

Attachment 1

Manufactured Treatment Device (MTD) Registration

1. **Manufactured Treatment Device Name:** Hydroworks Hydroguard

2. **Company Name:** Hydroworks, LLC
Mailing Address: 50 S 21st St.
City: Kenilworth
State: NJ Zip: 07033

3. **Contact Name (to whom questions should be addressed):** Graham Bryant
Mailing Address: 50 S 21st St.
City: Kenilworth
State: NJ Zip: 07033
Phone number: 888-290-7900
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Web address: www.hydroworks.com

4. **Technology**
Specific size/capacity of MTD assessed (include units): HG 4 (4 ft diameter) to HG 12 (12 ft diameter)

Range of drainage areas served by MTD (acres): The range of area served depends on the design TSS particle size, local hydrology, and percentage of annual TSS removal required. In states that size using a water quality flow it also depends on the size of water quality storm and methodology to convert rainfall to runoff. Typical ranges of areas served include 0.1 to 15 impervious acres.

Include sizing chart or describe sizing criteria: Our sizing methodology is based on continuous simulation using local hydrology and SWMM to derive flow rates and TSS buildup and washoff. TSS removal in the sizing model is based on independent laboratory TSS removal testing results (Alden, 2008). The Alden laboratory TSS removal results have been used to calculate critical Peclet numbers for each particle size tested (1-1000 um) in the NJDEP TSS distribution that was tested. The critical Peclet numbers can be used in the sizing model with any user input TSS distribution to determine long term removal of that TSS distribution based on the Alden testing results. Documentation of the SWMM model and Peclet calculations is provided on the enclosed CD. In states that regulate hydrodynamic separators by a water quality flow rate we have attached a flyer that indicates what our systems' water quality flow rates are for various TSS distributions and annual TSS removal rates.

Intended application: on-line or offline: Online

Media used (if applicable): N/A

5. Warranty Information (describe, or provide web address):

See attached warranty page. We offer a standard 1 year warranty with the option to purchase a longer warranty at an additional price.

6. Treatment Type

- Hydrodynamic Structure
- Filtering Structure
- Manufactured Bioretention System
- Provide Infiltration Rate (in/hr):
- Other (describe):

7. Water Quality Treatment Mechanisms (check all that apply)

- Sedimentation/settling
- Infiltration
- Filtration (specify filter media)
- Adsorption/Cation exchange
- Chelating/precipitation
- Chemical treatment
- Biological uptake
- Other (describe):

8. Performance Testing and Certification (check all that apply):

Performance Claim (include removal efficiencies for treated pollutants, flow criteria, drainage area):

The HG 6 (6 ft internal diameter separator, 1200 gallon) has been independently reviewed (NJCAT, 2008) and is certified by NJDEP to provide 60% annual TSS removal for the NJDEP TSS distribution (d50 = 70 um), based on the NJDEP annual weighting system, a 100% treatment flow rate of 1.8 cfs, and independent laboratory testing at Alden Research Labs (2008). Hydroworks routinely sizes for various levels of annual TSS removal both lower and higher than 60% TSS (i.e. 50%,70%, 80%) removal based on the NJDEP and other TSS distributions as required (OK110, 100 um, NJDEP, etc.).

Specific size/Capacity of MTD assessed: Independent testing was performed on a 6 ft internal diameter separator with 1200 gallons (6 ft sump) of water (permanent pool). Hydroworks sells various sizes of this separator from 4 ft (internal diameter) up to 12 ft (internal diameter)

ranging in volume from 450 gallons to 8500 gallons. Individual separator designs are customized to provide larger oil or sediment storage volumes as required.

Has the MTD been "approved" by an established granting agency, e.g. New Jersey Department of Environmental Protection (NJDEP) , Washington State Department of Ecology, etc.?

<input type="checkbox"/>	No
<input checked="" type="checkbox"/>	Yes

For each approval, indicate (1) the granting agency, (2) use level if awarded (3) the protocol version under which performance testing occurred (if applicable), and (4) the date of award, and attach award letter.

1. NJDEP – Interim Approval based on the 2002 NJDEP Laboratory Protocol and NJDEP TSS (d50=70 um)

Was an established testing protocol followed?

Yes

The 2002 NJDEP protocol was followed:

1. NJDEP TSS was used for TSS removal (20% <8 um, d50 = 70 um)
2. Scour testing was performed up to 125% of the treatment flow rate with the full NJDEP TSS distribution (1-1000 um as per 2002 NJDEP protocol)

Two deviations were made from the protocol:

1. Mass balance testing was done for TSS removal instead of inlet/outlet concentration sampling (Mass balance is now recognized as the preferred methodology for TSS removal testing and is the preferred methodology in the 2013 NJDEP laboratory protocol).
2. Tests were conducted using a single TSS loading concentration (200 mg/l) instead of the three listed in the 2002 protocol (100, 200, 300 mg/l). Testing at Alden had shown that the results at various concentrations were similar/correlated and could be predicted by a mathematical regression. NJCAT and NJDEP have subsequently modified the protocol such that only a single TSS loading concentration (200 mg/l) is now mandated in the latest protocol (NJDEP, 2013).

For lab tests:

- i. Summarize the specific settings for each test run (flow rates, run times, loading rates) and performance for each run: Flow rates ranging from 0.45 cfs to 2.25 cfs were tested with a TSS concentration of 200 mg/l. The time of each test varied to provide a consistent input TSS load ranging from 20 lb to 25 lb and a volume of water through the separator consistent with an exchange of 8 to 10 tank volumes. This information is detailed in the Alden Test Report (2008) and NJCAT verification report (2009). Performances ranged from 74% TSS removal down to

- 43% TSS removal for the NJDEP TSS distribution (1-1000 um, 20% < 8 um).
- ii. If a synthetic sediment product was used, include information about the particle size distribution of the test material: The TSS tested closely matched the NJDEP TSS distribution with 20% of the TSS being finer than 8 um, 43% finer than 40 um and a d50 of 70 um. This information is detailed in the Alden Test Report (2008) and NJCAT verification report (2009)
- iii. If less than full-scale setup was tested, describe the ratio of that tested to the full-scale MTD: A full scale HG 6 was tested at Alden Labs.

For field tests:

Hydroworks has purposely not undertaken field monitoring since there are too many errors associated with field monitoring that make the results unreliable and unrepeatable with respect to performance verification. Samples collected during a storm represent less than 1% of the volume of water flowing through a hydrodynamic separator. Automatic samplers introduce sampling error related to the sampling location of the intake and power of the sampler to adequately draw representative samples. Errors occur in the laboratory analysis due to methodological procedures (aliquots, splitting, filtration methods, etc – TSS/SSC) and calibration/equipment error (accuracy/precision of lab). These errors are compounding in field monitoring making the results unfit for performance verification. That is why Hydroworks chose to perform mass balance laboratory testing (minimize sampling errors and laboratory analysis errors). The data provided in the Alden report is repeatable and reliable.

The Hydroworks HG (Hydroguard) separator has been reviewed and approved/certified/rated by numerous regulatory agencies based on a review of Hydroworks testing, literature, and the 2008 Alden laboratory testing. Letters are provided on the attached CD. These agencies include:

- a. New Jersey Department of Environmental Protection (NJDEP)
- b. Wisconsin Department of Commerce
- c. Connecticut Department of Transportation (ConnDOT)
- d. Massachusetts Stormwater Evaluation Program (STEP), University of Massachusetts
- e. City of Wichita, Kansas
- f. City of Virginia Beach, Virginia
- g. Montgomery County, Maryland
- h. New Environmental Technology Evaluation (NETE) – Ministry of Environment, Ontario, Canada
- i. Ontario Provincial Standards, Product Management Committee, The Roads Authority, Ontario, Canada

9. MTD History:

How long has this specific model/design been on the market? The Hydroworks Hydroguard or HG separators have been on the market since 2003 (12 years).

List no more than three locations where the assessed model size(s) has/have been installed in Virginia. If applicable, provide permitting authority. If known, provide latitude &

longitude:

- a) Virginia Beach Middle School – 5 separators installed (HG4 and HG5 units). Approved by MSA, P.C.
- b) City of Norfolk Maintenance Yard – 2 separators installed (HG6 and HG7)
- c) McIntire School of Business – University of Virginia – Charlottesville – 1 separator installed (HG 7). Approved by Gilbane Company.

List no more than three locations where the assessed model size(s) has/have been installed outside of Virginia. If applicable, provide permitting authority. If known, provide latitude & longitude:

- a) Boston Police Station B2, Roxbury, MA – 2 separators installed (HG6), Approved by Green Associates
- b) University of Wisconsin Dept. of Ecology, Madison, WI – 7 separators (4 x HG4, HG5, HG6, HG7) Approved by Bloom Companies.
- c) ConnDOT 146-162, Vernon, CT – 1 HG6 separator

10. Maintenance:

What is the generic inspection and maintenance plan/procedure? (attach necessary documents): We recommend the separator be inspected every 2 weeks during the construction period, if rainfall has occurred during this time, and cleaned as required. We also recommend that the unit be cleaned prior to final assumption once the site has been developed/stabilized. Inspection of the separator during post development should be conducted annually. This inspection frequency can be adjusted once site loading and accumulation rates have been established after the first or second inspection. Maintenance is required based on the presence of a defined layer of oil, surface areal loading of trash, and/or accumulated sediment depth. We have attached our Operations and Maintenance Manual that provides the inspection and maintenance procedures.

Is there a maintenance track record/history that can be documented?

No track record is documented for maintenance. The Hydroguard (HG) separator has been installed in Ontario, Canada for the past two years. Inspections are required as part of the sales process for these types of structures in Ontario. There is limited information regarding the maintenance requirements/frequency for Hydroguard based on these inspections.

Recognizing that maintenance is an integral function of the MTD, provide the following: amount of runoff treated, the water quality of the runoff, and what is the expected maintenance frequency for this MTD in Virginia, per year?

The maintenance frequency can be expected to vary based on the following factors:

- a) Exposed materials storage or nearby construction activities
- b) Average daily traffic
- c) Spill potential

Typically for standard applications on stabilized sites (parking lots, roads, gas stations, etc.) without spills we would expect maintenance to be required annually or every two years. This is based on limited data from Ontario, Canada where inspections are required as part of the sales of these types of structures. However for sites with exposed material such as public works yards, or sites that are subject to spills, maintenance may be required much more frequently.

Total life expectancy of MTD when properly operated in Virginia and, if relevant, life expectancy of media: The life expectancy of the Hydroguard would be similar to any concrete structure (100+ years). The internals are made from copolymer polypropylene. This material has an anticipated lifespan similar to the concrete itself (100+ years).

Is the maintenance procedure and/or are materials/components proprietary?
No, the maintenance procedures and/or materials are not proprietary

Maintenance complexity (check all that apply):

- | | |
|-------------------------------------|--|
| <input type="checkbox"/> | Confined space training required for maintenance |
| <input checked="" type="checkbox"/> | Liquid pumping and transportation Specify method: Vacuum Truck |
| <input type="checkbox"/> | Solids removal and disposal Specify method: |

Other noteworthy maintenance parameter (describe):

Solids removal requires the removal of water from the tank and is easily accomplished by removing the entire contents using a vacuum truck. If there is an oil spill in the unit, by law the entire contents must be removed and the contents sent to a registered facility for disposal. Sediments removed from the separator are typically not considered hazardous waste but will be contaminated and may have limited disposal options depending on local or state testing and disposal requirements.

11. Comments

Include any additional explanations or comments: The current NJDEP certifications are not directly comparable since the flow rates certified for some MTDs are based on coarse TSS (F95 sand, OK110 sand) and not the proper NJDEP TSS. This should be rectified by 2016 when all vendors are required to re-test with the NJDEP TSS for recertification.

Until this time, it is recommended that the state of Virginia adopt the following requirements for the design and review of acceptability of any hydrodynamic separator on a project:

1. A prescribed methodology to determine a water quality flow rate for the proposed location of the separator. Most states (CT, MA, NH) use the SCS (NRCS) methodology of calculating a water quality flow based on a rainfall of 1".
2. Selection of a State Design Particle Size Distribution. This may be NJDEP TSS or another distribution as determined suitable by the state of Virginia.
3. Use of the NJDEP water quality flow ratings adjusted for the state TSS design distribution. The state can either allow the vendors to make these corrections or implement a policy to correct the NJDEP flow rates. If a policy is implemented it should be a weighted adjustment based on several values and not just a single value such as the d50 of the TSS tested. Several values are required since the smaller particles are the hardest to remove and the NJDEP TSS contains significant fines (20% < 8 um, 30% < 20 um). A tested distribution may concentrate around the d50 of the NJDEP TSS (67 um) but not contain any TSS finer than 40 um which is the hardest material to remove and therefore even though the d50 may be consistent with NJDEP the water quality flow rates will be overstated.

12. Certification

Signed by the company president or responsible officer of the organization:

"I certify that all information submitted is to the best of my knowledge and belief true, accurate, and complete."

Signature:



Name: Graham Bryant

Title: President

Date: 7/11/2014

NOTE: All information submitted to the department will be made publically accessible to all interested parties. This MTD registration form will be posted on the Virginia Stormwater BMP Clearinghouse website.