

NJCAT TECHNOLOGY VERIFICATION

AtlanFilter

Atlan Stormwater

May 2026

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1.0 Description of Technology

The AtlanFilter is a new technology incorporating hydrodynamic processes and filtration into a compact high density polyethylene (HDPE) package (**Figure 1**). AtlanFilter cartridges are enclosed within a rectangular, precast concrete vault designed to be installed in an offline configuration, utilizing an upstream diversion pit and downstream collection pit. AtlanFilters perform water treatment to remove very fine particulates, and other pollutants, using a specific proprietary media blend, though this test is for suspended solids only. Operation begins as runoff is conveyed into the AtlanFilter vault. Hydraulic pressure developed by increasing water level in the vault, forces water upwards through the filter media, is collected by the central tube and discharges through the outlet pipe. Once the water level in the vault reaches the level of the air release valve on the lid, all air is evacuated from the filter, and a siphon commences inside the cartridge. This siphon continues to operate until the water level in the vault drops (under drawdown conditions) below the inlet level of the cartridge (height of the legs), whereby the siphon breaks and a backwash occurs. Upon completion of a storm event, each cartridge backwashes and dislodges particulates from the filtration media. The dislodged particles accumulate on the vault floor for easy removal during maintenance.

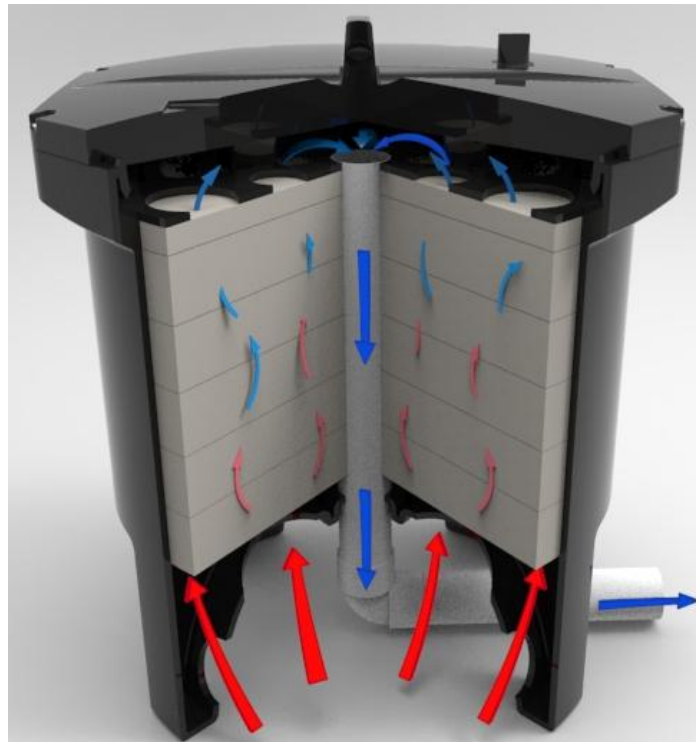


Figure 1. Typical AtlanFilter Schematic Cross-section (ATLAN Stormwater, 2022)

AtlanFilter cartridges are installed inside a vault (typically underground) and require a weir in the vault to form the hydraulic head for the filters to activate a siphon (**Figure 2**). AtlanFilter cartridges are produced in two standard configurations for treatment flowrates (1.5 L/s and 3.0 L/s)(23.78 gpm and 47.55 gpm). The FIL-3.0 has an overall cartridge height of 849 mm (33.43 in) and the

FIL-1.5 model has an overall cartridge height of 616 mm (24.25 in). Flow through the models is controlled by an internal orifice to ensure the contact time in the filter media remains consistent with the scaling.



Figure 2. Typical AtlanFilter Arrangement (ATLAN Stormwater, 2025)

*Note – The tested arrangement was at the minimum tank footprint for a single cartridge where the above arrangement indicates potentially a larger filter vault (effective sedimentation treatment area) with multiple filters, that could be expanded to fill the available vault area. The image is indicative only.

2.0 Laboratory Testing

The test program was conducted from September - October 2025 on the FIL-3.0 and from March 2026 – April 2026 on the FIL-1.5 by Waterlabs Australia (WLA) at the company’s full-scale hydraulic testing facility in Brisbane, Australia under the direction of Dr Darren Drapper. WLA is an independent, third party hydraulics laboratory that provides testing services to external clients.

The particle size distribution (PSD) was independently verified by ALS Environmental (ALS) Brisbane, Queensland (QLD), Australia, to demonstrate that the test sediment meets the specifications as detailed in Section 4 of the NJDEP Filtration Protocol. ALS Environmental is ISO/IEC 17025 (2017) accredited with the National Association of Testing Authorities (NATA) for PSD testing in accordance with Australian Standards AS1289 3.6.1 (sieve) and AS1289 3.6.3 (hydrometer). Water analysis of background and effluent samples was conducted by the Environmental Analysis Laboratory (EAL), Southern Cross University, Lismore, New South Wales (NSW), Australia, also an ISO/IEC 17025 (2017) NATA accredited laboratory. EAL is accredited for suspended sediment concentration (SSC) analysis (APHA 2540D).

Laboratory testing was conducted in accordance with the NJDEP “Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device” January 14, 2022, updated April 25, 2023 (Filtration Protocol). Prior to starting the performance testing program, a quality assurance project plan (QAPP) was submitted to, and approved by, the New Jersey Corporation for Advanced Technology (NJCAT) as per the NJDEP procedure for obtaining

verification of a stormwater MTD from NJCAT (August 4, 2021).

2.1 Test Setup

The laboratory setup is shown schematically in **Figure 3**. Descriptions of the key components are provided in the following text.

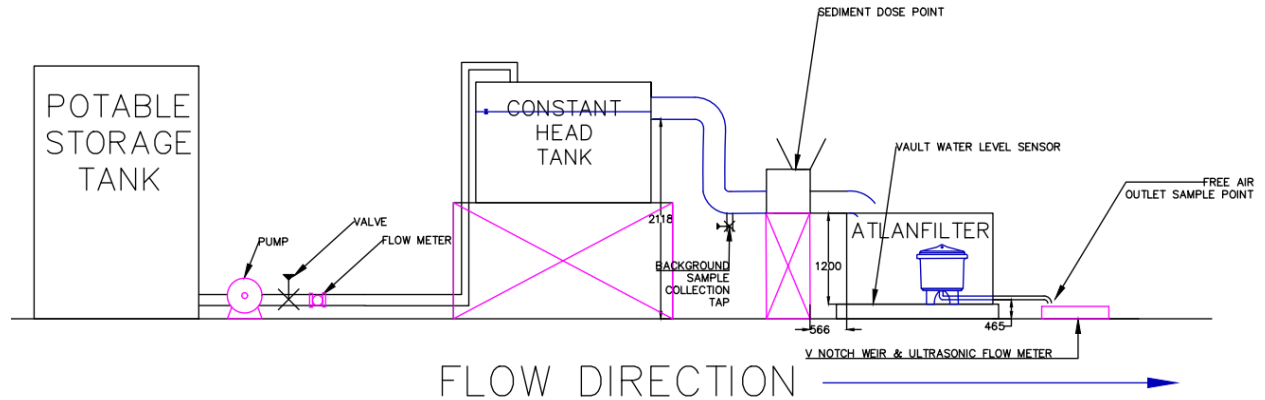


Figure 3. Laboratory Test Setup

Test Unit

Full-scale commercially available AtlanFilter FIL-1.5 and FIL-3.0 models were tested. **Figure 4** shows the AtlanFilter FIL-3.0 model test rig.



Figure 4. Photo of the AtlanFilter FIL-3.0 Model Test Rig

Table 1. Relevant Dimensions of AtlanFilters

AtlanFilter	Standard Height FIL-3.0	Half Height FIL-1.5
Inlet pipe diameter	225 mm (8.86 in)	100 mm (4 in)
Outlet pipe diameter	51 mm (2.0 in)	51 mm (2.0 in)
Invert Level Inlet	1665 mm (65.55 in)	1665 mm (65.55 in)
Invert Level Outlet	465 mm (18.31 in)	465 mm (18.31 in)
Test rig vault internal width	870 mm (34.25 in)	870 mm (34.25 in)
Test rig vault internal length	1200 mm (47.24 in)	1200 mm (47.24 in)
Available depth in test rig	1200 mm (47.24 in)	1200 mm (47.24 in)
Overall Filter Cartridge Height	851 mm (33.5 in)	622 mm (24.5 in)
Nominal Diameter	782 mm (30.79 in)	782 mm (30.79 in)
Effective Filtration Treatment Area (EFTA)	0.419 m ² (4.51 ft ²)	0.419 m ² (4.51 ft ²)
Max. Operating depth	970 mm (38.19 in)	660 mm (25.98 in)

Flow Measurement

Water was pumped to the constant head tank and flowrate monitored using a DN100 MagFlux 7200 ultrasonic flow meter (Serial no. 7015842, Part no. 887231-016-00).



Figure 5. Photo of the Installed Constant Head Tank

Pumping into a constant head tank allowed the water to naturally overflow from the tank as a free surface flow into a 225mm (8.86 inches) diameter PVC pipe at >1% grade, simulating a stormwater pipe under typical flow conditions. The gradient on the PVC pipe from the header tank (**Figure 5**) is sufficient to prevent any tailwater conditions causing a head variation in the tank.

Calibration of the MagFlux was performed by the manufacturers in the factory. In-situ calibration is not required by the manufacturer. However, for the purposes of this testing, flow measurements and temperature were also taken from a downstream 30° V notch weir using a Starflow QSD ultrasonic sensor to provide water depth against the calibrated V notch (refer **Figure 3**). This also acts as a second flowrate check against the Magflux influent flow rate measurement.

All flow meter data were recorded by a Campbell Scientific datalogger at a maximum of 10 second intervals, with average flowrate calculated across a 60 second rolling window. The target flowrate was 3 L/s (47.55 gpm) with an acceptable variation of +/- 0.3 L/s (4.76 gpm) ($\pm 10\%$) for the FIL-3.0, and 1.5 L/s (23.78 gpm) +/- 0.15 L.s (2.38 gpm) for the FIL-1.5. The concentration coefficient of variance (COV) of the flow data was ≤ 0.03 .

Head Measurements

An additional Starflow QSD was installed inside the filter vault test rig to record the head level during the test (**Figure 6**).

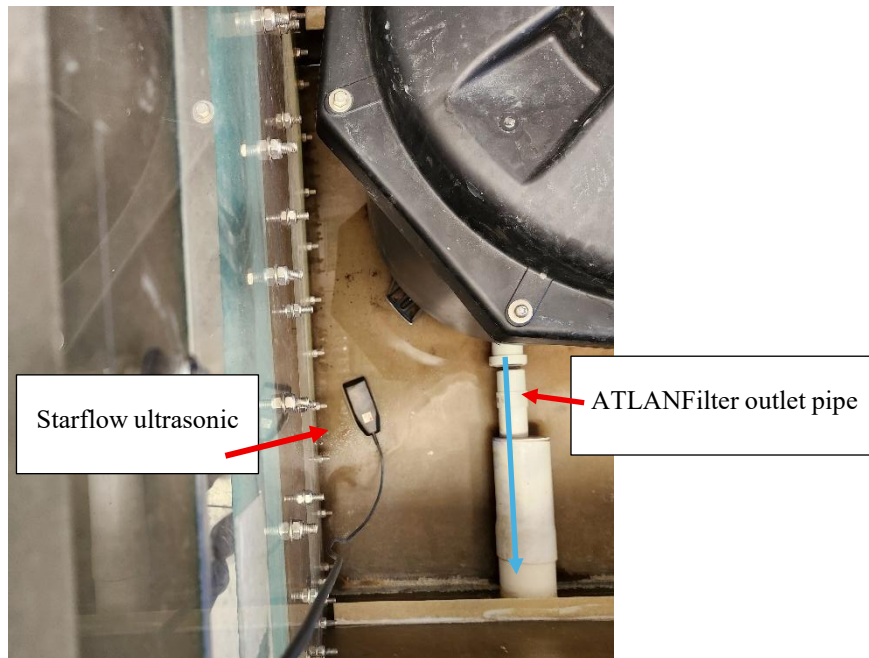


Figure 6. Starflow QSD Installed at the Invert of the AtlanFilter Test Vault

The water level in the vault was recorded every 5 seconds during the test. The minimum tolerance of the Starflow QSD was ± 2.5 mm (0.1 inches). This was used to determine the driving head as the filter occludes.

Test Sediment Dosing

A screw-auger (WAM Micro-batch Feeder, MBF042A) was used to deliver the appropriate target levels of test sediment to the potable water flow, at 566 mm (less than the maximum of 1,000mm, <3 feet) upstream of the test device (**Figure 7**). The pipework upstream of the device was configured to provide appropriate turbulence to ensure a fully mixed influent prior to entering the device. The inlet pipe for the FIL-3.0 was 225mm (8.86 inches) PVC and had a minimum 1% slope. The filter outlet pipe was 50mm (2 inches) discharging into a 100mm (4 inches) PVC connection through the vault wall. The inlet pipe for the FIL-1.5 was 100mm (4 inches) diameter PVC and had a minimum 1% slope. The filter outlet pipe was 50mm (2 inches) diameter discharging into a 100mm (4 inches) diameter PVC connection through the vault wall. Photos of the dosing location and outlet sampling location can be seen in **Figures 8** and **9**, respectively. Any sediment settled in the inlet pipe was removed, weighed and added to the balance of sediment not dosed to the test unit.



Figure 7. Screw-Auger Dosing

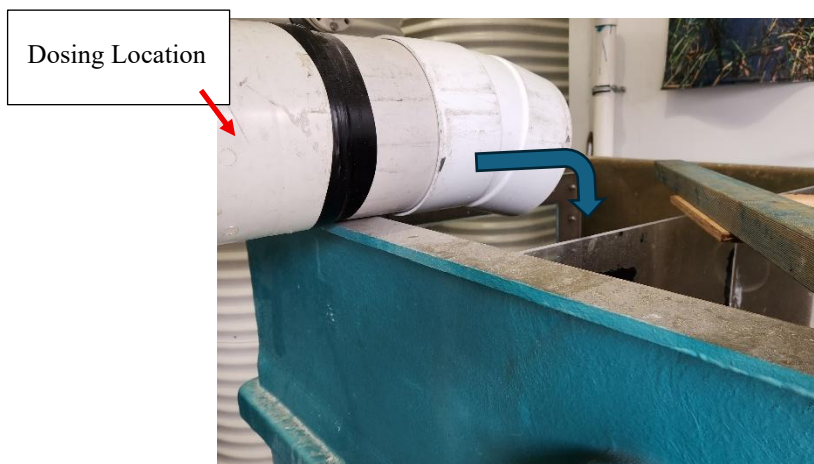


Figure 8. Upstream Dosing Location

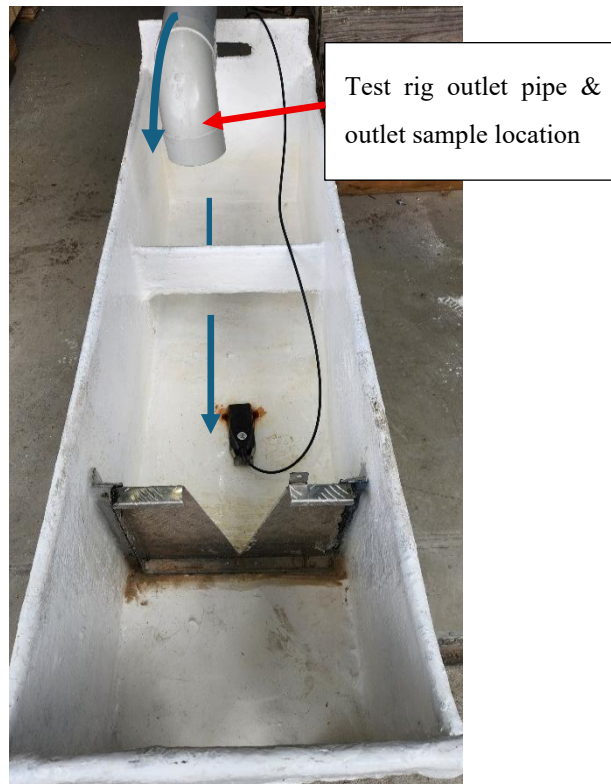


Figure 9. Outlet Sampling Location and 30° V Notch Weir (flow direction shown)

2.2 Removal Efficiency and Mass Loading Capacity Testing

Sediment removal testing was conducted to determine the removal efficiency as well as the sediment mass loading capacity. All test runs were conducted with clean, potable water containing a background suspended sediment concentration (TSS) of <20 mg/L.

The sediment testing was conducted on an initially clean system at the target 100% MTR of 3 L/s (47.55 gpm) for the FIL-3.0, and 1.5 L/s (23.78 gpm) for the FIL-1.5 with an influent concentration of 200 mg/L ($\pm 10\%$). A minimum of ten, 30-minute test runs were required to be conducted to meet the removal efficiency criterion of a cumulative removal efficiency >80%. The captured sediment was not removed from the system between test runs.

Ten (10) test runs were performed for Sediment Removal Efficiency at a target sediment influent TSS concentration of 200 mg/L ($\pm 10\%$). For each of these tests, five effluent samples, three background samples, and two drawdown samples were collected. Samples collected at the WLA hydraulics laboratory were forwarded to the EAL laboratory at Southern Cross University for TSS analysis. Water samples were tested using the whole sample with washout, in accordance with ASTM D3977.

Prior to each sediment removal efficiency test, the auger was calibrated to ensure the appropriate

amount of test sediment was injected +/- 10%. The mass of the dose sediment was determined prior to each test with a calibrated Ohaus Scout SPX123 balance to the nearest 0.01kg. This was deposited into the auger. The sediment remaining in the auger was removed at completion of the test and weighed. The total influent mass dosed per test run was determined by correcting for moisture content, sediment retained in the inlet pipe and subtracting the mass collected for the dose rate samples.

The total mass injected into the system was quantified for each run by subtracting the mass remaining in the auger, and the mass settled in the inlet pipe, and the feed mass removed in the sediment samples, from the initial dose mass, and corrected for moisture content. This value was used in calculating the influent mass/volume concentration.

The Sediment Mass Loading Capacity Testing was a continuation of the TSS Removal Efficiency study. Once 10 compliant test runs were completed, the Mass Loading Capacity testing was performed at a target influent concentration of 200 mg/L ($\pm 10\%$). In accordance with the NJDEP Protocol, testing continued until the cumulative TSS removal efficiency dropped below 80%, and/or the driving head exceeded the maximum driving head. The driving head was not observed to exceed the maximum level in the vault (1000mm for the FIL-3.0) during the testing. The Sediment Mass Loading test was terminated once the cumulative TSS removal efficiency dropped below 80%. Due to the delay in receiving the TSS results from the laboratory, a total of 22 tests were completed before it was identified that the cumulative RE no longer achieved 80%. These latter results are included in the report for completeness but not used for performance evaluation.

The driving head for the FIL-1.5 did not exceed 660mm (25.98 in) for the FIL-1.5 nor did the removal efficiency drop below 80% after 13 tests, however, Atlan elected to cease testing at this replicate since it exceeded the requirement to demonstrate the FIL-1.5 could be scaled according to the FIL-3.0 SML results.

From the data collected, the following graphs are produced to show the life cycle performance of the AtlanFilter FIL-3.0 and FIL-1.5 stormwater treatment devices:

- Driving Head vs. Sediment Mass Loading
- Removal Efficiency vs. Sediment Mass Loading

The total mass captured in the system was quantified at the conclusion of the testing. This data is used for determination of the maximum inflow drainage area (acres) per the NJDEP protocol.

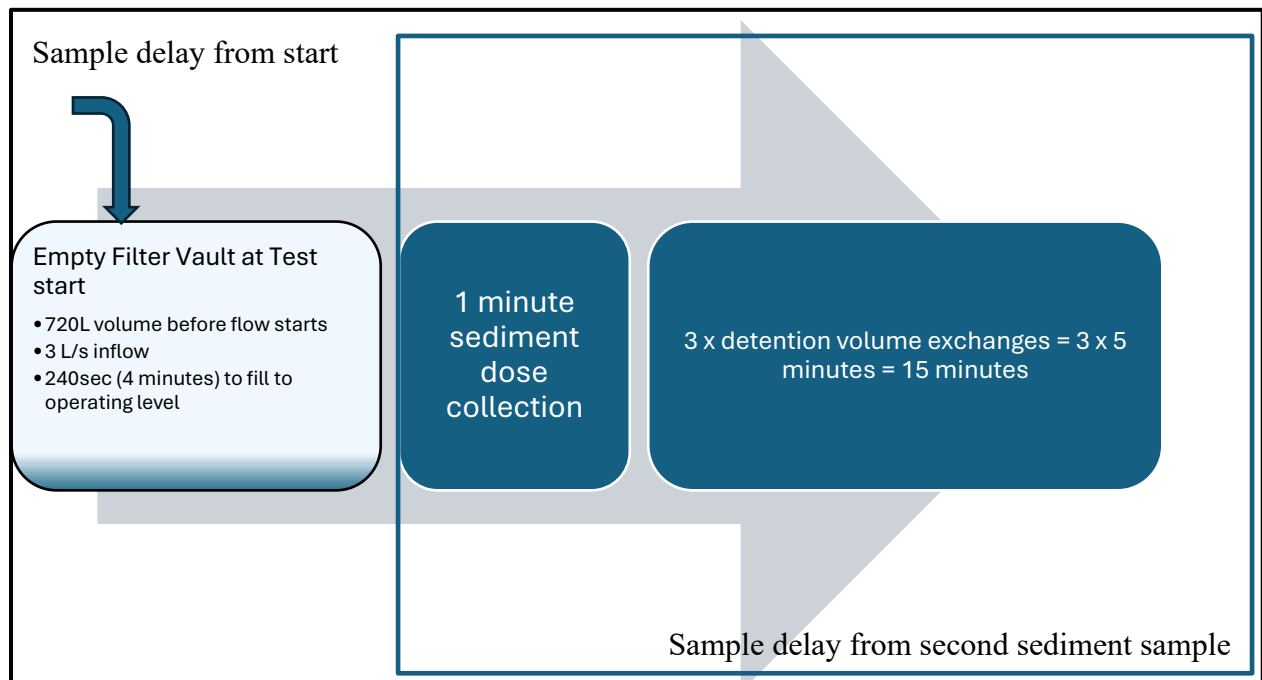
Sediment Sampling

During the test, sediment feed samples were collected at the injection point before, in the middle of and just prior to the conclusion of each test run, into a clean 500mL plastic jar. A minimum volume of 0.1 liter was collected or a collection interval that did not exceed 1 minute, timed to the nearest second (whichever comes first). Samples were weighed to the nearest 0.01g with analysis revealing that the COV did not exceed 0.10. When sampling was interrupted to collect the sediment feed sample, three MTD detention times were waited before outlet sampling recommenced.

Background, Effluent and Drawdown Sampling

The background and effluent samples were collected according to a predetermined schedule. The effluent grab samples were collected in clean plastic 1-L containers in a single sweeping motion across the full effluent flow profile.

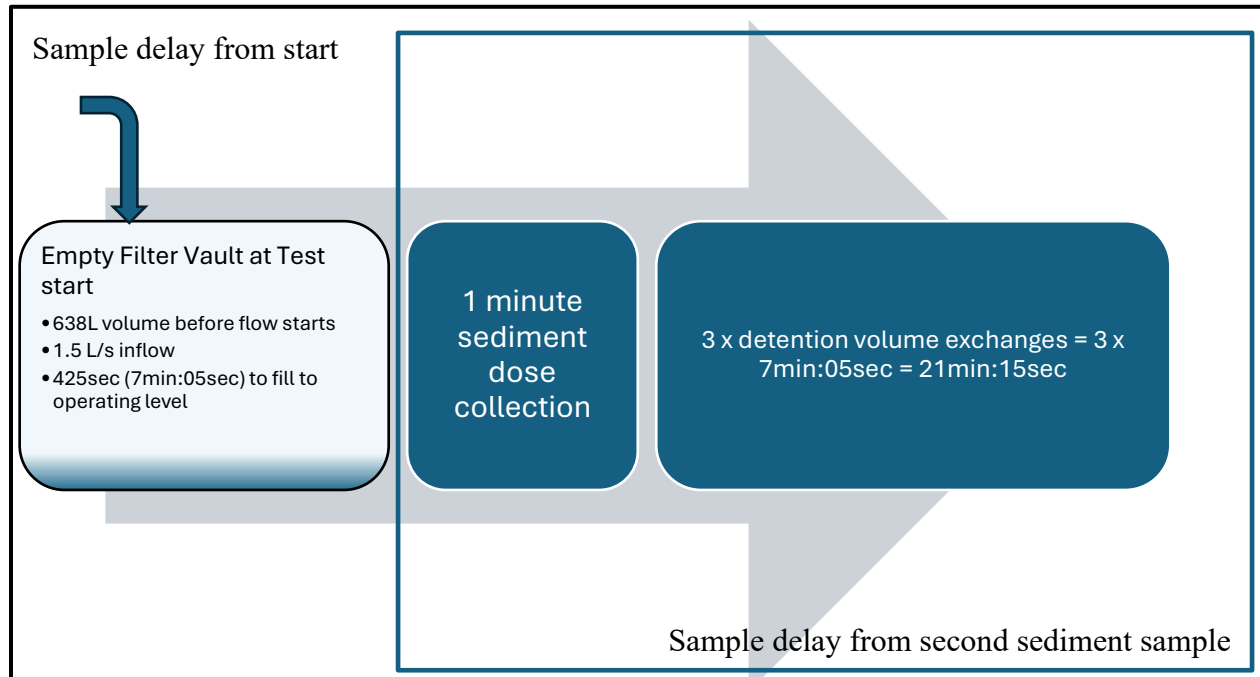
Background grab samples were collected in clean plastic 2-L containers, taken from the inlet pipe, via a tap in the invert of the pipe, in correspondence with each odd-numbered effluent sample. The first effluent grab sample was collected following a minimum of three MTD detention times after flow rate was established and the first sediment sample was collected. The detention time for the FIL-3.0 was calculated to be 5min:00sec. Therefore, the first effluent sample was collected at 20min:00sec from the commencement of flow to account for the vault to fill, flow through the AtlanFilter to commence, 1-minute sediment dose collection + 15min:00 sec for the three detention times. This is explained with the following graphic.



Each subsequent sample for FIL-3.0 was taken 2 minutes thereafter, until Sample 3, when the sediment feed sample 2 was taken. Since the filter vault was already filled and operating, the next effluent sample was delayed by 16min:00sec (3 detention times + 1 minute sediment collection) to avoid being influenced by the interruption of the sediment dosing. The initial 4 minute filling time was not required. Sample volumes were a minimum of 500 ml per the NJDEP Protocol requirements. Since the AtlanFilter incorporates an internal backwash and post-operation drawdown flow, flow measurement and samples of this function were captured according to the observed volume (measured by HGL level) as drawdown occurred. The sampling schedule used is shown in **Table 2**.

The detention time for the FIL-1.5 was calculated to be 7min:05sec. Therefore, the first effluent sample was collected at 29min:18sec from the commencement of flow to account for the vault to fill, flow through the AtlanFilter to commence, 1-minute sediment dose collection + 21min:15 sec for the three detention times.

This is explained with the following graphic.



Each subsequent sample for FIL-1.5 was taken 1 minutes thereafter, until Sample 3, when the sediment feed sample 2 was taken. Since the filter vault was already filled and operating, the next effluent sample was delayed by 22min:15sec (3 detention times + 1 minute sediment collection) to avoid being influenced by the interruption of the sediment dosing. The initial 7 minute filling time was not required. Sample volumes were a minimum of 500 ml per the NJDEP Protocol requirements. Since the AtlanFilter incorporates an internal backwash and post-operation drawdown flow, flow measurement and samples of this function were captured according to the observed volume (measured by HGL level) as drawdown occurred. The sampling schedule used for FIL-1.5 is shown in **Table 3**.

Table 2. FIL-3.0 Sampling Schedule

Elapsed Time (h:mm:ss)	Effluent Sample	Sediment Feed Sample	Background TSS Sample	Drawdown Sample
0:00:00		1		
0:20:00	1		1	
0:22:00	2			
0:24:00	3	2	2	
0:40:00	4			

0:42:00	5	3	3	
0:44:30 ¹				1
0:46:00 ¹				2

¹Exact time was determined by the flowrate out and volume passed to ensure even volume-spaced samples.

Table 3. FIL-1.5 Sampling Schedule

Elapsed Time (h:mm:ss)	Effluent Sample	Sediment Feed Sample	Background TSS Sample	Drawdown Sample
0:00:00		1		
0:29:18	1		1	
0:30:18	2			
0:31:18	3	2	2	
0:53:32	4			
0:54:32	5	3	3	
0:56:30 ¹				1
0:58:00 ¹				2

¹Exact time was determined by the flowrate out and volume passed to ensure even volume-spaced samples.

2.3 Scour Testing

No scour testing was conducted since the AtlanFilter is designed for offline installation.

2.4 Quality Objectives and Criteria

Samples were collected in-house by WLA personnel. All collection bottles were labelled and organized prior to testing. Samples were sent to EAL as soon as possible after testing. A Chain of Custody (COC) form was used for each set of samples.

Sediment was stored in sealed crates, with desiccant parcels to minimize moisture content, and accessed immediately prior to the test to weigh the dose amount required for the test.

Other quality control measures that were performed during the tests were:

- Monitoring water temperature to ensure temperature did not exceed 80 degrees Fahrenheit (26.7°C).
- Monitoring background water concentrations to ensure background TSS levels did not exceed 20 mg/L.
- Monitoring flowrate at the inlet and the outlet.

2.5 Laboratory Proficiency

To demonstrate laboratory proficiency in accordance with Section 3B of the Protocol, eight water samples were spiked with known concentrations [4 @ 20 (± 5) mg/L, 4 @ 50 (± 5) mg/L] by WLA using the same sediment as that used for the performance testing. This exceeds the minimum protocol requirement of 3 each. These samples were sent to EAL, the independent third party laboratory, for analysis against the APHA 2540D standard, adapted to apply the same requirements of ASTM D3977-97 including using the full 500mL sample volume, and rinsing the sample container. When considered as an average of all results ($n = 4$ each), the TSS recovery is within the 85%-115% range specified by the Protocol. Results are shown in **Table 4**.

Table 4. Laboratory Proficiency TSS Results

Sample ID	Measured Concentration (mg/L)	Reported Concentration (mg/L)	% recovery
8326-0018	24.5	28	114%
8326-0017	18.5	17	92%
8326-0016	24.5	27	110%
8326-0015	21.5	23	107%
Average			106%
Standard Deviation [SD _(n-1)]			10%
COV			0.09
8326-0006	50.5	46	91%
8326-0005	45.5	39	86%
8326-0004	50.5	54	107%
8326-0003	54.5	65	119%
Average			101%
SD _(n-1)			15%
COV			0.15

3.0 Performance Claims

Per the NJDEP verification procedure and based on the laboratory testing conducted on the AtlanFilter FIL-1.5 and FIL-3.0, the following are the performance claims made by ATLAN.

Total Suspended Solids (TSS) Removal Efficiency

Based on the laboratory testing conducted, the tested AtlanFilter FIL-3.0 achieved a 82.9% and the FIL-1.5 82.1% cumulative TSS removal efficiency rounded down to 80% per the NJDEP protocol.

Effective Filtration Treatment Area (EFTA)

The AtlanFilter FIL-1.5 and FIL-3.0 tested have an EFTA of 0.419 m^2 - (4.51 ft^2).

Effective Sedimentation Treatment Area (ESTA)

The AtlanFilter FIL-1.5 and FIL-3.0 test rig has an ESTA of 1.044 m^2 - (11.24 ft^2).

Wet Volume (WV)

The AtlanFilter FIL-1.5 has a Wet Volume of 0.679 m^3 - (179.3 gal) and the FIL-3.0 test rig has a Wet Volume of 1.044 m^3 - (275.8 gal).

Maximum Treatment Flow Rate (MTFR)

The AtlanFilter FIL-1.5 tested has an MTFR of 23.8 gpm (1.5 L/s) – ($23.8/4.51 = 5.28 \text{ gpm/ft}^2$) and the FIL-3.0 tested has an MTFR of 47.55 gpm (3 L/s) – ($47.55/4.51 = 10.54 \text{ gpm/ft}^2$)

Sediment Load Capacity/Mass Load Capture Capacity

Based on laboratory testing results, the AtlanFilter FIL-1.5 has a mass loading capacity of 28.13 lbs (12.76 kg) and a mass loading capture capacity of 23.19 lbs (10.52 kg) and the FIL-3.0 has a mass loading capacity of 51.59 lbs (23.407 kg) and a mass loading capture capacity of 41.29 lbs (18.727 kg). where mass load capacity is the maximum load delivered to the MTD and mass load capture capacity is the load retained by the MTD. The AtlanFilter FIL-1.5 captured 5.14 lbs/ft^2 of EFTA and the FIL-3.0 captured 9.15 lbs/ft^2 of EFTA.

Maximum Allowable Inflow Drainage Area

Per the NJDEP filter protocol, to calculate the maximum inflow drainage area, the total sediment load captured mass observed during the FIL-1.5 test (23.19 lbs) is divided by 600 lb. The total sediment load capture mass observed during the FIL-3.0 (41.29 lbs) is divided by 600 lbs/acre. Thus, the maximum inflow drainage area for the AtlanFilter FIL-1.5 is 0.039 acres (per cartridge) and for the FIL-3.0 is 0.069 acres (per cartridge).

4.0 Supporting Documentation

The NJDEP procedure (NJDEP, 2021) for obtaining verification of a stormwater manufactured treatment device (MTD) from the New Jersey Corporation for Advanced Technology (NJCAT) requires that “copies of the laboratory test reports, including all collected and measured data; all

data from performance evaluation test runs; spreadsheets containing original data from all performance test runs; all pertinent calculations; etc.” be included in this section. This was discussed with NJDEP, and it was agreed that as long as such documentation could be made available by NJCAT upon request it would not be prudent or necessary to include all this information in this verification report. This information was provided to NJCAT and is available upon request.

4.1 Test Sediment PSD Analysis

The test sediment is a commercial brand of ground silica known as Sil-Co-Sil 106, blended with a sieved silica sand to simulate the NJDEP required particle size distribution. This material has a specific gravity of 2.65. The particle size distribution (PSD) was independently verified by ALS Environmental (ALS) to demonstrate that the test sediment meets the specifications as detailed in Section 4 of the NJDEP Protocol (**Table 5**). ALS Environmental is accredited with the National Association of Testing Authorities (NATA) for PSD testing in accordance with AS1289 3.6.1 (sieve) and AS1289 3.6.3 (hydrometer) analysis. Three (3) samples were tested using the above methods. Results of the particle size gradation testing are shown in **Table 6**. These results are graphed against the NJDEP required PSD in **Figure 10**.

Table 5. NJDEP Test Sediment PSD Requirements

Particle size (microns)	NJDEP Specification (% passing)
1000	100
500	95
250	90
150	75
100	60
75	50
50	45
20	35
8	20
5	10
2	5

Table 6. PSD of Test Sediment Samples

Particle diameter (microns)	Test sediment particle size (% less than)				NJDEP (-2%)
	Sediment 1	Sediment 2	Sediment 3	Test Sediment Average	PASS/FAIL
1000	100	100	100	100	PASS
500	98	98	98	98	PASS
250	87	87	90	88	PASS
150	77	77	82	79	PASS
100	61	63	68	64	PASS
75	53	56	61	57	PASS
50	49	51	55	52	PASS
20	32	32	34	33	PASS
8	19	18	20	19	PASS
5	14	14	15	14	PASS
2	9	11	11	10	PASS
d50(μm)	59	50	42	50	PASS

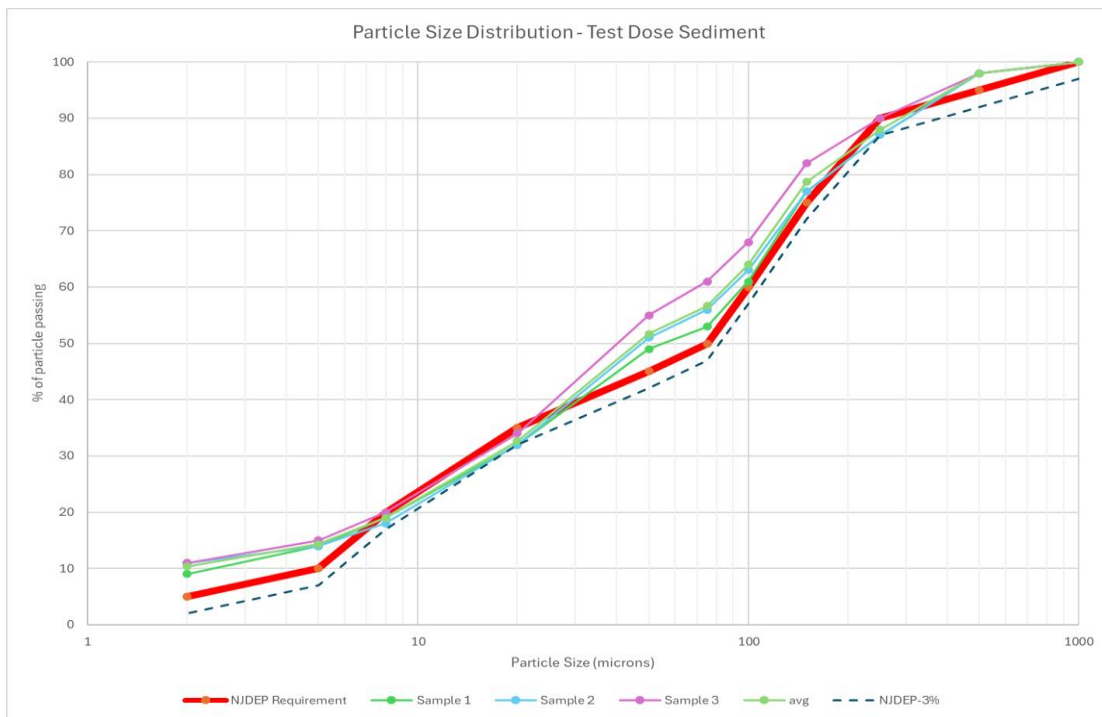


Figure 10. PSD Curves of 1-1000 Micron Test Sediment

4.2 Sediment Moisture Content Results

The moisture content of the feed sediment was tested for each feed sample in accordance with NEPM Schedule B(3). The results are averaged and presented in **Table 7** and **Table 8**.

Table 7. FIL-1.5 Moisture Content Results

	Moisture content			
Test	Feed 1	Feed 2	Feed 3	Average
1	0.1	0.3	<0.1	0.15
2	0.1	<0.1	0.2	0.12
3	0.3	0.4	<0.1	0.25
4	<0.1	0.2	<0.1	0.10
5	<0.1	<0.1	<0.1	0.05
6	<0.1	<0.1	<0.1	0.05
7	<0.1	<0.1	0.2	0.10
8	0.1	<0.1	<0.1	0.07
9	0.1	0.1	<0.1	0.08
10	<0.1	<0.1	0.1	0.07
SML-1	<0.1	<0.1	<0.1	0.05
SML-2	<0.1	<0.1	<0.1	0.05
SML-3	<0.1	<0.1	<0.1	0.05
Average				0.09

Table 8. FIL-3.0 Moisture Content Results

	Moisture content			
Test	Feed 1	Feed 2	Feed 3	Average
1	<0.1	<0.1	<0.1	0.05
2	<0.1	<0.1	<0.1	0.05
3	0.6	0.3	0.2	0.37
4	0.3	0.3	0.6	0.40
5	0.3	<0.1	<0.1	0.13
6	0.2	0.1	<0.1	0.12
7	<0.1	<0.1	<0.1	0.05
8	<0.1	<0.1	<0.1	0.05
9	<0.1	<0.1	0.1	0.07
10	<0.1	<0.1	<0.1	0.05
11	<0.1	<0.1	<0.1	0.05

Test	Moisture content			
	Feed 1	Feed 2	Feed 3	Average
12	<0.1	<0.1	0.3	0.13
13	0.2	0.1	<0.1	0.12
14	<0.1	<0.1	<0.1	0.05
15	<0.1	<0.1	<0.1	0.05
16	0.2	0.4	0.3	0.30
17	0.2	<0.1	<0.1	0.10
18	0.1	0.2	<0.1	0.12
19	<0.1	0.2	0.2	0.15
20	0.2	0.2	0.2	0.20
21	<0.1	<0.1	<0.1	0.05
22	<0.1	<0.1	<0.1	0.05
Average				0.12

4.3 Removal Efficiency and Mass Loading Testing

The influent mass was calculated from **Eqn. 1**:

$$\text{Influent Mass (mg)} = (1 - \text{Sediment Moisture Content}) \times [\text{Mass}_{\text{pre-test (kg)}} - \text{Mass}_{\text{post-test (kg)}} - \text{Mass}_{\text{inlet pipe (kg)}}] - \sum \text{Mass}_{\text{dose samples}} \times (1 \times 10^6)$$

The average influent TSS was then calculated from **Eqn. 2**:

$$\text{Average Influent SSC} \left(\frac{\text{mg}}{\text{L}} \right) = \frac{\text{Eqn 1. Influent Mass (mg)}}{\text{Average Flowrate} \left(\frac{\text{L}}{\text{min}} \right) * \text{Time}_{\text{dose injection}} \text{ (min)}}$$

The individual run efficiency was calculated from **Eqn. 3**:

Removal Efficiency =

$$\left(\frac{\text{Average Influent SSC Concentration} \times \text{Total Volume of Test Water}}{\text{Average Influent SSC Concentration} \times \text{Total Volume of Test Water}} \right) - \left(\frac{\text{Adjusted Effluent SSC Concentrations} \times \text{Total Volume of Effluent Water}}{\text{Average Influent SSC Concentration} \times \text{Total Volume of Test Water}} \right) - \left(\frac{\text{Average Drawdown SSC Concentrations} \times \text{Total Volume of Drawdown Water}}{\text{Average Influent SSC Concentration} \times \text{Total Volume of Test Water}} \right) \times 100$$

Testing Summary FIL-1.5

For the FIL-1.5 a total of 10 removal efficiency test runs, and 3 additional sediment mass loading capacity test runs were performed in accordance with the NJDEP Protocol. The target influent concentration was maintained at 200 mg/L for the 3 sediment mass loading capacity test runs. The target removal efficiency tests were conducted at 1.5 L/s (23.8 gpm) as were all of the sediment mass loading capacity tests. The driving head was not exceeded during the SML testing and the TSS results remained above the cumulative 80% Removal Efficiency requirement. All tests met the requirements of the NJDEP protocol and the QA/QC parameters. **Table 9** (Flow Rate and Water Temperature) and **Table 10** (Feed Rate and Water Temperature) summarize the various QA/QC parameters recorded during the test runs.

Table 9. FIL-1.5 Summary of Flow Rate and Water Temperature

Test ID	QA/QC Pass/Fail	Target Inflow Rate (L/s)	Target Inflow Rate (gpm)	Average Inflow Rate (L/s)	Average Inflow Rate (gpm)	Inflow Rate COV (≤ 0.03)	Maximum Water Temperature (≤ 26.7 °C)	Maximum Water Temperature (≤ 80 °F)
1	PASS	1.5	23.78	1.51	23.89	0.003	25.9	78.6
2	PASS	1.5	23.78	1.51	23.99	0.006	26.2	79.2
3	PASS	1.5	23.78	1.49	23.67	0.003	26.4	79.5
4	PASS	1.5	23.78	1.48	23.48	0.009	26.4	79.5
5	PASS	1.5	23.78	1.51	23.95	0.005	25.0	77.0
6	PASS	1.5	23.78	1.47	23.35	0.013	25.5	77.9
7	PASS	1.5	23.78	1.51	23.99	0.006	25.9	78.6
8	PASS	1.5	23.78	1.51	23.91	0.004	26.4	79.5
9	PASS	1.5	23.78	1.52	24.05	0.008	26.4	79.5
10	PASS	1.5	23.78	1.50	23.78	0.0001	26.4	79.5
SML-1	PASS	1.5	23.78	1.50	23.85	0.002	25.2	77.4
SML-2	PASS	1.5	23.78	1.48	23.48	0.009	25.7	78.3
SML-3	PASS	1.5	23.78	1.49	23.60	0.005	25.9	78.6

Table 10. FIL-1.5 Feed Rate and Concentration QA/QC Results

Test ID	QA/QC Pass/Fail	Target Inflow TSS (mg/L)	Average Influent TSS (mg/L) ($\pm 10\%$)	Dose Mass in Pipe & Auger (g)	Moisture Corrected Feed Rate (g/min)			Feed Rate COV (≤ 0.10)	Average Background TSS (mg/L)	Minimum TSS Sample Volume (mL) (>500 mL)
1	PASS	200	202.7	2	19.16	19.12	17.35	0.056	0.5	502
2	PASS	200	210.2	2	19.50	20.05	18.80	0.032	0.5	506
3	PASS	200	213.7	3	18.58	19.17	17.92	0.034	0.5	501
4	PASS	200	203.4	3	18.50	18.66	17.03	0.05	0.5	506
5	PASS	200	184.3	3	18.42	18.74	18.62	0.009	2.0	591
6	PASS	200	211.5	2	18.44	19.62	18.64	0.033	1.3	592
7	PASS	200	212.9	3	19.33	18.84	18.65	0.019	1.7	502
8	PASS	200	203.6	2	19.68	19.30	18.44	0.033	2.3	508
9	PASS	200	215.3	3	17.88	19.34	18.57	0.040	1.0	511
10	PASS	200	210.2	2	19.51	19.53	18.69	0.025	1.0	534
SML-1	PASS	200	216.1	3	18.85	17.41	18.56	0.042	0.5	506
SML-2	PASS	200	213.5	3	18.34	18.23	17.79	0.016	0.7	502
SML-3	PASS	200	208.2	3	19.86	17.89	19.14	0.053	0.5	503

Removal Efficiency Results

Results from the 10 removal efficiency tests are shown in **Table 11** (Background and Effluent Sediment Concentrations) and **Table 12** (Summary of Removal Efficiency Test Results). The cumulative sediment removal efficiency at Run 10 of 82.1% exceeds the NJDEP protocol requirement of $\geq 80\%$.

Table 11. FIL-1.5 Removal Efficiency Tests Background and Effluent Sediment Concentrations (mg/L)

Test ID		Individual Sample					Average
		1	2	3	4	5	
1	Background	0.5		0.5		0.5	0.50
	Effluent	34	34	33	32	31	32.80
	Drawdown	22	18				20.00
2	Background	0.5		0.5		0.5	0.50
	Effluent	35	35	35	30	27	32.40
	Drawdown	22	16				19.00
3	Background	0.5		0.5		0.5	0.50
	Effluent	33	32	34	35	35	33.80
	Drawdown	25	21				23.00
4	Background	0.5		0.5		0.5	0.50
	Effluent	35	36	36	35	32	34.80
	Drawdown	25	19				22.00
5	Background	2		2		2	2.00
	Effluent	40	40	39	39	40	39.60
	Drawdown	29	25				27.00
6	Background	2		1		1	1.33
	Effluent	39	36	38	37	36	37.20
	Drawdown	25	26				25.50
7	Background	2		1		2	1.67
	Effluent	38	40	42	37	37	38.80
	Drawdown	28	22				25.00
8	Background	2		2		3	2.33
	Effluent	37	38	36	38	34	36.60
	Drawdown	28	20				24.00
9	Background	0.5		0.5		2	1.00
	Effluent	38	36	38	36	37	37.00
	Drawdown	24	20				22.00
10	Background	1		1		1	1.00
	Effluent	38	37	37	35	36	36.60
	Drawdown	26	20				23.00

Table 12. FIL-1.5 Summary of Removal Efficiency Test Results

Test ID	Dosing Water Volume (L)	Net Sediment Mass Injected (g)	Average Adjusted Effluent TSS (mg/L)	Drawdown Volume (L)	Average Drawdown Mass (g)	Effluent Mass (g)	Mass Captured (g)	Test Removal Efficiency (%)	Cumulative Mass Captured (kg)	Cumulative Mass Injected (kg)	Cumulative Removal Efficiency (%)
1	4740	961	32.30	405	8	153	800	83.2	0.80	0.96	83.2
2	4760	1000	31.90	471	9	152	840	84.0	1.64	1.96	83.6
3	4696	1004	33.30	446	10	156	837	83.4	2.48	2.96	83.5
4	4659	948	34.30	433	9	160	779	82.2	3.26	3.91	83.2
5	4753	876	37.60	454	11	179	686	78.3	3.94	4.79	82.2
6	4633	980	35.87	413	10	166	804	82.0	4.74	5.77	82.2
7	4768	1015	37.13	443	10	177	828	81.5	5.57	6.78	82.1
8	4744	966	34.27	431	9	163	794	82.2	6.37	7.75	82.1
9	4772	1027	36.00	463	10	172	846	82.3	7.21	8.78	82.1
10	4718	992	35.60	435	11	168	813	82.0	8.03	9.77	82.1

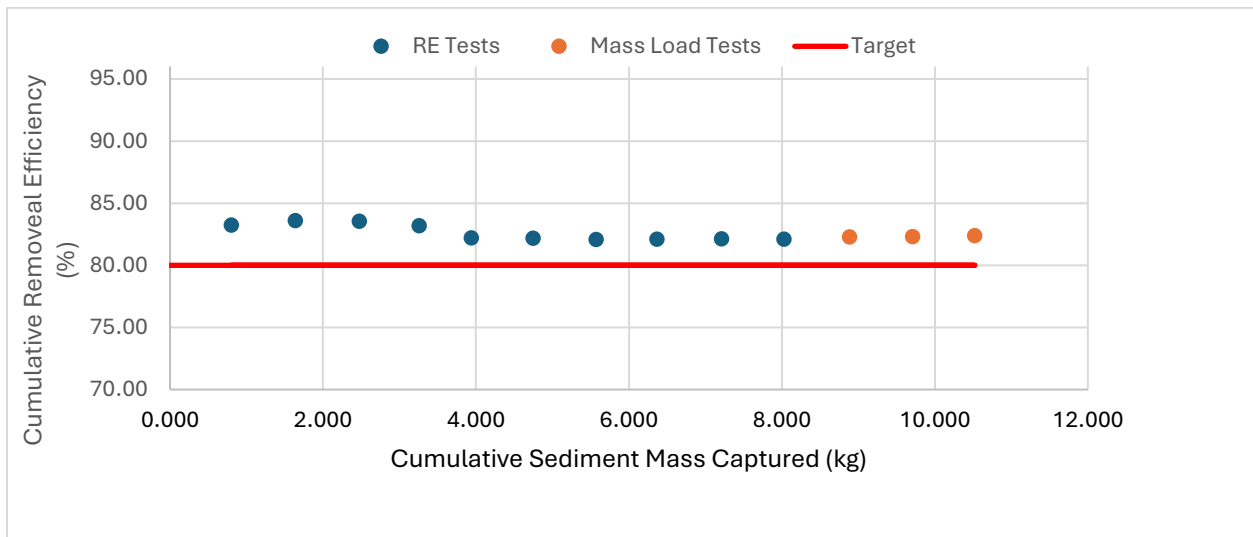


Figure 11. FIL-1.5 Cumulative Removal Efficiency vs Cumulative Sediment Mass Captured

Table 13. FIL-1.5 Sediment Mass Load Tests Background and Effluent Sediment Concentrations (mg/L)

Test ID		Individual Sample					Average
		1	2	3	4	5	
SML-1	Background	0.5		0.5		0.5	0.50
	Effluent	34	33	33	34	34	33.60
	Drawdown	23	17				20.00
SML-2	Background	0.5		1		0.5	0.67
	Effluent	36	35	36	35	35	35.40
	Drawdown	25	29				27.00
SML-3	Background	0.5		0.5		0.5	0.50
	Effluent	33	35	36	33	31	33.60
	Drawdown	19	16				17.50

Table 14. FIL-1.5 Summary of Sediment Mass Loading Results

Test ID	Dosing Water Volume (L)	Net Sediment Mass Injected (g)	Average Adjusted Effluent TSS (mg/L)	Effluent Mass (g)	Drawdown Volume (L)	Drawdown mass (g)	Mass Captured (g)	Test Removal Efficiency (%)	Cumulative Mass Captured (kg)	Cumulative Mass Injected (kg)	Cumulative Removal Efficiency (%)
SML-1	4733	1023	33.10	157	405	8	858	83.9	8.88	10.791	82.3
SML-2	4666	996	34.73	162	342	9	825	82.8	9.71	11.787	82.3
SML-3	4682	975	33.10	155	442	8	812	83.3	10.52	12.761	82.4

Testing Summary FIL-3.0

For the FIL-3.0 a total of 10 removal efficiency test runs, and 12 additional sediment mass loading capacity test runs were performed in accordance with the NJDEP Protocol. The target influent concentration was maintained at 200 mg/L for the 12 sediment mass loading capacity test runs. The target removal efficiency tests were conducted at 3 L/s (47.55 gpm) as were all of the sediment mass loading capacity tests. The driving head was not exceeded during the SML testing; however, TSS results were observed below the cumulative 80% Removal Efficiency requirement at Run 17. All tests met the requirements of the NJDEP protocol and the QA/QC parameters. **Table 15** (Flow Rate and Water Temperature) and **Table 16** (Feed Rate and Water Temperature) summarize the various QA/QC parameters recorded during the test runs.

Table 15. FIL -3.0 Summary of Flow Rate and Water Temperature

Test ID	QA/QC Pass/Fail	Target Inflow Rate (L/s)	Target Inflow Rate (gpm)	Average Inflow Rate (L/s)	Average Inflow Rate (gpm)	Inflow Rate COV (≤0.03)	Maximum Water Temperature (≤ 26.3 °C)	Maximum Water Temperature (≤ 80 °F)
1	PASS	3.0	47.55	2.992	47.430	0.0018	21.1	70.0
2	PASS	3.0	47.55	3.034	48.092	0.0080	21.3	70.3
3	PASS	3.0	47.55	3.005	47.625	0.0011	22.3	72.1
4	PASS	3.0	47.55	2.964	46.979	0.0086	22.3	72.1
5	PASS	3.0	47.55	3.014	47.779	0.0034	22.0	71.6
6	PASS	3.0	47.55	2.984	47.299	0.0038	22.3	72.1
7	PASS	3.0	47.55	2.996	47.483	0.0010	22.3	72.1
8	PASS	3.0	47.55	2.965	47.002	0.0082	22.5	72.5
9	PASS	3.0	47.55	3.006	47.643	0.0014	23.0	73.4
10	PASS	3.0	47.55	2.953	46.808	0.0111	23.0	73.4
SML-1	PASS	3.0	47.55	2.983	47.280	0.0040	23.3	73.9
SML-2	PASS	3.0	47.55	2.991	47.410	0.0021	23.7	74.7
SML-3	PASS	3.0	47.55	2.990	47.385	0.0025	23.7	74.7
SML-4	PASS	3.0	47.55	2.967	47.035	0.0077	24.0	75.2
SML-5	PASS	3.0	47.55	2.959	46.906	0.0097	24.0	75.2
SML-6	PASS	3.0	47.55	2.966	47.005	0.0082	23.7	74.7

Test ID	QA/QC Pass/Fail	Target Inflow Rate (L/s)	Target Inflow Rate (gpm)	Average Inflow Rate (L/s)	Average Inflow Rate (gpm)	Inflow Rate COV (≤0.03)	Maximum Water Temperature (≤ 26.3 °C)	Maximum Water Temperature (≤ 80 °F)
SML-7	PASS	3.0	47.55	2.969	47.066	0.0073	24.2	75.6
SML-8	PASS	3.0	47.55	3.008	47.680	0.0019	24.2	75.6
SML-9	PASS	3.0	47.55	3.087	48.930	0.0202	24.2	75.6
SML-10	PASS	3.0	47.55	3.033	48.068	0.0076	24.5	76.1
SML-11	PASS	3.0	47.55	3.013	47.754	0.0030	25.2	77.4
SML-12	PASS	3.0	47.55	3.009	47.692	0.0021	25.5	77.9

Table 16. FIL-3.0 Feed Rate and Concentration QA/QC Results

Test ID	QA/QC Pass/Fail	Target Inflow TSS (mg/L)	Average Influent TSS (mg/L) ($\pm 10\%$)	Dose Mass in Pipe & Auger (g)	Moisture Corrected Feed Rate (g/min)			Feed Rate COV (≤ 0.10)	Average Background TSS (mg/L)	Minimum TSS Sample Volume (mL) (>500 mL)
1	PASS	200	196.00	3	36.28	34.88	32.96	0.0480	0.5	512
2	PASS	200	189.92	3	35.00	34.10	33.54	0.0215	0.5	519
3	PASS	200	199.29	2	36.51	37.25	37.32	0.0121	0.5	512
4	PASS	200	209.27	3	36.38	37.60	35.54	0.0284	0.5	515
5	PASS	200	212.40	4	38.00	38.77	39.05	0.0141	0.5	556
6	PASS	200	204.92	3	37.43	34.76	35.02	0.0412	0.5	524
7	PASS	200	195.16	2	38.01	37.41	35.09	0.0418	0.5	527
8	PASS	200	203.83	3	37.53	36.89	35.49	0.0285	0.7	526
9	PASS	200	194.32	2	37.12	35.50	34.88	0.0323	0.5	526
10	PASS	200	198.17	2	35.63	36.34	35.22	0.0159	0.5	527
SML-1	PASS	200	216.28	3	35.08	38.48	37.18	0.0465	0.5	504
SML-2	PASS	200	206.00	5	38.10	35.58	35.78	0.0383	0.5	502
SML-3	PASS	200	211.75	3	37.16	36.07	37.21	0.0175	1.2	533
SML-4	PASS	200	202.85	5	33.87	37.59	35.54	0.0522	0.5	541
SML-5	PASS	200	207.41	4	35.55	38.13	35.86	0.0386	0.5	537
SML-6	PASS	200	212.76	4	38.10	38.87	36.10	0.0379	0.5	552
SML-7	PASS	200	216.15	5	39.03	35.76	34.57	0.0634	0.5	550
SML-8	PASS	200	200.92	4	37.97	38.46	34.56	0.0574	0.5	546
SML-9	PASS	200	213.04	3	35.35	39.03	40.33	0.0676	0.5	542
SML-10	PASS	200	213.70	4	38.26	40.38	39.22	0.0270	0.5	538
SML-11	PASS	200	213.36	4	35.54	34.52	37.54	0.0429	1.0	531
SML-12	PASS	200	201.63	5	36.93	37.07	33.80	0.0516	0.5	518

Removal Efficiency Results

Results from the 10 removal efficiency tests are shown in **Table 17** (Background and Effluent Sediment Concentrations) and **Table 18** (Summary of Removal Efficiency Test Results). The cumulative sediment removal efficiency at Run 10 of 82.9% exceeds the NJDEP protocol requirement of $\geq 80\%$.

Table 17. FIL-3.0 Background and Effluent Sediment Concentrations (mg/L)

Test ID		Individual Sample					Average
		1	2	3	4	5	
1	Background	0.5		0.5		0.5	0.5
	Effluent	30	30	34	32	31	31.4
	Drawdown	21	16				18.5
2	Background	0.5		0.5		0.5	0.5
	Effluent	35	36	37	35	34	35.4
	Drawdown	23	16				19.5
3	Background	0.5		0.5		0.5	0.5
	Effluent	35	35	30	36	38	34.8
	Drawdown	26	18				22.0
4	Background	0.5		0.5		0.5	0.5
	Effluent	38	43	38	38	38	39
	Drawdown	22	16				19.0
5	Background	0.5		0.5		0.5	0.5
	Effluent	43	43	44	43	43	43.2
	Drawdown	28	19				23.5
6	Background	0.5		0.5		0.5	0.5
	Effluent	38	37	37	36	36	36.8
	Drawdown	28	17				22.5
7	Background	0.5		0.5		0.5	0.5
	Effluent	7	7	9	7	8	7.6
	Drawdown	7	3				5.0
8	Background	1		0.5		0.5	0.67
	Effluent	34	19	17	12	12	18.8
	Drawdown	9	3				6.0

Test ID		Individual Sample					Average
		1	2	3	4	5	
9	Background	0.5		0.5		0.5	0.5
	Effluent	47	48	45	44	44	45.6
	Drawdown	28	18				23.0
10	Background	0.5		0.5		0.5	0.5
	Effluent	41	39	43	41	40	40.8
	Drawdown	27	22				24.5

Table 18. FIL-3.0 Summary of Removal Efficiency Test Results

Test ID	Dosing Water Volume (L)	Net Sediment Mass Injected (g)	Average Adjusted Effluent TSS (mg/L)	Drawdown Volume (L)	Average Drawdown Mass (g)	Effluent Mass (g)	Mass Captured (g)	Test Removal Efficiency (%)	Cumulative Mass Captured (kg)	Cumulative Mass Injected (kg)	Cumulative Removal Efficiency (%)
1	7212	1417	30.90	508	9	223	1185	83.63	1.185	1.417	83.6
2	7282	1387	34.90	760	14	254	1118	80.63	2.303	2.804	82.1
3	7196	1438	34.30	560	12	247	1179	82.00	3.482	4.241	82.1
4	7099	1489	38.50	741	14	273	1202	80.73	4.684	5.730	81.7
5	7219	1537	42.70	747	17	308	1212	78.83	5.896	7.268	81.1
6	7162	1471	36.30	506	11	260	1200	81.57	7.096	8.739	81.2
7	7190	1407	7.10	523	2	51	1353	96.20	8.449	10.145	83.3
8	7087	1449	18.13	510	3	129	1318	90.94	9.767	11.595	84.2
9	7199	1403	45.10	761	17	325	1061	75.63	10.828	12.997	83.3
10	7087	1408	40.30	498	12	286	1110	78.87	11.938	14.405	82.9

Sediment Mass Load Capacity Testing

After completion of the required 10 removal efficiency test runs, sediment feed rate, background, outlet and drawdown samples were collected via grab sampling for a further 12 sediment mass loading (SML) capacity test runs. The target influent concentration for the sediment mass load capacity testing was maintained at 200 mg/L. The maximum permitted HGL (1000 mm) was not reached during this testing. Cumulative removal efficiency dropped below 80% on Test 17. Due to the delay in receiving results from EAL, a further 5 test runs had already been completed and submitted for testing. Testing was suspended after 22 test runs. Only the results from tests 1-16 are reported for performance claims. These results are shown in **Table 19** (Background and Effluent Sediment Concentrations) and **Table 20** (Summary of Sediment Mass Loading Test Results). **Figure 12** plots cumulative removal efficiency vs sediment mass load captured.

Table 19. FIL-3.0 Background and Effluent Sediment Concentrations (mg/l)

Test ID		Individual Sample					Average
		1	2	3	4	5	
SML-1	Background	0.5		0.5		0.5	0.5
	Effluent	52	53	52	46	43	49.2
	Drawdown	33	24				28.5
SML-2	Background	0.5		0.5		0.5	0.5
	Effluent	44	36	33	39	42	38.8
	Drawdown	27	21				24.0
SML-3	Background	0.5		0.5		0.5	0.5
	Effluent	33	28	39	34	41	35
	Drawdown	31	25				28.0
SML-4	Background	0.5		0.5		0.5	0.5
	Effluent	63	62	68	54	43	58
	Drawdown	35	26				30.5
SML-5	Background	0.5		0.5		0.5	0.5
	Effluent	62	64	63	52	48	57.8
	Drawdown	35	25				30.0
SML-6	Background	0.5		0.5		0.5	0.5
	Effluent	51	61	63	58	57	58
	Drawdown	42	29				35.5
SML-7	Background	0.5		0.5		0.5	0.5
	Effluent	53	51	58	48	57	53.4
	Drawdown	33	31				32.0

Test ID		Individual Sample					Average
		1	2	3	4	5	
SML-8	Background	0.5		0.5		0.5	0.5
	Effluent	56	62	58	54	57	57.4
	Drawdown	36	28				32.0
SML-9	Background	0.5		0.5		0.5	0.5
	Effluent	42	53	51	53	55	50.8
	Drawdown	40	27				33.5
SML-10	Background	0.5		0.5		0.5	0.5
	Effluent	33	36	34	57	59	43.8
	Drawdown	35	25				30.0
SML-11	Background	2.0		0.5		0.5	1.0
	Effluent	9	5	12	5	6	7.4
	Drawdown	5	4				4.5
SML-12	Background	0.5		0.5		0.5	0.5
	Effluent	5	7	5	5	7	5.8
	Drawdown	4	4				4.0

Table 20. FIL-3.0 Summary of Sediment Mass Loading Test Results

Test ID	Dosing Water Volume (L)	Net Sediment Mass Injected (g)	Average Adjusted Effluent TSS (mg/L)	Effluent Mass (g)	Drawdown Volume (L)	Drawdown mass (g)	Mass Captured (g)	Test Removal Efficiency (%)	Cumulative Mass Captured (kg)	Cumulative Mass Injected (kg)	Cumulative Removal Efficiency (%)
SML-1	7129	1545	48.7	347	771	22	1176	76.14	13.114	15.950	82.2
SML-2	7179	1482	38.3	275	773	18	1189	80.23	14.303	17.432	82.1
SML-3	7175	1528	33.8	243	740	20	1265	82.80	15.568	18.966	82.1
SML-4	7122	1448	57.5	410	755	23	1016	70.16	16.584	20.408	81.3
SML-5	7102	1477	57.3	407	734	22	1048	70.97	17.632	21.885	80.6
SML-6	7132	1521	57.5	410	502	18	1093	71.88	18.725	23.406	80.0
SML-7	7127	1544	52.9	377	487	15	1152	74.59	19.877	24.950	79.7
SML-8	7220	1454	56.9	411	509	16	1027	70.65	20.904	26.404	79.2
SML-9	7393	1579	50.3	372	519	17	1190	75.36	22.094	27.983	79.0
SML-10	7263	1556	43.3	314	732	22	1220	78.40	23.314	29.539	78.9
SML-11	7216	1547	6.4	46	736	3	1498	96.85	24.812	31.086	79.8
SML-12	7221	1460	5.3	38	765	3	1419	97.20	26.231	32.546	80.6

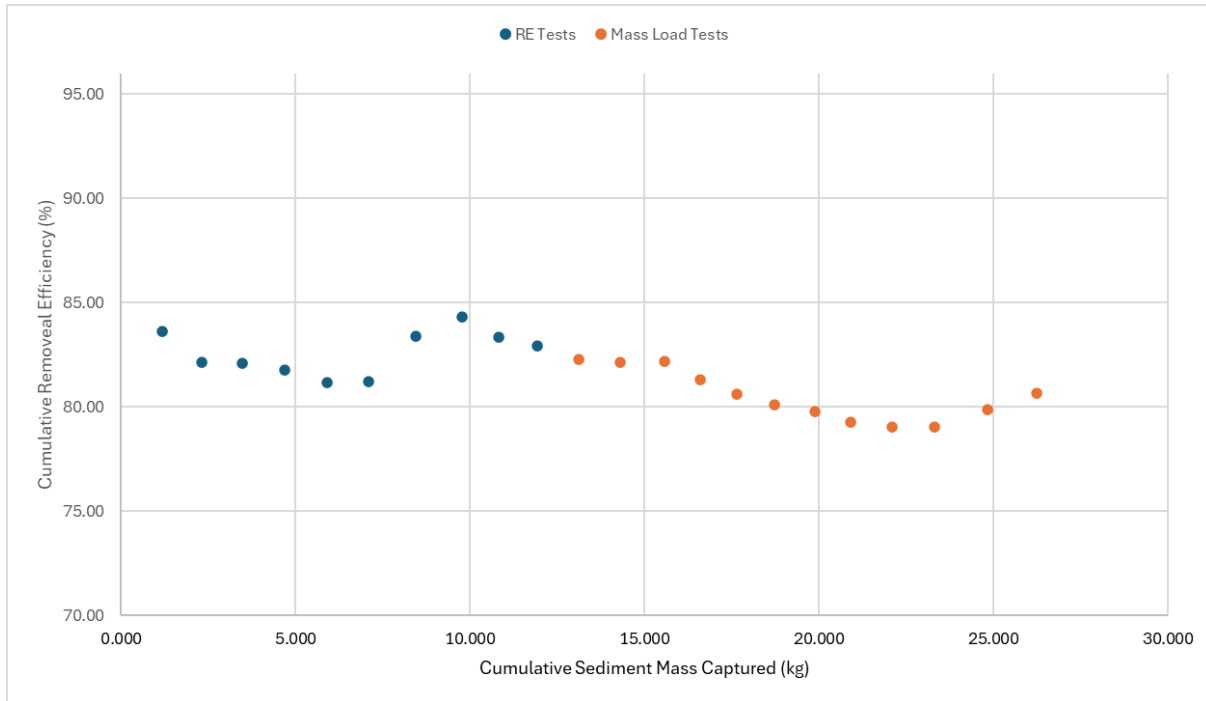


Figure 12. FIL-3.0 Cumulative Removal Efficiency vs Cumulative Sediment Mass Captured

4.4 Water Surface Level (Hydraulic Grade Line)

AtlanFilter FIL-1.5

Hydraulic grade was monitored for every test. The maximum level permitted before the internal bypass occurs is 1000 mm (39.37 inches). The operating level for the FIL-1.5 is specified by Atlan to be 650mm (25.6 inches). This level was not reached in any the 13 tests. The maximum water surface level (WSL) during each run along with the cumulative mass captured is shown in **Table 21** and plotted in **Figure 13**.

Table 21. FIL-1.5 Maximum WSL vs Cumulative Mass Captured

Test ID	Upstream Maximum WSL (mm)	Cumulative Mass Captured (kg)
1	637	0.80
2	643	1.64
3	626	2.48
4	620	3.26
5	644	3.94

Test ID	Upstream Maximum WSL (mm)	Cumulative Mass Captured (kg)
6	641	4.74
7	626	5.57
8	638	6.37
9	642	7.21
10	622	8.03
SML-1	644	8.88
SML-2	622	9.71
SML-3	623	10.52

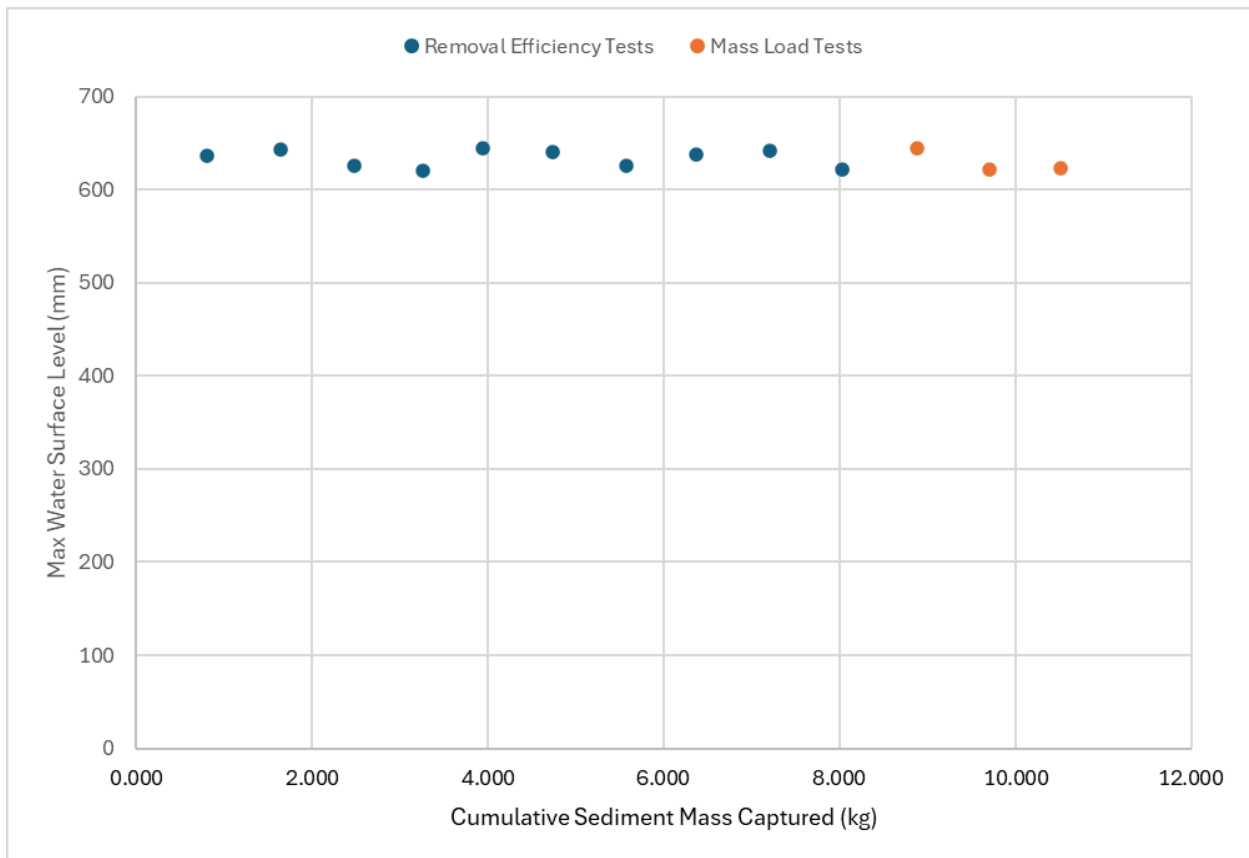


Figure 13. FIL-1.5 Maximum Water Surface Level vs Cumulative Sediment Mass Captured

AtlanFilter FIL-3.0

Hydraulic grade was monitored for every test. The maximum level permitted before the internal bypass occurs is 1000 mm (39.37 inches). This level was not reached at all in the 22 tests. The

maximum water surface level (WSL) during each run along with the cumulative mass captured is shown in **Table 22** and plotted in **Figure 14**.

Table 22. FIL-3.0 Maximum WSL vs Cumulative Mass Captured

Test ID	Upstream Maximum WSL (mm)	Cumulative Mass Captured (kg)
1	822	1.185
2	982	2.303
3	819	3.482
4	961	4.684
5	981	5.896
6	826	7.096
7	821	8.449
8	819	9.767
9	968	10.828
10	817	11.938
SML-1	968	13.115
SML-2	967	14.304
SML-3	951	15.569
SML-4	953	16.585
SML-5	934	17.633
SML-6	817	18.727
SML-7	814	19.878
SML-8	815	20.906
SML-9	814	22.096
SML-10	951	23.315
SML-11	970	24.813
SML-12	988	26.232

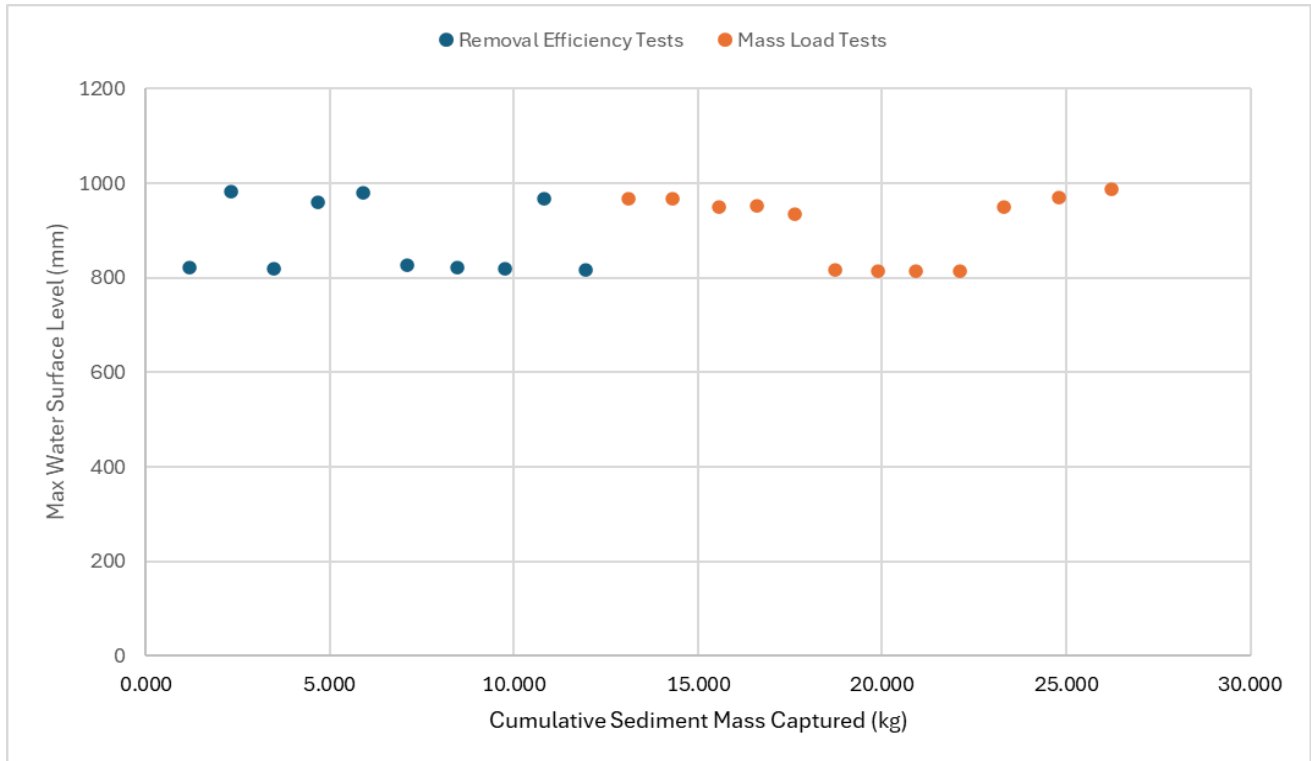


Figure 14. FIL-3.0 Maximum Water Surface Level vs Cumulative Sediment Mass Captured

5.0 Design Limitations

Required Soil Characteristics

The soil should be verified for its bearing capacity to ensure it is adequate for the required load prior to installation. The site shall be stabilized to achieve a non-erodible soil surface. Any topsoil removed during the excavation stage should be stockpiled and kept separate from subsoil or other materials. The AtlanFilter should not be installed on frozen ground.

Slope

The floor of the filter vault should have a maximum slope of 6 mm (0.24 inches) across its width and a downstream slope of 25 mm (0.98 inches) per 3.7 m (12.14 ft) of length. Here, "length" refers to a line from the outlet invert through the center of the vault, while "width" is perpendicular to this length.

Maximum Flow Rate

The maximum treatment flow rate of the AtlanFilter is dependent upon model (FIL-1.5 or FIL-3.0) and performance specifications.

Driving Head

The maximum driving head for AtlanFilter FIL-1.5 model is 650 mm (25.59 inches) FIL-3.0 model is 1000 mm (39.37 inches).

Installation Limitations

The AtlanFilter is supplied to the site in separate, easily identifiable components. An installation guide is also provided. The device can be installed by a civil or plumbing contractor, with an ATLAN representative present if necessary. Component maximum weights and required lifting sling information will be shared to the contractor prior to installation. An AtlanFilter FIL-3.0 weighs ~90kg (198 lbs) and an AtlanFilter FIL-1.5 weighs ~45kg (99 lbs).

Configurations

The AtlanFilter is designed solely for offline installations to minimize maintenance requirements and for optimal performance.

Structural Load Limitations

The AtlanFilter is assembled within a fully trafficable (HS-20), precast concrete chamber for underground installations on constrained sites, optimizing above land-use.

Pre-treatment Requirements

Pre-treatment is recommended, but not required, to keep gross pollutants from this device.

Depth to Seasonal High-Water Table

During installation, excavated areas with a high-water table should be continuously dewatered to ensure the site is stable and free of water. Wherever practicable, discharge outlets should be free-draining, without tailwater. AtlanFilters are bolted to the vault floor to resist buoyancy created during filling of the filter vault. Designers should perform their own calculations to confirm high groundwater will not float the entire AtlanFilter vault.

6.0 Maintenance

The AtlanFilter unit must be maintained in accordance with all relevant health and safety requirements including the use of personal protective equipment (PPE) and fall protection where required. It is generally recommended that inspection of the unit be undertaken every four months for the first year of operation. The schedule may then be relaxed after a year, when confidence is gained regarding the actual pollutant load and run-off generated by the upstream catchment.

Maintenance

Yearly maintenance involves removing the contents of the sump with a vacuum truck. A filter

exchange requirement will be triggered if the water level in the filter vault rises to the level of the overflow weir and remains more than 72 hours after rainfall. If this requirement is not triggered, the filters may remain until the following inspection period.

Expanded maintenance includes the above procedures as well as additional maintenance practices. Experience in the field has shown that every 6-8 years AtlanFilter cartridges require removing and replacement, though each site will require inspection to confirm activities subject to catchment loads. The inside of the concrete chamber should be thoroughly rinsed, and the residual material and water vacuumed out. The filters should be replaced with new items, and the old filters taken to the manufacturer for cleaning and replenishment.

Solids Disposal

Solids vacuumed from the device during maintenance including sediment, floatables, and gross pollutant debris can generally be disposed of at a local landfill in accordance with local regulations. The potential toxicity of the residues generated will vary based on the activities within the drainage area. If there is a possibility that the residues are hazardous, testing may be necessary. It is important to consult local regulatory authorities regarding proper disposal procedures in all instances.

Inspection / Maintenance

A detailed inspection procedure, operation and maintenance overview for the AtlanFilter can be found at: https://wp1.jensenprecast.com/wp-content/uploads/Atlan-Filter-Maintenance-Manual-US.pdf?_gl=1*wb1juq*_gcl_au*MTY1NDk1MzkzMC4xNzc3OTk4NDEw*_ga*Nzc0MzI2NjExLjE3NTE0MDE0NzM.*_ga_BT3ST125NV*czE3NzkzODczNTIkbzY0NyRnMSR0MTc3OTM4NzY1OCRqMzckbDAkaDA

7.0 Statements

The following signed statements from the manufacturer (ATLAN), independent testing laboratory (Waterlabs Australia), and NJCAT are required to complete the NJCAT verification process.



Waterlabs Australia Pty Ltd
4/54 Quilton Place, Crestmead, QLD 4132
info@waterlabs.com.au

Your Ref:

Dr Richard Magee
Executive Director
New Jersey Corporation for Advanced Technology
c/o Center for Environmental Systems
Stevens Institute of Technology
One Castle Point on Hudson
Hoboken, NJ 07030

**Verification of the ATLANFilter
Independent Test Facility Statement**

Dear Dr Richard Magee,

This correspondence is being sent in accordance with the *Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology; for use in accordance with the Stormwater Management Rules, N.J.A.C. 7:8, August 4, 2021.*

Compliance

As an Independent Third Party conducting the laboratory testing on behalf of ATLAN Stormwater Pty Ltd (trading as ATLAN), we can advise that all of the procedures and requirements identified in the aforementioned process document, and the *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device*, April 25, 2023, and the approved Quality Assurance Project Plan (v1, dated 27th August 2025) have been met or exceeded. The testing executed in the Waterlabs Australia laboratory in Crestmead, QLD, Australia from September to October of 2025, was conducted in full compliance with all applicable protocol and process criteria. We confirm that all the required documentation from the testing, and performance calculations have been provided with the supporting information.

ATLAN representatives were not present during testing.

All samples were tested by independent, external laboratories accredited under the National Association of Testing Authorities (NATA) scheme.

Conflicts of Interest

This letter also discloses that we, and our staff, have no conflicts of interest in performing the above testing. We have a consulting agreement with ATLAN for the ATLANFilter laboratory testing, and have historically provided field testing for ATLAN on the ATLANFilter for the Stormwater Australia, Stormwater Quality Improvement Device Evaluation Protocol (SQIDEP) process. We have no

ownership stake, do not receive sales commissions, do not have licensing agreements and do not receive funds or grants beyond those associated with the testing program.

Waterlabs Australia has provided professional services to other manufacturers of stormwater products with no history of conflicts of interest, or ethical disputes. Our work with each client is protected through non-disclosure agreements and is independent of the work for ATLAN.

Should you have any further queries or concerns, please don't hesitate to contact me on 0431 299 875.

Kind Regards,



Dr Darren Drapper,
B.Eng[Env] Hons, PhD[EnvEng], MBA, Cert IV [WHS], MIEAust, CPEng, RPEQ.
Principal Engineer
Waterlabs Australia



Dr Richard Magee
Executive Director
New Jersey Corporation for Advanced Technology
c/o Center for Environmental Systems
Stevens Institute of Technology
One Castle Point on Hudson
Hoboken, NJ 07030

November 04, 2025

Re: Verification of the ATLAN Filter 850 model

Dear Dr. Richard Magee,

This correspondence is provided in accordance with the *Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from the New Jersey Corporation for Advanced Technology*, for use under the *Stormwater Management Rules, N.J.A.C. 7:8* (August 4, 2021; updated April 25, 2023).

As required by the process document, manufacturers must submit a signed statement confirming that all procedures and requirements outlined therein—and in the *New Jersey Department of Environmental Protection (NJDEP) Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device* (August 4, 2021; updated April 25, 2023)—have been met.

We confirm that testing conducted at Waterlabs Australia in Brisbane, QLD, on the ATLAN Filter 850 model during September and October 2025, under the direct supervision of Dr. Darren Drapper, Principal Engineer at Waterlabs Australia, was performed in full compliance with all applicable protocol and process criteria. Furthermore, we confirm that all required documentation of the testing procedures and performance calculations is included in the accompanying submittal.

Please do not hesitate to contact me should you have any questions or require additional information.

Yours sincerely,

Signed by:

DF4F7199FFDE480...
Mr Andy Hornbuckle
Chief Executive Officer
ATLAN Stormwater



**Rutgers EcoComplex
1200 Florence Columbus Rd
Bordentown, NJ 08505-4200**

May 11, 2026

Gabriel Mahon, Chief
NJDEP
Bureau of Non-Point Pollution Control
Division of Water Quality
401 E. State Street
Mail Code 401-02B, PO Box 420
Trenton, NJ 08625-0420

Dear Mr. Mahon,

My review, evaluation and assessment covered the performance testing conducted on a commercially available AtlanFilter FIL-1.5 and FIL-3.0 cartridges by Waterlabs Australia (WLA) at the company's full-scale hydraulic testing facility in Brisbane, Australia under the direction of Dr Darren Drapper. WLA is an independent, third party hydraulics laboratory that provides testing services to external clients. The laboratory testing was conducted in accordance with the protocol requirements contained in the "*New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device*" (NJDEP Filtration Protocol, January 14, 2022, updated April 25, 2023). The protocol requirements were met or exceeded.

Specifically:

Test Sediment Feed

The test sediment is a commercial brand of ground silica known as Sil-Co-Sil 106, blended with a sieved silica sand to simulate the NJDEP required particle size distribution. This material has a specific gravity of 2.65. The particle size distribution (PSD) was independently verified by ALS Environmental (ALS) to demonstrate that the test sediment meets the specifications as detailed in Section 4 of the NJDEP Protocol (**Table 4**). ALS Environmental is accredited with the National Association of Testing Authorities (NATA) for PSD testing in accordance with AS1289 3.6.1 (sieve) and AS1289 3.6.3 (hydrometer) analysis. Three (3) samples were tested using the above methods. With a d_{50} of 50 μm , the test sediment was significantly finer than the sediment required by the NJDEP test protocol (<75 μm).

Removal Efficiency (RE) Testing

Ten (10) removal efficiency test runs were completed in accordance with the NJDEP test protocol. The target flow rate and influent sediment concentration were 1.5 L/s (23.8 gpm) and 3 L/s (47.55 gpm) and 200 mg/L for the removal efficiency testing. The AtlanFilter FIL-1.5 and FIL-3.0 cartridges achieved a cumulative removal efficiency of 82.1% and 82.9% respectively for the 10 required sediment removal runs both rounded down to 80% per the NJDEP protocol. The temperature for all test runs did not exceed 80 degrees Fahrenheit.

Sediment Mass Loading Capacity

Mass loading capacity testing was conducted as a continuation of removal efficiency testing . Mass loading test runs were conducted using identical testing procedures and flow rate target as those used in the removal efficiency runs. ATLAN made the decision to terminate testing on the FIL-1.5 before the sediment mass loading capacity was reached. Additional testing would have increased the mass capture capacity of the cartridge. For the FIL-3.0 the maximum permitted HGL (1000 mm), was not reached during this testing. However, cumulative removal efficiency dropped below 80% on Test 17. Due to the delay in receiving results from EAL, an additional 5 test runs had already been completed and submitted for TSS testing. Testing was suspended after 22 test runs. Only the results from tests 1-16 are reported for performance claims. The temperature for all test runs did not exceed 80 degrees Fahrenheit. Based on laboratory testing results, the AtlanFilter FIL-1.5 has a mass loading capacity of 28.13 lbs (12.76 kg) and a mass loading capture capacity of 23.10 lbs (10.52 kg) and the FIL-3.0 has a mass loading capacity of 51.59 lbs (23.407 kg) and a mass loading capture capacity of 41.29 lbs (18.727 kg).

Scour Testing

No scour testing was performed on the AtlanFilter since it is designed for offline installation.

Sincerely,



Richard S. Magee, Sc.D., P.E., BCEE
Executive Director

8.0 References

NJDEP 2021. *New Jersey Department of Environmental Protection Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology*. Trenton, NJ. August 4, 2021.

NJDEP 2022. *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device*. Trenton, NJ. January 14, 2022 (Updated April 25, 2023).

VERIFICATION APPENDIX

Introduction

- Manufacturer of the AtlanFilter®–ATLAN Stormwater Pty Ltd, 30 Technology Drive, Augustine Heights, QLD, 4300, AUSTRALIA. Phone: +61 1300 773 500. www.atlan.com.au
- MTD: The AtlanFilter cartridges (Models FIL-1.5 and FIL-3.0) design specifications are listed in **Table A-1**. These cartridges can be installed in any sized vault as long as the critical ratios of MTFR:EFTA, ESTA:EFTA, and WV:EFTA are met or exceeded.
- TSS Removal Rate: 80%
- The AtlanFilter is qualified for offline installation for the New Jersey Water Quality Design Storm (NJWQDS).

Detailed Specification

The AtlanFilter FIL-1.5 cartridge has a mass loading capture capacity of 23.19 lbs (10.52 kg). The maximum inflow drainage area for the tested system is 0.039 acres. The AtlanFilter FIL-3.0 cartridge has a mass loading capture capacity of 41.29 lbs (18.727 kg). The maximum inflow drainage area for the tested system is 0.069 acres.

- Prior to installation, Atlan provides contractors with detailed installation and assembly instructions and is available to consult on site during installation.
- The AtlanFilter Operations & Maintenance Guide may be found at: https://wp1.jensenprecast.com/wp-content/uploads/Atlan-Filter-Maintenance-Manual-US.pdf?_gl=1*_wb1juq*_gcl_au*MTY1NDk1MzkzMC4xNzc3OTk4NDEw*_ga*Nzc0MzI2NjExLjE3NTE0MDE0NzM.*_ga_BT3ST125NV*czE3NzkzODczNTIkbzY0NyRnMSR0MTc3OTM4NzY1OCRqMzckbDAkaDA

Table A-1. AtlanFilter Model Design Specifications*

Model	MFTR (L/s)	MFTR (gpm)	EFTA¹ (m²)	EFTA¹ (ft²)	ESTA² (m²)	ESTA² (ft²)	WV³ (m³)	WV³ (gal)	MTFR:EFTA (L/s/m²)	ESTA:EFTA	WV:EFTA	Mass Load Captured⁴ (lbs)	ACRES⁵
FIL- 1.5 model	1.5	23.78	0.419	4.51	1.044	11.24	0.679	179.3	3.579	2.492	1.620	23.19	0.039
FIL- 3.0 model	3	47.55	0.419	4.51	1.044	11.24	1.044	275.8	7.160	2.492	2.492	41.29	0.069

- 1. EFTA – Effective Filtration Treatment Area** – The base area of the cartridge where water enters the media.
- 2. ESTA – Effective Sedimentation Treatment Area** – The minimum area that must be provided for an individual filter cartridge.
- 3. WV – Wet Volume** – The maximum water volume required by a single filter cartridge during a filtration run.
- 4. Mass Load Captured** – determined from testing of both FIL-3.0 and FIL-1.5 models.
- 5. ACRES** – The drainage area based on the equation in the NJDEP Filtration protocol wherein drainage area is calculated by dividing the pounds of mass captured by 600 lb/acre.

***Filters can be installed in any sized vault as long as the above ratios are maintained.**

Table A-2. AtlanFilter Typical Configuration

AtlanFilter Models	Internal Width (or diam.) (ft)	Internal Length (ft)	Effective Sedimentation Treatment Area (ESTA) (m²)	Effective Sedimentation Treatment Area (ESTA) (ft²)	Treatment Flow Rate (L/s)	Treatment Flow Rate (gpm)	MTFR:ESTA (L/s/m²)	Maximum Allowable Drainage Area (ac)
FIL-1.5-1*	3.28	3.43	1.04	11.24	1.5	23.8	1.437	0.039
AF-MH-48	4.00	n/a	1.17	12.57	1.5	23.8	1.285	0.039
AF-MH-60	5.00	n/a	1.82	19.63	1.5	23.8	0.822	0.039
AF-MH-72	6.00	n/a	2.63	28.27	3	47.6	1.142	0.078
AF-MH-96	8.00	n/a	4.67	50.27	6	95.1	1.285	0.156
AF-PD-6-8	6.00	6.00	3.34	36.00	4.5	71.3	1.345	0.117
AF-PD-6-12	6.00	8.00	4.46	48.00	6	95.1	1.345	0.156
AF-PD-8-12	8.00	8.00	5.95	64.00	7.5	118.9	1.261	0.195
AF-PD-8-14	8.00	10.00	7.43	80.00	10.5	166.4	1.413	0.273
AF-PD-8-16	8.00	12.00	8.92	96.00	12	190.2	1.345	0.312
AF-PD-8-18	8.00	14.00	10.41	112.00	15	237.8	1.442	0.390
AF-PD-8-20	8.00	16.00	11.89	128.00	16.5	261.5	1.388	0.429
AF-PD-8-22	8.00	18.00	13.38	144.00	18	285.3	1.345	0.468
FIL-3.0-1*	3.28	3.43	1.04	11.24	3	0.1059	2.874	0.069
AF-MH-48	4.00	n/a	1.17	12.57	3	47.6	2.570	0.069
AF-MH-60	5.00	n/a	1.82	19.63	3	47.6	1.645	0.069
AF-MH-72	6.00	n/a	2.63	28.27	6	95.1	2.284	0.138
AF-MH-96	8.00	n/a	4.67	50.27	12	190.2	2.570	0.276
AF-PD-6-8	6.00	6.00	3.34	36.00	9	142.7	2.691	0.207

AtlanFilter Models	Internal Width (or diam.) (ft)	Internal Length (ft)	Effective Sedimentation Treatment Area (ESTA) (m²)	Effective Sedimentation Treatment Area (ESTA) (ft²)	Treatment Flow Rate (L/s)	Treatment Flow Rate (gpm)	MTFR:ESTA (L/s/m²)	Maximum Allowable Drainage Area (ac)
AF-PD-6-12	6.00	8.00	4.46	48.00	12	190.2	2.691	0.276
AF-PD-8-12	8.00	8.00	5.95	64.00	15	237.8	2.523	0.345
AF-PD-8-14	8.00	10.00	7.43	80.00	21	332.9	2.826	0.483
AF-PD-8-16	8.00	12.00	8.92	96.00	24	380.4	2.691	0.552
AF-PD-8-18	8.00	14.00	10.41	112.00	30	475.5	2.883	0.69
AF-PD-8-20	8.00	16.00	11.89	128.00	33	523.1	2.775	0.759
AF-PD-8-22	8.00	18.00	13.38	144.00	36	570.6	2.691	0.828

***tested unit**