



December 2009 (Updated February 2011)

CONDITIONAL USE LEVEL DESIGNATION FOR BASIC TREATMENT

For

Royal Environmental Systems, Inc. ecoStorm/ecoStorm plus Treatment Train

Ecology's Decision:

Based on Royal Environmental's application submissions Ecology hereby issues a conditional use level designation (CULD) for the ecoStorm plus filter system:

- As a basic stormwater treatment device for total suspended solids (TSS) removal,
- Using the Standard concrete filter,
- Sized at a design rate of 360 GPM per filter (17.63 ft² surface area),
- As part of a treatment train that includes an upstream ecoStorm unit.

The Use Level Designation expires on June 1, 2013 unless extended by Ecology, and is subject to the conditions specified below.

Ecology's Conditions of Use:

ecoStorm plus units shall be designed, installed, and maintained to comply with these conditions:

1. ecoStorm plus units must be designed, assembled, installed, operated, and maintained in accordance with Royal Environmental Systems Inc.'s applicable manuals and documents and the Ecology Decision.
2. ecoStorm plus units using the Standard concrete filter are approved for treatment at 360 GPM maximum flow rate per filter at the 15-minute water quality design flow rate (as specified in Ecology's most recent 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 of the 2005 Stormwater Management Manual for Western Washington should be used to adjust the approved hydraulic loading rate of 360 GPM. 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 ecoStorm Plus units necessary.

3. Royal Environmental Systems Inc. commits to submitting a QAPP for Board of External Reviewers (BER) review and Ecology approval by June 1, 2011 that meets the TAPE requirements for attaining a GULD for Basic Treatment. Additional QAPPs must be reviewed and approved by the BER and Ecology for each field monitoring site in Washington State. The sites chosen should be reflective of the product's treatment intent.
4. Royal Environmental Systems Inc. shall complete all required testing and submit a TER for Ecology review by December 1, 2012.
5. Royal Environmental Systems Inc. may request Ecology to grant deadline or expiration date extensions, upon showing cause for such extensions.
6. Discharges from the ecoStorm plus units shall not cause or contribute to water quality standards violations in receiving waters.

ecoStorm units shall be designed, installed, and maintained to comply with these conditions:

1. ecoStorm units must be designed, assembled, installed, operated, and maintained in accordance with Royal Environmental Systems Inc.'s applicable manuals and documents and the Ecology Decision.
2. An appropriately sized ecoStorm unit must be installed upstream of the ecoStorm plus unit(s).

Applicant: Royal Environmental Systems Inc.

Applicant's Address: 30622 Forest Blvd, PO Box 430
Stacy, MN, 55079

Application Documents:

- ecoStorm plus CULD Request: Supplemental information/clarification as requested in Ecology's December 21, 2010 letter and use level designation extension request. Memorandum prepared by WaterTectonics (January 19, 2011).
- Request for Conditional Use Level Designation for the ecoStorm plus™ unit, memorandum prepared by Royal Environmental Systems, Inc. (October 21, 2010).
 - a. ecoStorm plus™ Product Information for Washington State Department of Ecology Use Designation Determination (September 29, 2010)

- b. Herrera Environmental Consultants Memorandum – Update on Water Tectonics TAPE process for the ecoStorm plus filter system (September 8, 2010)
- c. Water Tectonics, Inc. – Internal Memorandum McRedmond ecoStorm plus Data Collection, (October 5, 2010)
- d. Herrera Environmental Consultants – McRedmond TSS Discrete Analysis (2010 Data)
- e. Herrera Environmental Consultants – McRedmond TSS Composite Analysis (2010 Data)
- f. Herrera Environmental Consultants – Third Party Technical Review City of Redmond ecoStorm plus Monitoring Project, January 8, 2010 (2009 Data)
- QAPP ecoStorm plus™ McRedmond RWQF – Addendum 4 (March 1, 2010)
- QAPP ecoStorm plus™ McRedmond RWQF – Addendum 3 (September 1, 2009)
- QAPP ecoStorm plus™ McRedmond RWQF – Addendum 2 (August 1, 2009)
- QAPP ecoStorm plus™ McRedmond RWQF – Addendum 1 (April 8, 2009)
- Quality Assurance Project Plan (QAPP) ecoStorm plus™ McRedmond Regional Water Quality Facility (RWQF), prepared by Water Tectonics and Royal Environmental Systems, Inc. (March 18, 2008)
- ecoStorm plus™ Quality Assurance Project Plan (QAPP) for Basic, Enhanced & Phosphorus Treatment (Rev04), prepared by Water Tectonics and Royal Environmental Systems, Inc. (August, 28, 2007)
- Product Information for Washington State Department of Ecology Use Designation Determination, prepared by Water Tectonics (July 2006)
- ecoStorm plus Lab Scale Testing Final Report, prepared by Water Tectonics (July 2006)
- Report on investigations into retention of pollutants in rainfall runoff from a concrete plant using a ecoStorm plus filter pit prepared by: Dr. Dierkes (August 2004)

Applicant’s Use Level Request:

Conditional Use Designation as a Basic Treatment device in accordance with Ecology’s 2005 *Stormwater Management Manual for Western Washington*.

Applicant’s Performance Claims:

- Average of 80% removal of TSS.

Ecology’s Recommendations:

Ecology finds that:

- Royal Environmental Systems Inc. should be given the opportunity to demonstrate, through additional laboratory and field testing, whether the combined ecoStorm and ecoStorm Plus filter system can attain Ecology’s Basic Treatment goals.

Findings of Fact:

- Based on laboratory testing of a scaled down unit (0.784 ft² of filter media), at a flowrate of 7 GPM per filter, the ecoStorm Plus filter system has been shown to have a total suspended solids removal efficiency of 81% using Sil-Co-Sil 106 with an average influent concentration of 100 mg/L and zero initial sediment loading.
- Based on laboratory testing of a scaled down unit (0.784 ft² of filter media), at a flowrate of 14 GPM per filter, the ecoStorm Plus filter system has been shown to have a total suspended solids removal efficiency of 78% using Sil-Co-Sil 106 with an average influent concentration of 200 mg/L and zero initial sediment loading.
- Based on preliminary field testing (flow-weighted composite samples) of a full-size unit, the ecoStorm plus achieved an effluent of under 20 mg/L total suspended solids for influent concentrations less than 100 mg/L (8 samples); a 74-94 percent reduction of influent concentrations 100-200 mg/L (3 samples); and a 74-93 percent reduction of influent concentrations greater than 200 mg/L (3 samples). Discrete samples collected at flow rates ranging from 54 to 124 percent of the design flow showed similar results (5 samples). NOTE: these results are for the ecostorm/ecoStorm plus treatment train.

Other ecoStorm/ecoStorm plus Treatment Train Related Issues to be Addressed By the Company:

1. Preliminary field test results are available, yet it is unknown whether the ecoStorm/ecoStorm plus filter 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. Royal Environmental Systems Inc. should test a variety of operating rates to establish conservative design rates. Pollutant loading capacities and breakthrough data on the filter media should also be determined to better predict maintenance cycles.
2. The system should be tested under normal operating conditions, such that the settling basin is partially filled with pollutants. Results obtained for “clean” systems may not be representative of typical performance.
3. Field testing should be conducted at sites that are indicative of the treatment goals.
4. Testing should be conducted to obtain information about maintenance requirements in order to come up with a maintenance cycle.
5. Testing should be conducted to determine if oils and grease affect the treatment ability of the concrete filter. This should include a determination of how oil and grease may affect the ion-exchange capacity of the system if claims are to be made for metals and phosphorus removal.
6. Loading tests should be conducted on the filter to determine maximum treatment life of the system.

7. Current and future field sampling will be conducted to assess the overall performance of the treatment train, comprising an ecoStorm unit followed by an ecoStorm plus unit.

Technology Description: Download at www.royalenterprises.net

Contact Information:

Applicant: Jim Mothersbaugh
WaterTectonics, Inc.
6300 Merrill Creek Parkway
Suite C-100
Everett, WA, 98203
425-349-4200
jim@watertectonics.com

Applicant website: www.royalenterprises.net

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

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