

# Attachment 1

## Manufactured Treatment Device (MTD) Registration

**1. Manufactured Treatment Device Name: Up-Flo® Filter**

**2. Company Name: Hydro International**

Mailing Address: **94 Hutchins Drive**

City: **Portland**

State: **Maine** Zip: **04102**

**3. Contact Name (to whom questions should be addressed): Lisa Lemont, CPSWQ**

Mailing Address: **94 Hutchins Drive**

City: **Portland**

State: **Maine** Zip: **04102**

Phone number: **207 756 6200**

Fax number: **207 756 6212**

E-mail address: **llemont@hydro-int.com**

Web address: **www.hydro-int.com**

**4. Technology**

Specific size/capacity of MTD assessed (include units):

**6-Module Up-Flo Filter sized at 22.7 gpm/sq-ft (given a filter module surface area of 1.1 sq-ft, for a total flow of 25 gpm per Filter Module)**

Range of drainage areas served by MTD (acres):

**1.1 acre per Filter Module (based on TSS mass load rating in attached NJCAT Report). When sized appropriately there is no upper limit on the drainage area served by the Up-Flo Filter.**

Include sizing chart or describe sizing criteria:

**Sizing criteria is typically based on the water quality flow rate, dividing the water quality flow rate by 25 gpm per Filter Module and rounding up to determine the most appropriate number of filter modules. When local authorities require sizing by drainage area instead of by water quality flow rate, the total drainage area is divided by 1.1 acres per Filter Module and rounding up to determine the number of Filter Modules needed.**

Intended application: on-line or offline:

**Online. TARP Field testing results are for an online unit where 21 of the 30 sampled storms exceeded the Up-Flo Filter's maximum treatment flow rate, therefore the online Up-Flo Filter has been proven to work in the field.**

Media used (if applicable): **CPZ Mix (Carbon, Peat, Zeolite mix)**

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

**Hydro International warrants all of its products to be free from defects in materials and workmanship; and will replace, repair, or reimburse at its discretion any part or parts which, after Hydro's examination, Hydro shall have determined to have failed under normal use and**

service by the original user within two years following initial installation. Such repair or replacement shall be free of charge for all items except for (i) those items that are consumable and normally replaced during maintenance, (ii) labor costs incurred by Hydro to obtain access to the part or unit for repair or replacement, (iii) any costs to repair or replace any surface treatment / cover after repair or replacement or (iv) other charges that Hydro may incur incident to such repair or replacement. Repair or replacement of such consumable items shall be subject to assessment of a pro-rated charge based upon Hydro International's estimate of the percentage of normal service life realized by the item. Hydro International's obligation under this Warranty is conditioned upon (a) its receiving prompt notice of claimed defects which shall in no event be later than thirty (30) days following expiration of the above warranty period and (b) owner of the product properly operating, inspecting, maintaining and caring for the product and is limited to repair or replacement as aforesaid. Purchaser agrees that the foregoing warranty is Purchaser's sole remedy under any legal theory whether pleaded in contract, tort, or otherwise.

## 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 with "CPZ Mix" 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 Up-Flo® Filter with CPZ Mix media removes >80% of Total Suspended Solids from stormwater runoff and 40% of Total Phosphorus at a design flow rate of 25 gallons per minute per Filter Module.**

Specific size/Capacity of MTD assessed:

**6-Filter Module Up-Flo® Filter sized at 25 gpm for a total design flow rate of 150 gpm**

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.

**No**

**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) **NJCAT/NJDEP – TARP Tier I (Laboratory) Certification**
- 2) **NJCAT TARP Tier II (Field) Certification – NJCAT Verification Received in June 2014; NJDEP Certification Pending (currently in review). NJDEP Certification Letter Pending.**
- 3) **Washington Department of Ecology – Conditional Use Level Designation for Basic Treatment – While TAPE field testing on the Up-Flo Filter is ongoing in Washington State, the Up-Flo was granted Conditional Use Level for Basic Treatment (TSS, Oils) due to the results from the 2012-2013 TARP study showing that the Up-Flo removed >80% TSS.**

Was an established testing protocol followed?

**No**

**Yes**, (1) Provide name of testing protocol followed, (2) list any protocol deviations:

**TARP Protocol (NJDEP 2009 Amendments) was followed. Deviations from the protocol include:**

- 1) **Sizing – The Up-Flo Filter was sized more aggressively (i.e., undersized) compared to the sizing required by the NJDEP Amendments to the TARP protocol. Using NJDEP sizing, approximately 38 Filter Modules would have been needed, and only 6 Filter Modules were used in the test unit. Effluent samples included composite subsamples from both treated and bypassed flow so the performance results from the TARP study are considered conservative, as the “effluent” used to calculate pollutant removal performance contains bypassed (i.e., unfiltered) flow.**
- 2) **New Jersey State certification for the analyzing laboratory – The NJDEP 2009 Amendments to the TARP Protocol require that the lab that analyzes the samples be a New Jersey state-certified lab. Both a university lab and a state-certified lab were used to analyze results. As discussed in the report, significant issues with the analyses from the State-certified lab arose and were present in their analysis results, therefore the measurements from the state-certified lab were not used and instead only the analysis measurements from the university lab were used.**

Provide the information below and provide a performance report (attach report):

For lab tests:

- i. Summarize the specific settings for each test run (flow rates, run times, loading rates) and performance for each run: **The Up-Flo® Filter was tested in the lab using Sil-Co-Sil 106 as the test contaminant. Five runs at the maximum design flow rate of 25 gpm were conducted, ranging from 85.7% removal to 89.7% removal, with an overall**

average 87% removal. See test report attached.

- ii. If a synthetic sediment product was used, include information about the particle size distribution of the test material:  
**Sil-Co-Sil 106 is a commercially available ground silica product from US Silica having a particle size distribution with 100% of material finer than 212 micron, 98.4% of material finer than 106 micron and a d50 of approximately 16 microns.**
- iii. If less than full-scale setup was tested, describe the ratio of that tested to the full-scale MTD: **A full scale commercially available Up-Flo Filter model was used for testing.**

For field tests:

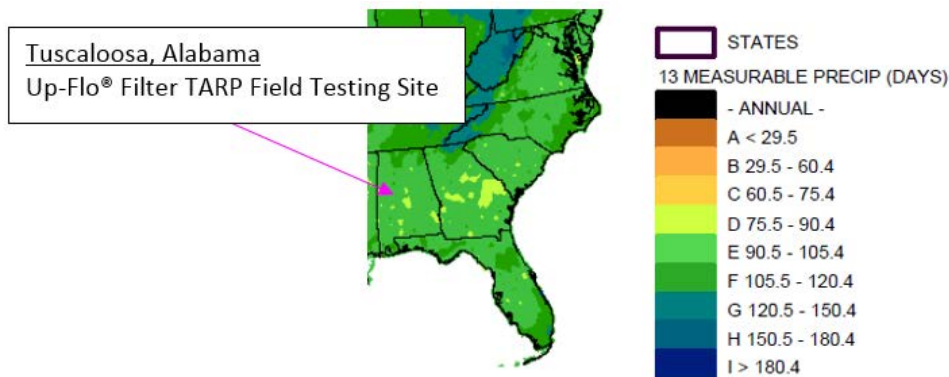
- i. Provide the address, average annual rainfall and characterized rainfall pattern, and the average annual number of storms for the field-test location:  
**Address: The TARP field test site was located at 1 Greensboro Ave in Tuscaloosa, AL 35401.**  
**Average Annual Rainfall: Tuscaloosa, AL (source: Weatherbase)**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average Rainfall (in)	5.0	5.5	6.1	4.3	4.4	3.4	4.0	3.0	3.3	2.7	3.9	4.7	50.3

**Characterized Rainfall Pattern:**

**Tuscaloosa, AL is in a Type III rainfall distribution pattern characterized by coastal storms with large 24-hour rainfall amounts.**

**Average Annual number of Storms: On average Tuscaloosa, AL has an 90 to 105 days of precipitation per year (NOAA).**



- ii. Provide the total contributing drainage area for the test site, percent of impervious area in the drainage area, and percentages of land uses within the drainage area (acres):

**Bama Belle TARP Test Site:**

Land Use	Area		Fraction of Site's Land Use
	(ft <sup>2</sup> )	(acre)	%
Parking Space	11,800	0.27	30.5
Other Paved	1,300	0.03	3.4
Sidewalks	2,100	0.05	5.4
Driveways	10,990	0.25	28.5
Green Space	12,400	0.29	32.2
<b>Total Contributing Area</b>	<b>38,590</b>	<b>0.89</b>	

- iii. Describe pretreatment, bypass conditions, or other special circumstances at the test site:

**Pretreatment at TARP Site: None**

**Bypass Conditions: The Up-Flo Filter at the test site included an internal high-flow bypass that would start bypassing flows when the maximum treatment flow rate of 150 gpm was exceeded.**

**Effluent sub-samples were taken downstream of the Up-Flo Filter outlet stub. Sub-samples were composited into one large effluent sample bottle for each storm event. For storms that exceeded 150 gpm in peak runoff rate, the Up-Flo Filter results therefore include a flow-proportionate fraction of bypassed (i.e., untreated) flow in the effluent sample, and therefore the performance results from the TARP study are considered conservative.**

- iv. Provide the number of storms monitored and describe the monitored storm events (amount of precipitation, duration, etc.):

**Thirty storms were monitored, of which 29 were “qualifying” based on rainfall depth, inter-event time period, maximum rainfall intensity and percentage of the storm proportionately covered by sub-sampling.**

Storm Event	Storm Date	Storm Duration	Total Precipitation	Inter-Event Time since prior rain	Maximum 15-Min Rainfall Intensity	Samples Coverage of Total Storm Flow	
		(hr)	(in)	(hr)	(in/hr)	No. Samples	(%)
1	31 May 2012	16.9	0.27	220.0	0.28	12	100.0
2	10 June 2012	15.3	0.6	246.4	1.64	16	90.3
3	11 July 2012	9.2	0.29	20.6	0.32	36	96.8
4	12 July 2012	5.8	0.28	18.9	0.16	42	98.2
5	21 July 2012	13.1	1.78	64.5	3.56	75	99.5
6	3 August 2012	4.8	0.18	84.3	0.48	15	92.8

7	4 August 2012	0.67	0.75	26.9	2.16	35	100.0
8	13 August 2012	2.2	1.01	154.9	2.52	42	97.9
9	1 September 2012	3.6	0.70	52.1	1.12	21	96.1
10	3 September 2012	5.6	0.41	36.3	0.64	16	93.2
11	30 September 2012	35.7	1.83	631.8	0.48	74	96.9
12	14 October 2012	3.1	1.01	357.6	2.20	78	98.3
13	18 October 2012	2.4	1.17	74.9	1.88	35	93.9
14	27 November 2012	1.9	0.32	355.0	0.28	18	96.0
15	4 December 2012	8.9	0.59	175.8	1.04	21	94.9
16	8 December 2012	Non-qualifying Event					
17	10 December 2012	8.50	2.24	40.8	2.04	98	98.0
18	16 December 2012	10.0	1.20	143.2	0.40	13	87.6
19	28 December 2012	12.6	0.73	64.0	0.24	32	91.6
20	1 January 2013	16.8	1.30	74.9	0.32	57	98.1
21	13 January 2013	53.5	2.15	27.67	1.36	92	96.2
22	30 January 2013	15.2	1.59	99.1	1.72	57	96.9
23	10 February 2013	64.7	2.44	79.1	1.04	109	96.8
24	21 February 2013	35.9	2.29	56.6	0.56	110	98.4
25	25 February 2013	9.5	0.31	64.4	0.24	11	90.4
26	5 March 2013	1.9	0.23	175.4	0.88	19	93.1
27	11 March 2013	11.2	2.32	132.0	0.96	110	98.8
28	22 March 2013	23.5	0.41	87.3	0.68	21	91.3
29	23 March 2013	7.7	0.89	12.3	1.16	41	94.2
30	30 March 2013	22.8	0.78	156.7	1.08	22	96.1
	Total	422.9	30.7				

- v. Describe whether or not monitoring examined seasonal variation in MTD performance:

The field testing period lasted a full calendar year therefore the Up-Flo Filter results reflect average annual performance during all four seasons.

- vi. If particle size distribution was determined for monitored runoff and/or sediment collected by the MTD, provide this information:

Particle size was determined using combined methods of wet sieving, Coulter Counter analysis and filtering. The Up-Flo Filter was shown to remove >81% of particulate matter with a d50 of 29 microns over the course of the monitoring period in spite of bypassing 28% of the total flow (untreated bypass flow comprised a flow-proportionate fraction of the effluent samples for the 23 storms that had bypass flows).

## 9. MTD History:

How long has this specific model/design been on the market?

**The Up-Flo® Filter has been on the market since 2006. The first units were hand-fabricated. The rotationally molded units that are sold now have been available since late 2007.**

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:

- 1) The Shoppes at Sunset Cay, Montena, VA. Permitter Unknown. Lat/Long. Unknown.**
- 2) Potomac Creek Industrial Park, Stafford, VA. Permitter Unknown. Lat/Long. Unknown.**
- 3) Firestone Tire Store, Fredericksburg, VA. Permitter Unknown. Lat/Long. Unknown.**

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:

- 1) Dane County Regional Airport, Madison, WI. Permitted by WI DNR. Lat/Long. Unknown.**
- 2) Marlboro Commons, Marlboro, NJ. Permitted by NJDEP. Lat/Long Unknown.**
- 3) SoCal Disposal, Santa Monica, CA. Permitted by the City of Santa Monica. Unknown. Lat/Long. Unknown.**

## **10. Maintenance:**

What is the generic inspection and maintenance plan/procedure? (attach necessary documents):

**Yes. See attached Up-Flo Filter Operation & Maintenance Manual.**

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

No, no track record.

**Yes**, track record exists; (provide maintenance track record, location, and sizing of three to five MTDs installed in Virginia [preferred] or elsewhere):

**NOTE: Up-Flo Filter Maintenance is tracked when replacement filter media is ordered from Hydro International. If maintenance is conducted only to clean out the sump and not to replace the Filter Bags, Hydro International will have no record of the maintenance.**

- 1) Rappahannock Industrial Park, Fredericksburg, VA. Two (2) 16-Module UFFs. Maintained 6/25/2012.**
- 2) Spotsylvania Town Centre, Fredericksburg, VA. 12-Module UFF. Maintained 9/8/2010.**
- 3) FlightSafety, St. Louis, MO. 1-Module UFF. Maintained 2/19/2010.**
- 4) Target – Hilldale Mall, Madison, WI. 6-Module UFF. Maintained 8/30/2013.**
- 5) Nucor Steel. 6 Module Up-Flo Filter. Tuscaloosa, AL. Maintained 3/23/2010, 5/18/2011, 10/11/2013, 5/06/2014.**

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?

Total life expectancy of MTD when properly operated in Virginia and, if relevant, life expectancy of media:

**When operated properly, the life expectancy of the Up-Flo Filter is in line with a 75-year design life due to suitability of rotationally molded PEX and stainless steel components for a stormwater drainage environment.**

**The life expectancy of the CPZ Mix media varies depending on site use. Based on a theoretical solids loading of 200 lb per year, the Up-Flo Filter sized to treat 1.1 impervious acres per Filter Module would be expected to last 1 year before a 10% drop in filtration capacity is expected (refer to Section 4.4 in attached TARP report).**

For media or amendments functioning based on cation exchange or adsorption, how long will the media last before breakthrough (indicator capacity is nearly reached) occurs?

**N/A**

For media or amendments functioning based on cation exchange or adsorption, how has the longevity of the media or amendments been quantified prior to breakthrough (attach necessary performance data or documents)?

**N/A**

Is the maintenance procedure and/or are materials/components proprietary?

Yes, proprietary

No, not proprietary

**X Maintenance includes both proprietary and non-proprietary aspects. The procedure of maintaining an Up-Flo Filter is non-proprietary. The CPZ Mix media blend is also non-proprietary. The filter bags and replacement drain-down filter are proprietary and must be ordered from Hydro International.**

Maintenance complexity (check all that apply):

**X** Confined space training required for maintenance

**X** Liquid pumping and transportation

Specify method:

**Vector truck removal of standing water in sump; transportation to disposal location**

**X** Solids removal and disposal

Specify method:

**Vector truck removal of sediment in sump; removal (by hand) of 2 filter bags per Filter Module. Dispose as per local ordinance requirements (typically landfill).**

Other noteworthy maintenance parameter (describe):

## 11. Comments

Include any additional explanations or comments:

## 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:     *L. Lemont*    

Name:     Lisa Lemont, CPSWQ    

Title:     Business Development Manager    

Date:     July 8, 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.