

# FILTERRA®: ANALYSIS OF LONG-TERM PERFORMANCE [REPORT SUMMARY]

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**DETERMINING THE LONG-TERM PERFORMANCE OF FILTERRA BIORETENTION  
A 13-YEAR-STUDY OF FILTERRA’ S HYDRAULIC AND POLLUTANT REMOVAL PERFORMANCE**



The performance of the Filterra® system, a high rate biofiltration system, has been established through short-term (1-3 years) third-party verified field studies and documented in the [International Stormwater BMP \(Best Management Practice\) Database](#), a clearinghouse for test results from stormwater BMP field performance studies.

Included in the summary report of the BMP Database is performance data for Bioretention (BR) and High Rate Biofiltration (HRBF) which are defined as follows:

“Bioretention - Shallow, vegetated basins with a variety of planting/filtration media and often including underdrains. Also called rain gardens and biofiltration”

“High Rate Biofiltration - Manufactured devices with high-rate filtration media that support plants.”

Although there are several proprietary biofiltration systems commercially available, the data for HRBF in the summary report is entirely comprised of results from 6 Filterra sites, since that was the only proprietary biofilter data in the database at the time of the report.

***The 2020 summary report concludes that both Bioretention (BR) and High Rate Biofiltration (HRBF) provide significant removal of TSS. High Rate Biofiltration also provides significant reduction in total phosphorus concentration, but runoff treated by Bioretention shows a significant increase in total phosphorus (Table 1).***

**Table 1.** Bioretention and high rate biofiltration performance for TSS and total phosphorus from the 2020 Summary Statistics Report by the International Stormwater BMP Database

Parameter		TSS		Total Phosphorus	
Units		(mg/L)		(mg/L)	
Stormwater Control Measure		BR	HRBF	BR	HRBF
Median Value	Influent	44	30.8	0.19	0.099
	Effluent	10	3.8	0.24	0.05
Significant Median Value Reduction (Mann Whitney P-value 0.05)		Yes	Yes	Significant export	Yes

**However, if we are truly concerned with protecting our water quality, we need to determine how the Filterra media, which is expected to last decade without replacement, would provide consistent water quality and hydraulic performance over the long term.**

**TEST SITES**

To answer these questions, three Filterra systems located in Maryland and Virginia were studied over 3 to 13 years. These systems differed in terms of age, size, and land use. Pollutants monitored varied by site; and included total suspended solids (TSS), phosphorus, nitrogen, heavy metals, and oil and grease.

**Table 2:** Filterra Study Test Sites

Study Site ID	A	B	C
Land Use	Restaurant Commercial Parking Lot	Oil Service Station Commercial Parking Lot	Gas Station Retail Area
Location	Virginia Beach, VA	Baltimore, MD	Hampton, VA
System Size (ft.)	6x4	6x6	6x8
Plant Type	Nellie Stevens Holly	Northern Bayberry	Red Twig Dogwood, Foster Holly
Activation Date	4/13/2007	6/1/2005	5/27/2005
Time Monitored (yrs.)	10	3	13

Grab samples were collected following EPA sampling guidance (1992). Samples were collected near the beginning of the storm to capture the pollutant first flush. Sample collection and analysis was performed by Universal Laboratories at study sites A and C and Microbac Laboratories at study site B.

**TEST RESULTS – POLLUTANT REMOVAL**

The tests show Filterra long-term performance is similar to short-term (1-3 year), third-party verified Filterra field studies for TSS, phosphorus, copper and zinc per the 2020 International BMP Database.

- Filterra long-term performance meets or exceeds conventional bioretention performance with each system type providing significant reduction in TSS, total and dissolved zinc, and total copper.
- Filterra demonstrated significant total phosphorus and dissolved copper reduction while conventional bioretention showed insignificant dissolved copper removal and a net export of phosphorus (Clary et al. 2020).
- Filterra performance should remain consistent over time with routine maintenance based on long-term quality and hydraulic performance, and media composition analysis.

**Table 3.** Filterra long-term performance versus high rate biofiltration performance as reported in the 2020 Summary Statistics Report by the International Stormwater BMP Database.

Parameter	TSS		Total Phosphorus		Total Copper		Total Zinc		
	(mg/L)		(mg/L)		(µg/L)		(µg/L)		
Stormwater Control Measure	High Rate Biofiltration	Filterra Long-Term Performance							
Median Value	Influent	30.8	31.2	0.099	0.1	7.95	29	178	140
	Effluent	3.8	3.6	0.05	0.05	3.75	10	60.6	46
Significant Median	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

## TEST RESULTS – HYDRAULIC PERFORMANCE

Field hydraulic evaluation was performed in July 2021 on the 14-year-old Filterra system at study site A. The media flow rate was tested after completion of the pollutant removal testing to establish a worst-case scenario. The site was originally designed based on a media flow rate of 100"/hr.

The evaluation was based on a protocol developed with Geosyntec Consultants. Samples were analyzed for particle size analysis via following ASTM standards.

The tests resulted in an unsaturated median rate (a measurement of the flow through the system when water begins to enter the system up to the point that the media is fully saturated) of 177"/hr., proving that the system continues to outperform expectations even after 14 years. The saturated median media flow rate of 107"/hr. also meets the original design flow rate.



## CONCLUSION

Engineers and Regulators can have confidence in the long-term pollutant removal and hydraulic performance of Filterra.

TO READ THE COMPLETE REPORT, PLEASE VISIT [WWW.CONTECHES.COM/FILTERRA](http://WWW.CONTECHES.COM/FILTERRA).