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-Swirl™ Concentrator by AquaShield™ Inc.

Applicant Information:

AquaShield™ Inc.
2733 Kanasita Drive, Suite B
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Technology Description:

The patented Aqua-Swirl™ Concentrator, which is constructed of High-Density Polyethylene (HDPE), provides for the removal of sediment, floating debris, and free-oil. Free-floating oil and floatable debris can be removed directly through the 30" service access provided on the Aqua-Swirl™ Concentrator. When the sediment pile is within 30" to 36" of the water surface, cleaning is required, and vacuum trucks can be used to remove the accumulated sediment and debris. The entire sediment storage area can be accessed with a vacuum hose from the surface.

Treatment begins when stormwater enters the Aqua-Swirl™ Concentrator through its tangential inlet pipe, which results in a circular (or vortex) flow pattern. The Aqua-Swirl™ Concentrator retains water between storm events providing both "quiescent and dynamic" settling of inorganic solids. The dynamic settling occurs during each storm event, while the quiescent settling takes place between successive storms. A combination of gravitational and hydrodynamic drag forces results in solids dropping out of the flow and migrating to the center of the chamber where velocities are the lowest. The treated flow exits the Aqua-Swirl™ Concentrator behind the arched outer baffle. The top of the baffle is sealed across the treatment channel, which prevents floatable pollutants from escaping the system. A vent pipe is extended up the riser to expose the backside of the baffle to atmospheric conditions, preventing a siphon from forming at the bottom of the baffle.

As indicated in the New Jersey Corporation of Advanced Technology's verification report, the Aqua-Swirl™ Concentrator, schematically described in figure 1, can provide full treatment of the "first flush" or the determined water quality flow while the peak design storm is diverted and channeled through the main conveyance pipe. The Aqua-Swirl™ Concentrator is designed so that it can easily be used for retrofit applications, and with the invert of the inlet and outlet pipe at the same elevation, the Aqua-Swirl™ Concentrator can easily be connected directly to the existing storm conveyance drainage system.

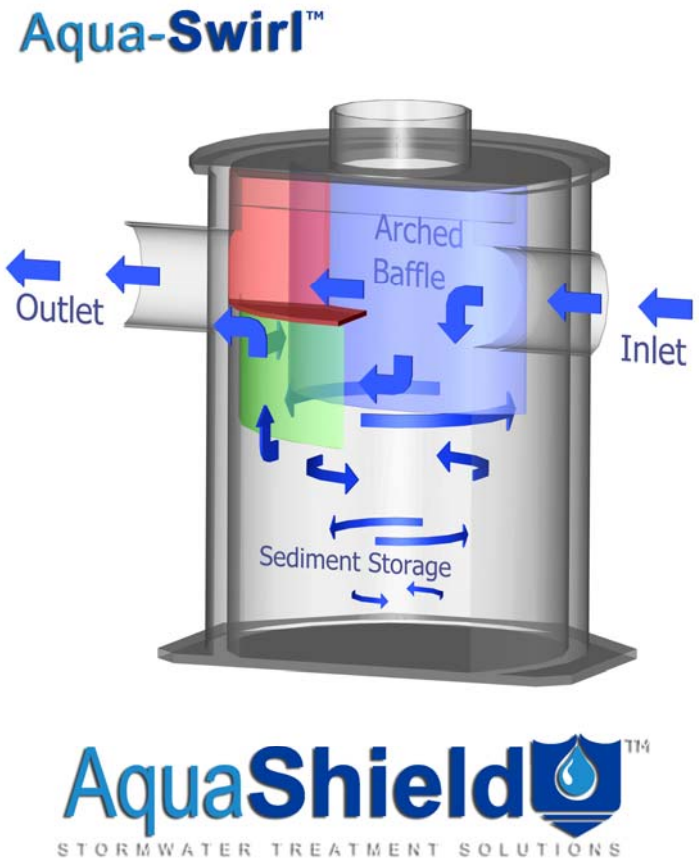

Figure 1. Aqua-Swirl™ Concentrator

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

The Aqua-Swirl™ Concentrator, model AS-3, has been shown to have a total suspended solids (TSS) removal efficiency (as measured as suspended sediment concentration (SSC)) of 60% when operated at 60% of its water quality treatment flow using OK-110 unground silica with a d_{50} particle size of 110 microns, an average influent concentration

of 320 mg/L and zero initial sediment loading in laboratory studies using simulated stormwater.

Technology Limitations/Concerns:

- Lack of maintenance may cause the system to operate at a reduced efficiency, and over time the system could become totally filled with sediment.
- Heavy loads of sediment would require an increased maintenance frequency.
- The Aqua-Swirl™ Concentrator's design allows for the accumulation of standing water in the lower chamber, which can be a breeding site for mosquitoes.

NJDEP Conditional Interim Certification:

Based on the demonstrated laboratory performance, the NJDEP feels confident that the Aqua-Swirl™ Concentrator has the capability of achieving, in field applications, a TSS removal efficiency of 50%. Therefore, NJDEP certifies that the Aqua-Swirl™ Concentrator is capable of achieving a TSS removal efficiency of 50%, while operating at 50% of the maximum designed flow rates. In addition, the various models of the Aqua-Swirl™ Concentrator that are also capable of achieving TSS removal efficiencies of 50% from stormwater runoff at the respective maximum designed flow rates are given in **Table 1**, and shall be permitted accordingly. The following conditions shall apply to the Conditional Interim Certification:

1. The Aqua-Swirl™ Concentrator should be the first component if used as part of a treatment train (i.e., utilized in front of best management practices such as detention, retention, and infiltration basins, etc., as defined in the NJ Stormwater Best Management Practices Manual). Use of this device in series with other manufactured treatment devices can only be approved by the Land Use Regulation Program and/or the Division of Watershed Management.
2. The Aqua-Swirl™ Concentrator 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).
3. 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 including any additional field testing requirements that the NJDEP shall request, shall be submitted to NJDEP and/or NJCAT within six (6) months from the date of the Conditional Interim Certification letter.
4. Field evaluation data that are consistent with the Tier II Protocol and any additional NJDEP requirements shall be submitted to NJDEP and/or NJCAT by June 30, 2007.
5. The appropriate devices satisfying site selection and sizing criteria must be consistent with the specifications as described in **Table 1**.

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

Table 1. Aqua-Swirl™ Concentrator Models at 50% of Original Treatment Flow

(1) The Aqua-Swirl™ Conveyance Flow Diversion (CFD) provides full treatment of the "first flush," while the peak design storm is diverted and channeled through the main conveyance pipe.