



**December 3, 2003
(Updated December 2009)**

**PILOT USE LEVEL DESIGNATION FOR BASIC (TSS), ENHANCED,
PHOSPHORUS AND OIL TREATMENT**

For

AquaShield™, Inc.'s Aqua-Filter™ System

Ecology's Decision:

Based on AquaShield™, Inc.'s application submissions and recommendations by the Technical Review Committee (TRC), Ecology hereby issues the following use level designations:

1. Pilot Use Level Designation (PULD) for the Aqua-Filter™ System for Basic Treatment:

- **Using a coarse perlite filter media as specified by AquaShield™, Inc.**
- **Sized at an operating rate of no more than 5 gpm/ft² per cartridge (surface area of about 4 square feet).**

2. Pilot Use Level Designation (PULD) for the Aqua-Filter™ System for Enhanced, Phosphorus, and Oil Treatment:

- **Using Aqua-Blend™ C filter media as specified by AquaShield™, Inc.**
- **Sized at an operating rate of no more than 5 gpm/ft² per cartridge (surface area of about 4 square feet).**

3. These designations apply only to the two-component AquaShield™, Inc. Aqua-Filter™ System which is an Aqua-Swirl™ Concentrator followed by an Aqua-Filter™ filtration chamber.

4. The use level designations expire on June 1, 2012 unless extended by Ecology, and are subject to the conditions specified below.

Ecology's Conditions of Use:

Aqua-Filter™ Systems shall be designed, installed, and maintained to comply with these conditions:

- 1. Aqua-Filter™ Systems must be designed, assembled, installed, operated, and maintained in accordance with AquaShield™, Inc.'s applicable manuals and documents and the Ecology Decision.**
- 2. Aqua-Filter™ Systems containing coarse perlite mix are approved for treatment at 5 GPM/ft² maximum flow rate per cartridge at the 15-minute water quality design flow rate (as specified in Ecology's most recent Western Washington Stormwater Manual), as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model. Note that if single event methods are used to estimate runoff flowrates, Figures 9.6a and 9.6b in Volume V of the 2005 Stormwater Management Manual for Western Washington should be used to adjust the approved hydraulic loading rate of 5 GPM/ ft². This is done by multiplying the above hydraulic loading rate by the ratio indicated in Figure 9.6a for on-line designs or Figure 9.6b for off-line designs. The 6-month, 24-hour rainfall amount for the project site must be known to identify the appropriate ratio. The adjusted hydraulic loading rate is divided into the peak 10-minute flowrate predicted by the single event method to compute the number of cartridges necessary.**
- 3. Aqua-Filter™ Systems containing Aqua-Blend™ C are approved for treatment at 5 GPM/ ft² maximum flow rate per cartridge at the 15-minute water quality design flow rate (as specified in Ecology's most recent Western Washington Stormwater Manual), as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model. Note that if single event methods are used to estimate runoff flowrates, Figures 9.6a and 9.6b in Volume V of the 2005 Stormwater Management Manual for Western Washington should be used to adjust the approved hydraulic loading rate of 5 GPM/ ft². This is done by multiplying the above hydraulic loading rate by the ratio indicated in Figure 9.6a for on-line designs or Figure 9.6b for off-line designs. The 6-month, 24-hour rainfall amount for the project site must be known to identify the appropriate ratio. The adjusted hydraulic loading rate is divided into the peak 10-minute flowrate predicted by the single event method to compute the number of cartridges necessary.**
- 4. Aqua-Filter™ Systems shall be installed in such a manner that flows exceeding the maximum operating rate are bypassed and will not resuspend captured sediment.**
- 5. AquaShield™, Inc. commits to submitting a QAPP for TRC review and Ecology approval by June 1, 2011 that meets the TAPE requirements for attaining a GULD for Basic Treatment for the coarse perlite mix media. This QAPP is in addition to the approved QAPP mentioned below. A QAPP must be submitted for each site monitored.**

- 6. Ecology hereby approves the AquaShield™, Inc. QAPP, dated May 2006, for testing to be completed on the Aqua-Blend™ C media. Any additional pilot use level field test sites must submit a QAPP for Ecology approval before startup. Once the final test site is selected additional information shall be submitted with site-specific information.**
- 7. Local jurisdictions must file a “Pilot Level Technologies Notice of Intent” form with the Department of Ecology prior to authorizing Aqua-Filter™ for a Pilot Use Level application.**
- 8. AquaShield™, Inc. shall complete all required testing and submit a TER for TRC and Ecology review by June 1, 2011.**
- 9. AquaShield™, Inc. may request Ecology to grant deadline or expiration date extensions, upon showing cause for such extensions.**
- 10. Discharges from the Aqua-Filter™ System shall not cause or contribute to water quality standards violations in receiving waters.**

Applicant: AquaShield™, Inc.

Applicant’s Address: 2733 Kanasita Drive, Suite B
Chattanooga, TN 37343

Application Documents:

Aqua-Filter™ Stormwater Treatment System, Application for Stormwater Quality Treatment Pilot Use Designation (Short-Term) for Basic, Enhanced, Oil, and Treatment Train Treatment in Western Washington submitted to Stan Ciuba, Washington State Department of Ecology (August 21, 2003)

NJCAT Technology Verification for Aqua-Swirl™ Concentrator and Aqua-Filter™ Stormwater Treatment System (December 2005)

Alden Research Laboratory, Inc., Verification Testing of the Gravity-Flow Aqua-Filter™ Filtration Cartridge with Sil-Co-Sil 106 (November 2006)

Analytical Industrial Research Laboratories, Inc., Testing of the Aqua-Blend™ C for Soluble/Insoluble Copper, Lead and Zinc Removal (October 2006)

Aqua-Filter™ Stormwater Treatment System, Application for Stormwater Quality Treatment Conditional Use Level Designation for Basic and Treatment Train in Western Washington submitted to Washington State Department of Ecology (July 21, 2006)

Applicant’s Use Level Request:

Pilot Use Designation as a Basic, Enhanced, Oil, and Treatment Train Treatment device in accordance with Ecology's 2005 Western Washington Stormwater Manual.

Conditional Use Designation as a Basic Treatment device in accordance with Ecology's 2005 Western Washington Stormwater Manual

Applicant's Performance Claims:

- Based on laboratory testing, at a flowrate of 5 GPM/ft² per filter, a coarse perlite filtration cartridge has been shown to have an average TSS removal efficiency of 80.5% for Sil-Co-Sil 106 at an average influent concentration of 175 mg/L.
- Based on laboratory testing, at a flowrate of 20 GPM/ft² per filter, a coarse perlite filtration cartridge has been shown to have an average TSS removal efficiency of 92% for F-110 silica sand at an average influent concentration of 136.2 mg/L.

Technical Review Committee's Recommendations:

The TRC finds that:

- The Aqua-Swirl™ Concentrator, sized at no more than 23 GPM/ft² should provide equivalent performance to a presettling basin as defined in the most recent version of *Stormwater Management Manual for Western Washington, Volume V, Chapter 6*.
- AquaShield™, Inc. should be given the opportunity to demonstrate, through additional laboratory and field-testing, whether the Aqua-Filter™ System can attain Ecology's Basic, Enhanced, Phosphorus, or Oil Treatment goals.

Findings of Fact:

1. Laboratory testing was completed by Tennessee Tech University for US Silica OK-110 silica using an Aqua-Swirl™ Concentrator Model AS-3. Laboratory results for this 50 to 125-micron silica showed 80% removal at about 23 GPM/ft² operating rate. Estimated annual TSS removal efficiency, based on Portland, ME rainfall, is 91%.
2. Bench-scale laboratory testing was completed by Analytical Industrial Research Laboratories, Inc. on perlite and cellulose media (which are used in the Filter Chamber) for a blend of 50% motor oil and 50% diesel fuel at 160 mg/L and 75-micron particle size TSS at 110 mg/L. The media provided 91 to 98% TSS and 92 to 97% TPH removal at operating rates ranging from 41 to 68 GPM/ft².
3. Laboratory testing was completed by Analytical Industrial Research Laboratories, Inc. on perlite media filters. Laboratory results showed an 80.5% removal of Sil-Co-Sil 106 at an operating rate of 5 GPM/ft² per filter.

4. Laboratory testing was completed by Alden Research Laboratory, Inc. on coarse perlite media filters. Laboratory results showed a 69.2% mean corrected removal (65.1% uncorrected) of Sil-Co-Sil 106 at an operating rate of 16.5 GPM/ft² per filter for influent concentrations ranging from 82 to 206 mg/L.
5. Laboratory testing was completed by Analytical Industrial Research Laboratories, Inc. on Aqua-BlendTM C media filters. Laboratory results showed approximately >95% removal for insoluble copper, lead and zinc; and, 60 to 85% removal for soluble copper, lead and zinc.
6. Field studies are underway in Washington.
7. The system is maintained using a vacuum truck and requires entry into the filter chamber to remove the filter bags.

Other Aqua-FilterTM Related Issues to be Addressed By the Company:

1. No complete field test results are available, so it is unknown whether the Aqua-FilterTM System can reliably attain 80% removal of the finer particles comprising TSS found on local highways, parking lots, and other high-use areas at the design-operating rate. AquaShieldTM, Inc. should test a variety of operating rates and filter media to establish conservative design rates. Pollutant loading capacities of and breakthrough data on the filter media should also be determined to better predict maintenance cycles.
2. Determine whether the system removes used motor oil adsorbed to fine particles, rather than free product/clean motor oil.
3. The system should be tested under normal operating conditions, such that the swirl concentrator and filter beds are partially filled with pollutants. Results obtained for “clean” systems may not be representative of typical performance.
4. Develop raw material specifications for all media to ensure that all supplies of media meet minimum physical/chemical standards.
5. Develop easy-to-implement methods of determining that an Aqua-FilterTM System requires maintenance.
6. Determine maximum treatment capacity of filter.

Technology Description: Download at <http://www.aquashieldinc.com>

Contact Information:

Applicant: J. Kelly Williamson
AquaShieldTM, Inc.
(888) 344-9044
jkwilliamson@aquashieldinc.com

Applicant website: <http://www.aquashieldinc.com>

Ecology web link: <http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html>

Ecology: Douglas C. Howie, P.E.
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov