Retrofit Sizing and Crediting

This section provides guidance on sizing of stormwater retrofits and quantifying the benefits of retrofits (i.e., credits) in terms of disconnecting and reducing DCIA.

Stormwater BMP Performance Curves

As introduced in Chapter 4 - Stormwater Management Standards and Performance Criteria, the EPA Region 1 stormwater BMP performance curves can be used to help select, size, and quantify the pollutant reduction benefits of stormwater retrofits. Use of the performance curves is becoming widely accepted in New England for sizing and quantifying the benefits of stormwater BMPs in general, including retrofit applications.

Benefits of Using Performance Curves for Stormwater Retrofit Design

The curves (SNEP Network, 2022):

- Are highly flexible to accommodate site constraints.
- Encourage the use of multiple smaller BMPs when larger retrofits are not feasible.
- Credit a range of sizes including smaller sizes.
- Credit a range of pollutants to help connect performance with specific pollutant goals.
- Allow for crediting non-conforming designs (i.e., designs that cannot fully meet the stormwater management standards, performance criteria, and design guidance).
- Allow for crediting existing systems as they are currently functioning.
- Support optimization and cost-effective designs.
- Are based on the most recent stormwater BMP performance data.

The performance curves provide estimates of the long-term cumulative pollutant removal performance of a BMP as a function of the BMP size (physical storage capacity). The performance curves relate the depth of runoff treated from the impervious area to average annual pollutant reduction for various types of structural stormwater BMPs and stormwater pollutants (TSS, TP, TN, Zinc, and fecal indicator bacteria). The curves can be used to size stormwater BMPs and to quantify the pollutant removal benefit (i.e., credit) for a range of sizes and types of BMPs.

Chapter 4 - Stormwater Management Standards and Performance Criteria provides an overview of the performance curves, how they were developed, and their basic use for quantifying the pollutant reduction benefits of structural stormwater BMPs and documenting compliance with the minimum required pollutant load reductions when the Required Retention Volume cannot be retained on-site. Appendix C provides the corresponding EPA stormwater BMP performance curves and equations for calculating the static storage volume for each type of structural stormwater BMP presented in this Manual.

The Stormwater Retrofit Manual developed by the Southeast New England Program (SNEP) Network in collaboration with the University of New Hampshire Stormwater Center, EPA Region 1, and state agencies and the other information sources listed at the end of this chapter provide additional information on the use of stormwater BMP performance curves for retrofit design.

Retrofit Sizing Guidance

In retrofit settings, similar to new development and redevelopment applications, stormwater BMPs should be designed to meet the retention and treatment requirements of Standard 1 – Runoff Volume and Pollutant Reduction as follows (refer to Table 4-2 in Chapter 4):

- Retain on-site the applicable post-development stormwater runoff volume (i.e., the "Required Retention Volume"), which is equal to 100% or 50% of the site's Water Quality Volume (WQV) depending on the existing DCIA of the site and the amount of proposed land disturbance. When the Required Retention Volume is retained on-site using suitable stormwater retention practices (refer to Table 8- 1.), the retrofit is presumed to meet or exceed the minimum required average annual pollutant load reductions for TSS, TP, and TN, as described in Chapter 4 - Stormwater Management Standards and Performance Criteria.

- In cases where the volume of stormwater runoff retained on-site does not fully meet the Required Retention Volume due to physical site constraints or other factors, retain runoff on-site to the "Maximum Extent Achievable" (for the definition see Standard 1 Section of Chapter 4) and provide additional stormwater treatment without retention for the post-development runoff volume above that which can be retained up to 100% of the site's WQV.

- In cases where the additional stormwater treatment requirement cannot be achieved on-site, provide stormwater treatment to the "Maximum Extent Achievable."

Where stormwater treatment is proposed in addition to or in lieu of stormwater retention (i.e., when the retrofit cannot fully meet the retention requirement), the designer should use the stormwater BMP performance curves to:

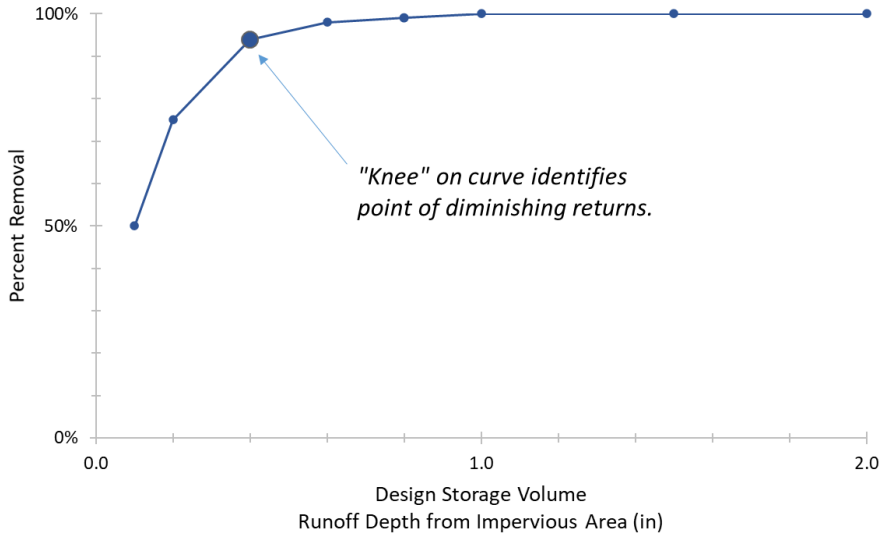
- Optimize retrofit sizing based on anticipated pollutant reduction performance, and

- Document that the proposed retrofit meets or exceeds the minimum required average annual pollutant load reductions for TSS, TP, and TN, as described in Chapter 4 - Stormwater Management Standards and Performance Criteria and Appendix C – BMP Performance Curves and Static Storage Volume Calculation Methods

The performance curves show significant pollutant reduction for design storage volumes in the smaller range (0.1 to 0.5-inch over the contributing impervious area), providing flexibility for retrofits that cannot fully meet the retention and/or treatment requirements. Stormwater BMPs with a design storage volume smaller than 0.1 inch likely do not provide sufficient pollutant reduction benefit due to their lack of capacity to capture, hold, and treat stormwater and therefore are not recommended. Structural stormwater BMPs sized to store less than the WQV can still achieve substantial pollutant load reductions, which allows for the use of smaller structural controls for retrofit applications and on sites with limited space and other physical constraints, while still meeting pollutant removal goals.

Furthermore, the performance curves show that stormwater BMPs provide diminishing pollutant reduction benefits above a certain size (the "knee" of the curve – see Figure 9-1 for an example). Some curves are steeper and have a more obvious point of diminishing returns while some are flatter and show more gradual increases in performance. The knee of the curve is typically in the range of 0.35 to 0.5 inches of runoff over the impervious area for all pollutants and BMP types.[70]

Figure 9-1. Example of Stormwater BMP Performance Curve Showing Point of Optimal Pollutant Load Reduction Performance (Knee of the Curve)[68]



It is important to note the following issues regarding use of the performance curves for retrofit sizing:

- While the knee of the curve represents a point of diminishing returns in terms of cost-effectiveness, the design storage volume corresponding to the knee may not achieve the minimum required average annual pollutant load reductions as outlined in Chapter 4 - Stormwater Management Standards and Performance Criteria, in which case larger design storage volumes may be necessary to demonstrate compliance with Standard 1.

- The performance curves provide flexibility to select and size retrofits in a cost-effective manner, but the curves should not be used to minimize treatment. Instead, they should be used to maximize/optimize retention and treatment performance given physical site constraints. The performance curves provide a basis for justifying the use of smaller retrofits strictly in terms of pollutant load reduction, but their use is not meant to replace the retention standard and associated design guidance described in Chapter 4 - Stormwater Management Standards and Performance Criteria and elsewhere in this Manual. On-site retention of stormwater volumes up to the Required Retention Volume

[70] Southeast New England Program (SNEP) Network. 2022. *Stormwater Retrofit Manual.* Developed in conjunction with University of New Hampshire Stormwater Center, EPA Region 1, and state agencies.

(100% or 50% of the site's WQV) is important to maintain or restore pre-development /hydrology (i.e., volume, rate, and temperature of runoff) and groundwater recharge, in addition to providing pollutant load reduction benefits.

Getting Credit for Retrofits – DCIA Disconnection

DCIA is considered disconnected when the appropriate portion of the Water Quality Volume has been retained and/or treated as described in Chapter 4 - Stormwater Management Standards and Performance Criteria. This can be accomplished by using any of the stormwater retrofit types described previously in this chapter, including impervious area conversion, impervious area (simple) disconnection, new structural stormwater BMPs, and modifying existing stormwater BMPs.

Each type of retrofit must meet specific criteria and conditions to receive credit for DCIA disconnection and to meet Standard 1 – Runoff Volume and Pollutant Reduction of this Manual. Table 9- 2 summarizes, for each major type of retrofit, the criteria and conditions that must be met for DCIA to be considered disconnected, and the amount of DCIA reduction credit associated with the disconnection.