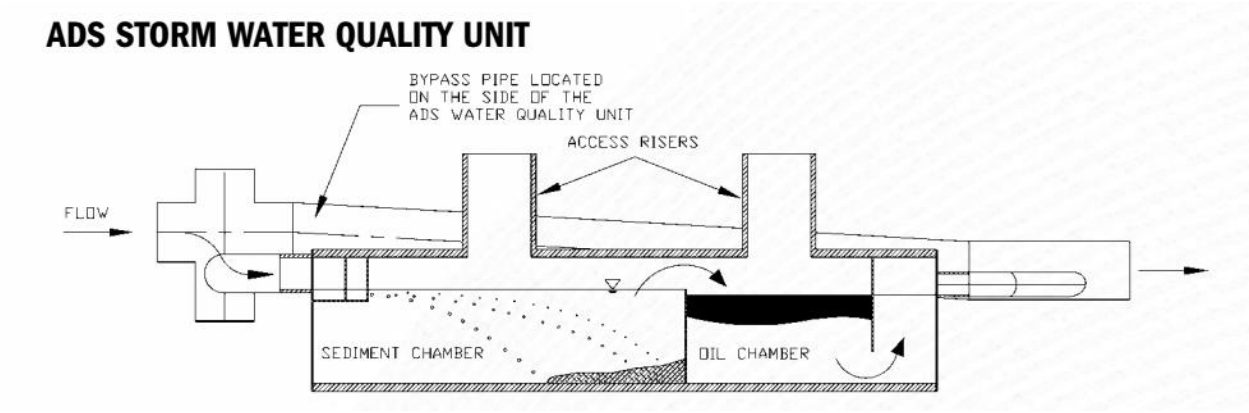
Attachment 1

Manufactured Treatment Device (MTD) Registration

1. Manufactured Treatment Device Name:



The ADS HDPE Water Quality Unit is designed with two weir plates to trap oils and total suspended solids as the storm water flows through surface drainage structures and into the water quality unit. This structure also incorporates the use of a bypass system, which prevents re–suspension of captured solids by diverting water flows greater than 'first flush'.

These durable, lightweight structures have been specifically designed for fast installation and easy maintenance. Made from high–density polyethylene N–12®drainage pipe, these units are resistant to abrasives and chemicals typically found in storm water and surrounding soils.

ADS Water Quality Units are typically used as a part of a multi–tiered approach known as the treatment train and are installed on the upstream side of a retention/detention system.

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**):** Chuck Lacey, Jr. PE
Mailing Address: 12137 Deer Haven Road
City: Marriottsville
State: MD Zip: 21104
Phone number: 301.875.8535
Fax number: n/a
E-mail address: chuck.lacey@ads-pipe.com
Web address: www.ads-pipe.com

4. Technology

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

ADS manufactures 16 standard models that provide efficient removal of pollutant particles and hydrocarbons for the majority of site conditions. A chart is provided to show sediment chamber volume and oil chamber volume. For unusual conditions, ADS can recommend a system combining a variety of sizes and configurations.

Range of drainage areas served by MTD (acres):

Site configuration is the only limiting factor as to the drainage area that can be served. Multiple Water Quality Units can be placed side by side to increase the size of the area served.

Include sizing chart or describe sizing criteria:

STANDARD MODELS

Product Number	Diameter in (mm)	Length ft (m)	Inlet Size in (mm)	Outlet Size in (mm)	Treated Flow Rate cfs (L/S)	Sed. Vol. ft^3 (m^3)	Oil Vol. ft^3 (m^3)	Sieve Size
3620WQA	36 (900)	20 (6)	10 (250)	10 (250)	1.5 (42)	65 (1.8)	30 (0.8)	140
3640WQA	36 (900)	40 (12)	10 (250)	10 (250)	2.38 (67)	137 (3.9)	63 (1.8)	140
3620WQB	36 (900)	20 (6)	10 (250)	10 (250)	0.7 (20)	65 (1.8)	30 (0.8)	200
3640WQB	36 (900)	40 (12)	10 (250)	10 (250)	1.6 (45)	137 (3.9)	63 (1.8)	200
4220WQA	42 (1050)	20 (6)	12 (300)	12 (300)	1.75 (49)	83 (2.3)	38 (1.1)	140
4240WQA	42 (1050)	40 (12)	12 (300)	12 (300)	3.66 (104)	175 (5.)	81 (2.3)	140
4220WQB	42 (1050)	20 (6)	12 (300)	12 (300)	0.86 (24)	83 (2.3)	38 (1.1)	200
4240WQB	42 (1050)	40 (12)	12 (300)	12 (300)	1.83 (52)	175 (5.)	81 (2.3)	200
4820WQA	48 (1200)	20 (6)	12 (300)	12 (300)	2.26 (64)	116 (3.3)	55 (1.6)	140
4840WQA	48 (1200)	40 (12)	12 (300)	12 (300)	3.94 (112)	245 (6.9)	115 (3.3)	140
4820WQB	48 (1200)	20 (6)	12 (300)	12 (300)	1.13 (32)	116 (3.3)	55 (1.6)	200
4840WQB	48 (1200)	40 (12)	12 (300)	12 (300)	2.39 (68)	245 (6.9)	115 (3.3)	200
6020WQA	60 (1500)	20 (6)	15 (375)	15 (375)	2.95 (84)	183 (5.2)	87 (2.5)	140
6040WQA	60 (1500)	40 (12)	15 (375)	15 (375)	6.23 (176)	385 (10.9)	184 (5.2)	140
6020WQB	60 (1500)	20 (6)	15 (375)	15 (375)	1.47 (42)	183 (5.2)	87 (2.5)	200
6040WQB	60 (1500)	40 (12)	15 (375)	15 (375)	3.12 (88)	385 (10.9)	184 (5.2)	200

140 sieve is equal to a particle size of 0.0042" (0.106mm) 200 sieve is equal to a particle size of 0.0030" (0.075mm)

Intended application: on-line or offline:

The ADS Water Quality Unit is an on-line device that can be installed with or without a by-pass. The by-pass pipe of the ADS WQU is designed to convey the peak storm water flow of the storm line. For example, @ a 1% slope, peak flow rates for the by-pass line are as follows:

	CFS	L/S
12"	3.8419	103.9
15"	6.971	188.0
18"	11.343	307.0
24"	24.451	661.0
30"	44.37	1,240.0
36"	72.19	1,950.0
42"	108.95	2,950.0
48"	155.61	4,210.0
60"	282.36	7,630.0

Media used (if applicable):

Not Applicable.

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

Sale of all Advanced Drainage System products come with a "terms and conditions of sale" which includes a section on limited warranty. This section provides a warranty that the products to delivered are free from defects in materials and workmanship in normal use and service. This warranty is limited to the Buyer and there are no other intended beneficiaries of this warranty.

Further ADS provides a technical service review of all water quality projects which can include (at owners discretion) a letter signed by a PE that states the project meets the required sizing criteria and language stating "the proposed use of the product falls within the capacity and capability in which the product was designed to function".

6. Treatment Type

☐ Hydrodynamic Structure
☐ Filtering Structure
☐ Manufactured Bioretention System
Provide Infiltration Rate (in/hr):
☒ Other (describe): The unit is designed using the fundamental principles of Stoke's Law and a standard orifice outlet control. The settling velocity of a particle is calculated based on the smallest particle to be removed. Standard units offer a choice of 140 or 200 sieve size removal.

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

- ☒ Sedimentation/settling
- ☐ Infiltration
- ☐ Filtration (specify filter media) woven geotextile (315W by ADS)
- ☐ 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 ADS Water Quality Unit has been tested by numerous agencies. It has been used and installed throughout Virginia with great success. ***Independent*** test data attached includes testing from notable agencies such as: University of New Hampshire, Maine DEP and Alden Labs.

Test data from Alden Labs and shows removal rates in excess of 80% TSS (based on removal of OK110) and 40% TP. As an added benefit, the ADS Water Quality Unit has removal rates for oils in excess of 80% (TPH-D) at typical design flows.

Test data from Nashville shows TSS removal rates in excess of 80% for particles ranging in size from the No.10 to the No.140 sieve.

Test data from UNH shows removal rates of 66% TSS and 47% TPH-D

Advanced Drainage Systems fully recognizes the effect of particle size distribution and influent concentrations in a testing environment and **respectfully is requesting the Water Quality unit be approved as a stand-alone treatment device providing 60% TSS and 40% TP removal rates.**

Specific size/Capacity of MTD assessed:

STANDARD MODELS

Product Number	Diameter in (mm)	Length ft (m)	Inlet Size in (mm)	Outlet Size in (mm)	Treated Flow Rate cfs (L/S)	Sed. Vol. ft^3 (m^3)	Oil Vol. ft^3 (m^3)	Sieve Size
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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.

See attached test reports from University of New Hampshire, Maine DEP (Alden Labs) and MASTEP (University of Massachusetts Stormwater Technologies Clearinghouse).

Advanced Drainage Systems has many other installations/approvals across the United States including some big cities like City of Indianapolis, City of Fort Wayne, Houston and even Ontario, CA. In general, these approvals all provide 80% TSS based on removal of OK110. Please let me know if additional information is required.

Was an established testing protocol followed?

☐ **No**

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

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

See attached test reports from University of New Hampshire, Maine DEP (Alden Labs), and MASTEP (University of Massachusetts Stormwater Technologies Clearinghouse).

9. MTD History:

How long has this specific model/design been on the market? 2004

Maine DEP - Alden Labs testing - Sept 2004
Full scale laboratory testing was performed at Alden Laboratories in Holden, Mass. Alden Labs tested the SWQU for conformance with the Maine Department of Environmental Protection Protocol for total suspended solids (TSS) removal.

A 60-inch diameter full scale Water Quality Unit was tested. The targeted flow rate based on Stoke's Law for the 60-inch Water Quality Unit is 1.47 cfs. Tests were conducted on the unit above and below the unit's anticipated flow rate to determine the performance limitations.

For the 1.5 cfs test, the average removal rate for the OK-110 sand was 88.3%.

Maine DEP - Alden Labs (Holden Massachusetts) April 2005
60 inch diameter Water Quality Unit was tested to determine the oil capture efficiency for flows ranging from 0.5 to 2 cfs. Soybased vegetable oil having a density of approximately 0.92 g/ml was used to test the capture efficiency. Oil removal efficiencies that were measured

Oil Removal Efficiencies

Flow Rate (cfs)	Removal Efficiency (%)
0.5	95
1	87
1.5	80
2	57

Nashville, TN Study of eight Water Quality Units - June 2005

Each unit was tested for one storm event within each unit's treatment capacity. The samples were collected in accordance with the Technology Acceptance Reciprocity Partnership (TARP) Protocol for Stormwater BMP demonstrations. The testing was done in accordance with ASTM 3977-97, Standard Test Method for Determining Sediment Concentration in Water Samples, for the range of particles specified by Nashville using the No.10 to the No.140 sieve. Results from this testing are summarized in the table below:

Location	Unit Diameter	Sieve #	Weight Retained Influent (Grams)	Weight Retained Effluent (Grams)	Precent Removed
Occupational Health 4300 Sidco Drive	48"	140	8.28	0.14	98
Jim and Nick's BBQ 7004 Charlotte Pike	60"	140	2.99	0.05	98
Autowash 7006 Charlotte Pike	36"	140	1.5	0.3	80
Shurgard Storage 2360 Gallatin Road	48"	140	4.59	0.21	95
Southern Unit: Walgreen's HWY 100 at Old Harding Pike	48"	140	1.81	0.13	93
Taco Bell 2904 Gallatin Road	48"	140	1.21	0.08	93
High Tech Instituite 560 Royal Parkway	42"	140	0.88	0.08	91
DMW Expedite 1850 Elm Hill Pike	48"	140	1.22	0.21	83

University of New Hampshire Center for Stormwater Technology- Feb 2006
General statistical analysis was performed on the results for ADS Water Quality Unit performance for 12 storms over a full year of monitoring between 2004 and 2005. Results are presented in the table below. Each quartile contains 25% of the total observations.

	TSS	TPH-D	Nitrate	Zinc
Min	22.4%	13.0%	-175.3%	25.6%
25% Quartile	52.4%	22.2%	-35.2%	38.9%
Median	66.3%	46.7%	-13.4%	74.3%
75% Quartile	87.6%	94.9%	26.3%	100%
Max	100.0%	100%	90.3%	100%
Average RE	**68%**	**55%**	**-14%**	**68%**

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:

Thornburg Gas Station/Dairy Queen
Woodford, VA
38° 7'58.39"N
77°30'44.08"W

Manassas Park Public Works Facility
38°46'52.80"N
77°28'23.84"W

Performance Auto Car
Dumfries, VA
38°34'22.87"N
77°19'4.16"W

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:

ADS has literally hundreds of installs throughout the United States and Canada.

E2CR, Inc – Halethorpe, MD
39°15'35.60"N
76°41'12.96"W

Ontario Mills Mall – Ontario, CA
34° 4'27.94"N
117°33'1.84"W

Knightdale Baptist Church – Knightdale, NC
35°47'19.74"N
78°28'50.28"W

Windward Community College – Kaneohe, Hawaii
(included in case you needed to perform a site visit)
21°24'33.53"N
157°48'48.02"W

10. Maintenance:

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

Per the Water Quality installation guide (IG 2.02), system should be inspected once each year (preferably in the spring after winter loading of salt/sand). Cleaning should be performed when the sediment volume has reduced the storage area by 20% or if the depth of the sediment has reached approximately 25% of the diameter of the structure. System is easily cleaned byshall be cleaned with a JetVac in accordance with cleaning procedures in IG 2.02.

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):

Since the inspection and cleaning of these systems is so straightforward, ADS has not taken an active role in the maintenance of these systems. Property owners are directed to companies like Clean Harbors, ESI Environmental Services Inc. and Stormwater Maintenance & Consulting to clean these systems.

One system that ADS was asked to witness the clean out was at the Food Lion in Woodbridge, VA
38°38'0.76"N
77°22'20.37"W

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?

Given the large storage capacity of these systems it is likely that they could easily exceed 5 years before cleaning is required.

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

With proper maintenance, the life expectance of the ADS Water Quality unit is 100 years and is based on the life expectancy of HDPE pipe.

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?

Not Applicable

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)?

Not Applicable

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:

☒ Solids removal and disposal

Specify method: Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Listed below are the cleaning procedures outlined in our published literature.

- Insert vacuum hose into By-Pass Structure and pump out. Inspect By-Pass Structure for any damage.
- Insert vacuum hose into 24" riser and pump out the Sediment Chamber. Pressure wash this Chamber if needed. Inspect for any damage. Inspect the inlet pipe for any blockage. Also inspect weir plate for damage.
- Insert vacuum hose into other 24" riser. This will pump out the Oil Chamber. Inspect for any structural damage. Pressure wash this Chamber if needed.
- Refill water quality unit with water.
- Replace all riser lids.

Other noteworthy maintenance parameter (describe): N/A

Not Applicable

11. Comments

Include any additional explanations or comments:

Because of land constraints, ADS underground Water Quality Units have become an increasingly efficient solution for treating storm water. These durable, lightweight structures have been specifically designed for fast installation and easy maintenance.

Independent testing shows the following benefits from these units:

- 80% TSS removal
- 80% oil & grease removal
- Greater than 40% Total Phosphorus removal
- 74% heavy metals removal
- Removes floatable debris such as oils and greases.
- Available in 36" (900mm) through 60" (1500mm) diameters.
- Lightweight High Density Polyethylene (HDPE) unit installs easily with a minimum of manpower. Heavy cranes are not necessary to install the unit.
- Each unit is fitted with access risers for easy inspection and maintenance of the sediment and oil chambers.
- The unit is inexpensive because the design is simple and there are no moving parts.
- The bypass system prevents re-suspension of captured solids by diverting water flows greater than the first flush.
- HDPE resists abrasion and chemicals found in storm water and in the surrounding soil.

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: Chuck T. Lacey, Jr PE

Title: ADS Engineering Product Manager

Date: 07.16.2014

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.