STEPP STORMWATER TESTING AND EVALUATION FOR PRODUCTS AND PRACTICES

Mr. Daniel Figola
Director – Engineering & Environmental Strategy
Advanced Drainage Systems, Inc.
4640 Trueman Blvd
Hilliard, Ohio 43026

December 22, 2025

Mr. Figola:

On June 9, 2025, **Advanced Drainage Systems, Inc.** submitted an application requesting that the Stormwater Testing and Evaluation of Products and Practices (STEPP) program grant concurrence for the **Arcadia Hydrodynamic Separator** (Arcadia HDS). A concurrence indicates the STEPP program agrees with performance testing conducted by the New Jersey Corporation for Advanced Technologies (NJCAT) program and certified by the New Jersey Department of Environmental Protection (NJDEP). The applicable testing protocol is the *New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device* dated January 1, 2021, and last updated April 25, 2023. The Arcadia HDS was certified by the NJDEP on May 15, 2025.

Because the STEPP program **verifies** the performance of HDS for testing following requirements in ASTM standards C1745, C1746, and E3373, a concurrence review consists of comparing requirements in the ASTM standards with information in the NJCAT report for the device. Deviations from the ASTM standards do not indicate testing done through the New Jersey program is deficient or compromised. The review instead identifies information that would be required if testing had followed the ASTM standards and that is not contained in the NJCAT report. For more information see the STEPP *Concurrence Technical Document*. The review was completed by three independent STEPP External Review Group (SERG) members and STEPP staff.

The STEPP program concurs with the testing and findings of NJCAT testing for the Arcadia Hydrodynamic Separator, manufactured by Advanced Drainage Systems, Inc., when designed, operated and maintained in accordance with the information provided in the NJCAT report and the NJDEP certification document (see Appendix A).

Appendix B summarizes information from the NJCAT report.

Disclaimer: NMSA has not directly verified or been asked to directly verify the data reported by the vendor. NMSA has evaluated the testing standards supporting the vendor's report as promulgated by an independent verification entity. NMSA has determined that the testing

protocols followed by the vendor in their testing campaign are sufficiently similar to those testing standards and procedures required by the STEPP program that the results from the use of both programs effectively illustrate the performance of the subject technology. However, NMSA has not separately verified that the testing procedures complied with those standards and defers to the testing standards organization on matters of compliance.

This review of vendor data, subsequent determinations and public dissemination of information does not constitute an approval process or an endorsement of any product by the STEPP program. Local governments and other entities are free to use this information as part of their processes to evaluate the suitability of this product for use within their jurisdiction. Local governments and other entities may also allow removal efficiencies that differ from manufacturer claims based on local geography, policies, or other conditions.

Sincerely,

Seth P. Brown, PE, PhD
Executive Director, National Municipal Stormwater Alliance

Attachment: Maintenance Plan
https://www.adspipe.com/water-management-solutions/water-quality/separators/arcadia-separator

Appendix A – Summary of Certification Information from the New Jersey Department of Environmental Protection for the Arcadia Hydrodynamic Separator

The following information is provided in the NJDEP certification letter, dated November 6, 2025. Note that these conditions apply for use of the Arcadia HDS in the State of New Jersey. See STEPP's *Concurrence Technical Document* for more information.

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs).
2. The Arcadia Hydrodynamic Separator shall be installed using the same configuration reviewed by NJCAT and shall be sized in accordance with the criteria specified in item 6 below. The Arcadia Hydrodynamic Separator may be configured with a single inlet pipe and a single outlet pipe offset by anywhere from 40 to 180 degrees or configured with a single inlet pipe and a single outlet pipe tangential to the unit on the same side of the unit and parallel to each other. A grate inlet was not tested and is not certified.
3. This Arcadia Hydrodynamic Separator cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal.
4. Additional design criteria for MTDs can be found in Chapter 11.3 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual.
5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Arcadia Hydrodynamic Separator. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at https://www.adspipe.com/water-management-solutions/water-quality/separators/arcadia-separator#productdocumentation-anchor for any changes to the maintenance requirements.
6. Sizing Requirements:

   The example below demonstrates the sizing procedure for the Arcadia HDS:

   Example: A 0.25-acre impervious site with a slope of 5% is to be treated to 50% TSS removal using an Arcadia Hydrodynamic Separator. The hydraulically most distant point to the inlet of the Arcadia is 110 feet. The site is located in an area with a projected 2-year storm rainfall depth of 3.84 inches.

   Maximum Treatment Flow Rate (MTFR) Evaluation:
   The site runoff (Q) was based on the following:

   CN = 98 (Curve Number for impervious)

Dimensionless Unit Hydrograph (DUH) = SCS Standard DUH (peak rate factor of 484) Time of concentration = 0.8 minutes.

Q = 0.77 cfs

Given the site runoff is 0.77 cfs and based on Table 1 below, the Arcadia AR3 model with an MTFR of 0.95 cfs would be the smallest model approved that could be used for this site that could remove 50% of the TSS from the impervious area without exceeding the MTFR.

The sizing table below corresponds to available system. Additional specifications regarding each model can be found in the New Jersey documents.

Arcadia Hydrodynamic Separator Models and Associated MTFRs

Arcadia Hydrodynamic Separator Model	Diameter (ft)	Maximum Treatment Flow Rate (cfs)	Treatment Area (sq. ft.)	Hydraulic Loading Rate (gpm/sq. ft.)
Arcadia AR3	3	0.95	7.07	60.0
Arcadia AR4	4	1.68	12.57	60.0
Arcadia AR5	5	2.63	19.63	60.0
Arcadia AR6	6	3.78	28.27	60.0
Arcadia AR8	8	6.72	50.27	60.0
Arcadia AR10	10	10.5	78.54	60.0

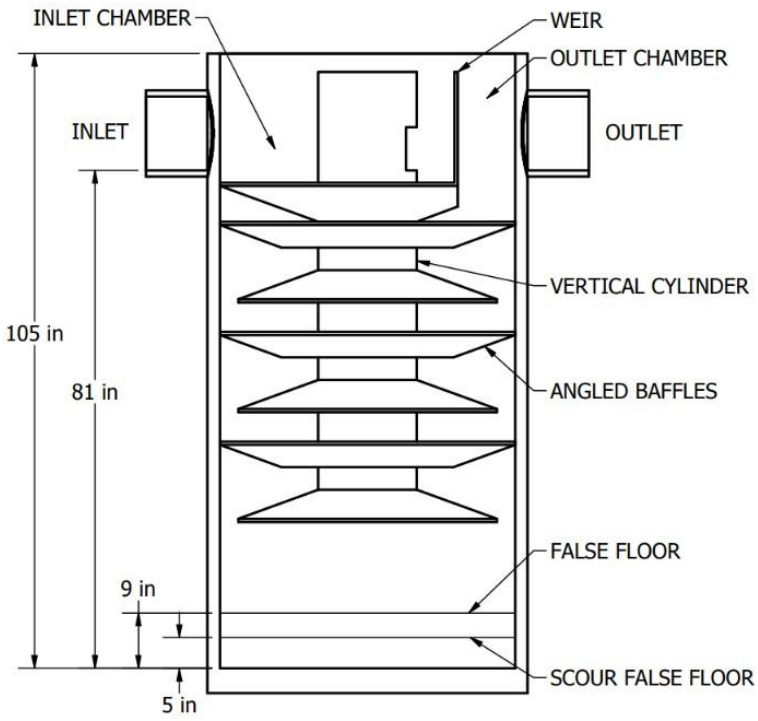
New Jersey requires a detailed maintenance plan for any project with a Stormwater BMP subject to New Jersey's Stormwater Management Rules.

Appendix B – Summary information from New Jersey testing for Arcadia Hydrodynamic Separator

1. **Describe the test protocol used to verify the hydrodynamic separator (HDS)**

"New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device", dated January 1, 2021 and last updated April 25, 2023

2. **Summary Information**
    a. Manufactured Treatment Device (MTD) type: **Hydrodynamic Separator**
    b. Company: **Advanced Drainage Systems, Inc.**
    c. Company contact: **Michelle Mangan, Manager, Engineering and Environmental Strategy, 475-289-7063, Michelle.Mangan@adspipe.com**
    d. Product Name: **Arcadia**
    e. Product (including technology description w photos/figures): **Arcadia removes suspended solids from stormwater by directing stormwater to an inlet chamber inside the unit, which then directs the flow into the vertical cylinder. A weir separates the inlet chamber from the outlet chamber. Once water has flowed through the inlet chamber and down through the vertical cylinder to the sump, the water rises through a series of angled baffles up to the outlet pipe. The angled baffles have concentric openings, alternating in location between the outer wall and the vertical cylinder, causing the water to flow upward in a circuitous path, which enhances settling and reduces resuspension. The inlet chamber is equipped with a sediment drain opening that directs sediment into the sump during operation.**



f. Test protocol: **NJDEP April 25, 2023 HDS protocol amended**
g. ASTM protocols: **ASTM D3977, D2216, D6913, D7928**
h. Verified maximum treatment flow rate (gpm): **754 (1.68 CFS)**
i. Verified surface loading rate (gpm/ft2): **60**
j. Test model size: **4 ft round**
k. Test model area (ft2): **12.57**
l. Depth below invert (ft): **6' 9"**
m. Maximum storage depth (in): **18**
n. Maximum storage volume (ft3): **9.43**
o. Particle size distribution: **the test sediment blend meets the specification as described in Section 4A of the 2023 New Jersey Protocol**
p. Scaling method: **Horizontal footprint of the device**
q. Maximum scour test flow rate: **200% of the MTFR**
r. TSS concentration at maximum scour test flow rate: **<20mg/L**
s. Is the HDS certified for on-line configuration? **Yes**
t. Configurations tested (attach standard detail): **Arcadia AR4**

Table illustrating standard dimensions for Arcadia models

Model	Manhole Diameter (ft)	NJDEP 50% TSS MTFR (cfs)	Total Chamber Depth (ft)	Treatment Chamber Depth[1] (ft)	Treatment Chamber Wet Volume[4] (ft^3)	Aspect Ratio[2] (Depth/Dia.)	Sediment Sump Depth (in)
Arcadia AR3	3	0.95	4.58	3.83	27.0	1.275	18.0
Arcadia AR4	4	1.68	6.75	6	75.4	1.50	18.0
Arcadia AR5	5	2.63	6.75	6	117.8	N/A	18.0
Arcadia AR6	6	3.78	6.75	6	169.6	N/A	18.0
Arcadia AR8	8	6.72	11.00	10.25	512.8	1.281	18.0
Arcadia AR10	10	10.50	13.50	12.75	1001.4	1.275	18.0

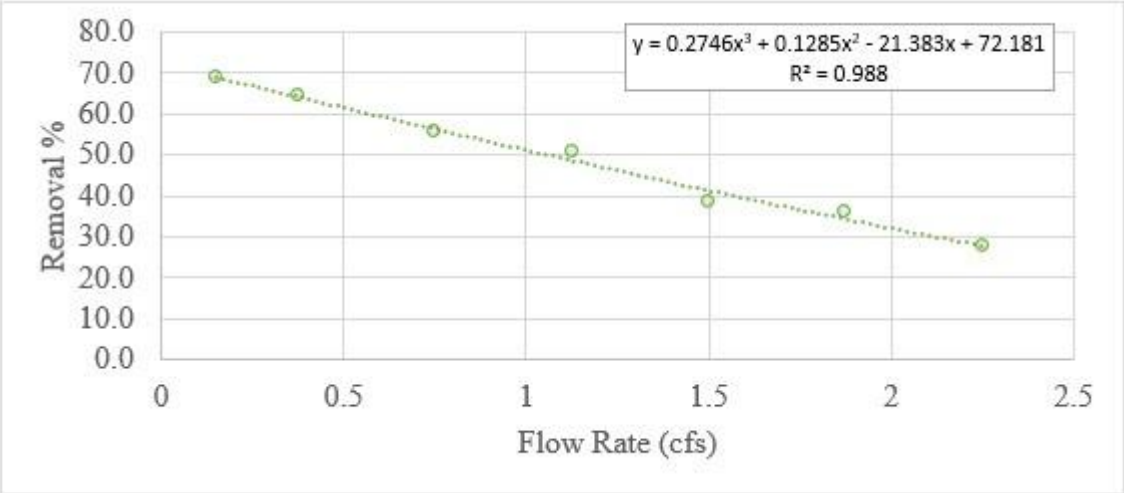
Notes:

1. Treatment chamber depth is defined as the total chamber depth minus ½ the sediment storage depth.
2. The aspect ratio is the unit's treatment chamber depth/diameter. The aspect ratio for the tested unit is 1.50. Larger models (>250% MTFR of the tested unit, > 4.20 cfs) must be geometrically proportionate to the tested unit. A variance of 15% is allowable (1.275 to 1.725).
3. For units < 250% MTFR (5 and 6 ft models), the depth must be equal or greater than the depth of the unit tested.
4. Referred to as Treatment Chamber Capacity in the ADS Arcadia Maintenance Guide

3. Table illustrating verified removal efficiencies

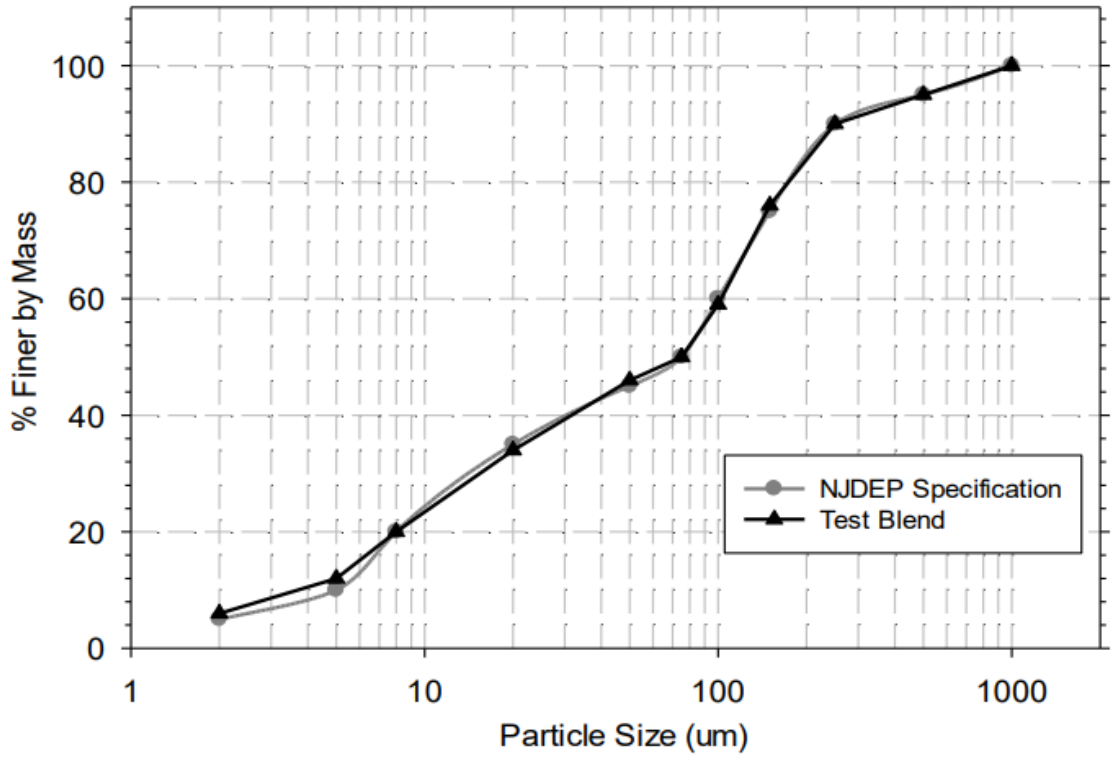
%MTFR	Flow Rate (cfs)	Removal Efficiency (%)	Weighting Factor	Weighted Removal (%)
25	0.42	63.24	0.25	15.81
50	0.84	54.47	0.3	16.34
75	1.26	45.99	0.2	9.20
100	1.68	37.92	0.15	5.69
125	2.10	30.39	0.1	3.04
Annualized Weighted Removal Efficiency (%)				50.08

4. Removal efficiency curve formula and verified removal efficiency curve



5. Particle size distribution for sediment removal efficiency

Particle Size (um)	% Finer				Test Sediment Average	NJDEP Specification (minimum % passing)
	NJDEP Protocol	Sample 1	Sample 2	Sample 3		
1000	100	100	100	100	100	98
500	95	95	95	95	95	93
250	90	90	89	90	90	88
150	75	75	77	77	76	73
100	60	56	59	59	58	58
75	50	50	50	51	50	50
50	45	47	46	48	47	43
20	35	35	33	35	34	33
8	20	18	18	18	18	18
5	10	12	11	13	12	8
2	5	4	4	5	4	3

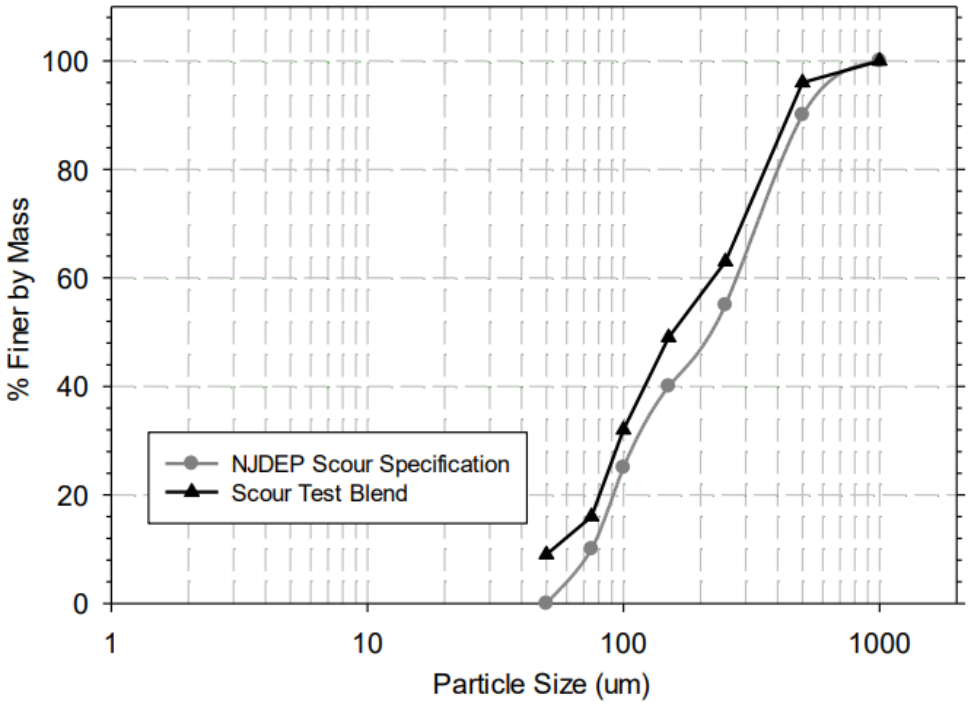


6. Head Loss Testing

Flow Rate		Head (inches)		Head Loss (inches)
gpm	cfs	Inlet	Outlet	
67	0.15	1.31	1.24	0.07
168	0.38	3.15	2.13	1.02
337	0.75	6.83	3.37	3.47
505	1.13	12.27	4.63	7.63
605 (Bypass)	1.35	14.70	5.30	9.40
673	1.50	15.26	6.00	9.26
842	1.88	16.11	6.63	9.48
1010	2.25	16.68	7.44	9.23
1346	3.00	18.14	8.41	9.73
1528	3.41	18.73	8.84	9.89
1700	3.79	19.23	8.17	11.07

7. Scour Testing

Sample ID	Effluent Concentration (mg/L)	Background Concentration (mg/L)	BG QA/QC ≤ 20.0 mg/L	Adjusted Effluent Concentration (mg/L)
1	0.5	4.7	PASS	0.0
2	7.4		PASS	2.5
3	8.1	5.1	PASS	3.0
4	10.0		PASS	4.7
5	14.0	5.5	PASS	8.5
6	6.1		PASS	0.9
7	6.3	5.0	PASS	1.3
8	21.0		PASS	15.5
9	11.0	6.1	PASS	4.9
10	14.0		PASS	8.0
11	19.0	5.9	PASS	13.1
12	6.8		PASS	0.7
13	10.0	6.2	PASS	3.8
14	10.0		PASS	4.0
15	11.0	5.9	PASS	5.1
AVERAGE			PASS	5.1


100
80
60
40
20
0
% Finer by Mass
NJDEP Scour Specification
Scour Test Blend
1
10
100
1000
Particle Size (um)