Attachment 1

Manufactured Treatment Device (MTD) Registration

1. **Manufactured Treatment Device Name: ADS Barracuda MAX**

2. **Company Name: Advanced Drainage Systems**
   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@adspipe.com
   Web address: adspipe.com

4. **Technology**
   Specific size/capacity of MTD assessed (include units): S3: 0.85 cfs, S4: 1.52 cfs, S6: 3.40 cfs, S8: 6.08 cfs
   Range of drainage areas served by MTD (acres): Site specific
   Include sizing chart or describe sizing criteria:

Table A-1 Barracuda™ MAX HDS Models and Associated MTFRs

Model	Manhole Diameter (ft)	Maximum Treatment Flow Rate (cfs)	50% Maximum Sediment Storage Area Volume (ft^3)
Barracuda MAX S3	3	0.85	5.89
Barracuda MAX S4	4	1.52	10.47
Barracuda MAX S5	5	2.37	16.36
Barracuda MAX S6	6	3.40	23.56
Barracuda MAX S8	8	6.08	41.89
Barracuda MAX S10	10	9.48	65.45

Intended application: on-line or offline: Both

Media used (if applicable): NA

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

All water quality products manufactured by ADS are warranted for a period of one (1) year to be free of any material and manufacturing defects. This applies only to Separators and Filter Cartridges manufactured by ADS 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 1not 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):
☐ 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): 50% TSS and 20% TP for all Barracuda MAX models.

Specific size/Capacity of MTD assessed: The S4 MAX (48” manhole) was tested under the NJ protocol.

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.

NJCAT verified and NJDEP certified under the protocol as enforced in 2021. The 50% TSS removal certification was awarded on 4/28/21.

Was an established testing protocol followed?

☐ **No**

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

The Barracuda MAX was tested under the NJ protocol with no deviation.

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

For lab tests:

Summarize the specific settings for each test run (flow rates, run times, loading rates) and performance for each run: Removal efficiency testing was conducted in accordance with Section 5 of the NJDEP Laboratory Protocol for HDS MTDs. A false floor was installed in the unit at the 50% sediment storage depth of 10-inches above the device floor. Testing was conducted at five flow rates: 25%, 50%, 75%, 100%, and 125% of the Barracuda MAX S4 Maximum Treatment Flow Rate (MTFR) of 1.52 cfs, and at a target influent sediment concentration of 200 mg/L.

The flow rate, measured using a manufacturer-calibrated FloCat MFE flow meter and recorded once per minute using a Seametrics DL76 data logger, was held steady during each test at ±10% of the target value with a coefficient of variation (COV) less than the allowed 0.03. Water temperature remained below 80 °F during all testing.

Test sediment was introduced to the flow stream via a volumetric screw auger to produce a target average influent concentration of 200 mg/L (± 10%) with a COV of less than the allowed 0.10. Each sediment sample was collected in a 1000 ml plastic container over an interval timed to the nearest tenth of a second using a Sportline P176 stopwatch, for a sample volume of 100 ml or a collection time of one minute (whichever came first). Sediment feed samples were weighed to the nearest mg on a Cole-Parmer Symmetry PR410 analytical balance (under the supervision of BEC).

The total mass introduced was determined by measuring the mass of sediment added to the doser prior to testing, subtracting the amount of sediment remaining in the doser at the end of the run, and subtracting the mass of the sediment feed samples taken during the run. The average influent TSS concentration for each run was calculated using the total measured mass of the test sediment added during dosing divided by the total volume of water that flowed through the unit during dosing as described by Equation 1.

Equation 1:

i. Effluent samples were collected in clean, 1 L bottles by sweeping the bottle through the cross-section of the free-discharge effluent stream in a single pass. The first effluent grab sample was collected following a minimum of three MTD detention times after flow rate was established and the first sediment sample was collected.

Sequential effluent samples were collected every 30 seconds. When sediment feed was interrupted for measurement, the next series of sequential effluent samples were collected after three MTD detention times had passed. Fifteen effluent samples were collected during each flow test run, and eight background samples were collected in correspondence with the odd-numbered effluent samples. Scour testing was also performed and the device is approved for online installation.

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

Table 1 Particle Size Distribution of Removal Efficiency Test Sediment

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	100.0	100.0	100.0	100	98
500	94.5	94.5	94.0	94.3	93
250	89.9	90.1	89.9	90.0	88
150	76.8	74.2	77.4	76.1	73
100	59.2	57.5	59.1	58.6	58
75	51.1	50.8	50.8	50.9	50
50	48.1	48.1	48.2	48.1	43
20	37.1	37.3	37.5	37.3	33
8	19.4	20.2	20.5	20.0	18
5	13.5	13.5	14.2	13.7	8
2	7.1	7.1	7.1	7.1	3

iii. If less than full-scale setup was tested, describe the ratio of that tested to the full-scale MTD: NA

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: NA

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): NA

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

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

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

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

9. MTD History:

How long has this specific model/design been on the market? 8 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. The original Barracuda has been widely used across VA.

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: Knoxville, TN, Columbia, SC, Atlanta, GA

10. Maintenance:

What is the generic inspection and maintenance plan/procedure? (attach necessary documents): Maintenance manual attached. We recommend that the unit be maintained with a vac truck once 20" of sediment are present in the sump.

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): The MAX unit functions in a very similar way to the original Barracuda, so we are confident that performance and maintenance will be very similar.

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 of the Barracuda are a direct function of the pollutant load in the runoff treated by the device. Typically, Barracuda separators will be maintained every 3-5 years.

Total life expectancy of MTD when properly operated in Virginia and, if relevant, life expectancy of media: 100+ years with proper maintenance

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? NA

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)? NA

Is the maintenance procedure and/or are materials/components proprietary?
☐ Yes, proprietary
☒ No, not proprietary

Maintenance complexity (check all that apply):
☐ Confined space training required for maintenance
☒ Liquid pumping and transportation
Specify method: Standard vac truck
☐ Solids removal and disposal
Specify method:
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: Water Quality Manager- East

Date: 12/28/21

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.