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Bureau of Clean Water

BMP Selection

MS4 Workshops – Pollutant Reduction and TMDL Stormwater Plans

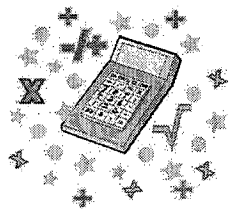
Fall 2016

Tom Wolf, Governor

John Quigley, Acting Secretary

Training Goal

Describe acceptable methods to calculate BMP pollutant load removal



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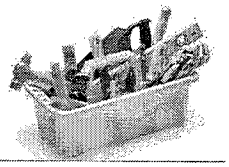
Tool For Every Job

BMPs are *tools* with specific applications

- Land uses
- Pollutant loads
- Site characteristics

Effectiveness Values Table is the *tool box*



BMP Toolbox

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
STORMWATER DISCHARGES FROM
SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS
BMP EFFECTIVENESS VALUES

[illegible]

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Wet Ponds and Wetlands	20%	45%	60%	[illegible]
Dry Detention Basins and Hydrodynamic Structures	5%	10%	10%	[illegible]
Dry Extended Detention Basins	20%	20%	60%	[illegible]

BMP Efficiency Calculation Options

1. Effectiveness values in the permit package
2. Expert Panel reports
3. Appropriate technical sources for BMPs not in the above two documents

→ only if not avail. in Option 1 or 2.

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Use the BMP Tool Properly

Very important **:**
Design considerations, operation and maintenance, and construction sequences should be as outlined in the:

1. Pennsylvania Stormwater BMP Manual
2. Chesapeake Bay Program guidance
3. Other technical sources

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BMP Selection Example

Raingarden in A/B soils with an underdrain

- What is the sediment removal efficiency?
- Where could you go to find the design considerations, O&M, and construction sequences?

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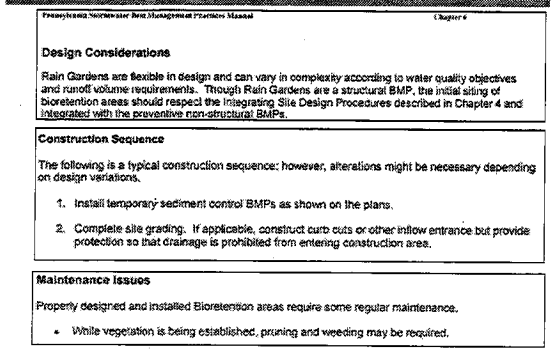
BMP Manual



Pennsylvania Stormwater Best Management Practices Manual Chapter 6

Design Considerations

Rain Gardens are flexible in design and can vary in complexity according to water quality objectives and runoff volume requirements. Though Rain Gardens are a structural BMP, the initial siting of Bioretention areas should respect the Integrating Site Design Procedures described in Chapter 4 and integrated with the preventive non-structural BMPs.

Construction Sequence

The following is a typical construction sequence; however, alterations might be necessary depending on design variations.

1. Install temporary sediment control BMPs as shown on the plans.
2. Complete site grading. If applicable, construct curb cuts or other inflow entrance but provide protection so that drainage is prohibited from entering construction area.

Maintenance Issues

Properly designed and installed Bioretention areas require some regular maintenance.

- While vegetation is being established, pruning and weeding may be required.

Retrofit Projects

NOT in DEP's Effectiveness Values Table

- Covered in detail in Expert Panel Report
- DEP anticipates these projects will be heavily utilized by MS4s

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Urban Stormwater Retrofit Projects

Recommendations of the Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects

Ray Bahr, Ted Brown, LJ Hansen, Joe Kelly, Jason Papacosma, Virginia Snead, Bill Stack, Rebecca Stack and Steve Stewart

Accepted by Urban Stormwater Work Group: April 30, 2012
Revised based on Watershed Technical Work Group feedback: May 29, 2012
Resubmitted to Watershed Technical Work Group: July 15, 2012
Conditionally Approved by Watershed Technical Work Group: August 1, 2012
Conditionally Approved by Water Quality Goal Implementation Team: August 13, 2012
Resubmitted to WQGIT: September 28, 2012
Final Approval by WQGIT: October 9 2012

Retrofit Categories

1. New retrofit facilities
2. Existing BMP retrofits

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1. New Retrofit Facilities

- Create storage from existing developed land
- Credit can be taken for the entire BMP reduction

2. Existing BMP Retrofit

An existing BMP is:

- Converted into a different BMP
- Enhanced by increasing treatment volume and/or hydraulic retention time
- Restored to renew its performance

key slide

Cannot be counted if its a BMP that was already done as part of an NPDES permit required activity & listed on MCM 5 (Post-Constr.)

Calculation Methodology

- Similar to the Performance Standard approach
- Determine the runoff storage and impervious area draining to the BMP

$$\text{X Axis Value} = \frac{(RS)(12)}{IA}$$

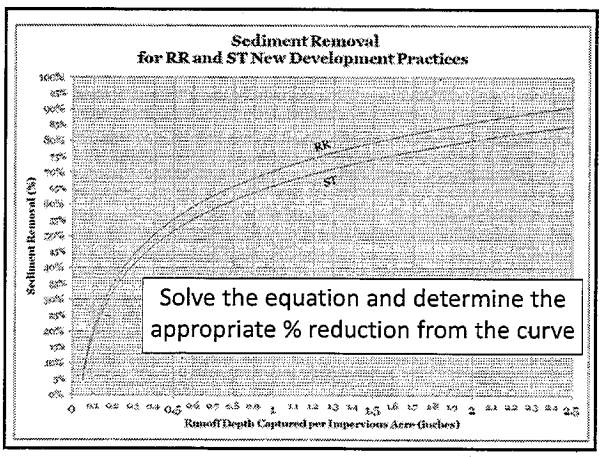
RS = Runoff Storage Volume (acre-feet)
IA = Impervious Area (acres)

BMPs built prior to March 5, 2003, are perfect candidates to look for retrofit opportunities.

Any BMP put in any time & for any reason could be counted toward existing loading reduction.

But - after date the PRP is submitted, can't count any IDC-driven projects toward loads reduction?

(? Some confusion on this?)



2. Existing BMP Retrofit

Sub-categories:

A. Conversion

B. Enhancement

C. Restoration

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2. A. Conversions

Retrofit existing stormwater facilities

No effective water quality treatment

Water quality treatment

2. B. Enhancements

Improve existing stormwater treatment facilities

Limited water quality treatment

Improved water quality treatment

2. C. Restorations

Restore performance of existing stormwater treatment facilities

Limited water quality treatment

↓

Improved water quality treatment

Failed practice is brought back to life.

2. Existing BMP Retrofit

Incremental Removal Rate = **New Efficiency** - **Past Efficiency**

BMP Conversion

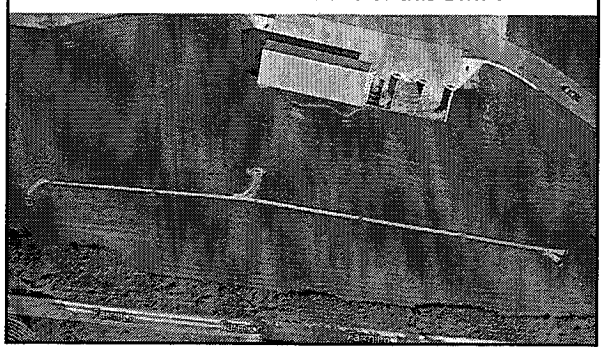
New Removal Rate – 0 = Incremental/New Removal Rate

Enhancement & Restoration

New Removal Rate - Past Removal Rate = Incremental Removal Rate

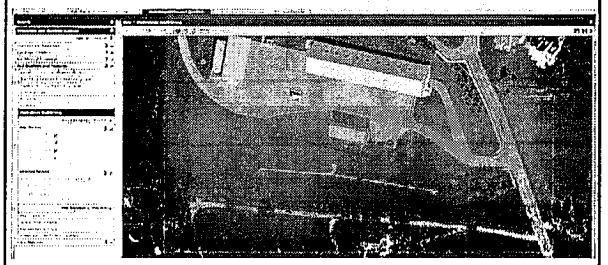
BMP Conversion Example

What are the limitations of this BMP?

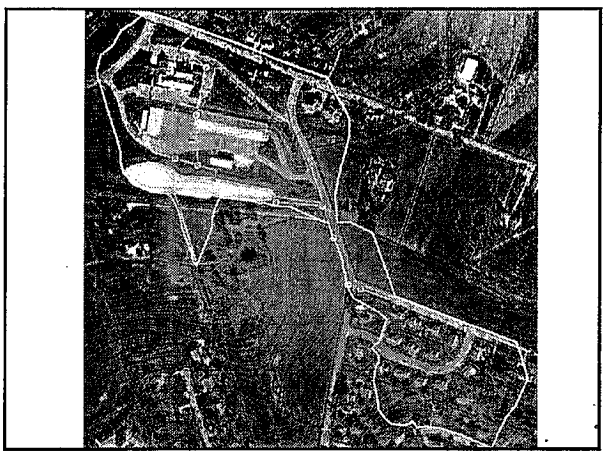


Selection Consideration

What makes this a good candidate for conversion?

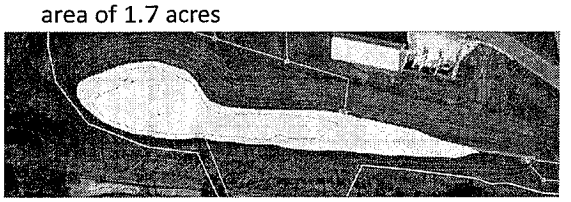


Hydrologic soil group rating = B
(good infiltration capacity)



BMP Conversion Example

- Low-flow channel can be removed
- Soils amended
- Orifice height adjusted to obtain 0.5 feet of storage within the basin
- The highlighted basin bottom elevation has an area of 1.7 acres



BMP Conversion Example

- 1.7 ac X 0.5 ft of storage = 0.9 ac-ft of runoff storage volume
- Land uses
  - Impervious area = 11.1 acres
  - Pervious area = 20.4 acres
- Solve the equation:

$$\text{X Axis Value} = \frac{(RS)(12)}{IA}$$

RS = Runoff Storage Volume (acre-feet)
IA = Impervious Area (acres)

X = [0.9 ac-ft * 12(in/ft)] / 11.1 ac = **1.0 in**

RR or ST?

Table 4 Classification of BMPs based on Runoff reduction capability[1]

Runoff Reduction (RR) Practices	*Stormwater Treatment (ST) Practices*[2]
Non-Structural Practices	
Landscape Restoration/Reforestation	Constructed Wetlands
Riparian Buffer Restoration	Filtering Practices (aka Constructed Filters, Sand Filters, Stormwater Filtering Systems)

Infiltration (aka Infiltration Basin, Infiltration Bed, Infiltration Trench, Dry Well/Seepage Pit, Landscape Infiltration)

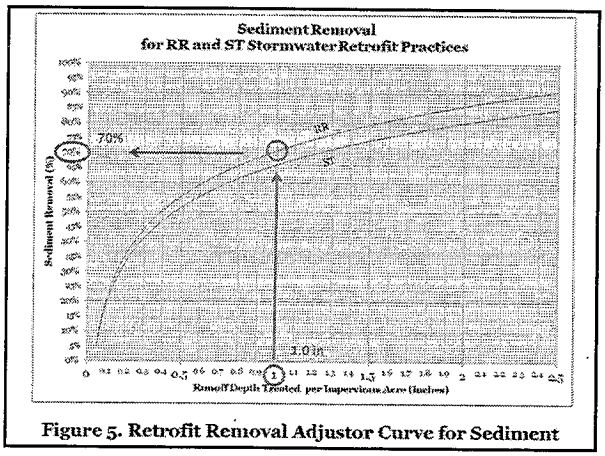


Figure 5. Retrofit Removal Adjustor Curve for Sediment

BMP Conversion Example

- Curve yields 70% sediment removal for the **converted BMP**
- Curve is valid for BMP Conversion, Enhancement, and Restoration efficiencies
- Existing BMP removal must be determined in the same manner as the enhanced BMP

BMP Conversion Example

- BMP Conversion category is used for retrofits currently providing no effective water quality treatment
- **Existing BMP efficiency is zero**

Enhanced BMP − Existing BMP = Incremental sediment removal rate

70% - 0% = 70%

effective sediment removal

What if?

If the basin:

- NO low-flow channel
- functioned to infiltrate the 1-inch storm from the entire drainage area

  (0.35 inches per impervious acre)
- is being retrofitted exactly as we described in the BMP Conversion example

(create 0.848 ac-ft of runoff storage volume)

What type of existing retrofit would this be?

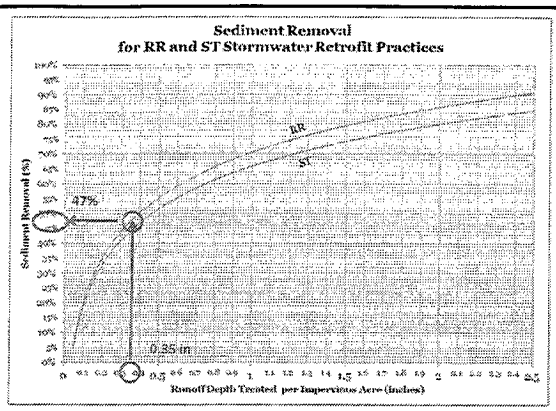


Figure 5. Retrofit Removal Adjustor Curve for Sediment

BMP Enhancements Example

Incremental Sediment Removal Rate

Enhanced BMP − Existing BMP = Incremental sediment removal rate

70% - 47% = 23%

effective sediment removal

Applying the Percentages

Incremental sediment removal rate applied to the sediment loading calculated in **the same manner as both the effectiveness values example and the performance standards example**

Summary

1. There are two primary sources of BMP Efficiencies
2. If BMP Effectiveness Values are used, then BMP design must match with BMP manual standards.
3. BMP Effectiveness Values are being phased out and replaced with Performance Curves (Expert Panel Reports)