State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
Post Office Box 029
Trenton, New Jersey 08625-029
609-633-7021 Fax: 609-984-2147
http://www.state.nj.us/dep/dwq/bnpc_home.htm

JON S. CORZINE
Governor

MARK N. MAURIELLO
Acting Commissioner

May 27, 2009

J. Kelly Williamson
2733 Kanasita Drive, Suite B
Chattanooga, TN 37343

Re: Extension of Conditional Interim Certification for the AquaFilter Filtration Chamber by AquaShield Inc.

Expiration Date: May 15, 2011

Dear Mr. Williamson:

The Stormwater Management Rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by New Jersey Corporation for Advanced Technology and have been certified by the New Jersey Department of Environmental Protection (NJDEP).

The certification process has been revised. The revised process places MTDs into five categories. The AquaFilter Filtration Chamber by AquaShield Inc. has been qualified for Category II, MTDs with Interim Certifications.

The NJDEP received the maintenance plan required under Category II and acknowledges that the requirements for this category are met; therefore, the expiration of the interim certification letter dated 2/14/2006 has been extended until May 15, 2011.

The Department anticipates proposing further adjustments to this process through the readoption of the Stormwater Management Rules. Additional information regarding the implementation of the Stormwater Management Rules N.J.A.C. 7:8 are available at www.njstormwater.org. If you have any questions regarding the above information, please contact Ms. Sandra Blick of my office at (609) 633-7021.

Sincerely,

Barry Chalofsky, P.P., Chief
Bureau of Nonpoint Pollution Control

April 6, 2008

Addendum to the AquaShield's Aqua-Filter™ Filtration Chamber
Conditional Interim Certification

Based on the progress made in the field testing phase, the NJDEP is approving the request for an extension of the Conditional Interim Certification of the AquaShield's Aqua-Filter™ Filtration Chamber. The Conditional Interim Certification is extended until **March 31, 2009** to complete the field test. AquaShield must submit quarterly reports showing progress of the field test to the NJDEP and NJCAT.

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Science, Research and Technology
Bureau of Sustainable Communities & Innovative Technologies
PO Box 409
Trenton, NJ 08625-0409
Tel: 609-292-9692
FAX: 609-292-7340

JON S. CORZINE
Governor

LISA P. JACKSON
Acting Commissioner

February 14, 2006

J. Kelly Williamson
AquaShield™ Inc.
2733 Kanasita Drive, Suite B
Chattanooga, TN 37343

RE: Conditional Interim Certification of AquaShield's Aqua-Filter™ Filtration Chamber.

Dear Mr. Williamson:

In accordance with the Energy and Environmental Technology Verification (EETV) Act at N.J.S.A. 13:1D-134, the New Jersey Department of Environmental Protection (NJDEP) is pleased to issue a **Conditional Interim Certification** for the Aqua-Filter™ Stormwater Filtration Chamber developed by AquaShield, Inc. This Conditional Interim Certification is being issued pursuant to this program's receipt and review of the New Jersey Corporation for Advanced Technology (NJCAT) verification report for the Aqua-Filter™ Stormwater Filtration System, which was originally dated September 2005 and revised December 2005 following additional NJDEP requirements. **This certification letter must be used in conjunction with the enclosed Interim Certification Findings document**.

According to NJCAT's verification report, and as indicated in the attached Conditional Interim Certification Findings, at a flow rate of 20 gpm, the coarse perlite media filtration cartridge used in the Aqua-Filter™ Stormwater Treatment System has been shown to have an average TSS removal efficiency of 80.5% for SIL-CO-SIL 106 silica with a d_{50} particle size of 22 microns at influent concentrations of 90, 155, 176, and 280 mg/L in laboratory studies using simulated stormwater.

Based on the demonstrated laboratory performance with a material having an average particle size of 22 μm (SIL-CO-SIL 106), the NJDEP certifies that at a flow of 20 gpm the coarse perlite media within each filter section of the Aqua-Filter Filtration Chamber is capable of achieving a TSS removal efficiency of 80%. However, regardless of the number of filter sections used, the maximum TSS removal efficiency of the Aqua-Filter Filtration Chamber can not exceed 80%. **Please note that this Conditional Interim Certification is limited to the Aqua-Filter Filtration Chamber since the entire Aqua-Filter Stormwater Filtration System was not tested as a unit.** Tables 1, 2 and 3 of the enclosed Conditional Interim Certification Findings document provide additional information for choosing the proper devices to meet varying flow rate requirements. The following conditions shall apply to the Conditional Interim Certification:

1. Since the Aqua-Filter™ filtration cartridge was verified through laboratory performance data using a surrogate material, this device must be used with a pre-treatment device as part of a treatment train. The NJDEP has decided to adopt this conservative approach as a safety factor. However, upon the availability of acceptable **verified** field data, the NJDEP would consider revising this Interim Condition Certification to make the Aqua-Filter™ filtration cartridge a stand-alone device. Presently, the selected pre-treatment device to be used with the respective Aqua-Filter™ filtration cartridge can only be approved by the Land Use Regulation Program and/or the Division of Watershed Management.
2. The maximum TSS removal rate for any treatment train, comprising a pre-treatment device and the Aqua-Filter™ filtration device, shall be 80%.
3. The Aqua-Filter™ filtration device shall be designed in accordance with New Jersey's water quality design storm, as required in the Stormwater Management Rules (N.J.A.C. 7:8).
4. A Quality Assurance Project Plan supporting the Technology Acceptance and Reciprocity Partnership (TARP) Tier II Protocol for Stormwater Best Management Practice Demonstration (July, 2003), and New Jersey Tier II Stormwater Test Requirements, shall be submitted to the NJDEP and NJCAT within six (6) months from the date of the Conditional Interim Certification letter.
5. Field evaluation data that are consistent with the TARP Tier II Protocol and New Jersey Tier II Stormwater Test Requirements, which are available from NJCAT or www.state.nj.us/dep/dsr/bscit/Documents.htm, shall be submitted to the NJDEP and NJCAT by July 31, 2007.
6. The appropriate devices satisfying site selection and sizing criteria must be consistent with the specifications as described in respective **Table(s) of the Conditional Interim Certification Findings document**.

Please note that this approval letter shall expire on January 31, 2008, unless extended by NJDEP. For final certification of the Aqua-Filter™ Stormwater Filtration System, verified data must be generated from a full-scale field demonstration utilizing the TARP Tier II Protocol and additional NJDEP field testing requirements. If you have any questions about this Conditional Interim Certification, please contact Ravi Patraju of my staff at (609) 292-0125.

Sincerely,

Martin Rosen
Chief - Bureau of Sustainable Communities
and Innovative Technologies, DSRT

Enclosure

c: Mark Mauriello, Acting Assistant Commissioner, Land Use Management
Sam Wolfe, Assistant Commissioner, Environmental Regulation
Larry Baier, Director, Division of Watershed Management
Eileen Murphy, Director, Division of Science, Research, and Technology
Director, Land Use Regulation Program
Narinder Ahuja, Director, Division of Water Quality
Rhea Brekke, Executive Director, New Jersey Corporation for Advanced Technology

Conditional Interim Certification Findings

NJDEP Technology Certification Program:

Bureau of Sustainable Communities & Innovative Technologies
Division of Science, Research & Technology
401 E State Street
P.O. Box 409
Trenton, NJ 08625
(609) 292-9692

Stormwater Manufactured Treatment Device:

Aqua-Filter™ Stormwater Filtration Chamber by AquaShield™ Inc.

Applicant Information:

AquaShield™ Inc.
2733 Kanasita Drive, Suite B
Chattanooga, TN 37343
Phone #: (423) 870-8888
Fax #: (423) 826-2112

Technology Description:

The Aqua-Filter™ Stormwater Filtration System is designed for sites that require advanced treatment of stormwater runoff discharging to sensitive receiving waters. The Aqua-Filter™ Stormwater Filtration System is a stand alone two-component structure, which utilizes a "treatment-train" approach for stormwater pollutant removal. This patented configuration begins with a Swirl Concentrator (using vortex enhanced sedimentation technology) designed for pre-treatment of stormwater runoff followed by a Filtration Chamber (using media filtration technology) capable of removing finer sediments and water-borne pollutants. A schematic of the Aqua-Filter™ Stormwater Filtration System is provided in Figure 1.

Each Filter Chamber has an inside diameter of approximately 72-inches (an outside diameter of 80.75-inches) containing rows of adjoining porous filters fixed horizontally in the chamber and positioned perpendicular to the water flow. There are 3 filter sections per row; each has a surface area of approximately 4-square feet, therefore supplying a total of 12-square feet per row of filters. There are open grids on the bottom of each filter section where four (4), 6-inch thick filters are placed to form 2 layers in a pattern to avert short-circuiting of the water flow. Accordingly, there are 12 filters and approximately 12-cubic feet of filter media per row. Similar 1-inch thick open grates are firmly fixed above the filters to facilitate distribution of the pretreated water across the filter bed. The length of a single Filter Chamber can be extended up to 35 feet to accommodate additional rows of filters increasing the filter surface area based on the calculated water

quality flow to be treated. Furthermore, the Filter Chambers have been customized in parallel designs to process exceptionally large water quality flow rates.

The Filter Chamber is designed to facilitate distribution of the pretreated water above the filter bed and control the flow rate to each row using proprietary post-filtration hydraulic restraints. Bulkheads are positioned at each end of the filter bed to evenly distribute and restrain incoming water, create gravitational pressure for water to permeate the filters, contain captured pollutants during peak flows and provide structural support. The bulkhead design allows a maximum 10-inch water level above the filters. The principles of the post-filtration flow are based on controlling flow through orifices. The post-filtration hydraulic restraints ensure each row of filters receives a maximum flow of 60 gpm (20 gpm per filter).

The Aqua-Filter™ Stormwater Filtration System operates under gravitational and hydrodynamic forces with no moving parts or valves, which simplifies the treatment process. The Aqua-Filter™ Stormwater Filtration System operates in an offline configuration, thereby treating the more frequent 6-month to 1-year design storms (or roughly 90% of the annual rainfall on a given site in New Jersey).

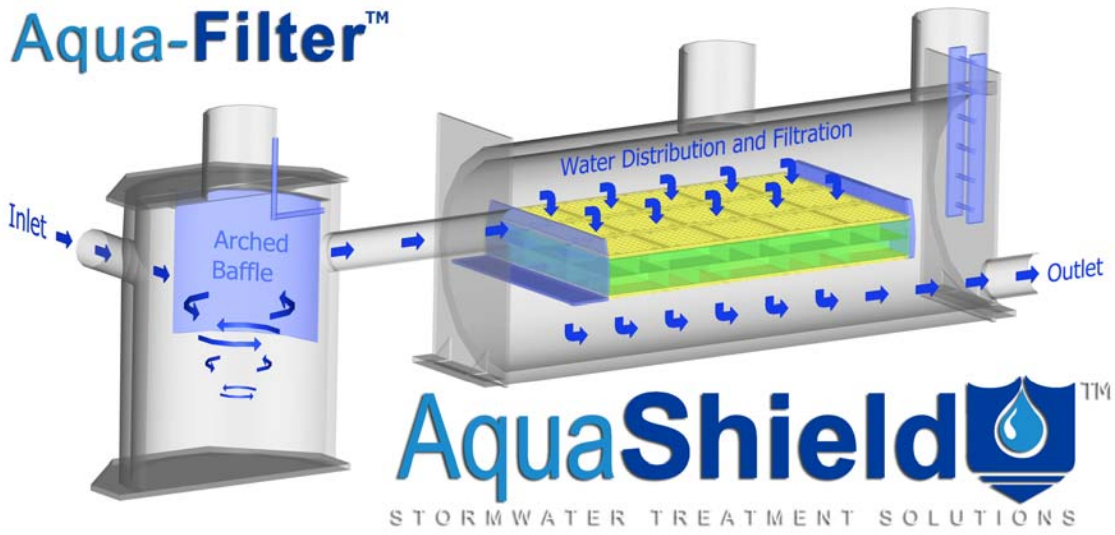

Figure 1. Aqua-Filter™ Stormwater Filtration System

New Jersey Corporation for Advanced Technology (NJCAT) Verified Claim:

At a flow rate of 20 gpm, the coarse perlite media filtration cartridge used in the Aqua-Filter™ Stormwater Treatment System has been shown to have an average TSS removal efficiency of 80.5% for SIL-CO-SIL 106 silica with a d_{50} particle size of 22 microns at influent concentrations of 90, 155, 176, and 280 mg/L in laboratory studies using simulated stormwater.

Technology Limitations/Concerns:

- Lack of maintenance may cause the Aqua-Filter™ Filtration Chamber to become occluded with sediments, thus reducing the TSS removal efficiency of the system. Also, heavy solids loading without pretreatment may cause the cartridges to be occluded earlier thus requiring an increase in maintenance frequency.
- Occluded chambers may result in standing water, which can become a breeding site for mosquitoes.
- Inspections of the Aqua-Filter™ Filtration Chamber units must be performed as recommended by the manufacturer.

NJDEP Conditional Interim Certification:

Based on the demonstrated laboratory performance with a material having an average particle size of 22 μm (SIL-CO-SIL 106), the NJDEP certifies that at a flow of 20 gpm the coarse perlite media within each filter section of the Aqua-Filter Filtration Chamber is capable of achieving a TSS removal efficiency of 80%. However, regardless of the number of filter sections used, the maximum TSS removal efficiency of the Aqua-Filter Filtration Chamber can not exceed 80%. **Please note that this Conditional Interim Certification is limited to the Aqua-Filter Filtration Chamber since the entire Aqua-Filter Stormwater Filtration System was not tested as a unit.** Table 1 contains the various filtration chamber configurations at the respective influent flow rates. The following **conditions** shall apply to the Conditional Interim Certification:

1. Since the Aqua-Filter™ Filtration Chamber was verified through laboratory performance data using a surrogate material, this device must be used with a pre-treatment device as part of a treatment train. The NJDEP has decided to adopt this conservative approach as a safety factor. However, upon the availability of acceptable **verified** field data, the NJDEP would consider revising this Interim Condition Certification to make the Aqua-Filter™ Filtration Chamber unit a stand-alone device. Presently, the selected pre-treatment device to be used with the respective Aqua-Filter™ Filtration Chamber units can only be approved by the Land Use Regulation Program and/or the Division of Watershed Management.
2. The maximum TSS removal rate for any treatment train, comprising a pre-treatment device and the Aqua-Filter™ Filtration Chamber unit, shall be 80%.
3. The Aqua-Filter™ Filtration Chamber unit shall be designed in accordance with New Jersey's water quality design storm, as required in the Stormwater Management Rules (N.J.A.C. 7:8).
4. A Quality Assurance Project Plan supporting the Technology Acceptance and Reciprocity Partnership (TARP) Tier II Protocol for Stormwater Best Management Practice Demonstration (July, 2003), and New Jersey Tier II Stormwater Test Requirements, shall be submitted to the NJDEP and NJCAT within six (6) months from the date of the Conditional Interim Certification letter.
5. Field evaluation data that are consistent with the TARP Tier II Protocol and New Jersey Tier II Stormwater Test Requirements, which are available from NJCAT or

www.state.nj.us/dep/dsr/bscit/Documents.htm, shall be submitted to the NJDEP and NJCAT by July 31, 2007.

6. The appropriate devices satisfying site selection and sizing criteria must be consistent with the specifications as described in **Table 1**.

Table 1. Aqua-Filter™ Stormwater Filtration Chamber Units Sizing Chart

Number of Filtration Rows	Water Quality Filtered Flow Rates		Filtration Chamber Lengths	Approx. Treatment Train Length
	(cfs)	(gpm)	(ft)	(ft)
1	0.13	60	9.6	16
2	0.27	120	12.0	18
3	0.40	180	14.3	21
4	0.53	240	16.6	24
5	0.67	300	18.7	28
6	0.80	360	21.0	31
7	0.94	420	23.6	34
8	1.07	480	25.9	36
9	1.20	540	28.2	38
10	1.34	600	30.5	40
11	1.47	660	32.8	42
12	1.6	720	35.6	45

If Aqua-Swirl™ Concentrator units are used as pre-treatment devices with the various Aqua-Filter™ Filtration Chamber units, then the models of the Aqua-Filter™ Stormwater Filtration System must satisfy the sizing requirements in Table 2.

Table 2. Aqua-Filter™ Stormwater Filtration System Sizing Chart

Aqua-Filter™ System Model	Water Quality Filtered Flow Rates		Filtration Chamber Lengths	Approx. Treatment Train Length
	(cfs)	(gpm)	(ft)	(ft)
AF 3.1	0.13	60	9.6	16
AF 3.2	0.27	120	12.0	18
AF 3.3	0.40	180	14.3	21
AF 4.4	0.53	240	16.6	24
AF 4.5	0.67	300	18.7	28
AF 4.6	0.80	360	21.0	31
AF 5.7	0.94	420	23.6	34
AF 5.8	1.07	480	25.9	36
AF 6.9	1.20	540	28.2	38
AF 6.10	1.34	600	30.5	40
AF 6.11	1.47	660	32.8	42
AF 6.12	1.6	720	35.6	45

Furthermore, an Aqua-Filter™ Stormwater Filtration System is a combination of the Aqua-Swirl™ Concentrator and Aqua-Filter™ Stormwater Filtration Chamber unit. For example, the model AF 3.1 represents a combination of the Aqua-Swirl™ Concentrator model AS-3 with one row of Aqua-Swirl™ Filtration Chambers. Table 3 represents the various Aqua-Swirl™ Concentrator models, which were included in the verification report that received an Interim Conditional Certification from the NJDEP.

Table 3. Aqua-Swirl™ Concentrator Models

Aqua-Swirl™ Model	**Swirl Chamber Diameter (ft)**	**Maximum Stub-Out Pipe Outer Diameter (in)**		**Water Quality Treatment Flow** (cfs)	**Oil/Debris Storage Capacity** (gal)	**Sediment Storage Capacity** (ft^3)
		On/Offline	CFD[1]			
AS-2	2.50	8	12	0.55	37	10
AS-3	3.25	10	16	0.9	110	20
AS-4	4.25	12	18	1.6	190	32
AS-5	5.00	12	24	2.2	270	45
AS-6	6.00	14	30	3.15	390	65
AS-7	7.00	16	36	4.3	540	90
AS-8	8.00	18	42	5.6	710	115
AS-9	9.00	20	48	7.1	910	145
AS-10	10.0	22	54	8.75	1130	180
AS-12	12.0	24	60	12.6	1698	270