation of the collected data from the permitted site. In past PEP projects DWQ has required a year of data, with an established minimum number of qualifying storm events. DWQ's favorable interpretation of the first data set allows the candidate technology to continue in the PEP program, but at another in-state location. After the small number of data sets is in hand, DWQ will establish the assigned removal rates, design loading limitations, and design particulars for the candidate proprietary technology. The intent is that with the performance characterizations and constraints derived from the test locations, DWQ can then provide qualified statewide approval of the particular proprietary BMP.

Despite having the PEP program in place since 1997, there have been relatively few enrollees in the program. The program is evolving, and it is likely that the technical requirements and the procedural requirements will be adjusted with experience in the program. As currently implemented on a case-by-case basis, the PEP process is highly collaborative, with necessary participation by the owner, the design engineer, the equipment vendor, and DWQ. Because of this, the time to review and approve projects with proprietary BMPs is typically protracted beyond the time that is typically required to review and approve projects featuring traditional BMPs.

DWQ is alert to mixed results from other states as to the success of other programs intended to qualify proprietary devices.

Two DWQ memoranda from 1997 and 2001 that establish the elements of our PEP program for proprietary technologies are appended at the end of this chapter.

20.4 Systems Approved under the PEP Program

Caution: This BMP Manual lists proprietary technology that has been tested in North Carolina and the performance has been evaluated based on the equipment specifications below. In addition to conformity with the equipment specifications listed, any stormwater control system must also meet the full requirements of the regulatory program under which it is being installed. This BMP Manual listing does not supersede, replace, or otherwise invalidate in any way the rule requirements of the governing regulatory program. See Section 20.2 of this BMP Manual chapter; or for further clarification see Chapter 2 of this BMP Manual. Ultimately the selection, installation, operation, and maintenance of proprietary technology by permittees, owners, operators, installers, contractors, and/or designers must comply with **the governing rules of the specific regulatory program** under which any proprietary technologies are proposed.

The following are approved systems in the PEP program. Any designs that use these systems must have the same specifications that were tested for approval. Any future changes to the configuration, design, or technology must be approved in writing by DWQ. Contact DWQ's Stormwater Permitting Unit to request written approval of proposed equipment changes.

20.4.1 StormFilter by Contech. PEP trials conducted 2005-2006, and 2011. DWQ approved 9/1/2012.

Regulatory Credits	
<i>Pollutant Removal</i>	
85%	Total Suspended Solids

A StormFilter is a patented treatment BMP that filters water through granular media cartridges. The systems typically are configured as an underground vault containing

cylindrical filter cartridges. The number of cartridges is determined by the site-specific flow rate and flow volume to be treated in accordance with the specific applicable DWQ regulations.

The 85% TSS removal credit is granted for StormFilter units designed and manufactured to the following equipment specifications:

- **1 gpm/sf** maximum annular media loading rate;
- **Media:** Perlite
- Cartridges shall be generally configured as shown in Figure 1. DWQ may interpret individual proposed StormFilter installations as to significance and compliance with this equipment specification on a case-by-case basis.

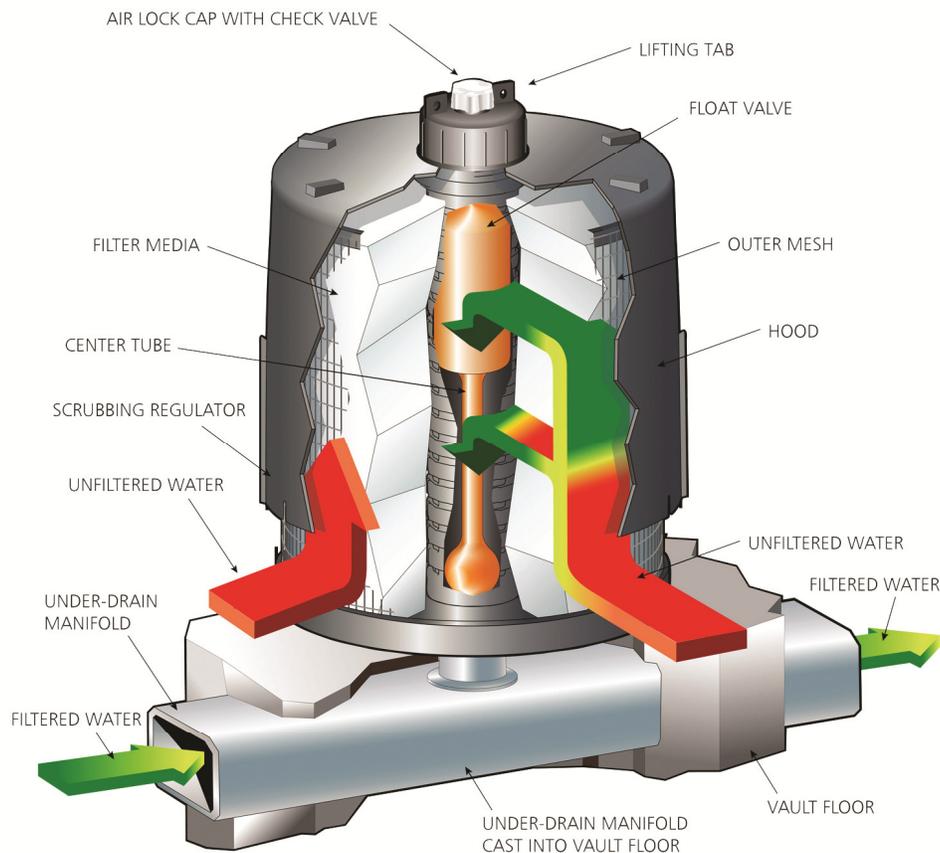


Figure 1: StormFilter Cartridge

20.5 Generalized Design Procedure for Meeting Regulatory Requirements for Approved Systems

Proprietary devices installed for stormwater control must meet all the requirements under the regulatory program governing the stormwater control installation, and must meet all the equipment specifications listed herein. In addition, specific manufacturer's installation guidelines must be followed. A generalized design procedure is provided below to assist owners, designers, and installers.

Step 1: Understand the Approved System

Review the approved equipment specifications and contact the manufacturer for specific design guidelines if necessary. Determine if, in addition to the approved proprietary technology BMP, the whole stormwater control system requires any additional common stormwater elements (found in Chapter 5). Make sure to understand the construction sequencing needed for the system and any maintenance considerations.

Step 2: Determine the Volume of Water to Treat

Most regulatory programs require the treatment and control of the runoff from a specific size rainfall event, usually described in terms of a rainfall amount, or a rainfall return frequency. Typically the design of the system must provide enough storage for the water quality volume for the design storm (typically 1", 1.5" or pre/post). Chapter 3, Stormwater Calculations, details the volumetric calculation for sizing the BMP.

Step 3: Design the system

Given the fact that approved systems will vary in pollutant removal methods, this section does not provide detail design guidelines therefore the burden is on the designer review the approved specs and manufacturer's literature for correct design. As stated previously, the system must be designed to meet all regulatory requirements for the jurisdiction and program that has regulatory authority.

Example of permitting requirements under the state Stormwater Management program rules at 15A NCAC 2H .1008(h) - Alternative Design Criteria. Note that the state Stormwater Management program regulates the discharge of stormwater pollutants by requiring certain property development activities to apply for a stormwater permit. *Again, the reader is cautioned that the following example is illustrative of some of the requirements under 15A NCAC 2H .1000: however for other projects other regulatory requirements may pertain, depending on the location of the system, and depending on which regulatory authority has jurisdiction.*

Example design basis under 15A NCAC 2H .1008(h):

- The system must achieve 85% average annual removal of TSS from the stormwater flow.

- The system must control and treat 100% of the water quality volume (resulting from the 1" or 1.5" design storm).
- **Either** the discharge rate of the treatment volume shall completely draw down between 2 and 5 days.
- **Or**, the discharge rate from the system must be controlled so that the post-development rate is no greater than the pre-development rate for the 1-year, 24-hour rain event.

Projects with approved systems must also include the following items:

Under 15A NCAC 2H .1000 rules: a site-specific Operation and Maintenance Plan must be included in the permit application submittal to DWQ.

Under 15A NCAC 2H .1000 rules: The system designer must be licensed in North Carolina for the design of the type of system proposed. And, the system designer must subsequently certify that:

- The stormwater system was inspected during its construction;
- The stormwater system has been constructed in substantial conformity with the approved plans and specs;
- The stormwater system complies with the requirements of 15A NCAC 2H .1000.

State of North Carolina
 Department of Environment,
 Health and Natural Resources
 Division of Water Quality

James B. Hunt, Jr., Governor
 Jonathan B. Howes, Secretary
 A. Preston Howard, Jr., P.E., Director



November 24, 1997

MEMORANDUM

TO: Regional Office Water Quality Supervisors
 Branch Heads

FROM: A. Preston Howard, Jr., P.E. *A.P.H.*

SUBJECT: POLICY MEMORANDUM
 PERMITTING NEW STORMWATER TREATMENT TECHNOLOGIES

In recent months there have been numerous requests to permit new stormwater treatment technologies. This policy memorandum is provided in response to these requests and the increasing availability and diversity of new stormwater treatment technologies. New technologies are defined as innovative systems [NCAC T15A: 02H .1008(b)] or alternative designs [NCAC T15A 2H .01008(h)] that the state does not have direct experience with.

A Preliminary Evaluation Period (PEP) shall be established for all new treatment technologies which are found to be of sound principle and concept. The PEP will allow a limited number of projects utilizing the new technology to be permitted and evaluated. The PEP is designed to provide the Division the time and information necessary to assess the effectiveness of the technology in meeting state requirements. All permits issued during the PEP will require analytical monitoring designed to generate a representative data set to evaluate pollutant removal efficiencies. Documentation of studies and information from other permitting agencies will also be used in making a comprehensive evaluation of any new treatment technology. For each new technology, a memorandum establishing a PEP and detailing specific requirements in force during the PEP will be sent to all Regional Offices.

The PEP memorandum will be issued by the Stormwater and General Permits Unit. The following minimum requirements shall be in effect during the Preliminary Evaluation Period:

1. No new technologies shall be permitted in areas draining to ORW, HQW, WS-II or SA waters.
2. All permits shall be signed by the Director.
3. A maximum of five permits per technology will be issued by DWQ during the PEP. Permitting will further be restricted to no more than three innovative

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technology permits in any one geographic region of the state (coastal, piedmont and mountain).

4. A copy of all application and supporting documentation shall be provided to the Stormwater and General Permits Unit for incorporation into a database and for use in overall evaluation of the technology.
5. A minimum of 10 data points for each installation shall be required to be collected to define a representative data set for final evaluation of the system. These data will be used in publishing the Report of Findings and establishing permanent permitting procedures for this technology. These data must be collected over the course of at least one full year with samples collected in each of the four seasons.
6. All permits shall require quarterly analytical monitoring of first flush grab samples. Specific monitoring parameters shall include TSS and flow. All installations draining to NSW designated waters shall include TN and TP monitoring. Additional parameters may be established in the PEP memorandum based upon specific water quality concerns or potential pollutant removal applications beyond the state 85% TSS design criteria.

A facility may opt to monitor more frequently than quarterly in order to generate the required data set in a shorter period of time as long as data is collected over the course of at least one full year with samples collected in each season.

7. All permits shall require that another treatment method be installed in the event that the permitted technology fails to substantially fulfill the state requirements.

The PEP will end when the Division has adequate information to make a final determination on widespread permitting of the new technology. When a final determination is made, the Stormwater and General Permits Unit will issue a Report of Findings for the specific technology. The report will include a summary of the system evaluation and recommendations for future permitting.

Please inform your stormwater staff of this policy, which is effective immediately. If you have any questions please contact Jeanette Powell at (919) 733-5083, ext. 537.

APH:jp

cc: Steve Tedder
Don Safrit
Bradley Bennett
Brent McDonald



NORTH CAROLINA DIVISION OF WATER QUALITY
WATER QUALITY SECTION
STORMWATER AND GENERAL PERMITS UNIT

June 13, 2001

MEMO

TO: Stormwater Treatment Technology Vendors
State Stormwater Management Program Staff

FROM: Bradley Bennett *BB*
SWGPU Supervisor

SUBJECT: Permitting Innovative and/or Proprietary Stormwater Treatment Technologies

The Division of Water Quality may approve innovative and/or proprietary (I/P) stormwater treatment technologies on a case by case basis. Each permitted I/P technology shall be subject to a Preliminary Evaluation Period (PEP). The PEP is designed to allow the Division to evaluate the technology, develop appropriate permitting criteria, and allow a limited number of installations. The PEP is terminated when enough information is available for the Division to make a final determination on the treatment technology by establishing permanent permitting criteria or prohibiting the technology from use. I/P treatment technology PEPs will typically include, but are not limited to, the following conditions:

- No I/P technology shall be permitted in areas draining to ORW, HQW, WS-II or SA waters.
- No I/P technology shall be permitted where continuous background flows such as springs are present.
- The facility requesting the use of the I/P technology will provide all pertinent documentation on the system design, system application, and system effectiveness as part of the application process.
- The I/P technology will be subject to a minimum one-year preliminary evaluation period.
- All approved I/P technology systems shall be designed and sized in accordance with the manufacturers specifications.
- Analytical monitoring and the generation of a minimum number of data points shall be a requirement.
- An executed operation and maintenance agreement shall be required.
- The facility will be responsible for installation of another treatment method in the event that the technology fails to substantially fulfill the state requirements it was permitted to meet.

To initiate a PEP for an I/P treatment system, the Division must receive a permit application for a project proposing to utilize the technology. Once an application is received by the Regional Office, the Division will begin research on the technology and develop appropriate interim permitting criteria. This research and the PEP document are generated in the Central Office. Once the PEP document is approved by the Division Director, the Regional Office can proceed with permit issuance. Note that the PEP development process may take six months or more depending on the quality of the permit application, availability of documentation, and availability of staff resources.

September 28, 2007 Changes:

1. Major Design Elements: Reformatted to include numbered requirements.

August 7, 2009 Changes:

1. Potential for protracted review and approval time noted in Disadvantages, and in 20.3.
2. Collaborative nature of the case-by-case development of the PEP program for a particular technology noted in 20.3.
3. Original enabling memos for the PEP program attached for reference.

August 15, 2012 Changes:

1. Added Section 20.4 Systems Approved under the PEP Program.
2. General edits and clarifications throughout chapter.

Draft