

REMOVAL RATES FOR URBAN STORMWATER RETROFIT PROJECTS

The Chesapeake Bay Program recently approved a new protocol to determine removal rates for urban stormwater retrofit projects. The protocol and the rationale for developing it are explained in detail in the [final report](#)¹ available through the Chesapeake Stormwater Network website: chesapeakestormwater.net. This fact sheet has been created by HRPDC staff to summarize the report’s recommendations and explain how designers can determine nutrient and sediment removal rates for urban stormwater retrofits. Several regulatory drivers, including new municipal stormwater permits, local TMDLs, and the Bay TMDL are likely to increase stormwater retrofit implementation across the Bay watershed.

DEFINITION:

Stormwater retrofits are a diverse group of projects that provide nutrient and sediment reductions on existing development that is currently untreated by any BMP or is inadequately treated by an existing BMP. There are two broad categories of stormwater retrofits, as described in Table 1.

TABLE 1	Retrofit Categories	
	New Retrofit Facilities	Retrofits of Existing BMPs*
	New BMPs that treat existing developed land that is not currently receiving stormwater treatment	Convert into a new type of BMP
		Enhance the BMP by increasing treatment volume and/or hydraulic retention time

*Although the Recommendations of the Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects also lists scenarios where permittees may receive credit for BMP restoration, any effort that only restores a BMP to its original design capacity will not be credited in VA.

PROTOCOL:

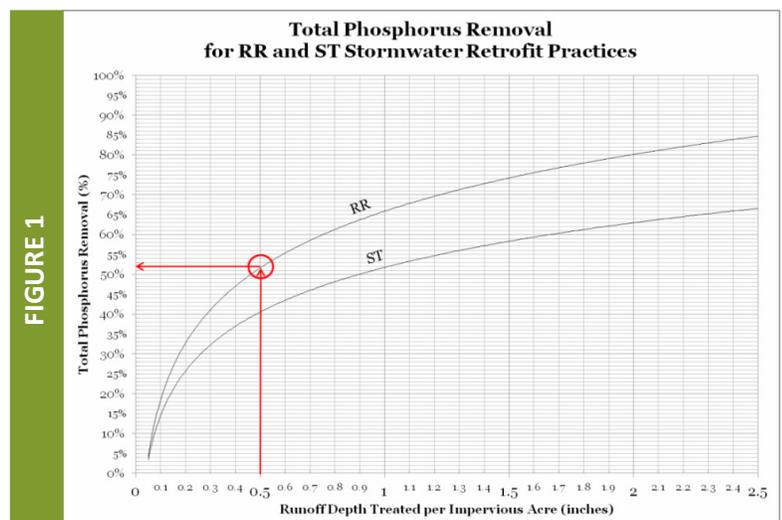
Due to the diversity of potential retrofit applications, the Panel elected to develop a protocol whereby the removal rate for each project is determined by the amount of runoff it treats and the degree of runoff reduction it provides. Following an extensive review of recent BMP performance research, the Panel developed a series of retrofit removal adjustor curves to define sediment, N, and P removal rates. Then, the Panel developed specific calculation methods tailored for different retrofit categories.

IMPACT TO RETROFIT DESIGNERS:

The designer must first estimate the Runoff Storage (RS) volume in acre-feet. This, along with the Impervious Area (IA) in acres, is used to calculate the following:

$$\text{Runoff Depth Treated per Impervious Acre (inches)} = \frac{(\text{RS})(12)}{\text{IA}}$$

Refer to Figure 1, the Total Phosphorous Removal Curve, for an example of the removal adjustor curves. There are additional curves for Total Nitrogen and Sediment Removal. The runoff depth provides the value for the x-axis of the curves and the percent removal of the pollutant of concern is along the y-axis. The designer then determines if the project is classified as having runoff reduction (RR) or stormwater treatment (ST) capability, which dictates the specific curve to use. Retrofit projects that achieve at least a 25% reduction of the annual runoff volume are classified as providing RR, and therefore earn a higher net removal rate. ST projects that employ a permanent pool, constructed wetlands or sand filters have less runoff reduction capability, and the removal rate is determined using the ST curve. Table 2 assigns stormwater practices into each category.



Classification of BMPs Based on Runoff Reduction Capability	
Runoff Reduction (RR) Practices ¹	Stormwater Treatment (ST) Practices
Site Design and Non-structural practices ²	Constructed wetlands
Bioretention/ rain garden	Filtering practices
Dry swale	Manufactured BMPs
Expanded tree pits	Retention ponds
Grass channels	Wet swale
Green roofs	
Green streets	
Infiltration practices	
Permeable pavement	
Rainwater harvesting	

¹Corresponds to the RR and ST curves in Figure 1. ²Examples include reforestation, riparian buffer restoration, rooftop disconnection, etc.

IMPORTANT NOTES REGARDING REMOVAL RATES:

- If the BMP project treats the runoff from 1 inch of rainfall, the VA BMP Clearinghouse specifications can be used in lieu of the Bay Program retrofit curves to determine pollutant removal.
- The removal rate will be limited to 10 years, although it can be renewed based on field inspection that verifies the retrofit still exists, is adequately maintained, and operating as designed.
- Nutrients removed by retrofit projects cannot be counted toward meeting Bay TMDL WIP requirements if the retrofit project is built to offset, compensate, or otherwise mitigate for a lack of compliance with new development stormwater performance standards elsewhere in the jurisdiction.
- No pollutant removal rates are given for routine maintenance of existing BMPs.
- The project file, including construction drawings, as-built surveys, photos, maintenance agreement, and inspection records, shall be maintained for the lifetime in which the removal rate will be claimed.

REPORTING:

The Panel recommends that the following reporting data be submitted for each individual urban retrofit project:

- Retrofit class
- GPS coordinates
- Year of installation and expected duration
- 12-digit watershed in which it is located
- Total drainage area and impervious cover area treated
- Runoff volume treated and identify type of BMP
- Projected TSS, N, and P removal rates

For details regarding crediting BMP enhancements and conversions in Virginia, refer to Appendix V.D of the *Final Chesapeake Bay TMDL Action Plan Guidance*. The following data should be reported to VADEQ:

- Visual inspection checklist(s)
- Pollutant removal credit for BMP enhancement and conversions should be calculated using an incremental rate (enhanced BMP efficiency minus existing BMP efficiency)
- Document explaining how BMP modification decisions were made using best professional judgment
- Determine which era the existing BMP was constructed in and apply modifications in 10% increments accordingly and submit

Sample Modification Table/Spreadsheet					
BMP Type	BMP Location	BMP Era	Modification Applied (%)	Design Criteria	Modification Applied (%)
Dry Pond		1991 - 1999	10	Missing Sediment Forebay	10
				No Riser Outlet Protection	10

¹Final CBP Approved Expert Panel Report on Stormwater Retrofits: <http://chesapeakestormwater.net/bay-stormwater/baywide-stormwater-policy/urban-stormwater-workgroup/retrofits/>