Attachment 1

Manufactured Treatment Device (MTD) Registration

1. **Manufactured Treatment Device Name: EcoPure BioFilter™**

2. **Company Name: Advanced Drainage Systems, Inc**
   Mailing Address: 4640 Trueman Blvd.
   City: Hilliard
   State: OH Zip: 43026

3. **Contact Name (**to whom questions should be addressed**):** Travis Dorman
   Mailing Address: 3707 Bloomer Springs Rd
   City: Elkton
   State: VA Zip: 22827
   Phone number: 540-526-6045
   Fax number:
   E-mail address: travis.dorman@ads-pipe.com
   Web address: www.ads-pipe.com

4. **Technology**
   Specific size/capacity of MTD assessed (include units): 4x8' tested. Multiple sizes available based on the treatment flow rate (GPM or cfs).
   Range of drainage areas served by MTD (acres): Dependent on site specifics, see table below.
   Include sizing chart or describe sizing criteria:

Model	Filter Bed Dimensions (ft x ft)	Effective Filtration Treatment Area (ft^2)	MTFR (cfs)	Maximum Allowable Drainage Area (acres)
EcoPure 60	5 x 4.5	60	0.13	0.324
EcoPure 120	5 x 8	120	0.27	0.648
EcoPure 180	5 x 12	180	0.40	0.972
EcoPure 240	10 x 8	240	0.53	1.297
EcoPure 360	10 x 12	360	0.80	1.945

   Intended application: on-line or offline: Both. Approved for online application by NJ.
   Media used (if applicable): Proprietary bioretention media blend. We can provide this information if the data can be protected.

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

Water quality products manufactured by Advanced Drainage Systems are warranted for a period of one (1) year to be free of any material and manufacturing defects. This applies only to separators and internal filter components manufactured by Advanced Drainage Systems and does not include precast concrete components or other components not manufactured by ADS.

This warranty is limited to providing a replacement unit (the same or equivalent) and does not include any installation or other costs associated with its replacement. This warranty does not extend to product defects or system failures due to improper installation, lack of maintenance, or improper system design

6. Treatment Type

- ☐ Hydrodynamic Structure
- ☐ Filtering Structure
- ☒ Manufactured Bioretention System
  Provide Infiltration Rate (in/hr): 96 in/hr
- ☐ Other (describe):

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

- ☒ Sedimentation/settling
- ☒ Infiltration (optionally)
- ☒ 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): Based on the WADOE TAPE findings, the EcoPure achieved a mean total phosphorus reduction of 68.9%. NJDEP findings for TSS removal removal of 88.0% at the same treatment flow rate (60 GPM for the EcoPure 60, 1 GPM per square foot of filtration treatment area).

Specific size/Capacity of MTD assessed: 4x8', 60 GPM treatment flow rate

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.

NJDEP has certified the EcoPure BioFilter as indicated in the attached letter, dated 8/3/20. Additionally, NJDEP has listed the EcoPure BioFilter as a Green Infrastructure MTD (https://www.nj.gov/dep/stormwater/treatment.html). EcoPure has also been granted a GULD for Basic and Phosphorus by WADOE (January 2023 letter attached).

Was an established testing protocol followed?

☐ **No**

☒ **Yes**, (1) Provide name of testing protocol followed, (2) list any protocol deviations: Current NJCAT/NJDEP protocol. Current WADOE TAPE protocol.

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: Sediment removal efficiency testing adhered to the guidelines set forth in Section 5 of the NJDEP Laboratory Protocol for Filtration MTDs. The target flow rate through the system was 60 gpm, with a target sediment concentration of 200 mg/L. All samples were collected in clean, 1-L widemouth bottles. Three background samples were taken at 27, 57 and 87 minutes after the test began to ensure the tap water source met the sediment concentration requirement. According to the NJDEP Filter Protocol, these background concentrations cannot exceed a TSS of 20 mg/L. The test sediment screw-auger feeder (doser) introduced the test sediment into the feed water stream to achieve the target influent TSS concentration of 200 mg/L. According to the NJDEP Filter Protocol, this influent concentration must stay within 10% of target, allowing for a 180 mg/L to 220 mg/L influent concentration. The feeder was calibrated prior to each run. In order to confirm sediment feed rates during the test, in accordance with the NJDEP Filter Protocol, three samples of the test sediment were collected from the injection point (Figure 3, "Doser") into a clean oneliter container for verification of sediment feed rate, over an interval timed to the nearest second, with a minimum volume of 0.1 liter or a collection interval not exceeding one minute (whichever came first). The time was kept with a stopwatch. The samples were weighed to the nearest milligram in the BaySaver Laboratory under the observation of BEC. The sediment feed rate coefficient of variance (COV) for the test sediment samples did not exceed 0.10. The mass from the sediment feed rate measurement samples was subtracted from the total mass introduced to the system when removal efficiency was calculated. Effluent sampling was performed by the grab sampling method during each run, according to the schedule in Table 1. When the test sediment feed was interrupted for test sediment measurements, the next effluent samples were collected after at least

three detention times had elapsed. During the drawdown period, two evenly-volume-spaced effluent samples were collected after flow and sediment feed had stopped. All sediment concentration samples were analyzed by Fredericktowne Labs (FTL) using the ASTM D3977-97 (re-approval 2007) "Standard Test Methods for Determining Sediment Concentrations in Water Samples."

ii. If a synthetic sediment product was used, include information about the particle size distribution of the test material:

Particle Size (µm)	Test Blend % Finer by Mass Analyzed by ECS				
	NJ Blend A	NJ Blend B	NJ Blend C	Average	NJDEP Specification (minimum % passing)
1000	99.6	99.6	99.5	99.6	98
500	94.3	94.2	93.9	94.1	93
250	90.2	90.1	89.6	90.0	88
150	79.3	79.2	78.5	79.0	73
100	59.9	61.1	60.6	60.5	58
75	50.7	52.4	51.0	51.4	50
50	48.2	50.3	48.3	48.9	43
20	36.4	36.6	36.6	36.6	33
8	19.6	20.0	19.7	19.8	18
5	13.2	13.3	13.2	13.2	8
2	5.8	5.5	5.8	5.7	3

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 unit was tested.

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: Washington State DOT Ship Canal Test Facility, Seattle, WA. Type IA rainfall distribution. Approximately 39" of rain annually with 150 rainy days.

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): 31.6 acres of drainage area, 22.7 acres of pavement, 8.9 acres of roadside landscaping. The site includes highway, express lanes, on/off ramps, and roadside landscaping.

iii. Describe pretreatment, bypass conditions, or other special circumstances at the test site: No pretreatment. The Ship Canal site uses a system of flow splitters and valves that direct water into as many as 4 test locations. A butterfly valve was utilized to control flow rate into the device. This is all within WADOE protocol. EcoPure also utilizes an internal bypass pipe.

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

Table 6. Comparison of EcoPure System Event Precipitation Data to TAPE Guidelines.				
Storm Start Date and Time	**Storm Precipitation Depth (inches)**	**Storm Antecedent Dry Period (hours)**	**Storm Precipitation Duration (hours)**	**Average Storm Intensity (inches/hour)**
12/8/2020	0.45	6.8	17	0.026
12/14/2020	0.18	7.8	11	0.017
12/16/2020	0.43	27	8.5	0.051
12/21/2020	2.50	27	23	0.11
1/11/2021	2.10	25	31	0.067
1/24/2021	0.26	70	15	0.017
1/31/2021	1.19	10	37	0.032
3/28/2021	0.29	76	3.8	0.077
10/21/2021	0.68	33	6.8	0.100
10/24/2021	0.27	6.3	12	0.023
10/27/2021	2.60	27	44	0.060
12/10/2021	0.65	93	12	0.054
12/22/2021	0.61	8.2	12.2	0.050
1/5/2022	2.92	15.6	53.5	0.055
1/10/2022	1.06	10.6	29.8	0.036
3/14/2022	0.54	40	16	0.035
3/18/2022	0.51	22	8.0	0.061
3/21/2022	0.29	12	7.0	0.045
3/23/2022	0.25	51	6.0	0.042
4/3/2022	0.90	45	8.0	0.114
4/18/2022	0.30	7.9	6.3	0.047
4/20/2022	0.18	46	16.5	0.011
Summary				
Minimum	0.18	6.3	3.8	0.011
Median	0.53	26	12	0.049
Maximum	2.92	93	53.5	0.114
Criteria	≥0.15	≥6	≥1	Range[a]

[a] Event rainfall intensities should represent a range.

Values in **bold** do not meet storm event guidelines recommended in the TAPE (Ecology 2018).

v. Describe whether or not monitoring examined seasonal variation in MTD performance: The system was installed and monitored for a 17 month period, covering all seasons as required by WADOE.

vi. If particle size distribution was determined for monitored runoff and/or sediment collected by the MTD, provide this information: Average d50 of the influent water was 43 microns.

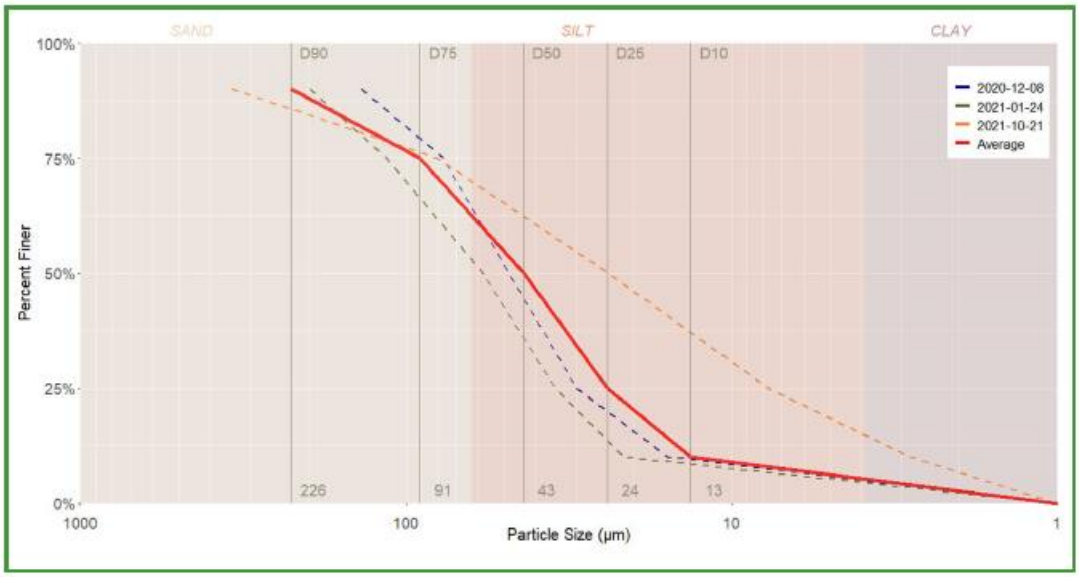

Figure 11. Influent Particle Size Distribution Results.

9. MTD History:

How long has this specific model/design been on the market? 18 months

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: NA

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: Overland Park, KS. Newark, NJ (NJDEP). Binghamton, NY.

10. Maintenance:

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

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? Maintenance requirements are a function of the pollutant load in the runoff treated by the device. The device should be inspected quarterly for the first year, and biannually thereafter. General landscaping practices should be utilized to maintain a level bed and plant health, and to remove

invasive species. Trash or other pollutants can be removed from the device when indicated by visual inspection, and the pretreatment sump should be cleaned with a vac truck when sediment depth reaches 10". The chamber area beneath the media layer can also be maintained by vac truck. The media layer itself will require less frequent maintenance and is expected to last approximately 20 years.

Total life expectancy of MTD when properly operated in Virginia and, if relevant, life expectancy of media: Approximately 20 years for the media layer, the structure itself could last well beyond 50 years.

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? Cation exchange is one component of the EcoPure BioFilter treatment, but other components of the device pretreat runoff. As a result, 20 year media life is expected with proper unit maintenance.

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)? The media blend is inline with other biofiltration media products. However, the specifics are proprietary and considered trade secret.

Is the maintenance procedure and/or are materials/components proprietary?
☒ Yes, proprietary (only when media replacement is indicated)
☐ No, not proprietary

Maintenance complexity (check all that apply):
☒ Confined space training required for maintenance
☒ Liquid pumping and transportation
Specify method: Vac truck will be utilized for maintaining the pretreatment area and chamber cavity. Solids will be removed during this procedure and should be properly disposed of at a landfill.
☒ Solids removal and disposal
Specify method: In the infrequent event of media layer replacement, the old media should be disposed of in accordance with local regulations (typically a 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: 

Name: Travis Dorman

Title: National Market Manager- Water Quality

Date: February 21, 2023

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