

APPENDIX A

RELEASE RATE MANAGEMENT DISTRICTS (MAPS)

Release Rate Map

O'Hara Township

Legend

- Municipal Boundary
- Streams
- Roads
- Railroad
- Release Rates
 - 65%
 - 100%

Subsided Number # 100%

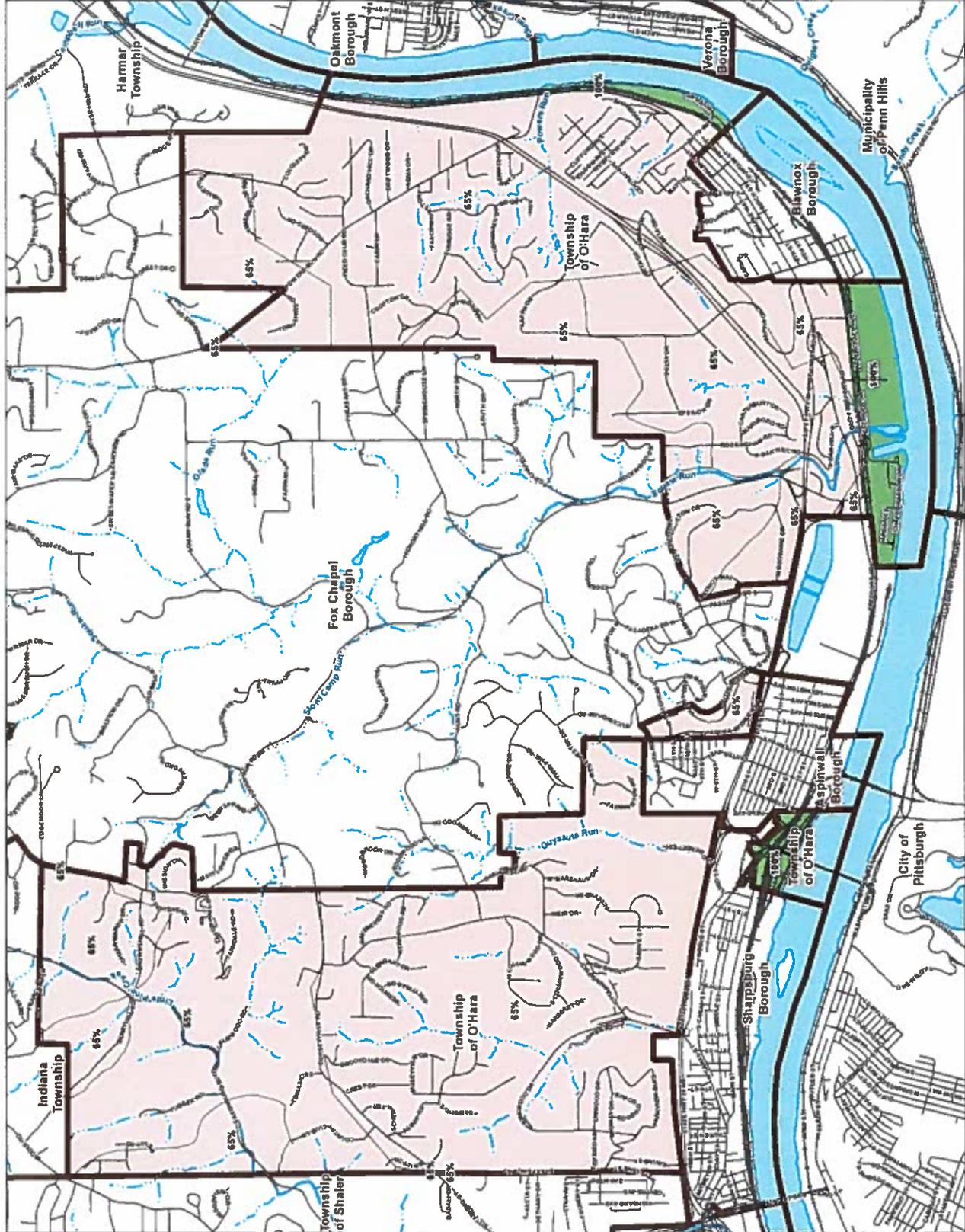
Release Rate Information From:
Allegheny County
Stormwater Management Plan
February 2017

Regional Release Rate Percentage Map
Act 187 Stormwater Management Plan update for
Square Run Watershed
April 20, 2009
For North Hills Council of Governments



1 inch = 2,000 feet

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APPENDIX B

OPERATION AND MAINTENANCE (O&M) AGREEMENT STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES (SWM BMPs)

THIS AGREEMENT, made and entered into this day of _____, 20_____, by and between _____ (hereinafter the "Landowner"), and _____, _____ County, Pennsylvania (hereinafter "Municipality");

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of _____ County, Pennsylvania, Deed Book _____ at page _____, (hereinafter "Property").

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the SWM BMP Operation and Maintenance (O&M) Plan approved by the Municipality (hereinafter referred to as the "O&M Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the Municipality, provides for management of stormwater within the confines of the Property through the use of BMPs; and

WHEREAS, the Municipality, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the Municipality and the protection and maintenance of water quality require that on-site SWM BMPs be constructed and maintained on the Property; and

WHEREAS, the Municipality requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said SWM Site Plan and the Municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, successors, and assigns.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The Landowner shall construct the BMPs in accordance with the plans and specifications identified in the SWM Site Plan.
2. The Landowner shall operate and maintain the BMPs as shown on the SWM Site Plan in good working order in accordance with the specific operation and maintenance requirements noted on the approved O&M Plan.
3. The Landowner hereby grants permission to the Municipality, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper credentials, to inspect the BMPs whenever necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the property.
4. In the event the Landowner fails to operate and maintain the BMPs per paragraph 2, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.
5. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the Municipality.

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the on-site BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.
7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Municipality from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Municipality.
8. The Municipality intends to inspect the BMPs at a minimum of once every three years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of _____ County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs, and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

For the Landowner:

ATTEST:

_____ (City, Borough, Township)

County of _____, Pennsylvania

I, _____, a Notary Public in and for the county and state aforesaid, whose commission expires on the _____ day of _____, 20____, do hereby certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day _____, 20_, has acknowledged the same before me in my said county and state.

GIVEN UNDER MY HAND THIS _____ day of _____, 20_.

NOTARY PUBLIC

(SEAL)

APPENDIX C

SMALL PROJECT STORMWATER MANAGEMENT SITE PLAN GUIDANCE

This small project stormwater site plan has been developed to assist those proposing residential projects to meet the requirements of the *Allegheny County Stormwater Management Plan Model Ordinance* without having to hire professional services to draft a formal stormwater management plan. This small project site plan is only permitted for projects with earth disturbances between one-twentieth (0.05) acre and one quarter (0.25) acre of earth disturbance (Section 302.B) and using *The Simplified Method* (CG-2 in the BMP Manual³) for Volume Control as described in Section 303.B. Additional information can be found in Chapter 6 of the Pennsylvania Stormwater Best Management Practices Manual. Applicants proposing use of this methodology shall complete and submit for review a Small Development Stormwater Management Plan Application, as included herein.

A. What is an applicant required to submit?

All requirements of Section 302.B including a brief description of the proposed stormwater facilities, including types of materials to be used, total square footage of proposed impervious areas, volume calculations, and a simple sketch plan showing the following information:

- Location of proposed structures, driveways, or other paved areas with approximate surface area in square feet.
- Location of any existing or proposed onsite septic system and/or potable water wells showing proximity to infiltration facilities.
- County Conservation District erosion and sediment control “Adequacy” letter as may be required by Municipal, County or State regulations.

B. Determination of Required Volume Control and Sizing Stormwater Facilities

By following the simple steps outlined below in the provided example, an applicant can determine the runoff volume that is required to be controlled and how to choose the appropriate stormwater facility to permanently remove the runoff volume from the site. Impervious area calculations must include all areas on the lot proposed to be covered by roof area or pavement which would prevent rain from naturally percolating into the ground, including impervious surfaces such as sidewalks, driveways, parking areas, patios or swimming pools. Sidewalks, driveways or patios that are designed and constructed to allow for infiltration are not included in this calculation.

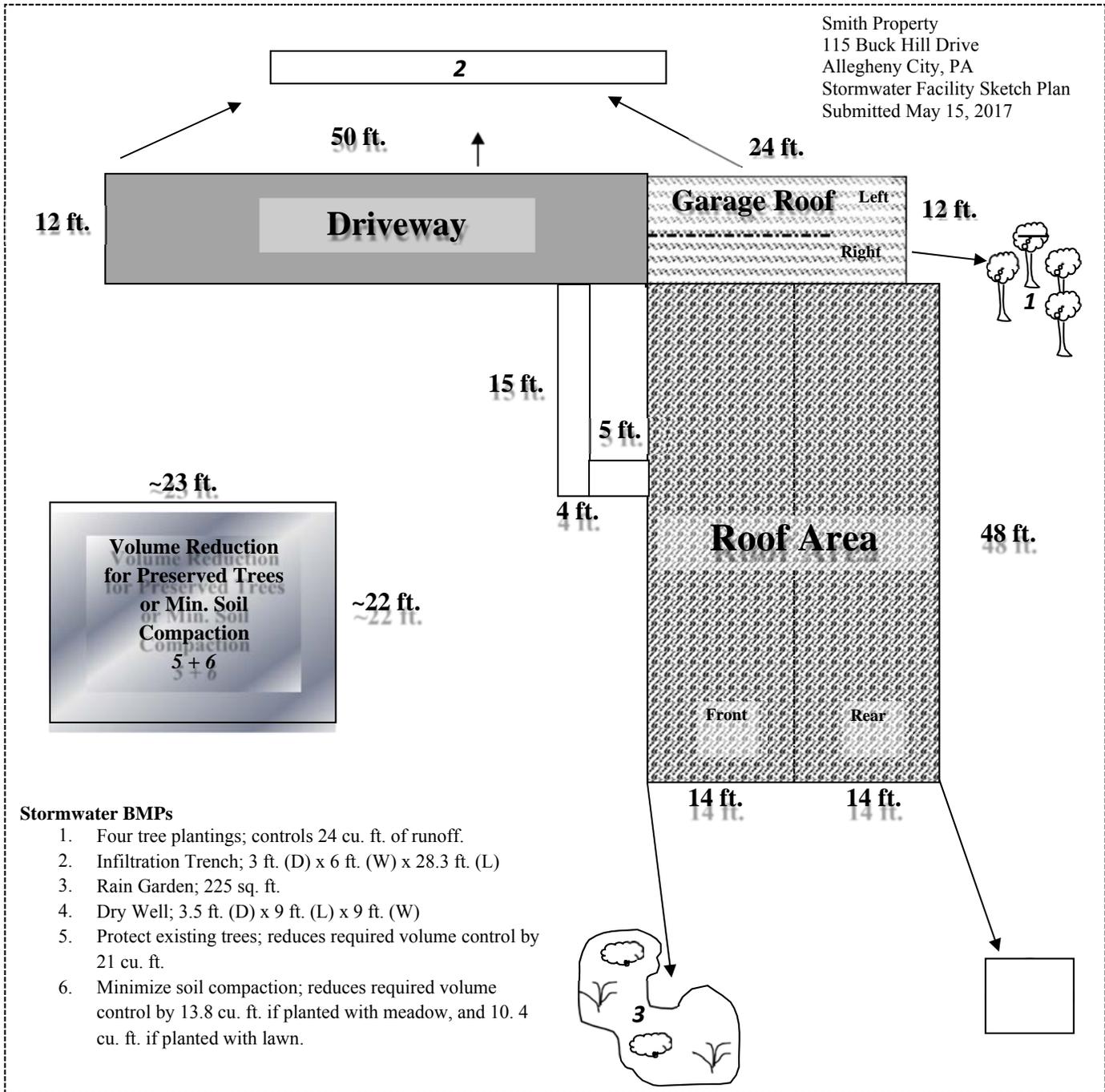
Site Plan Example: Controlling runoff volume from a proposed home site

Step 1: Determine Total Impervious Surfaces

Impervious Surface			Area (sq. ft.)
House Roof (Front)	14 ft. x 48 ft.	=	672 sq. ft.
House Roof (Rear)	14 ft. x 48 ft.	=	672 sq. ft.
Garage Roof (Left)	6ft. x 24 ft.	=	144 sq. ft.
Garage Roof (Right)	6 ft. x 24 ft.	=	144 sq. ft.
Driveway	12 ft. x 50 ft.	=	1000 sq. ft.
Walkway	4 ft. x 20 ft.	=	80 sq. ft.

	Total Imp.		3000 sq. ft.

Figure 1: Sample Site Sketch Plan



Step 2: Determine Required Volume Control (cubic feet) using the following equation:

$$\text{Volume (cu. ft.)} = (\text{Total impervious area in square feet} \times 2 \text{ inches of runoff}) / 12 \text{ inches}$$

$$(3,000 \text{ sq. ft.} \times 2 \text{ inches of runoff}) / 12 \text{ inches} = 500 \text{ cu. ft.}$$

Example continued:

Step 3: Sizing the Selected Volume Control BMP

Several Best Management Practices (BMPs), as described below, are suitable for small stormwater management projects. However, their application depends on the volume required to be controlled, how much land is available, and the site constraints. Proposed residential development activities can apply both nonstructural and structural BMPs to control the volume of runoff from the site. A number of different volume control BMPs are described below. Note that Figure 1 is an example of how these BMPs can be utilized in conjunction to control the total required volume on one site.

Structural BMPs

1. Infiltration Trench

An Infiltration Trench is a linear stormwater BMP consisting of a continuously perforated pipe at a minimum slope in a stone-filled trench. During small storm events, infiltration trenches can significantly reduce volume and serve in the removal of fine sediments and pollutants. Runoff is stored between the stones and infiltrates through the bottom of the facility and into the soil matrix. Runoff should be pretreated using vegetative buffer strips or swales to limit the amount of coarse sediment entering the trench which can clog and render the trench ineffective. In all cases, an infiltration trench should be designed with a positive overflow.

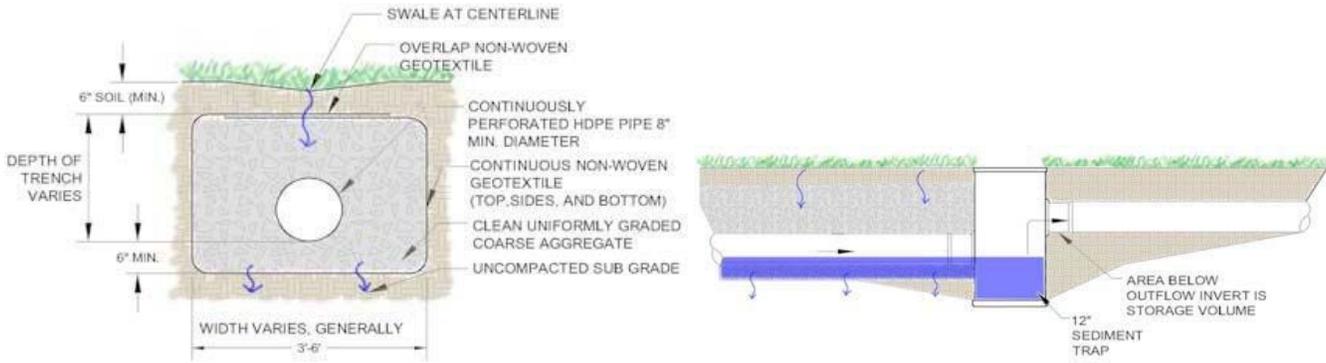
Design Considerations:

- Although the width and depth can vary, it is recommended that Infiltration Trenches be limited in depth to not more than six (6) feet of stone.
- Trench is wrapped in nonwoven geotextile (top, sides, and bottom).
- Trench needs to be placed on uncompacted soils.
- Slope of the Trench bottom should be level or with a slope no greater than 1%.
- A minimum of 6" of topsoil is placed over trench and vegetated.
- The discharge or overflow from the Infiltration Trench should be properly designed for anticipated flows.
- Cleanouts or inlets should be installed at both ends of the Infiltration Trench and at appropriate intervals to allow access to the perforated pipe.
- Volume of facility = Depth x Width x Length x Void Space of the gravel bed (assume 40%).

Maintenance:

- Catch basins and inlets should be inspected and cleaned at least two times a year.
- The vegetation along the surface of the infiltration trench should be maintained in good condition and any bare spots should be re-vegetated as soon as possible.
- Vehicles should not be parked or driven on the trench and care should be taken to avoid soil compaction by lawn mowers.

Figure 2: Infiltration Trench Diagram



Source: PA BMP Guidance Manual, Chapter 6, page 42.

Figure 3: Example of Infiltration Trench Installation



Source: PA BMP Guidance Manual, Chapter 6, Page 46.

Sizing Example for Infiltration Trench

1. Determine Total Impervious Surface to drain to Infiltration Trench:

Garage Roof (Left)	6 ft. x 24 ft.	=	144 sq. ft.
Driveway	12 ft. x 50 ft.	=	1000 sq. ft.
Walkway	4 ft. x 20 ft.	=	80 sq. ft.

2. Determine the required infiltration volume:

$$(1224 \text{ sq. ft.} \times 2 \text{ inches of runoff}) / 12 \text{ ft.} = 204 \text{ cu. ft.} / 0.4^* = 510 \text{ cu. ft.}$$

(*0.4 assumes 40% void ratio in gravel bed)

3. Sizing the infiltration trench facility:

$$\text{Volume of Facility} = \text{Depth} \times \text{Width} \times \text{Length}$$

Set Depth to 3 feet and determine required surface area of trench.

$$510 \text{ cu. ft.} / 3 \text{ ft.} = 170 \text{ sq. ft.}$$

The width of the trench should be greater than 2 times its depth (2 x D), therefore in this example the trench width of 6 feet selected.

Determine trench length: $L = 170 \text{ sq. ft.} / 6 \text{ ft.} = 28.3 \text{ ft.}$

Final infiltration trench dimensions: 3 ft. (D) x 6 ft. (W) x 28.3 ft. (L)

2. Rain Garden

A Rain Garden is a planted shallow depression designed to catch and filter rainfall runoff. The garden captures rain from a downspout or a paved surface. The water sinks into the ground, aided by deep rooted plants that like both wet and dry conditions. The ideal location for a rain garden is between the source of runoff (roofs and driveways) and the runoff destination (drains, stream, low spots, etc.).

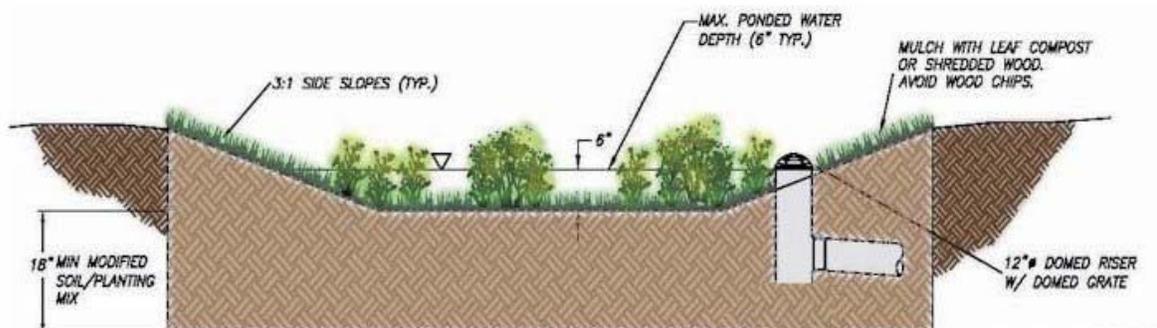
Design Considerations:

- A maximum of 3:1 side slope is recommended.
- The depth of a rain garden can range from 6 - 8 inches. Ponded water should not exceed 6 inches.
- The rain garden should drain within 72 hours.
- The garden should be at least 10-20 feet from a building's foundation and 25 feet from septic system drainfields and wellheads.
- If the site has clay soils, soil should be amended with compost or organic material.
- Choose native plants. See http://pa.audubon.org/habitat/PDFs/RGBrochure_complete.pdf for a native plant list. To find native plant sources go to www.pawildflower.org.
- At the rain garden location, the water table should be at least 2' below the soil level. If water stands in an area for more than one day after a heavy rain you can assume it has a higher water table and is not a good choice for a rain garden.

Maintenance:

- Water plants regularly until they become established.
- Inspect twice a year for sediment buildup, erosion and vegetative conditions.
- Mulch with hardwood when erosion is evident and replenish annually.
- Prune and remove dead vegetation in the spring season.
- Weed as you would any garden.
- Move plants around if some plants would grow better in the drier or wetter parts of the garden.

Figure 4: Rain Garden Diagram



Source: PA BMP Guidance Manual, Chapter 6 Page 50

Sizing Example for Rain Garden

1. Pick a site for the rain garden between the source of runoff and a low lying area, a.k.a., a drainage area.

2. Perform an infiltration test to determine the depth of the rain garden:

- Dig a hole 8" x 8"
- Fill with water and put a popsicle stick at the top of the water level.
- Measure how far it drains down after a few hours (ideally 4 hours).
- Calculate the depth of water that will drain out over 24 hours.

3. Determine total impervious surface area to drain to rain garden:

House Roof (Front)	14 ft. x 48 ft.	=	672 sq. ft.
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4. Sizing the rain garden:

For this example, let's say the infiltration test determined 6" of water drained out of a hole in 24 hours. The depth of the rain garden should be set to the results of the infiltration test so 6" is the depth of the rain garden. The sizing calculation below is based on controlling 1" of runoff. First divide the impervious surface by the depth of the rain garden.

$$672 \text{ sq. ft.} / 6 \text{ (depth of rain garden in inches)} = 112 \text{ sq. ft.}$$

In order to control 2" of runoff volume, the rain garden area is multiplied by 2.

$$112 \text{ sq. ft.} * 2 = 224 \text{ sq. ft.}$$

The rain garden should be about 225 sq. ft. in size and 6" deep.

3. Dry Well (a.k.a., Seepage Pit)

A Dry Well, sometimes called a Seepage Pit, is a subsurface storage facility that temporarily stores and infiltrates stormwater runoff from the roofs of structures. By capturing runoff at the source, Dry Wells can dramatically reduce the increased volume of stormwater generated by the roofs of structures. Roof leaders connect directly into the Dry Well, which may be either an excavated pit filled with uniformly graded aggregate wrapped in geotextile, or a prefabricated storage chamber or pipe segment. Dry Wells discharge the stored runoff via infiltration into the surrounding soils. In the event that the Dry Well is overwhelmed in an intense storm event, an overflow mechanism (surcharge pipe, connection to a larger infiltration area, etc.) will ensure that additional runoff is safely conveyed downstream.

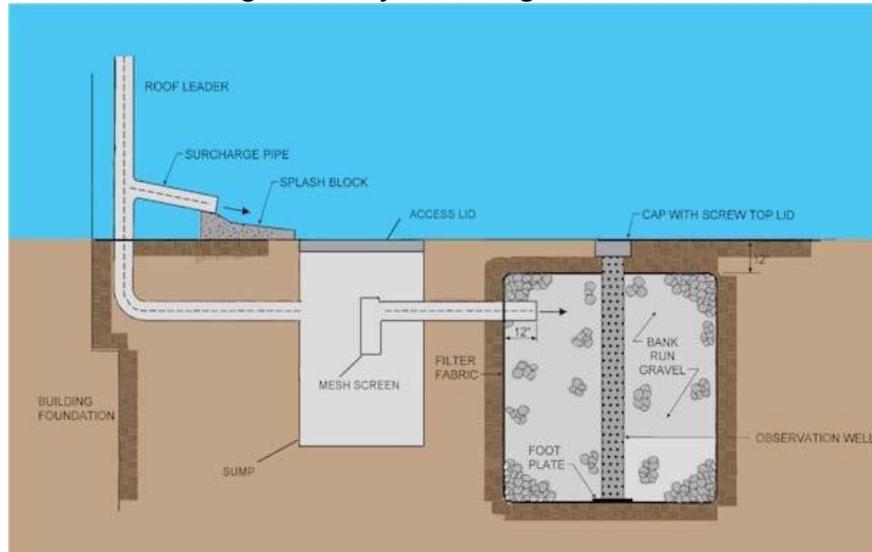
Design Considerations:

- Dry Wells typically consist of 18 to 48 inches of clean washed, uniformly graded aggregate with 40% void capacity (AASHTO No. 3, or similar). "Clean" gravel fill should average one and one-half to three (1.5 – 3.0) inches in diameter.
- Dry Wells are not recommended when their installation would create a significant risk for basement seepage or flooding. In general, 10 - 20 feet of separation is recommended between Dry Wells and building foundations.
- The facility may be either a structural prefabricated chamber or an excavated pit filled with aggregate.
- Depth of dry wells in excess of three-and-a-half (3.5) feet should be avoided unless warranted by soil conditions.
- Stormwater dry wells must never be combined with existing, rehabilitated, or new septic system seepage pits. Discharge of sewage to stormwater dry wells is strictly prohibited.
- As shown in Figure 5, the installation should include a surcharge or overflow pipe.

Maintenance:

- Dry wells should be inspected at least four (4) times annually as well as after large storm events.
- Remove sediment, debris/trash, and any other waste material from a dry well.
- Regularly clean out gutters and ensure proper connections to the dry well.
- Replace the filter screen that intercepts the roof runoff as necessary.

Figure 5: Dry Well Diagram



Source: PA BMP Guidance Manual, Chapter 6, Page 65.

Sizing Example for Dry Wells:

1. Determine contributing impervious surface area:

House Roof (Rear)	14 ft. x 48 ft.	=	672 sq. ft.
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2. Determine required volume control:

$$(672 \text{ sq. ft.} \times (2 \text{ inches of runoff} / 12 \text{ inches/ft.})) = 112 \text{ cu. ft.}$$

$$112 \text{ cu. ft.} / 0.4 = 280 \text{ cu. ft. (assuming the 40% void ratio in the gravel bed)}$$

3. Sizing the dry well:

Set the depth to 3.5 ft.; Set the width equal to the length for a square chamber.

$$3.5 \text{ ft.} \times L \times L = 280 \text{ cu. ft.}; \quad L \times L = 280 \text{ cu. ft.} / 3.5 \text{ ft.}; \text{ thus } L \times L = 80 \text{ sq. ft.}; L=9 \text{ (approx)}$$

$$\text{Dimensions} = 3.5 \text{ ft. (D)} \times 9 \text{ ft. (L)} \times 9 \text{ ft. (W)}$$

NonStructural BMPs

1. Tree Plantings and Preservation

Trees and forests reduce stormwater runoff by capturing and storing rainfall in the canopy and releasing water into the atmosphere through evapotranspiration. Tree roots and leaf litter also create soil conditions that promote the infiltration of rainwater into the soil. In addition, trees and forests reduce pollutants by taking up nutrients and other pollutants from soils and water through their root systems. A development site can reduce runoff volume by planting new trees or by preserving trees which existed on the site prior to development. The volume reduction calculations either determine the cubic feet to be directed to the area under the tree canopy for infiltration or determine a volume reduction credit which can be used to reduce the size of any one of the planned structural BMPs on the site.

Tree Considerations:

- Existing trees must have at least a 4" trunk caliper or larger.
- Existing tree canopy must be within 100 ft. of impervious surfaces.
- A tree canopy is classified as the continuous cover of branches and foliage formed by a single tree or collectively by the crowns of adjacent trees.
- New tree plantings must be at least 6 ft. in height and have a 2" trunk caliper.
- All existing and newly planted trees must be native to Pennsylvania. See <http://www.dcnr.state.pa.us/forestry/commontr/commontrees.pdf> for a guide book titled *Common Trees of Pennsylvania* for a native tree list.
- When using trees as volume control BMPs, runoff from impervious areas should be directed to drain under the tree canopy.

Determining the required number of planted trees to reduce the runoff volume:

1. Determine contributing impervious surface area:

Garage Roof (Right)	6 ft. x 24 ft.	=	144 ft.
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2. Calculate the required control volume:

$$(144 \text{ sq. ft.} \times 2 \text{ inches of runoff}) / 12 \text{ inches} = 24 \text{ cu. ft.}$$

3. Determine the number of tree plantings:

- A newly planted deciduous tree can reduce runoff volume by 6 cu. ft.
- A newly planted evergreen tree can reduce runoff volume by 10 cu. ft.

$$24 \text{ cu. ft.} / 6 \text{ cu. ft.} = 4 \text{ Deciduous Trees}$$

Determining the volume reduction for preserving existing trees:

1. Calculate approximate area of the existing tree canopy:

$$\sim 22 \text{ sq. ft.} \times \sim 23 \text{ sq. ft.} = 500 \text{ sq. ft.}$$

2. Measure distance from impervious surface to tree canopy: 35 ft.

3. Calculate the volume reduction credit by preserving existing trees:

- For Trees within 20 feet of impervious cover:
Volume Reduction cu. ft. = (Existing Tree Canopy sq. ft. x 1 inch) / 12
- For Trees beyond 20 feet but not farther than 100 feet from impervious cover:
Volume Reduction cu. ft. = (Existing Tree Canopy sq. ft. x 0.5 inch) / 12

$$(500 \text{ sq. ft.} \times 0.5 \text{ inches}) / 12 = 21 \text{ cu. ft.}$$

This volume credit can be utilized in reducing the size of any one of the structural BMPs planned on the site. For example, the 21 cu. ft. could be subtracted from the required infiltration volume when sizing the infiltration trench;

$$510 \text{ cu. ft.} - 21 \text{ cu. ft.} = 489 \text{ cu. ft.}$$

$$489 \text{ cu. ft.} / 3 \text{ ft. (Depth)} = 163 / 6 \text{ ft. (Width)} = 27.1 \text{ ft. (Length)}$$

Using the existing trees for a volume credit would decrease the length of the infiltration trench to 27.1 ft. instead of 28.3 ft.

2. Minimize Soil Compaction and Replant with Lawn or Meadow

When soil is overly compacted during construction it can cause a drastic reduction in the permeability of the soil and rarely is the soil profile completely restored. Runoff from vegetative areas with highly compacted soils similarly resembles runoff from an impervious surface. Minimizing soil compaction and re-planting with a vegetative cover like meadow or lawn, not only increases the infiltration on the site, but also creates a friendly habitat for a variety of wildlife species.

Design Considerations:

- Area shall not be stripped of topsoil.
- Vehicle movement, storage, or equipment/material lay down shall not be permitted in areas preserved for minimum soil compaction.
- The use of soil amendments and additional topsoil is permitted.
- Meadow should be planted with native grasses. Refer to *Meadows and Prairies: Wildlife-Friendly Alternatives to Lawn* at <http://pubs.cas.psu.edu/FreePubs/pdfs/UH128.pdf> for reference on how to properly plant the meadow and for a list of native species.

Determining the volume reduction by minimizing soil compaction and planting a meadow:

1. Calculate approximate area of preserved meadow:
 $\sim 22 \text{ sq. ft.} \times \sim 23 \text{ sq. ft.} = 500 \text{ sq. ft.}$

2. Calculate the volume reduction credit by minimizing the soil compaction and planting a lawn/meadow:

- For Meadow Areas: Volume Reduction (cu. ft.) = (Area of Min. Soil Compaction (sq. ft.) x 1/3 inch of runoff) / 12

$$(500 \text{ sq. ft.} \times 1/3 \text{ inch of runoff}) / 12 = 13.8 \text{ cu. ft.}$$

- For Lawn Areas: Volume Reduction (cu. ft.) = (Area of Min. Soil Compaction (sq. ft.) x 1/4 inch of runoff) / 12

$$(500 \text{ sq. ft.} \times 1/4 \text{ inch of runoff}) / 12 = 10.4 \text{ cu. ft.}$$

This volume credit can be used to reduce the size of any one of the structural BMPs on the site. See explanation under the volume credit for preserving existing trees for details.

Alternative BMP to Capture and Reuse Stormwater

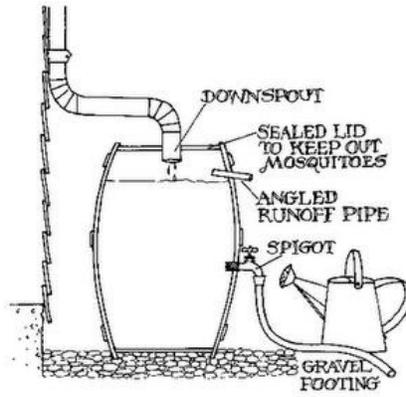
Rain Barrels

Rain barrels are large containers that collect drainage from roof leaders and temporarily store water to be released to lawns, gardens, and other landscaped areas after the rainfall has ended. Rain barrels are typically between 50 and 200 gallons in size. It is not recommended for rain barrels to be used as a volume control BMP because infiltration is not guaranteed after each storm event. For this reason, a rain barrel is not utilized in the site plan example. However, the information is included to provide an alternative for a homeowner to utilize when considering capture and reuse stormwater methods.

Design Considerations:

- Rain barrels should be directly connected to the roof gutter/spout.
- There must be a means to release the water stored between storm events to provide the necessary storage volume for the next storm.
- When calculating rain barrel size, rain barrels are typically assumed to be 25% full because they are not always emptied before the next storm.
- Use screens to filter debris and cover lids to prevent mosquitoes.
- An overflow outlet should be placed a few inches below the top with an overflow pipe to divert flow away from structures.
- It is possible to use a number of rain barrels jointly for an area.

Figure 6: Rain Barrel Diagram and Examples



Sources: (top picture) <http://www.citywindsor.ca/DisplayAttach.asp?AttachID=12348>
 (bottom picture on left) <http://repurposinglife.blogspot.com/2009/05/rainwater-harvesting.html>
 (bottom picture on right) <http://www.floridata.com/tracks/transplantedgardener/Rainbarrels.cfm>

Sizing Example for a Rain Barrel

1. Determine contributing impervious surface area:

Garage Roof (Right)	6 ft. x 24 ft.	=	144 sq. ft.
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2. Determine the amount of rainfall to be captured by the Rain Barrel. A smaller storm, no more than 2", is recommended to calculate the runoff to be captured. This example chose the 1" storm event.
3. Calculate the volume to be captured and reused:
 $(144 \text{ sq. ft.} \times 1 \text{ inch of runoff}) / 12 \text{ inches} = 12 \text{ cu. ft.}$
4. Size the rain barrel:

$$1 \text{ cu. ft.} = 7.48 \text{ gallons}$$

$$12 \text{ cu. ft.} \times 7.48 = 90 \text{ gallons}$$

$$90 \text{ gallons} \times (0.25^*) = 22.5 \text{ gallons} \text{ (*assuming that the rain barrel is always at least 25\% full)}$$

$$90 \text{ gallons} + 22.5 \text{ gallons} = 112 \text{ gallons}$$

The rain barrel or barrels should be large enough to hold at least 112 gallons of water.

REFERENCES:

Center for Watershed Protection and US Forest Service. (2008). *Watershed Forestry Resource Guide*.

Retrieved on May 26, 2010 from <http://www.forestsforwatersheds.org/reduce-stormwater/>.

DeBarry, Paul A., *Watersheds: Processes, Assessment and Management*. John Wiley &

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Wissahickon Watershed Partnership. *Pennsylvania Rain Garden Guide*. Retrieved on May 4, 2010 from http://pa.audubon.org/habitat/PDFs/RGBrochure_complete.pdf.

Building a Backyard Rain Garden. North Carolina Cooperative Extension. Retrieved on May 4, 2010 from <http://www.bae.ncsu.edu/topic/raingarden/Building.htm>

Delaware County Planning Commission. (2010). *Draft Crum Creek Watershed Act 167 Stormwater Management Plan. Ordinance Appendix B. Simplified Approach to Stormwater Management for Small Projects*.

Solebury Township. (2008). *Solebury Township Stormwater Management Ordinance. "Appendix J Simplified Stormwater Management Procedures for Existing Single Family Dwelling Lots"*

SMALL DEVELOPMENT STORMWATER MANAGEMENT PLAN APPLICATION

Small Project Stormwater Management Submission

Calculation of Impervious Area

In accordance with the Municipal Stormwater Management Ordinance, small developments are eligible for submission of a simplified stormwater management plan. Small developments propose disturbance of less than 0.25 acres and less than 5,000 square feet of impervious area. The calculations of proposed impervious area reported herein shall cumulatively include all new impervious area constructed within the last five years. An impervious surface is a surface that prevents the infiltration of water into the ground. Impervious surfaces (or areas) shall include, but not be limited to: roofs, additional indoor living spaces, patios, garages, storage sheds, porches, decks and similar structures, and any new driveways or sidewalks.

Table 1: Calculation of Impervious Surfaces

Surface Type		Length (ft)	X	Width (ft)	=	Proposed Impervious Area (sq ft)
Building	Home		x		=	
	Addition		x		=	
	Garage		x		=	
	Porch/deck		x		=	
			x		=	
Driveway			x		=	
			x		=	
			x		=	
Parking Areas			x		=	
			x		=	
			x		=	
Patios and Sidewalks			x		=	
			x		=	
			x		=	
			x		=	
			x		=	
Other			x		=	
			x		=	
			x		=	
Total Impervious Surface Area to Managed						

If the Total Impervious Surface Area is less than 5,000 Square Feet, complete the remainder of the Application.

If the Total Impervious Surface Area EXCEEDS 5,000 Square Feet, a complete stormwater management plan, prepared by a registered professional engineer must be submitted.

Small Project SWM Plan Worksheet

Based upon the information you have provided a *Stormwater Plan IS Required* for this development activity and the project is eligible for review as a small development. The Municipal Stormwater Management Ordinance allows for submission of a simplified stormwater management plan for small developments.

Regulated activities shall be conducted only after the Municipality approves a stormwater management plan. The Stormwater Management Ordinance will assist you in preparing the necessary information and plans for the Municipality to review and approve. **This document will constitute an approved plan if all of the relevant details are to be installed in their entirety AND no part of the stormwater system adversely affects any other property, nor adversely affects any septic systems or drinking water wells on this, or any other, parcel.** If an alternative system is to be used a plan will need to be submitted to the Municipality for approval. A design by a qualified professional may be required for more complex sites.

PLEASE INITIAL BELOW TO INDICATE THE STORMWATER MANAGEMENT PLAN FOR THIS SITE

The relevant details from Municipal Stormwater Management Ordinance will be installed in their entirety AND the system will be located as not to adversely affect other property, nor any septic systems or drinking water wells on this, or any other, parcel. The BMP or BMPs proposed be implemented are as follows:

Table 2: Runoff Volume Calculation						
Impervious Surface (sq ft) – From Table 1	X	Runoff Depth (in)	÷	12 in/ft	=	Total Runoff Volume to be Managed (cu ft)
	x	2	÷	12	=	

Table 3: Structural BMPs									
BMP Type	Length (ft)	X	Width (ft)	X	Depth (ft)	X	Void Space	=	Volume Managed (cu ft)
Infiltration Trench		x		x		x	0.40	=	
Rain Garden		x		x	0.5	x	1.0	=	
Dry Well		x		x		x	0.40	=	
Total Volume Managed – Structural BMPs									

Table 4: Non-Structural BMP - New Tree Planting					
Tree Type	Number of Trees	X	Volume Credit (cu ft)	=	Volume Managed (cu ft)
Deciduous Tree		x	4	=	
Evergreen Tree		x	6	=	
Total Volume Managed- Tree Planting					

Table 5: Non-Structural BMP - Preservation of Trees					
Distance from Impervious Area	Tree Canopy Area (sf)	X	Rainfall Depth Managed (in)	=	Volume Managed (cu ft)
Within 20 Feet		x	1	=	
Within 20 Feet		x	1	=	
Within 20 Feet		x	1	=	
Within 20 Feet		x	1	=	
Within 20 Feet		x	1	=	
Within 100 Feet		x	0.5	=	
Within 100 Feet		x	0.5	=	
Within 100 Feet		x	0.5	=	
Within 100 Feet		x	0.5	=	
Within 100 Feet		x	0.5	=	
Total Volume Managed- Tree Preservation					

Table 6: Non-Structural BMP - Minimize Soil Compaction and Planting					
Planting Type	Surface Area (sf)	X	Rainfall Depth Managed (in)	=	Volume Managed (cu ft)
Lawn		x	0.25	=	
Meadow		x	0.33	=	
Total Volume Managed- Minimize Compaction					

Table 7: Summation of Runoff Volume Managed	
BMP Type	Managed Volume
Structural BMPs (Table 3)	
Tree Planting (Table 4)	
Tree Preservation (Table 5)	
Minimize Soil Compaction/Planting (Table 6)	
Total Volume Managed (cu ft) - Must be Greater than that Calculated in Table 2	



In lieu of providing the above, an alternative and/or professional design is attached for approval AND the system will be located as not to adversely affect other property, any septic systems or drinking water wells on this, or any other, parcel.



Site Sketch Plan showing:

- Property Lines with dimensions
- Proposed buildings with dimensions
- Proposed impervious surfaces with dimensions
- Proposed sanitary sewer lateral or septic system, as applicable
- Proposed water service or well site, as applicable
- Proposed stormwater management system(s)
- Erosion and Sedimentation Controls to be installed and maintained during construction



Operations and Maintenance Agreement

- Execute and record a Stormwater Maintenance and Agreement



Application Review Fee

- The application review fee has been made to the Municipality. The review fee shall be as listed in the current Municipal Fee Schedule.

Condition of approval - The stormwater management plan must be fully implemented prior to a request for final inspection of the building or zoning permit.

Acknowledgement – By executing below, the Owner acknowledges the following:

- I declare I am the owner of the property.
- The information provided is accurate.
- I further acknowledge that municipal representatives are granted access to the above described property for review and inspection as may be required.

Owner _____

Date _____