



May 2016

**GENERAL USE LEVEL DESIGNATION FOR PRETREATMENT
CONDITIONAL USE LEVEL DESIGNATION FOR BASIC TREATMENT**

**For
AquaShield™, Inc.'s Aqua-Swirl® Stormwater Treatment System**

Ecology's Decision:

Based on AquaShield™, Inc. application submissions, Ecology hereby issues the following use level designations:

- 1. General Use Level Designation (GULD) for the Aqua-Swirl® for pretreatment use (a) ahead of infiltration treatment, or (b) to protect and extend the maintenance cycle of a Basic or Enhanced Treatment device (e.g., sand or media filter). This GULD applies to Aqua-Swirl™ units sized at water quality design flow rate of no more than 23 GPM/sf at the Water Quality design flow rate.**
- 2. Conditional Use Level Designation (CULD) for the Aqua-Swirl® for standalone Basic (TSS) treatment, sized at a water quality design flow rate of rate of no more than 23 GPM/sf.**
- 3. The water quality design flow rates are calculated using the following procedures:**
 - Western Washington: for treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.**
 - Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.**
 - Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.**

Table 1 lists the Standard Aqua-Swirl® Models available. The model designated AS-XX allows for custom designs including multiple (twin) units.

Table 1. Standard Aqua-Swirl® Models

Model	Swirl Chamber Diameter (ft)	Area (ft²)
AS-2	2.5	4.9
AS-3	3.3	8.6
AS-4	4.3	14.5
AS-5	5.0	19.6
AS-6	6.0	28.3
AS-7	7.0	38.5
AS-8	8.0	50.3
AS-9	9.0	63.6
AS-10	10.0	78.5
AS-11	11.0	95.0
AS-12	12.0	113.1
AS-13	13.0	132.7
AS-XX*	Custom	

*** Custom designs to meet site-specific water quality treatment flow. Can include multiple (twin) and custom units.**

The GULD designation has no expiration date but it may be amended or revoked by Ecology and is subject to the conditions specified below.

The CULD expires on November 1, 2018 unless extended by Ecology, and is subject to the conditions specified below.

Ecology's Conditions of Use:

- 1. Design, assemble, install, operate, and maintain Aqua-Swirl® units in accordance with AquaShield™, Inc.'s applicable manuals and documents and the Ecology Decision.**
- 2. AquaShield™, Inc. commits to submitting a QAPP for Ecology review and approval by October 1, 2017 that meets the TAPE requirements for attaining a GULD for basic treatment. The selected field-testing site(s) should reflect the product's treatment intent.**
- 3. AquaShield™, Inc. shall complete all required testing and submit a TER for Ecology review by August 1, 2018.**
- 4. AquaShield™, Inc. may request Ecology to grant deadline or expiration date extensions, upon showing cause for such extensions.**
- 5. Discharges from the Aqua-Swirl® shall not cause or contribute to water quality standards violations in receiving waters.**

Applicant: AquaShield™, Inc.

Applicant's Address: 2719 Kanasita Drive
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: Aqua-Swirl™ Concentrator and Aqua-Filter™ Stormwater Treatment System (September 2005)
- NJCAT Technology Verification. Aqua-Swirl® Model AS-5 Stormwater Treatment System, AquaShield™, Inc. November 2012
- NJCAT Field Test Verification Report Letter, Aqua-Swirl® Model AS-5, February 15, 2013.

Applicant's Use Level Request:

General Use Level Designation as a Basic Treatment device in accordance with Ecology's 2012 Stormwater Management Manual for Western Washington.

Applicant's Performance Claims:

Based on laboratory studies, the Aqua-Swirl® Model AS-3, has been shown to have a total suspended solids removal efficiency (measured as suspended sediment concentration) of 60% when operated at 60% of its water quality treatment flow using OK-110 silica with a d₅₀ particle size of 110 microns, and average influent of 320 mg/L and zero initial sediment loading.

Ecology's Recommendations:

Ecology finds that:

- AquaShield™, Inc. qualifies for the opportunity to demonstrate, through field-testing in the Pacific Northwest, whether the Aqua-Swirl® can attain Ecology's Basic treatment goals. The GULD approval for Pre-Treatment using the Aqua-Swirl® remains in effect.

Findings of Fact:

1. The Aqua-Swirl[®], sized at no more than 23 GPM/sf, 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 (BMP T6.10)*. Note: This reference applies to use in Eastern Washington as well.
2. Tennessee Tech University completed laboratory testing for removal of US Silica OK-110 silica using an Aqua-Swirl[®] Model AS-3. Laboratory results for this 50 to 125-micron silica showed 80% removal at about 23 GPM/sf operating rate. Estimated annual TSS removal efficiency, based on Portland, ME rainfall, is 91%.
3. Findings from the NJCAT Technology Verification report for field testing an Aqua-Swirl[®] Model AS-5 include:
 - a. Aqua-Swirl[®] monitored 18 storm events in Maryland from 2009 through 2011.
 - b. Influent TSS was greater than 100 mg/L for 8 events. Average annual TSS removal was 86.6 percent.
 - c. Influent TSS was less than 100 mg/L for 10 events. Effluent TSS for all 10 events was less than 20 mg/L.
 - d. Influent particle size was 72 percent silt (based on three samples).
 - e. Aqua-Swirl[®] monitored the system up to a maximum of 41.2 GPM/sf. They maintained an 80 percent removal of TSS per storm event up to approximately 23 GPM/sf.

Other Aqua-Swirl[®] Related Issues to be Addressed By the Company:

1. Resuspension: The Aqua-Swirl[®] Model AS-5 field test included 16 storm events at less than 23 GPM/sf. Effluent TSS for these 16 storms was less than 20 mg/L and averaged 7.9 mg/L. Influent TSS ranged from 27.8 to 266.3 mg/L and averaged 125.3 mg/L. Given the lack of resuspension at less than 23 GPM/sf, users can install the Aqua-Swirl[®] off-line or on-line.
2. AquaShield should test the system under normal operating conditions, such as partially filling the swirl concentrator with pollutants. Results obtained for “clean” systems may not be representative of typical performance.

Technology Description:

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

Contact Information:

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Applicant website:

<http://www.aquashieldinc.com>

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

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Revision History

Date	Revision
November 2006	GULD for Pre-Treatment
August 2007	Document updated
December 2012	Modified Design Storm Description, added Revision Table
October 2013	CULD for Basic Treatment
February 2014	Modified due dates for QAPP and TER, changed expiration date
August 2014	Modified due dates for QAPP and TER, changed expiration date
May 2016	Modified due dates for QAPP and TER, changed expiration date