



## ANNUAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) STATUS REPORT

**FOR THE PERIOD** March 16, 2018 **TO JUNE 30, 2018**

GENERAL INFORMATION					
Permittee Name:	New Hanover Township	NPDES Permit No.:	PAG130020		
Mailing Address:	2943 N. Charlotte Street	Effective Date:	March 16, 2018		
City, State, Zip:	Gilbertsville PA, 19525	Expiration Date:			
MS4 Contact Person:	Jamie L. Gwynn	Renewal Due Date:			
Title:	Township Manager	Municipality:	New Hanover Township		
Phone:	610-323-1008	County:	Montgomery		
Email:	jgwynn@newhanover-pa.org				
Co-Permittees (if applicable):					
Appendix(ces) that permittee is subject to (select all that apply):					
<input type="checkbox"/> Appendix A <input type="checkbox"/> Appendix B <input checked="" type="checkbox"/> Appendix C <input type="checkbox"/> Appendix D <input checked="" type="checkbox"/> Appendix E <input type="checkbox"/> Appendix F					
WATER QUALITY INFORMATION					
Are there any discharges to waters within the Chesapeake Bay Watershed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
Identify all surface waters that receive stormwater discharges from the permittee's MS4 and provide the requested information (see instructions).					
Receiving Water Name	Ch. 93 Class.	Impaired?	Cause(s)	TMDL?	WLA?
Swamp Creek (reach 02040203000487)	TSF	Y	Municipal Point source cause unk. Urban Runoff/Stormsewers- SILTATION	N	N
Swamp Creek (reach 02040203000488)	TSF	N		N	N
Minister Creek	TSF	N		N	N
Middle Creek	TSF	N		N	N
Scioto Creek	TSF	N		N	N
Unnamed tributary to Sanatoga Creek	WWF	N		N	N
Unnamed Tributary to Minister Creek Designated Use Gen ID 5623	TSF	N		N	N

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BUREAU OF POINT AND NON-POINT SOURCE MANAGEMENT

Unnamed Tributary to Minister Creek Designated Use Gen ID 50153	TSF	N		N	N
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**GENERAL MINIMUM CONTROL MEASURE (MCM) INFORMATION**

Have you completed all MCM activities required by the permit for this reporting period?  Yes  No

List the current entity responsible for implementing each MCM of your SWMP, along with contact name and phone number.

MCM	Entity Responsible	Contact Name	Phone
#1 Public Education and Outreach on Storm Water Impacts	Applicant	Lynda Jackmore	610-323-1008
#2 Public Involvement/Participation	Applicant	Lynda Jackmore	610-323-1008,
#3 Illicit Discharge Detection and Elimination (IDD&E)	Applicant	Jamie Gwynn, Dave Leh	610-323-1008, 610-489-4949
#4 Construction Site Storm Water Runoff Control	Applicant	Jim Wozniak, Dave Leh	610-323-1008, 610-489-4949
#5 Post-Construction Storm Water Management in New Development and Redevelopment	Applicant	Jim Wozniak, Dave Leh	610-323-1008, 610-489-4949
#6 Pollution Prevention / Good Housekeeping	Applicant	Dennis Flynn	610-970-5530

**MCM #1 – PUBLIC EDUCATION AND OUTREACH ON STORM WATER IMPACTS**

**BMP #1: Develop, implement and maintain a written Public Education and Outreach Program.**

1. For new permittees only, has the written PEOP been developed and implemented within the first year of permit coverage?

Yes  No

2. Date of latest annual review of PEOP: September 2014      Were updates made?  Yes  No

3. What were the plans and goals for public education and outreach for the reporting period?

New Hanover Township continued its policy of giving a pre-construction lecture about New Hanover Township's MS4 Program, stormwater management BMP's and proper erosion and sediment control techniques to all developers planning land development within the Township. "Don't Let Stormwater Run Off With Your Money" and "When it Rains, it Drains" pamphlets have been distributed during these meetings as well (See attachments 01 and 02).

New Hanover Township displayed stormwater pollution prevention educational posters in various businesses and Township Facilities throughout the municipality (these posters were updated in June of 2018). In addition, educational brochures were made available at the Township Building and sent out with new homeowner packets and building permit applications. (See attachments 03\_NHT SW Ed Materials).

New Hanover Township maintained and expanded the stormwater management weblinks on the website. (See attachment 04).

New Hanover Township continued to require developers to apply stormdrain medallions on new inlets, prior to dedication of the roads within the development. This requirement must be met prior to the Township's acceptance of any conveyance facility.

4. Did the MS4 achieve its goal(s) for the PEOP during the reporting period?  Yes  No

5. Identify specific plans and goals for public education and outreach for the upcoming year:

Public events held at Township sponsored functions will continue to be used as opportunities to hang educational posters and distribute educational pamphlets. As part of the upcoming permit cycle, the PEOP will be updated, annually in March to meet the Permit Requirements, an annual staff meeting for all of the identified individuals will be held every spring to make any required annual updates to the BMP's for MCM #1 (and all other MCMs).

**BMP #2: Develop and maintain lists of target audience groups present within the areas served by your MS4.**

1. For new permittees only, have the target audience lists been developed and implemented within the first year of permit coverage?

Yes  No

2. Date of latest annual review of target audience lists: \_\_\_\_\_ Were updates made?  Yes  No

**BMP #3: Annually publish at least one educational item on your Stormwater Management Program.**

1. For new permittees only, were stormwater educational and informational items produced and published in print and/or on the Internet within the first year of permit coverage?

Yes  No

2. Date of latest annual review of educational materials: September 2017 Were updates made?  Yes  No

3. Do you have a municipal website?  Yes  No (URL:  
[http://www.newhanover-  
pa.org/departments/planning/stormwater\\_ management.php](http://www.newhanover-pa.org/departments/planning/stormwater_management.php))

If Yes, what MS4-related material does it contain?

It contains links to a large variety of educational and government related websites. The website also contains the Township's Stormwater Management Ordinance.

4. Describe any other method(s) used during the reporting period to provide information on stormwater to the public:  
See BMP 1 above. New Hanover Township displayed stormwater pollution prevention educational posters in various businesses, and Township Facilities throughout the municipality (these Posters were updated in June of 2018). In addition, educational brochures were made available at the Township Building and sent out with new homeowner packets and building permit applications. (See attachment 03). Stormwater is also of great concern to the Township's Environmental Advisory Board, and during their monthly public meetings Stormwater issues are discussed in this public forum. Meeting Minutes are attached from the March and April EAB meetings (see attachments 05, 06).
5. Identify specific plans for the publication of stormwater materials for the upcoming year:  
The revised Pollutant Reduction Plan will be made available to the public in hard copy at the Township offices, and on the Township website. The Township will continue to look for new Stormwater-related pamphlets to distribute to the public, these new materials will be finalized during the annual MS4 Staff Meeting.

**BMP #4: Distribute stormwater educational materials to the target audiences.**

Identify the two additional methods of distributing stormwater educational materials during the previous reporting period (e.g., displays, posters, signs, pamphlets, booklets, brochures, radio, local cable TV, newspaper articles, other advertisements, bill stuffers, posters, presentations, conferences, meetings, fact sheets, giveaways, or storm drain stenciling).

During the Presentation of the revised Pollutant Reduction Plan (Fall 2018), a brief presentation will be given that focuses on the MS4 program. The Township will explore the opportunities to distribute updated flyers to assist with Illicit Discharge Detection.

**MCM #1 Comments:**

**MCM #2 – PUBLIC INVOLVEMENT/PARTICIPATION**

**BMP #1: Develop, implement and maintain a written Public Involvement and Participation Program (PIPP)**

1. For new permittees only, was the PIPP developed and implemented within one year of permit coverage?  
 Yes  No
2. Date of latest annual review of PIPP: September 2018                      Were updates made?     Yes  No

**BMP #2: Advertise to the public and solicit public input on ordinances, SOPs, Pollutant Reduction Plans (PRPs) (if applicable) and TMDL Plans (if applicable), including modifications thereto, prior to adoption or submission to DEP:**

1. Was an MS4-related ordinance, SOP, PRP or TMDL Plan developed during the reporting period?  Yes  No
2. If Yes, describe how you advertised the draft document(s) and how you provided opportunities for public review, input and feedback:

On 7/28/2018, a public notice was printed in the Mercury Newspaper, to provide the 30 day public comment period for the PRP, during this time, a digital copy of the PRP and attachments were made available on the Township's website. A public meeting was held on 8/28/2018 to present the PRP educate the Public on the MS4 program and offer open discussion of the PRP (See attachment 07).

This process will take place again this Fall to present the revised PRP that had to be revised due to technical deficiencies.

3. If an ordinance, SOP or plan was developed or amended during the reporting period, provide the following information:

<b>Ordinance / SOP / Plan Name</b>	<b>Date of Public Notice</b>	<b>Date of Public Hearing</b>	<b>Date Enacted or Submitted to DEP</b>
Revised Pollutant Reduction Plan For: Schuykill River - Appendix C Swamp Creek - Appendix E	TBD-Fall 2018	TBD-Fall 2018	TBD-Fall 2018

**BMP #3: Regularly solicit public involvement and participation from the target audience groups using available distribution and outreach methods.**

1. At least one public meeting or other MS4 event must be held during the 5-year permit coverage period to solicit participation and feedback from target audience groups. Was this meeting or event held during the reporting period?

Yes  No If Yes, Date of Meeting or Event:

2. Report instances of cooperation and participation in MS4 activities; presentations the permittee made to local watershed and conservation organizations; and similar instances of participation or coordination with organizations in the community.

The Township has ongoing coordination with its Environmental Advisory Board. The board offers feedback and published materials regarding stormwater and assists in its IDD&E activities.

3. Report activities in which members of the public assisted or participated in the meetings and in the implementation of the SWMP, including education activities or efforts such as cleanups, monitoring, storm drain stenciling, or others.

As mentioned above the EAB participates in many MS4 activities, and the Township regularly utilizes local BSA scouts in storm drain stenciling activities.

**MCM #2 Comments:**

**MCM #3 – ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDD&E)**

**BMP #1: Develop and implement a written program for the detection, elimination, and prevention of illicit discharges into the regulated small MS4.**

1. For new permittees only, was the written IDD&E program developed within one year of permit coverage?

Yes  No

2. Date of latest annual review of IDD&E program: Currently Were updates made?  Yes  No underway

**BMP #2: Develop and maintain map(s) that show permittee and urbanized area boundaries, the location of all outfalls and, if applicable, observation points, and the locations and names of all surface waters that receive discharges from those outfalls. Outfalls and observation points shall be numbered on the map(s).**

1. Have you completed a map(s) that includes all components of BMP #2?  Yes  No

If Yes and you are a new permittee and have not submitted the map(s) previously, attach the map(s) to this report.

If No, date by which permittee expects map(s) to be completed: June 2019

2. Date of last update or revision to map(s): March 2018

3. Total No. of Outfalls in MS4: 134 Total No. of Outfalls Mapped: 134

4. Total No. of Observation Points: n/a Total No. of Observation Points Mapped: n/a

5. During the reporting period, have you identified any existing outfalls that have not been previously reported to DEP in an NOI, application or annual report, or are any new MS4 outfalls proposed for the next reporting period?

Yes  No If Yes, select:  Existing Outfall(s) Identified  New Outfall(s) Proposed

**BMP #3: In conjunction with the map(s) created under BMP #2 (either on the same map or on a different map), the permittee shall develop and maintain map(s) that show the entire storm sewer collection system within the permittee's jurisdiction that are owned or operated by the permittee (including roads, inlets, piping, swales, catch basins, channels, and any other components of the storm sewer collection system), including privately-owned components of the collection system where conveyances or BMPs on private property receive stormwater flows from upstream publicly-owned components.**

1. Have you completed a map(s) that includes all components of BMP #3?  Yes  No

If Yes and you are a new permittee and have not submitted the map(s) previously, attach the map(s) to this report.

If No, date by which permittee expects map(s) to be completed: June 2019

2. If Yes to #1, is the map(s) on the same map(s) as for outfalls and receiving waters?  Yes  No

3. Date of last update or revision to map(s): Ongoing

**BMP #4: Conduct dry weather screenings of MS4 outfalls to evaluate the presence of illicit discharges. If any illicit discharges are present, the permittee shall identify the source(s) and take appropriate actions to remove or correct any illicit discharges. The permittee shall also respond to reports received from the public or other agencies of suspected or confirmed illicit discharges associated with the storm sewer system, as well as take enforcement action as necessary. The permittee shall immediately report to DEP illicit discharges that would endanger users downstream from the discharge, or would otherwise result in pollution or create a danger of pollution or would damage property.**

For new permittees, all identified outfalls (and if applicable observation points) must be screened during dry weather at least twice within the 5-year period following permit coverage. For existing permittees, all identified outfalls (and if applicable observation points) must be screen during dry weather at least once within the 5-year period following permit coverage and, for areas where past problems have been reported or known sources of dry weather flows occur on a continual basis, outfalls must be screened annually during each year of permit coverage.

1. How many unique outfalls (and if applicable observation points) were screened during the reporting period? 0

2. Indicate the percentage of all outfalls screened in the past five years. 100%

3. Indicate the percent of outfalls screened during the reporting period that revealed dry weather flows: 0%

4. Did any dry weather flows reveal color, turbidity, sheen, odor, floating or submerged solids?  Yes  No

5. If Yes for #4, attach all sample results to this report with a map identifying the sample location. Explain the corrective action(s) taken in the attachment.

6. Do you use the MS4 Outfall Field Screening Report form (3800-FM-BCW0521) provided in the permit?

Yes  No

If No, attach a copy of your screening report form.

**BMP #5: Enact a Stormwater Management Ordinance or SOP to implement and enforce a stormwater management program that includes prohibition of non-stormwater discharges to the regulated small MS4.**

1. Do you have an ordinance (municipal) or SOP or other mechanism (non-municipal) that prohibits non-stormwater discharges?  Yes  No

If Yes, indicate the date of the ordinance or SOP: 7/23/2007, updated 3/27/2017 (see attachment 09)

2. If Yes to #1, is the ordinance or SOP consistent with DEP's 2022 Model Stormwater Management Ordinance (3800-PM-BCW0100j) with respect to authorized non-stormwater discharges?  Yes  No

If Yes to #2 and the ordinance or SOP has not been submitted to DEP previously, attach the ordinance or SOP.

3. Were there any violations of the ordinance or SOP during the reporting period?  Yes  No

If Yes to #3, complete the table below (attach additional sheets as necessary).

Violation Date	Nature of Violation	Responsible Party	Enforcement Taken

4. Did you approve any waiver or variance during the reporting period that allowed an exception to non-stormwater discharge provisions of an ordinance or SOP?  Yes  No

If Yes to #4, identify the entity that received the waiver or variance and the type of non-stormwater discharge approved.

**BMP #6: Provide educational outreach to public employees, business owners and employees, property owners, the general public and elected officials (i.e., target audiences) about the program to detect and eliminate illicit discharges.**

1. Was IDD&E-related information distributed to public employees, businesses, and the general public during the reporting period?  Yes  No

If Yes, what was distributed? See attachment 03

2. Is there a well-publicized method for employees, businesses and the public to report stormwater pollution incidents?  
 Yes  No

3. Do you maintain documentation of all responses, action taken, and the time required to take action?  Yes  No

**MCM #3 Comments:**

New Hanover will develop a new Illicit discharge reporting system, to make it even easier for citizens to report any witnessed discharges.

**MCM #4 – CONSTRUCTION SITE STORMWATER RUNOFF CONTROL**

Are you relying on PA's statewide program for stormwater associated with construction activities to satisfy this MCM?

Yes  No

*(If Yes, respond to questions for BMP Nos. 1, 2 and 3 only in this section. If No, respond to questions for all BMPs in this section)*

**BMP #1: The permittee may not issue a building or other permit or final approval to those proposing or conducting earth disturbance activities requiring an NPDES permit unless the party proposing the earth disturbance has valid NPDES Permit coverage (i.e., not expired) under 25 Pa. Code Chapter 102.**

During the reporting period, did you comply with 25 Pa. Code § 102.43 (relating to withholding building or other permits or approvals until DEP or a county conservation district (CCD) has approved NPDES permit coverage)?

Yes  No  Not Applicable (no building permit applications received)

**BMP #2: A municipality or county which issues building or other permits shall notify DEP or the applicable CCD within 5 days of the receipt of an application for a permit involving an earth disturbance activity consisting of one acre or more, in accordance with 25 Pa. Code § 102.42.**

During the reporting period, did you comply with 25 Pa. Code § 102.42 (relating to notifying DEP/CCD within 5 days of receiving an application involving an earth disturbance activity of one acre or more)?

Yes  No  Not Applicable (no building permit applications received)

**BMP #3: Enact, implement and enforce an ordinance or SOP to require the implementation and maintenance of E&S control BMPs, including sanctions for non-compliance, as applicable.**

1. Do you have an ordinance (municipal) or SOP or other mechanism (non-municipal) that requires implementation and maintenance of E&S control BMPs?  Yes  No

If Yes, indicate the date of the ordinance or SOP: 7/23/2007, updated 3/27/2017

2. If Yes to #1, is the ordinance or SOP consistent with DEP's 2022 Model Stormwater Management Ordinance (3800-PM-BCW0100j)?  Yes  No

3. If Yes to #2 and the ordinance or SOP has not been submitted previously, attach a copy of the ordinance or SOP.

**BMP #4: Review Erosion and Sediment (E&S) control plans to ensure that such plans adequately consider water quality impacts and meet regulatory requirements.**

Specify the number of E&S Plans you reviewed during the reporting period:

**BMP #5: Conduct inspections regarding installation and maintenance of E&S control measures during earth disturbance activities. Maintain records of site inspections, including dates and inspection results, in accordance with the record retention requirements in this permit.**

Specify the number of E&S inspections you completed during the reporting period:

**BMP #6: Conduct enforcement when installation and maintenance of E&S control measures during earth disturbance activities does not comply with permit and/or regulatory requirements.**

Specify the number of enforcement actions you took during the reporting period for improper E&S:

**BMP #7: Develop and implement requirements for construction site operators to control waste at construction sites that may cause adverse impacts to water quality. The permittee shall provide education on these requirements to construction site operators.**

Specify the method(s) by which you are educating construction site operators on controlling waste at construction sites:

**BMP #8: Develop and implement procedures for the receipt and consideration of public inquiries, concerns, and information submitted by the public to the permittee regarding local construction activities.**

1. A tracking system has been established for receipt of public inquiries and complaints.  Yes  No

2. Specify the number of inquiries and complaints received during the reporting period:

**MCM #4 Comments:**

The Township acknowledges that it may have to modify its Stormwater Ordinance to comply with DEP's Model Ordinance.

**MCM #5 – POST-CONSTRUCTION STORM WATER MANAGEMENT IN NEW DEVELOPMENT AND REDEVELOPMENT**

**BMP #1: Enact, implement and enforce an ordinance or SOP to require post-construction stormwater management from new development and redevelopment projects, including sanctions for non-compliance.**

1. Do you have an ordinance (municipal) or SOP or other mechanism (non-municipal) that requires implementation and maintenance of post-construction stormwater management (PCSM) BMPs?  Yes  No  
If Yes, indicate the date of the ordinance or SOP: 7/23/2007, updated 3/27/2017
2. If Yes to #1, is the ordinance or SOP consistent with DEP's 2022 Model Stormwater Management Ordinance (3800-PM-BCW0100j)?  Yes  No
3. If Yes to #2 and the ordinance or SOP has not been submitted previously, attach a copy of the ordinance or SOP.

**BMP #2: Develop and implement measures to encourage and expand the use of Low Impact Development (LID) in new development and redevelopment. Measures should also be included to encourage retrofitting LID into existing development. Enact ordinances consistent with LID practices and repeal sections of ordinances that conflict with LID practices.**

1. Do you have an ordinance (municipal) or SOP or other mechanism (non-municipal) that encourages and expands the use of LID in new development and redevelopment?  Yes  No  
If Yes, indicate the date of the ordinance or SOP: 7/23/2007, updated 3/27/2017
2. If Yes to #1, is the ordinance or SOP consistent with DEP's 2022 Model Stormwater Management Ordinance (3800-PM-BCW0100j)?  Yes  No
3. If Yes to #2 and the ordinance or SOP has not been submitted previously, attach a copy of the ordinance or SOP.

**BMP #3: Ensure adequate O&M of all post-construction stormwater management BMPs that have been installed at development or redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale.**

1. Do you have an inventory of all PCSM BMPs that were installed to meet requirements in NPDES Permits for Stormwater Discharges Associated with Construction Activities approved since March 10, 2003?  Yes  No  
If Yes to #1, complete Table 1 on the next page.
2. Has proper O&M occurred during the reporting period for all PCSM BMPs?  Yes  No
3. If No to #2, explain what action(s) the permittee has taken or plans to take to ensure proper O&M.  
  
New Hanover Township requires self-inspection checklists to be completed by the owner annually. If these checklists are not completed within the grace period, the Township will notify the resident to completed the application. If the resident fails to complete the form, the Township will conduct the inspection.

*If you are relying on PA's statewide program for stormwater associated with construction activities, you may skip to MCM #6, otherwise complete all questions for BMPs #4 - #6 in this section.*

**BMP #4: Require the implementation of a combination of structural and/or non-structural BMPs that are appropriate to the local community, that minimize water quality impacts, and that are designed to maintain pre-development runoff conditions.**

1. Specify the number of PCSM Plans reviewed during the reporting period for projects disturbing greater than or equal to one acre (including projects less than one acre that are part of a larger common plan of development or sale): 11
2. Has a tracking system been established and maintained to record qualifying projects and their associated BMPs?  
 Yes  No

**PCSM BMP INVENTORY**

**Table 1.** To complete the information needed for MCM #5, BMP #3, list all existing structural BMPs that discharge stormwater to the permittee's MS4 that were installed to satisfy PCSM requirements for earth disturbance activities under Chapter 102, and provide the requested information (see instructions).

BMP No.	BMP Name	DA (ac)	Entity Responsible for O&M	Latitude	Longitude	Date Installed	O&M Requirements	NPDES Permit No.
1	SEE ATTACHED BMP INVENTORY			o ' "	o ' "			
2				o ' "	o ' "			
3				o ' "	o ' "			
4				o ' "	o ' "			
5				o ' "	o ' "			
6				o ' "	o ' "			
7				o ' "	o ' "			
8				o ' "	o ' "			
9				o ' "	o ' "			
10				o ' "	o ' "			
11				o ' "	o ' "			
12				o ' "	o ' "			
13				o ' "	o ' "			
14				o ' "	o ' "			
15				o ' "	o ' "			
16				o ' "	o ' "			

**BMP #5: Ensure that controls are installed that shall prevent or minimize water quality impacts. The permittee shall inspect all qualifying development or redevelopment projects during the construction phase to ensure proper installation of the approved structural PCSM BMPs. A tracking system (e.g., database, spreadsheet, or written list) shall be implemented to track the inspections conducted and to track the results of the inspections (e.g., BMPs were, or were not, installed properly).**

1. During the reporting period have you inspected all qualifying development and redevelopment projects during the construction phase to ensure proper installation of approved structural BMPs?  
 Yes  No  Not Applicable (no qualifying projects during reporting period)
2. Has a tracking system been established and maintained to record results of inspections?  
 Yes  No

**BMP #6: Develop a written procedure that describes how the permittee shall address all required components of this MCM.**

Have you developed a written plan that addresses: 1) minimum requirements for use of structural and/or non-structural BMPs in plans for development and redevelopment; 2) criteria for selecting and standards for sizing stormwater BMPs; and 3) implementation of an inspection program to ensure that BMPs are properly installed?  Yes  No

**MCM #5 Comments:**

The PCSM BMP inventory (attachemnts 10 and 11) is in the process of being updated, and mapped per the requirements of the inventory table, the current inventory will be verified and located through digital mapping, then ground-truthed during field visits. The Current SW ordinance is alsos attached for reference (09).

**MCM #6 – POLLUTION PREVENTION / GOOD HOUSEKEEPING**

**BMP #1: Identify and document all operations that are owned or operated by the permittee and have the potential for generating pollution in stormwater runoff to the MS4. This includes activities conducted by contractors for the permittee.**

1. Have you identified all facilities and activities owned and operated by the permittee that have the potential to generate stormwater runoff into the MS4?  Yes  No
2. When was the inventory last reviewed? March 2018
3. When was it last updated? February 2016

**BMP #2: Develop, implement and maintain a written O&M program for all operations that could contribute to the discharge of pollutants from the MS4, as identified under BMP #1. This program shall address stormwater collection or conveyance systems within the regulated MS4.**

1. Have you developed a written O&M program for the operations identified in BMP #1?  Yes  No
2. Date of last review or update to written O&M program: June 2011

**BMP #3: Develop and implement an employee training program that addresses appropriate topics to further the goal of preventing or reducing the discharge of pollutants from operations to the regulated small MS4. All relevant employees and contractors shall receive training.**

1. Have you developed an employee training program?  Yes  No
2. Date of last review or update to training program: Sept 2014                      Date of latest training: Fall 2017

3. Training topics covered:  
Stormwater Facilities Operations and Maintenance

4. Name(s) of training presenter(s):  
D. Flynn, J. Smith, Rob Rinehart

5. Names of training attendees:  
Current (then) public works employees

**MCM #6 Comments:**

A full review of MCM #6 is due and will be reviewed and updated in conjunction with Public Works Director.

**POLLUTANT CONTROL MEASURES (PCMs)**

*Indicate the status of implementing PCMs in Appendices A, B and/or C by completing the table below. Skip this section if PCMs are not applicable.*

Task	Date Completed	Attached	Anticipated Completion Date
Storm Sewershed Map(s)		<input type="checkbox"/>	June 2019
Source Inventory		<input type="checkbox"/>	June 2020
Investigation of Suspected Sources		<input type="checkbox"/>	June 2021
Ordinance/SOP for Controlling Animal Wastes		<input type="checkbox"/>	June 2022

**PCM Comments:**

The Township has been proactive in beginning to develop stormsewershed mapping. This in depth analysis has led to identification new outfalls, possible BMPs and relocation of some existing outfalls.

**POLLUTANT REDUCTION PLANS (PRPs) AND TMDL PLANS**

1. Complete this section if the development and submission of a PRP and/or TMDL Plan was required as an attachment to the latest NOI or application or was required by the permit, regardless of whether DEP has approved the plan(s).

Type of Plan	Submission Date	DEP Approval Date	Surface Waters Addressed by Plan
<input type="checkbox"/> Chesapeake Bay PRP (Appendix D)			Chesapeake Bay
<input checked="" type="checkbox"/> Impaired Waters PRP (Appendix E)	Sept 2017	N/A	Swamp Creek
<input type="checkbox"/> TMDL Plan (Appendix F)			
<input type="checkbox"/> Combined Chesapeake Bay / Impaired Waters PRP			Chesapeake Bay,
<input type="checkbox"/> Combined PRP / TMDL Plan			

Joint Plan (if checked, list the name of the MS4 group or names of all entities participating in the joint plan below)

Joint Plan Participants:

2. Identify the pollutants of concern and pollutant load reduction requirements under the permit (see instructions).

Type of Plan	TSS Load Reduction (lbs/yr)	TP Load Reduction (lbs/yr)	TN Load Reduction (lbs/yr)
<input type="checkbox"/> Chesapeake Bay PRP (Appendix D)			
<input checked="" type="checkbox"/> Impaired Waters PRP (Appendix E)	3644.75		
<input type="checkbox"/> TMDL Plan (Appendix F)			
<input type="checkbox"/> Combined Chesapeake Bay / Impaired Waters PRP			
<input type="checkbox"/> Combined PRP / TMDL Plan			

3. Date Final Report Demonstrating Achievement of Pollutant Load Reductions Due: Sept 30, 2023

4. Have any modifications to the plan(s) occurred since DEP approval?  Yes  No

If Yes to #4, was the updated plan(s) submitted to DEP?  Yes  No

If Yes to #4, did you comply with the public participation requirements of the applicable appendix?  Yes  No

If Yes to #4, describe the plan modifications.

5. Summary of progress achieved during reporting period.

6. Anticipated activities for next reporting period.

**PRP/TMDL Plan Comments:**

The revised PRP, is tentatively being released for Public review in the fall of 2018, the Township had been working closely with DEP to revise the Plan and focused its MS4 planning efforts on the revised plan.

**NEW BMPs FOR PRP/TMDL PLAN IMPLEMENTATION**

**Table 2.** List all new structural BMPs installed and ongoing non-structural BMPs implemented during the reporting period that are being used toward achieving load reductions in the permittee's PRP and/or TMDL Plan (see instructions).

BMP No.	BMP Name	DA (ac)	% Imp.	BMP Extent	Units	Latitude	Longitude	Date Installed or Implemented	Planning Area?	Ch. 102?	Annual Sediment Load Reduction (lbs/yr)
						o ' "	o ' "		<input type="checkbox"/>	<input type="checkbox"/>	
						o ' "	o ' "		<input type="checkbox"/>	<input type="checkbox"/>	
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						o ' "	o ' "		<input type="checkbox"/>	<input type="checkbox"/>	

**BMP INVENTORY FOR PRP/TMDL PLAN IMPLEMENTATION**

**Table 3.** List all existing structural BMPs that have been installed in prior reporting periods and are eligible to use toward achieving load reductions in the permittee's PRP and/or TMDL Plan (see instructions).

BMP No.	BMP Name	DA (ac)	% Imp.	BMP Extent	Units	Latitude	Longitude	Date Installed	Annual Sediment Load Reduction (lbs/yr)	Date of Latest Inspection	Satisfactory?
						o ' "	o ' "				<input type="checkbox"/>
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**CERTIFICATION**

**For PAG-13 Permittees:** I have read the latest PAG-13 General Permit issued by DEP and agree and certify that (1) the permittee continues to be eligible for coverage under the PAG-13 General Permit and (2) the permittee will continue to comply with the conditions of that permit, including any modifications thereto. I understand that if I do not agree to the terms and conditions of the PAG-13 General Permit, I will apply for an individual permit within 90 days of publication of the General Permit. I also acknowledge that any facility construction needed to comply with the General Permit requirements shall be designed, built, operated, and maintained in accordance with operative laws and regulations.

**For All Permittees:** I certify under penalty of law that this report was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. See 18 Pa. C.S. § 4904 (relating to unsworn falsification).

Jamie L. Gwynn, Township Manager

\_\_\_\_\_  
Name of Responsible Official

610-323-1008

\_\_\_\_\_  
Telephone No.

\_\_\_\_\_  
Signature

9/26/2018

\_\_\_\_\_  
Date

# Don't Let Storm Water Run Off With Your Time and Money!

## *What the Construction Industry Should Know About Storm Water In Our Community*

The construction industry plays an important role in improving our community's quality of life by not only providing new development, but also protecting our streams and rivers through smart business practices that prevent pollution from leaving construction sites.

Storm water runoff leaving construction sites can carry pollutants such as dirt, construction debris, oil, and paint off-site and into storm drains. In our community, storm drains carry storm water runoff directly to local creeks, streams, and rivers with no treatment. Developers, contractors, and homebuilders can help to prevent storm water pollution by taking the following steps:

1. Comply with storm water permit requirements.
2. Practice erosion control and pollution prevention practices to keep construction sites "clean."
3. Conduct advanced planning and training to ensure proper implementation on-site.

The remainder of this fact sheet addresses these three steps.

### Storm Water Permit Requirements for Construction Activity

Planning and permitting requirements exist for construction activities. These requirements are intended to minimize storm water pollutants leaving construction sites.

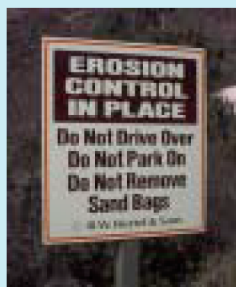
- Pennsylvania's Erosion and Sediment Pollution Control Program (25 Pa. Code, Chapter 102) requires Erosion and Sediment Control Plans for all earth disturbing activities.
- The National Pollutant Discharge Elimination System (NPDES) Permit Program (25 Pa. Code, Chapter 92) requires that construction activities disturbing greater than one acre submit a Notice of Intent for coverage under a general NPDES permit.



Knowing your requirements before starting a project and following them during construction can save you time and money, and demonstrate that you are a partner in improving our community's quality of life. For more information about these programs, contact your local county conservation district office or the Department of Environmental Protection.

### Erosion Control Practices:

- Perimeter controls (e.g. silt fence)
- Sediment traps
- Immediate revegetation
- Phased, minimized grading
- Construction entrance
- Protection of streams and drainage ways
- Inlet protection



### An Ounce of Prevention

Rain that falls onto construction sites is likely to carry away soil particles and other toxic chemicals present on construction sites (oil, grease, hazardous wastes, fuel). Storm water, if not properly managed, carries these pollutants to streams, rivers, and lakes. Erosion and sediment control practices can serve as a first line of defense,

## **Pollution Prevention Practices:**

- Designated fueling and vehicle maintenance area away from streams.
- Remove trash and litter.
- Clean up leaks immediately.
- Never wash down dirty pavement.
- Place dumpsters under cover.
- Dispose of all wastes properly.

minimizing clean up and maintenance costs, and the impacts to water resources caused by soil erosion during active construction. Erosion controls can reduce the volume of soil going into a sediment control device, such as a sediment trap, therefore, “clean out” frequencies are lower and maintenance costs are less. When possible, divert water around the construction site using berms or drainage ditches.

In addition, use pollution prevention and “good housekeeping measures” to reduce the pollution leaving construction sites as well. This can be as simple as minimizing the pollution source’s contact with rainwater by covering it, maintaining a “clean site” by reducing trash and waste, and keeping vehicles well maintained.

## **The Best Laid Plans**

Plans such as erosion and sediment control plans and storm water pollution prevention plans are important tools for outlining the erosion control and pollution prevention practices that you will use to manage storm water runoff prior to breaking ground. Developing good plans allows for proper budgeting and planning for the life of the project. Proper installation and maintenance of erosion and storm water controls is essential to a plan that works. Training for on-site staff helps to ensure the proper installation and maintenance of erosion controls and pollution prevention practices. Inspect controls and management techniques regularly to ensure they are working, especially after storm events. If polluted storm water is leaving the site, you may need to repair or add additional storm water controls.



## **The Bigger Storm Water Picture**

Your community is preventing storm water pollution through a comprehensive storm water management program. This program addresses storm water pollution from construction, but it also deals with new development, illegal dumping to the storm sewer system, and municipal operations. It will also continue to educate the community and get everyone involved in making sure the only thing that storm water contributes to our streams is . . . water! Contact your community or the Pennsylvania Department of Environmental Protection for more information about storm water management.

### **For more information:**

**Visit New Hanover Township at:**

<http://www.newhanover-pa.org/stormwater.html>

Pennsylvania Association of Conservation District’s:  
<http://www.pacd.org/default.html>

Pennsylvania Handbook of Best Management Practices for Developing Areas:  
[http://www.pacd.org/products/bmp/bmp\\_handbook.html](http://www.pacd.org/products/bmp/bmp_handbook.html)

Storm Water Manager’s Resource Center:  
<http://www.stormwatercenter.net>

Pennsylvania Department of Environmental Protection:  
<http://www.dep.state.pa.us>



## What is Storm Water?

Storm water is water from precipitation that flows across the ground and pavement when it rains or when snow and ice melt. The water seeps into the ground or drains into what we call storm sewers. These are the drains you see at street corners or at low points on the sides of streets. Collectively, the draining water is called storm water runoff.

## Why is Storm Water "Good Rain Gone Wrong?"

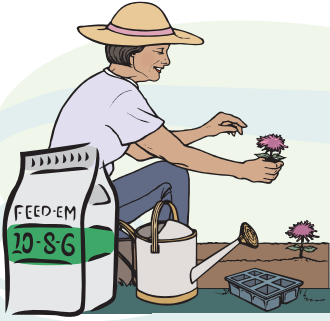
Storm water becomes a problem when it picks up debris, chemicals, dirt, and other pollutants as it flows or when it causes flooding and erosion of stream banks. Storm water travels through a system of pipes and roadside ditches that make up storm sewer systems. It eventually flows directly to a lake, river, stream, wetland, or coastal water. All of the pollutants storm water carries along the way empty into our waters, too, because storm water does not get treated!



**Pet wastes left on the ground get carried away by storm water, contributing harmful bacteria, parasites and viruses to our water.**



**Vehicles drip fluids (oil, grease, gasoline, antifreeze, brake fluids, etc.) onto paved areas where storm water runoff carries them through our storm drains and into our water.**



**Chemicals used to grow and maintain beautiful lawns and gardens, if not used properly, can run off into the storm drains when it rains or when we water our lawns and gardens.**

**Waste from chemicals and materials used in construction can wash into the storm sewer system when it rains. Soil that erodes from construction sites causes environmental degradation, including harming fish and shellfish populations that are important for recreation and our economy.**



## Where To Go To Continue the Information Flow

Your community is preventing storm water pollution through a storm water management program. This program addresses storm water pollution from construction, new development, illegal dumping to the storm sewer system, and pollution prevention and good housekeeping practices in municipal operations. It will also continue to educate the community and get everyone involved in making sure the only thing that storm water contributes to our water is . . . water! Contact your community's storm water management program coordinator or the Pennsylvania Department of Environmental Protection for more information about storm water management.



Pennsylvania Department of Environmental Protection  
www.dep.state.pa.us

- 1. Ditch** – Part of the storm sewer system. Most people think that the system is just a series of underground pipes. It can also include ditches used to convey storm water from the land to a receiving lake, river, or stream.
- 2. Fire Hydrant** – Not part of the storm sewer system. Water sprayed from fire hydrants is not storm water, but is allowed by law to enter the storm sewer system.
- 3. Curb with Storm Drain Inlet** – Part of the storm sewer system. Many people do not realize that this is an opening leading to the storm sewer system. Anything going into this inlet (e.g., trash, leaves, improperly disposed of hazardous materials) travel directly to a receiving lake, river, or stream without being treated first. Many communities stencil storm drains with "Do Not Dump" messages to let people know.
- 4. Storm Sewer Outfall** – Part of the storm sewer system. An outfall is where storm water drains from the storm sewer system into a receiving lake, stream, or river. If there is a flow from an outfall when it isn't raining, there could be a problem with the system or someone has used a storm drain for illegally disposing of materials.
- 5. Toilet** – Not part of the storm sewer system. Wastewater from sinks and toilets in houses and businesses travel through a sewer system constructed to carry sanitary wastes. In some instances, older communities may have a combined sewer system designed to carry both storm water and sanitary waste.
- 6. Septic System** – Not part of the storm sewer system. Homeowners use septic tanks to manage sanitary wastes on-site. Improperly maintained septic systems can leak and contribute pollutants to the storm sewer system, as well as directly to lakes, rivers, and streams.
- 7. Roads and Other Paved Areas** – Not part of the storm sewer system. Roads and other hardened surfaces such as parking lots and sidewalks can accumulate pollutants (e.g., oil, grease, dirt, leaves, trash, pet wastes) that storm water eventually washes into the storm sewer system.
- 8. Storm Drain Inlet** – Part of the storm sewer system. This is another example of what a storm drain may look like. Like the storm drain inlet shown in picture #3, anything that enters this drain will go directly to streams, rivers, and lakes without being treated first. It is important to recognize this as a storm drain to prevent it from being used as a trash can.

## Answers to Test Your Storm Sewer System Savvy:

## Attachment 02

# When It Rains, It Drains

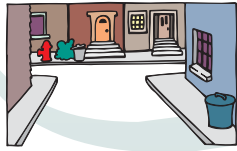
**Understanding Storm Water and How It Can Affect Your Money, Safety, Health, and the Environment**



## What Happens When It Rains?

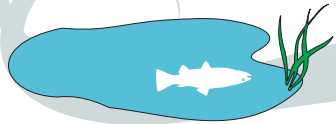


Rain is an important part of nature's water cycle, but there are times it can do more damage than good. Problems related to storm water runoff can include:



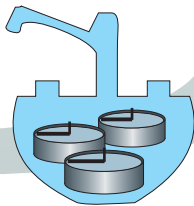
**Flooding caused by too much storm water flowing over hardened surfaces such as roads and parking lots, instead of soaking into the ground.**

**Increases in spending on maintaining storm drains and the storm sewer system that become clogged with excessive amounts of dirt and debris.**



**Decreases in sportfish populations because storm water carries sediment and pollutants that degrade important fish habitat.**

**More expensive treatment technologies to remove harmful pollutants carried by storm water into our drinking water supplies.**



**Closed beaches due to high levels of bacteria carried by storm water that make swimming unsafe.**

We can help rain restore its good reputation while protecting our health and environment while saving money for ourselves and our community. Keep reading to find out how...

## Test Your Storm Sewer System Savvy!



What does the storm sewer system look like in your community? See if you can identify which pictures are part of the storm sewer system. (Answers are on the back.)



## Restoring Rain's Reputation: What Everyone Can Do To Help

Rain by nature is important for replenishing drinking water supplies, recreation, and healthy wildlife habitats. It only becomes a problem when pollutants from our activities like car maintenance, lawn care, and dog walking are left on the ground for rain to wash away. Here are some of the most important ways to prevent storm water pollution:

- Properly dispose of hazardous substances such as used oil, cleaning supplies and paint—never pour them down any part of the storm sewer system and report anyone who does.
- Use pesticides, fertilizers, and herbicides properly and efficiently to prevent excess runoff.
- Look for signs of soil and other pollutants, such as debris and chemicals, leaving construction sites in storm water runoff or tracked into roads by construction vehicles. Report poorly managed construction sites that could impact storm water runoff to your community. (See the back of this brochure for contact information.)
- Install innovative storm water practices on residential property, such as rain barrels or rain gardens, that capture storm water and keep it on site instead of letting it drain away into the storm sewer system.
- Report any discharges from storm water outfalls during times of dry weather—a sign that there could be a problem with the storm sewer system.
- Pick up after pets and dispose of their waste properly. No matter where pets make a mess—in a backyard or at the park—storm water runoff can carry pet waste from the land to the storm sewer system to a stream.
- Store materials that could pollute storm water indoors and use containers for outdoor storage that do not rust or leak to eliminate exposure of materials to storm water.

# A Homeowner's Guide to Stormwater Management

*You can make  
a difference!*

*Learn what you can do on your  
property and in your community to  
improve the health of your watershed.*

The Office of Watersheds would like to thank the following organizations and partners for their assistance and for the use of their materials in this guide:

Center for Watershed Protection

Fairmount Park Commission

Montgomery County Conservation District

NAM Planning & Design, LLC

National Oceanic & Atmospheric Administration (NOAA)

Pennsylvania Department of Environmental Protection (DEP)

Pennsylvania Horticultural Society

Philadelphia Department of Streets

South River Federation

TreeVitalize

University of Wisconsin — Extension

Washington State Puget Sound Action Team

Wisconsin Department of Natural Resources

Wissahickon Valley Watershed Association

## Disclaimer

The information contained in this guide is being offered by the City of Philadelphia (City) through its Water Department (PWD) for the use of residents of the City. Please note that the stormwater management projects or Best Management Practices (BMPs) in this guide are voluntary projects recommended strictly for homeowners. They are not designed for professionals required to comply with the City's Stormwater Regulations.

If you plan to install any of the following structural projects on your property in the City, please notify PWD via its e-mail address (WaterShedsPWD@phila.gov): Rain Barrels, Rain Gardens, or Dry Wells. PWD would like to register your project with the City's Department of Licenses & Inspections (L&I). Also, PWD encourages you to take photographs of your project and to send them to PWD via the above e-mail address

If you experience problems with any water or sewer piping on your property, you should contact a registered plumber.

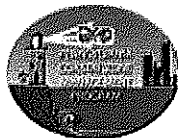
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# A Homeowner's Guide to Stormwater Management

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# Introduction

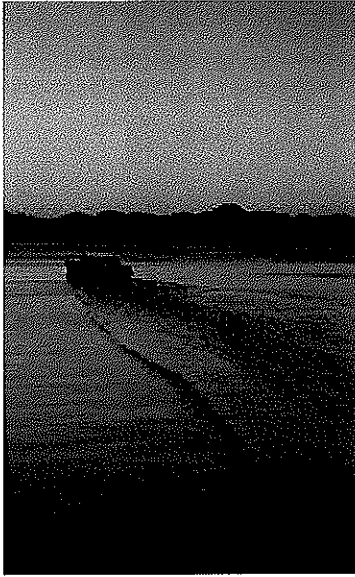


**T**he Office of Watersheds of the Philadelphia Water Department has a vision for Philadelphia—“Clean Water—Green City.” We want to unite the City with its water environment, creating a green legacy for future generations while incorporating a balance between ecology, economics and equity.

In order to achieve the goal of “Clean Water-Green City,” we must work together with our partners, local residents, homeowner associations and municipalities on managing stormwater in a manner that will restore our watersheds. We can all play a part in taking an active role in converting our streams, creeks and surrounding green spaces into healthy systems that local residents, along with native fish and wildlife, can use as amenities, sanctuaries and habitats. As a homeowner, your part can be as simple as maintaining your car properly or building a rain garden on your lawn. This guide provides you with the steps and actions you can take to improve stormwater management on your property or in your community. These stormwater management projects will not only help protect our invaluable drinking water sources, but they will help green the city, restore our waterways and improve quality of life for all residents.

For more information, please visit [www.PhillyRiverInfo.org](http://www.PhillyRiverInfo.org) or e-mail [WaterShedsPWD@phila.gov](mailto:WaterShedsPWD@phila.gov).

# Vehicle Maintenance



**B**y maintaining your car properly you can prevent oil leaks, heavy metals and toxic materials from traveling from your car onto the street. Rain washes oil and other hazardous chemicals from the street into the nearest storm drain, ultimately draining into the Delaware and Schuylkill Rivers, the source of drinking water for many. Just imagine the number of cars in our region and the amount of oil that finds its way into our local waterways! It has been estimated that each year over 180 million gallons of used oil is disposed of improperly (Alameda CCWP, 1992), and that a single quart of oil can pollute 250,000 gallons of drinking water (NDRC, 1994). Please follow proper automotive maintenance.

## **Maintaining your Vehicle**

- Maintain your car and always recycle used motor oil.
- Check your car or truck for drips and oil leaks regularly and fix them promptly. Keep your vehicle tuned to reduce oil use.
- Use ground cloths or drip pans under your vehicle if you have leaks or if you are doing engine work. Clean up spills immediately and properly dispose of clean up materials.
- Collect all used oil in containers with tight-fitting lids. Old plastic jugs are excellent for this purpose.
- Recycle used motor oil. Many auto supply stores, car care centers, and gas stations will accept used oil. Do not pour liquid waste down floor drains, sinks or storm drains.
- Do not mix waste oil with gasoline, solvents, or other engine fluids. This contaminates the oil which may be reused, increases the volume of the waste, and may form a more hazardous chemical.
- Never dump motor oil, antifreeze, transmission fluid or other engine fluids into road gutters, down the storm drain or catch basin, onto the ground, or into a ditch.
- Many communities have hazardous waste collection days where used oil can be brought in for proper disposal. Find out about your program. Recycling just one gallon of used oil can generate enough electricity to run the average household for almost 24 hours.
- Try to use drain mats to cover drains in case of a spill.
- Store cracked batteries in leak proof secondary containers.

# Lawn & Garden Care



**W**hen fertilizing lawns and using other common chemicals, such as pesticides and herbicides, remember you're not just spraying the lawn. When it rains, the rain washes the fertilizers, pesticides and herbicides along the curb and into storm drains, which ultimately carry runoff into the Schuylkill and Delaware Rivers, our drinking water source. In addition to degrading the water quality of our streams and rivers, pesticides can kill critters in the stream and fertilizers can cause algal blooms, which rob our waterways of oxygen that fish need to survive. If you have to use fertilizers, pesticides, and herbicides, carefully read all labels and apply these products sparingly.

Many homeowners are unaware of the actual nutrient needs of their lawns. According to surveys conducted by the Center for Watershed Protection, over 50% of lawn owners fertilize their lawns, yet only 10 to 20% of lawn owners take the trouble to perform soil tests to determine whether fertilization is even needed (CWP, 1999). *Organic lawn care practices (no chemical pesticides and fertilizers) can also be a wise environmental choice and will save you money.* Conduct a soil test on your lawn and follow the below practices to reduce the need to fertilize on your lawn and garden.

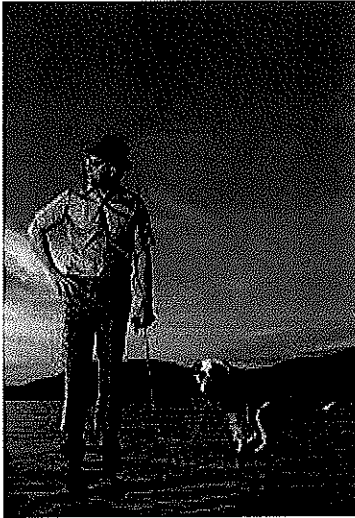
## Caring for your Lawn and Garden

- Use fertilizers sparingly. Lawns and many plants do not need as much fertilizer or need it as often as you might think. Test your soil to be sure!
- Consider using organic fertilizers; they release nutrients more slowly.
- Never fertilize before a rain storm (the pollutants are picked up by stormwater during rain events).
- Keep fertilizer off of paved surfaces—off of sidewalks, driveways, etc. If granular fertilizer gets onto paved surfaces, collect it for later use or sweep it onto the lawn.
- Use commercially available compost or make your own using garden waste. Mixing compost with your soil means your plants will need less chemical fertilizer and puts your waste to good use. Another alternative is to use commercial compost, called Earthmate, which is available for free through PWD. Call 215-685-4065 or visit the website to learn more about Earthmate: [www.phila.gov/water/brc/brchow2get.html](http://www.phila.gov/water/brc/brchow2get.html)
- Let your grass clippings lay! Don't bag the grass. Use a mulching lawn mower to cut one-third of the blade length each week and naturally fertilize your lawn in the process.

## Lawn & Garden Care

- Wash your spreader equipment on a pervious (penetrable) vegetated area, like the lawn, to allow for the natural absorption of excess fertilizer.
- Never apply fertilizer to frozen ground or dormant lawns.
- Maintain a buffer strip of unmowed natural vegetation bordering waterways and ponds to trap excess fertilizers and sediment from lawns/gardens.
- Grow an organic garden (no pesticides or fertilizers). Call the Organic Landscape Alliance at 1-866-820-0279 or visit [www.organiclandscape.org](http://www.organiclandscape.org).

# Pet Waste



**W**hen animal waste is left on the ground, rainwater or melting snow washes the pet waste into our storm drains or directly into our local creeks. The disease-causing bacteria found in pet waste eventually flows from our local waterways into the Delaware and Schuylkill Rivers, our drinking water source. In addition to contaminating waterways with disease-carrying bacteria, animal waste acts like a fertilizer in the water, just as it does on land. This promotes excessive aquatic plant growth that can choke waterways and promote algae blooms, robbing the water of vital oxygen.

## **Scooping Up the Poop**

- Bag it! When going for dog walks, take a shopping bag or sandwich bag. When doggy makes a deposit, turn the baggie inside out over your hand and use it as a glove to pick up the waste.
- Flush the pet waste down the toilet because then it is treated at a sewage treatment plant.
- If flushing down the toilet is not a viable option, put the pet waste in the trash, but never put waste into storm drains.
- Encourage your neighbors to provide pet waste stations for collection and disposal of waste. Check to see if the parks in your neighborhood have them.
- Dig a small trench in your yard where your pets tend to defecate and toss the waste in the trench, cover with a layer of leaves, grass clippings, and dirt.
- Dispose waste in disposal units called Doggy Loos where they are installed into the ground. Decomposition occurs within the unit.
- At the park, set up a pooch patch which has a pole surrounded by a light scattering of sand around it. Dog owners can introduce their dog to the pole upon entry to the park. Dogs will then return to the patch to defecate and then you can place the pet waste in special bins for disposal.

# Vehicle Washing



Car washing is a common routine for residents and a popular way for organizations, such as scout troops, schools, and sports teams to raise funds. However, most of the time, cars are washed in driveways and parking lots which allow wash water (dirty water) to find its way to the nearest storm drain, ultimately draining into our drinking water sources, the Delaware and Schuylkill Rivers. The wash water often contains pollutants, such as oils and grease, phosphates (from the soap), and heavy metals—all of which are unhealthy for people and fish.

## Washing Your Car Properly

- The best action is to take your vehicle to a commercial car wash, especially if you plan to clean the engine or the bottom of the car. Most car washes reuse water several times before sending it for treatment at a sewage treatment plant.

If you still want to wash your car at home...

- Wash your car on gravel, grass or another permeable surface, so the ground can filter the water naturally.
- Use soap sparingly. Try to use non-phosphate detergents. Phosphates are nutrients that can cause problems for nearby waterways.
- Use a hose that is high pressure, low volume. Use a hose with a nozzle that automatically turns off when left unattended or one that has a pistol grip or trigger nozzle to save water. Wash one section of the car at a time and rinse it quickly.
- When you're done, empty your bucket of soapy water down the sink, not the street.
- Block off the storm drain during charity car wash events or use an insert with a vacuum pump to catch wash water and empty it into the sink, not the street.

# Tree Planting



If you have any tree planting questions and need to ask an expert, go to [www.pennsylvaniahorticulturalsociety.org/garden/ask\\_gardener](http://www.pennsylvaniahorticulturalsociety.org/garden/ask_gardener)

**T**rees are not only a beautiful addition to the landscape, but they also provide invaluable benefits to cities. They reduce heat by cooling and shading homes during the hot summer months, decreasing the amount of energy required to cool a home and its related electric bills. Mature trees can actually cut summer cooling costs by 40% and tree-lined blocks can even decrease local temperatures. Trees naturally clean the air of pollutants and create a neighborhood noise buffer. Trees also improve stormwater management, reducing the amount of polluted stormwater that normally would go directly into storm drains. Tree roots also allow rainwater to filter back into the soil, recharging the often thirsty water table. A 2005 study by the University of Pennsylvania found that trees can increase property values. Planting a tree within 50 feet of a house can increase its sale price by 10 to 15%. Some studies even indicate that the mere presence of trees can create stronger neighborhood ties and reduce crime.

## Planting a Tree

Before getting started, you may be interested in participating in the TreeVitalize rebate program where you may be eligible to receive up to a \$25 rebate on the purchase of a tree. Whether you are planting a tree in your yard or hiring a contractor to plant a street tree, you may qualify. For more information, visit [www.treevitalize.net](http://www.treevitalize.net) and [www.pennsylvaniahorticulturalsociety.org/phlgreen/tree-pledge.html](http://www.pennsylvaniahorticulturalsociety.org/phlgreen/tree-pledge.html).

Also, the Pennsylvania Horticultural Society's Tree Tenders Program offers a basic training course designed to teach general tree-care skills to organized community groups and individuals in Philadelphia. If you are interested in the course or a free copy of the *Tree Tenders Handbook* or *Mini-Guide to Tree Planting*, visit [www.pennsylvaniahorticulturalsociety.org/phlgreen/treetenders](http://www.pennsylvaniahorticulturalsociety.org/phlgreen/treetenders).

1. Now, if you are ready to get started with your tree planting, select a site appropriate for your tree.
2. Dig the hole at least 1½ to 2 times the width of the root ball (container) to be installed, and no deeper than the height of the root ball so that the root flare (the top of the root mass) is flush with the existing ground. The planting pit should be dug so the walls of the pit are angled like a bowl or sloping outward in heavy soils.
3. Break up the walls of the pit after digging, so that fine roots can penetrate the soil. The soil that you dig out of the hole is what you will use to backfill around the root ball. Soil amendments are not recommended when planting a tree; therefore, no compost, moss, or shredded pine bark should be added to the backfill.

# Tree Planting

**You can also volunteer to plant trees elsewhere in the city—along creeks and streams in Fairmount Park and at local schools. The more trees in Philadelphia, the healthier we will be! Contact Fairmount Park, Greater Philadelphia Cares and UC Green to learn how you can volunteer to plant trees.**

4. Remove all debris from the pit and gently tightly pack the loose soil in the bottom of the pit by hand.
5. Cut and remove the rope and burlap from around the trunk and check for root flare. Remove all nails. Drop the burlap down to the bottom of the hole.
6. Do not handle the plant by the branches, leaves or stem. Place the plant straight in the center of the planting pit, carrying the plant by the root ball. Never carry a plant by the trunk or branches.
7. After the tree is in the pit, carefully cut and remove the top third of the wire basket and as much burlap as possible using the least amount of disturbance.
8. Backfill planting pit with existing soil and pack it in there tightly to fill all voids and air pockets. Do not over compact soil. Make sure plant remains straight during backfilling/packing procedure.
9. The top of the root mass (root flare) of the tree should be flush with the final grade. Do not cover stem with soil. If your tree has soil over the trunk flare (where the trunk curves outward into the root system), it is essential to plant the trunk flare above soil. Remove the soil from the root ball if the flare is buried by it.
10. Water plant thoroughly and slowly, immediately after planting to saturate backfill. For the first year after planting, water the tree with 15 gallons per week. Use your index finger to check the soil moisture under the mulch. If the soil is cool to the touch, do not water. If it is warm and dry, then water. A layer of mulch (i.e. shredded bark, compost) should be placed around the tree, at a depth between 3 to 4 inches and with a radius of approximately 2 to 4 inches from the tree stem. Do not rest the mulch directly against the tree stem. The mulch makes it easier to water the tree and reduces weed competition.
11. Remove all tags, labels, strings and wire from the plant material.

Many homeowners ask how a newly planted tree can affect the sewer, water lines, sidewalk and/or building's foundation? If you choose the correct tree, site, and planting conditions, your tree shouldn't interfere with your sewer, waterline, etc. Most tree roots grow in the soil's top 12 inches and spread well beyond the tree's canopy in search of water and nutrients. They don't "attack" underground mains, unless these are already damaged, providing entrances for developing roots. An adequate and generous tree pit, or long, narrow continuous "tree lawn" will provide the best conditions for establishing and maintaining a "well behaved" tree with the environment needed to survive in the city.

# Tree Planting

## Street Trees

If you do not have a yard, but you would like to have a tree in front of your property —on your sidewalk—you have several options in Philadelphia.

You can get a tree for free and installed at no cost by **Fairmount Park**, however, this may involve being placed on a waiting list

You or a group from your neighborhood can sign up for a **Tree Tenders program** through the Pennsylvania Horticultural Society, where you can get trained to care for your tree, learn how to organize a tree planting project and receive free tree care tools in exchange for your participation.

Lastly, you can **hire a contractor** approved by Fairmount Park to plant a tree in front of your house. However, the contractor you hire must apply for a Street Tree Permit from Fairmount Park before any work can be done. The private planting could cost you up to \$500 (not including the price of the tree).

Talk to your neighbors and find out if there is a neighborhood organization or Tree Tenders group organizing a street tree planting project. Some local groups that do tree plantings, include The South of South Neighborhood Organization, UC Green and Citizens Alliance.

## Recommended Street Tree List for Philadelphia

The Fairmount Park Commission recommends the below list of approved trees which will thrive in an urban setting, have a good track record, and won't interfere with overhead wires in Philadelphia.

### Small Trees—Under 30 feet

*Acer buergerianum*—Trident Maple  
*Acer campestre*—Hedge Maple  
*Acer ginnala*—Amur Maple  
*Acer tataricum*—Tartarian Maple  
*Crataegus crus-galli 'Inermis'*—Thornless Hawthorn, tree form  
*Crataegus laevigata 'Superba'*—Crimson Cloud Hawthorn tree form  
*Crataegus phaenopyrum*—Washington Hawthorn, tree form  
*Crataegus viridis*—Winter King Hawthorne  
*Prunus triloba*—Flowering Plum  
*Malus (selected varieties)*—Crabapple  
*Syringa reticulata*—Japanese Tree Lilac

### Medium Trees 30–46 feet

*Aesculus x carnea 'Brittoni'*—Ruby Red Horsechestnut  
*Cercidiphyllum japonica*—Katsura tree  
*Cladrastis lutea*—Yellowwood  
*Crataegus lavalleyi*—Lavalley Hawthorn  
*Koelreuteria paniculata*—Golden Rain Tree  
*Malus (selected varieties)*—Crabapple  
*Ostrya virginiana*—Hop Hornbeam  
*Phellodendron amurense*—Amur Cork Tree  
*Prunus x yedoensis*—Yoshino Cherry  
*Ulmus parvifolia*—Chinese Elm  
*Quercus acutissima*—Sawtooth Oak

### Large Trees Over 47 feet

*Acer rubrum (selected cultivars)*—Red Maple  
*Celtis occidentalis*—Hackberry  
*Corylus colurna*—Turkish Filbert  
*Fraxinus pennsylvanica 'Palmore'*—Palmore Green Ash  
*Gleditsia triacanthos (selected cultivars)*—Honey Locust, a) Halka, b) Moraine, c) Shademaster  
*Ginkgo biloba (male selections only)*—Ginkgo  
*Liquidambar styraciflua*—Sweetgum  
*Quercus rubra*—Red Oak  
*Quercus macrocarpa*—Bur Oak  
*Quercus palustris*—Pin Oak  
*Sophora japonica*—Japanese Pagoda Tree  
*Tilia cordata*—Little Leaf Linden  
*Zelkova serjata (selected cultivars)*—Japanese Zelkova— a) Green Vase, b) Village Green

### Columnar Trees for Narrow Streets

*Acer rubrum 'Armstrong'*—Armstrong Columnar Red Maple  
*Carpinus betulus fastigiata*—Pyramidal European Hornbeam  
*Ginkgo biloba 'Princeton Sentry'*—Princeton Sentry Ginkgo Grafted Male Variety  
*Prunus sargentii 'Columnaris'*—Columnar Sargent Cherry  
*Quercus robur 'Rose Hill'*—Rose Hill English Oak

# Backyard Stream



**E**stablish a streamside (riparian) buffer—a vegetated area along the edge of the stream that protects it from pollution and erosion. This buffer zone absorbs pollutants and nutrients that would otherwise end up running directly into the stream. Plant material slows runoff and filters out pollutants and sediments. Well-planted streamside buffers are also a great low-cost way to control erosion. While plants slow runoff, filter pollutants, and help control erosion, trees cast shade on the stream, cooling the water, reducing algae growth and improving fish habitat. A buffer with trees and shrubs also becomes a home to birds, butterflies and other creatures. Trees and plants that grow in the buffer play a critical role in keeping streams healthy.

## Caring for Your Stream

- Begin with a “no mow” or “no graze” zone along your stream banks. Make your buffer as wide as possible.
- Plant trees and shrubs in your buffer zone. They provide many long-lasting benefits and can be quite inexpensive to establish and maintain.
- Using shrubs will give your buffer a quick start; many reach full size in just a few years.
- Set your mower blades at least three inches high. Taller grass slows runoff, resists drought and needs less fertilizer
- Use hay bales or a special silt fence to prevent soil from washing off your site and into the stream while establishing your stream buffer.
- Cover piles of soil with tarps to protect them from rain.
- Use good farm practices by not cultivating the soil and planting winter cover crops to conserve soil.
- Contact your local DEP office or county conservation district if you see soil runoff in the stream from a nearby construction site.
- Limit your overall use of pesticides and herbicides, and use extreme caution when using them near streams.
- Keep grazing and other farm animals out of and away from the stream. Contact your county conservation district or the U.S. Fish and Wildlife Service to find out about farm fencing programs.
- Compost yard waste. Don't bag lawn trimmings or throw them into the stream; leave them in place for effective recycling of nutrients.
- Store firewood, trash and other materials well away from streams.

# Winter De-icing



As snow piles up in the winter, we oftentimes turn to salt to melt snow and ice. Salt, however, causes adverse environmental impacts, especially on our streams and rivers, our drinking water source in Philadelphia. Excess salt can saturate and destroy a soil's natural structure and result in more erosion to our waterways. High concentrations of salt can damage and kill vegetation. Salt poses the greatest danger to fresh water ecosystems and fish. Studies in New York have shown that as salt concentrations increase in a stream, biodiversity decreases. Excess salt can seep into groundwater and stormwater runoff. Effective ice control can help prevent excess salt runoff to our waterways.

## De-icing in the Winter

There are many alternatives to salt including potassium chloride, calcium chloride and magnesium chloride, corn processing byproducts, and calcium magnesium acetate (CMA). Most can be found in your local hardware stores under various trade names, so check the labels for chemical content. While these alternatives can be spread in a dry form or sprayed as a liquid, their best use occurs when they are used with salt. They tend to increase the efficiency of salt thereby reducing the amount that needs to be applied. When over-applied, all chloride compounds can be harmful to the environment. Non-chloride corn byproducts recycled from mills and breweries have been shown to be effective de-icers as well. While they are often advertised as organic or natural, they can have extremely high phosphorus content, a major water pollutant. Numerous studies have shown calcium magnesium acetate (CMA) to be the most environmentally benign de-icer. Many northern states use CMA on roads in sensitive areas (wetlands, endangered species' habitat, drinking water supply, etc.). A couple of disadvantages with CMA however, is that it does not work well below 25° Fahrenheit and it is the most expensive de-icer. Because all de-icers can be harmful to the environment when applied in excess, the best strategy is to reduce the use of these chemicals as much as possible.

- The first line of defense should simply be to shovel sidewalks and pathways to keep them clear and to prevent ice from forming. Also, consider that salt and de-icers are not effective when more than 3 inches of snow have accumulated.
- Consider the temperature. Salt and calcium magnesium acetate (CMA) have a much slower effect on melting snow and ice at temperatures below 25° Fahrenheit.

# Winter De-icing

- Track winter weather and only use salt and de-icers when a storm is about to come through. If a winter storm does not occur, sweep up any unused material, store, and reuse for the next big storm.
- Apply de-icing products discriminately, focusing on high-use areas and slopes where traction is critical. Apply the least amount necessary to get the job done. This will save money in product costs and will also help minimize property damage to paved surfaces, vehicles, and vegetation.
- Reduce salt and other chemicals by adding sand for traction.
- Become familiar with various de-icing products and wetting agents such as magnesium chloride and calcium chloride, which can improve the effectiveness of salt and reduce the amount needed.
- If you observe ongoing issues of ineffective ice management or examples of poor application, such as excess piles of road salt left to disperse, share your concerns with the property manager of your residence or business, or with the City of Philadelphia Streets Department. The Streets Department Hotline is 215-686-5560 and their website is [www.phila.gov/streets](http://www.phila.gov/streets).
- Plant native vegetation that is salt tolerant in stormwater drainage swales and ponds that may receive salt-laden runoff. Not only will these native species have a greater chance for survival, but they will continue to act as an effective buffer for our local waterways.
- Store salt and other products on an impervious (impenetrable) surface, such as a basement floor, to prevent ground contamination. Also store products in a dry, covered area to prevent stormwater runoff.

# Planters (Container Gardens)



**P**lanters reduce impervious cover (impenetrable surfaces, such as concrete sidewalks, parking lots, etc.) by retaining stormwater runoff rather than allowing it to directly drain into nearby sewers and creeks. Planters offer “green space” in tightly confined urban areas by providing a soil/plant mixture suitable for stormwater capture and treatment. They can be used on sidewalks, parking areas, back yards, rooftops and other impervious areas.

## Contained Planters

Contained planters are used for planting trees, shrubs, and ground cover. The planter is either prefabricated or permanently constructed and has a variety of shapes and sizes. Planters may range from large concrete planters to potted plants arranged on an impervious surface like the roof garden shown in the bottom photos to left. Planters can be placed on impervious surfaces like sidewalks, back yards, rooftops, or along the perimeter of a building in order to catch stormwater runoff from the roof. Contained planters may drain onto impervious surfaces through holes in their base or by an overflow structure so the plants do not drown during larger rain events.

Plants should be hardy and self-sustaining native species with little need for fertilizers or pesticides. Planters can be made of stone, concrete, brick, wood, or any other suitable material. However, treated wood should be avoided if it leaches any toxic chemicals.

Planters can be permanently fixed in place or easily moved around to enable you to change the look of the planter garden that you have created. Numerous manufactured pots and planters are available at your local hardware or landscaping store. You can create a “do-it-yourself” planter or use recycled items to create planters. Homemade planters may be constructed by stacking and fastening wood beams or laying and mortaring stones. There are many websites with detailed instructions to help with this type of project, such as [www.taunton.com](http://www.taunton.com), [www.hgtv.com](http://www.hgtv.com), [www.diynetwork.com](http://www.diynetwork.com).\*

## Creating a Contained Planter

- Purchase planters at the local hardware or landscaping store, if you are not building your own planter box.
- Drill holes in the bottom of the planter if they are not already there.
- Fill the planter with soil and leave a 12 inch area from the soil to the top of the planter.
- Choose native drought and saturation tolerant plants and trees to plant in the planter.
- Occasionally turn or till the soil to improve infiltration.

\*These are just a few of the websites PWD came across during our research. These particular companies are not endorsed by PWD, nor can PWD verify any information on these companies.

# Rain Barrels



Please read the Disclaimer on the inside cover, if you are interested in installing this project.

A rain barrel collects and stores stormwater runoff from rooftops. By detaining (temporarily holding) the stormwater runoff during a rain event, you can help add capacity to the city's sewer system and reduce sewer overflows to our creeks and rivers, our drinking water source. Also, the collected rain water can be reused for irrigation to water lawns, gardens, window boxes or street trees.

Rain barrels can be purchased on-line or they can be built. If you would like to purchase a rain barrel on-line, view the list of retailers we came across in our research.\*

Whether you buy or build a rain barrel, the most important thing to remember is that they are only effective at stormwater management when the stored water is emptied in between storms, making room in the barrel for the next storm.

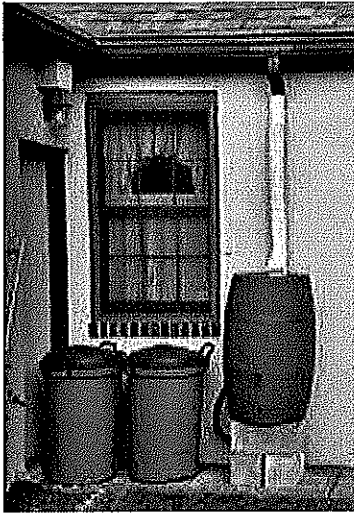
## Building a Rain Barrel

- Rain barrels help lower water costs when the stored water is recycled for lawn irrigation, for example.
- Rain barrels help reduce water pollution by reducing stormwater runoff, which oftentimes picks up pollutants in its path, such as oil, grease and animal waste, and transports these pollutants to the nearest creek, river or stormdrain.
- Storing rainwater for garden and lawn use helps recharge groundwater naturally.

## Materials Needed for Building a Rain Barrel

- One 55 gallon drum
  - One 5 foot section vinyl garden hose
  - One 4 foot diameter atrium grate (basket used in garden ponds and pool skimmers)
  - One ½ inch PVC male adapter
  - One ¾ inch x ½ inch PVC male adapter
  - One 5 foot section of drain hose, drain line, or sump pump line (1¼ inch)
  - One 1¼ inch female barbed fitting and
  - One 1¼ inch male threaded coupling
  - One vinyl gutter elbow
  - Drill (or a hole saw)
  - Router, jig saw or coping saw
  - Measuring tape
- Optional:**
- Waterproof sealant (silicone caulk, PVC glue)
  - Teflon tape
  - Fiberglass window screen material or mosquito netting
  - Cinder blocks or wooden crate

# Rain Barrels



## \*Rain Barrel Distributors

Clean Air Gardening

Composters.com

Day's Garden

ENVIRO ENERGY International Inc.

Gardener's Supply Company

GARDENWARE

Green Culture

Green Venture

Jerry Baker

Lee Valley Tools

Midwest Internet Sales

New England Rain Barrel and Composter Company

RainCatcher 4000

Plow&Hearth

Rain King

Rainsaver USA

Real Goods

Riversides

The Rain King

Spruce Creek Rainsaver

The Rain Pail

Urban Garden Center

This is not a comprehensive list of rain barrel distributors or suppliers. This is a list of rain barrel distributors that PWD came across during our rain barrel research. The particular companies are not endorsed by PWD, nor can PWD verify any information on these companies.

## Instructions for Building a Rain Barrel

### Step 1. Cut Holes in Rain Barrel:

- Cut lower drain hole: Measure about 1 inch above the bottom of the barrel (55 gallon drum) where the barrel side begins to rise toward the top. Using a  $\frac{3}{4}$  inch bit (or hole saw), drill a hole through the barrel.
- Cut upper drain hole: Mark the upper drain hole according to where you want the overflow to be in the upper region of the barrel and in relationship to the lower drain. Use a  $1\frac{5}{8}$  inch hole saw to cut out the overflow hole.
- Cut top hole for atrium grate (filter): Using the atrium grate as a template for size, mark a circle at the center of the top of the drum (locating the rainwater inlet in the center of the barrel lets you pivot the barrel without moving the downspout). Drill a  $\frac{1}{2}$  inch hole inside of the marked circle. Use a router, jigsaw or coping saw to cut until the hole is large enough to accommodate the atrium grate, which filters out large debris. Don't make the hole too big—you want the rim of the atrium grate to fit securely on the top of the barrel without falling in.
- Cut notch to hold hose: Using a  $\frac{1}{2}$  inch bit or hole saw, cut out a notch at the top of the barrel rim (aligned so that it is above the lower drain hole). The notch should be large enough so that the end of the hose with the adapter will firmly snap into place.

### Step 2. Set Up Barrel and Modify Downspout:

- Set up barrel: Since water will only flow from the garden hose when the hose is below the barrel, place the barrel on high ground or up on cinder blocks or a sturdy wooden crate underneath your downspout, making sure the barrel is level.
- Modify your downspout: Cut your existing downspout using a saw so that the downspout's end can be placed over the top of your rain barrel. Use a vinyl downspout elbow that fits the size of your downspout (usually 3 inch or 4 inch) to aim the stormwater into the rain barrel or just simply place the barrel right under the downspout.

### Step 3. Assemble Parts:

- Attach garden hose to lower drain hole: Screw in the  $\frac{1}{2}$  inch PVC male adapter to the lower drain hole. The hard PVC threads cut matching grooves into the soft plastic of the barrel. Unscrew the  $\frac{1}{2}$  inch PVC male adapter from the hole. Wrap threads tightly with teflon tape (optional). Coat the threads of the coupler with waterproof sealant (optional). Screw the coated adapter back into the hole and let it sit and dry for 24 hours (optional). Attach 5 foot garden hose to the PVC male adapter. Attach the  $\frac{3}{4}$  inch x  $\frac{1}{2}$  inch PVC

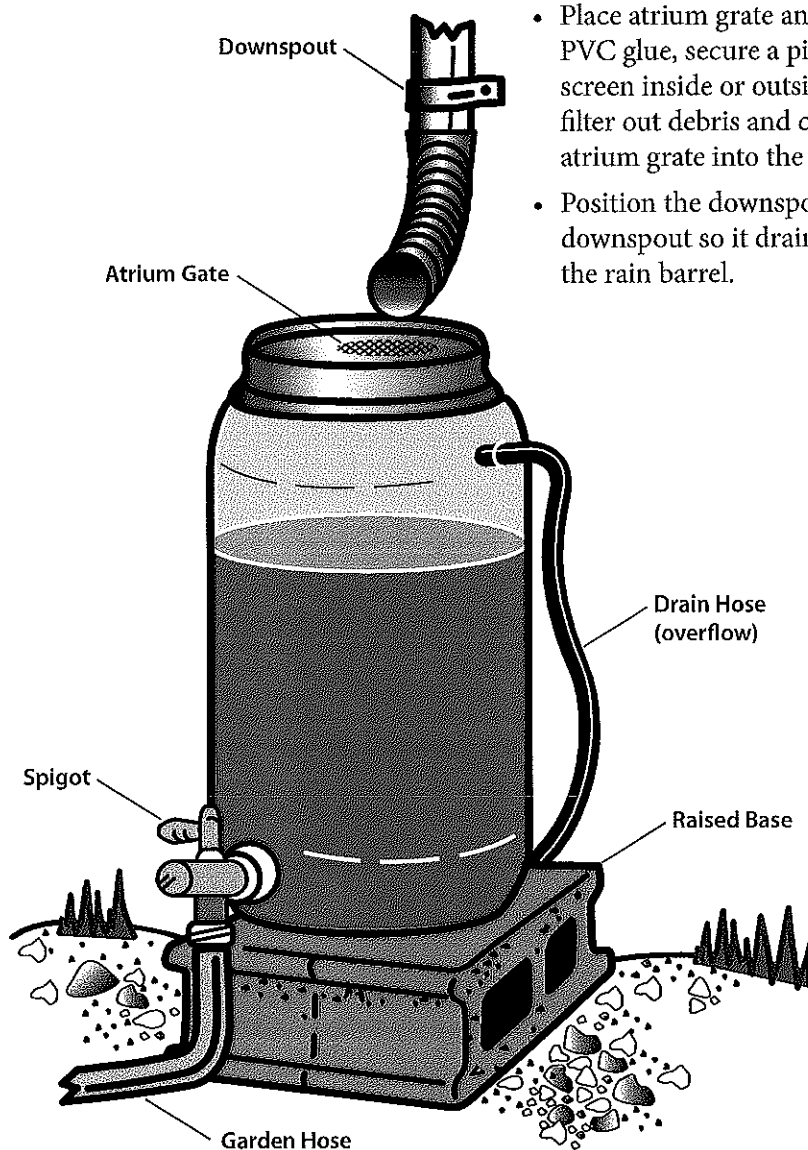
# Rain Barrels

**Don't forget to empty your rain barrel after the storm!**

male adapter to the other end of the hose (this can be readily adapted to fit a standard garden hose).

- Attach drain hose (overflow hose) to upper drain hole: Put the 1¼ inch male threaded coupling inside the barrel with the threads through the hole. From the outside, screw the 1¼ inch female barbed fitting onto the threaded coupling. Use silicone on the threads (optional). Attach 5 foot section of drain hose to upper fitting and connect it to where the original downspout was connected (sewer riser) in order to transport the overflow into the sewer.

The overflow must be conveyed safely away from your property and your neighbor's property. If your downspout was not originally connected to the sewer, place a splash pad on the ground under the overflow hose to direct the flow away from the foundation of your home.



- Place atrium grate and screen in top hole: Using PVC glue, secure a piece of fine mesh window screen inside or outside of the atrium grate to filter out debris and control mosquitoes. Place the atrium grate into the hole (basket down).
- Position the downspout: Position the end of your downspout so it drains onto the atrium grate on the rain barrel.

# Rain Gardens



Please read the Disclaimer on the inside cover, if you are interested in installing this project.

## Materials

- Plants for the garden (see plant list)
- Hose, rope or string
- Level
- Shovel or spade
- Measuring tape
- Humus or other soil amendments (optional)
- Downspout extension (also optional).

A rain garden uses native plants and landscaping to soak up rain water (stormwater) that flows from downspouts or simply flows over land during a rain event. The center of the rain garden holds several inches of water, allowing the stormwater to slowly seep into the ground instead of flow directly from your roof, yard or driveway into the nearest storm drain, creek or river.

## Creating a Rain Garden

- A rain garden allows 30% more water to seep into the ground than a conventional lawn (South River Federation & Center for Watershed Protection, 2002). This increase helps replenish the groundwater supply (important during a drought!), and also helps hold back stormwater from contributing to the stormwater and sewage overflows into nearby creeks and rivers.
- A rain garden reduces the amount of water pollution that would otherwise eventually reach the streams and rivers through stormwater runoff. Scientific studies have demonstrated that the first inch of rainfall is responsible for the bulk of the pollutants in stormwater runoff. A rain garden is designed to temporarily hold this one-inch of rainfall and slowly filter out many of the common pollutants in the water, such as oil, grease, and animal waste, that would otherwise flow into the waterways via the nearest stormdrain or stormwater runoff.
- The native plants used in rain gardens require less water and less fertilizer than conventional lawns. They also require less maintenance and provide habitat for birds and other wildlife.

## Instructions

*Before starting this project, please conduct an Infiltration Test (pages 26-27) to determine if your soil conditions are adequate for a rain garden.*

### Step 1. Size and Locate your Rain Garden:

- First, measure the footprint of your house by getting the area (length x width) of your house and then determine how much of your rooftop area drains to the downspout you are disconnecting to your garden (for gutters with a downspout at

## Sizing Example

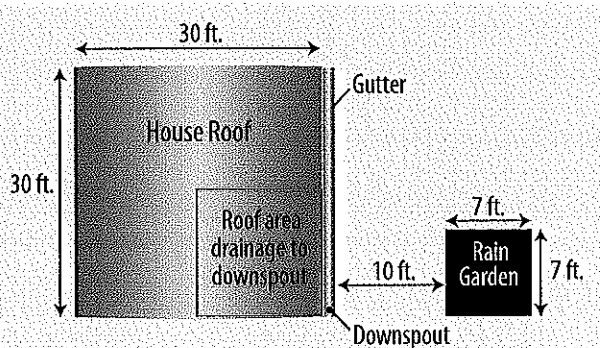
If the area of the house is 30 ft. x 30 ft. and ¼ of this area drains to one downspout:

$$15 \text{ ft.} \times 15 \text{ ft.} = 225 \text{ ft.}^2$$

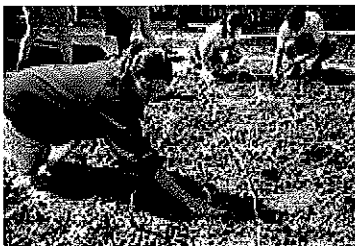
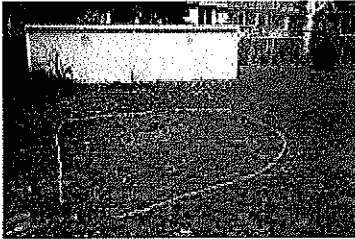
$$20\% \text{ of } 225 \text{ ft.}^2 = 45 \text{ ft.}^2$$

$$30\% \text{ of } 225 \text{ ft.}^2 = 67.5 \text{ ft.}^2$$

The rain garden area should be between 45 and 67.5 square feet, depending on soil type (use 20% for sandier soils).



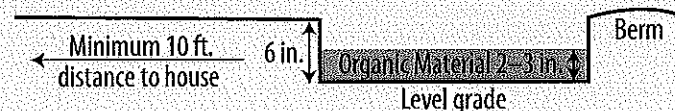
# Rain Gardens



each end, assume that half the water goes to each downspout). Refer to the sizing example for guidance. Be sure you measure the house footprint only, but include the area of any driveway or patio areas that will drain to the rain garden (do not take the roof slope into account). The surface area of your rain garden should be between 20% and 30% of the roof area that will drain into the rain garden.

- Locate the garden at least 10 feet away from your house and your neighbor's house (to prevent water leakage), and create the garden in the lowest point of this section of your lawn, maintaining a minimum 1% slope from the house down to the rain garden. If your yard drain is also located in this section of the lawn, you can build the rain garden around the drain. The bottom of the rain garden would be a few inches lower than the drain and the overflow would actually be in the middle of the rain garden.
- If you build the rain garden around your yard drain, when it fills up with water, the water that overflows from the garden will be conveyed safely to the yard drain. If you are not building around the yard drain, it is imperative that the overflow is safely conveyed to a drain nearby to prevent it from flowing into your neighbor's property. Make sure the drain is in a suitable location in relation to the rain garden in order to effectively manage the garden's overflow.

## Garden Cross Section

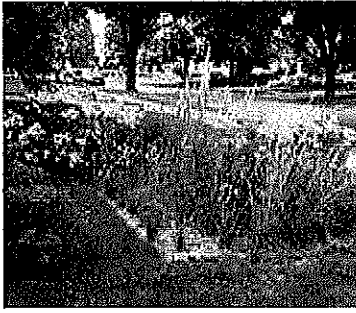


- When finding the right spot for your rain garden, keep in mind that you will want to create a shallow ditch or swale that carries the stormwater runoff from the disconnected downspout to the rain garden. The swale will help slow the runoff before it reaches the rain garden.
- Finally, lay out the boundary of the garden with a rope.

## Step 2. Dig the Rain Garden:

- To enable the rain garden to hold several inches of water during a storm, you'll have to dig a hole 3 to 4 inches deep across the entire surface of the rain garden. If the soil lacks organic material, you can improve it by digging the hole 5 to 6 inches deep, and adding 2 to 3 inches of humus or other organic material. Make sure the bottom is level, but gently slopes from the bottom to the ground level around the edges. If the drop at the edge is too steep, you might get some erosion around the edges.

# Rain Gardens



- Next, test how the garden will hold water during a storm by letting water flow into the rain garden from a hose placed at the downspout. Based on this test, make any necessary adjustments (e.g., create a berm on the lower side of the garden using the diggings—the soil that was excavated).

### Step 3. Add Plants to the Rain Garden:

- Choose native plants that won't require much watering, but make sure they can withstand wet soils for up to 24 hours. (Refer to the list of native plants below.)
- Also, take into account how much sun your garden receives. It's often helpful to draw out a planting plan before you start, and mark planting areas within the garden with string. After planting, weeding may be required until the plants become established. You may also need to periodically prune some of the plants to let others grow. In the winter, leave dead or dormant plants standing and cut back in the spring.
- Your garden may need a bit more maintenance than a lawn in the beginning, but in the long run it will be easier to care for and provide many added benefits!

## Native Plants Recommended by Fairmount Park for Rain Gardens

### Perennials

Bee-balm—*Monarda didyma*  
 Black-eyed Susan—*Rudbeckia hirta*  
 Blazing star—*Liatris spicata*  
 Blue flag iris—*Iris versicolor*  
 Boneset—*Eupatorium perfoliatum*  
 Butterfly weed—*Asclepias tuberosa*  
 Cardinal flower—*Lobelia cardinalis*  
 Early goldenrod—*Solidago bicolor*  
 Golden alexander—*Zizia aurea*  
 Joe-pye weed—*Eupatorium purpureum*  
 New England aster—*Aster novae-angliae*  
 New York Ironweed—*Veronia novaborensis*  
 Obedient plant—*Physostegia virginiana*  
 Ox-eye—*Heliopsis scabra*  
 Solomon's seal—*Polygonatum biflorum*  
 White snakeroot—*Eupatorium rugosum*

### Grasses and Grass-like plants

Big bluestem—*Andropogon gerardii*  
 Bottle brush grass—*Elymus hystrix*  
 Canada wild rye—*Elymus canadensis*  
 Path rush—*Juncus tenuis*  
 Purple-top—*Tridens flavus*  
 Soft rush—*Juncus effusus*  
 Switch-grass—*Panicum virgatum*  
 Virginia wild rye—*Elymus virginicus*

### Ferns

Christmas fern—*Polystichum acrostichoides*  
 Hay-scented fern—*Dennstaedtia punctilobula*  
 Rattlesnake fern—*Botrychium virginianum*  
 Sensitive fern—*Onoclea sensibilis*

### Shrubs

Gray dogwood—*Cornus racemosa*  
 Highbush blueberry—*Vaccinium corymbosum*  
 Mountain laurel—*Kalmia latifolia*\*  
 Ninebark—*Physocarpus opulifolius*  
 Pasture rose—*Rosa carolina*  
 Red osier dogwood—*Cornus sericea*  
 Spicebush—*Lindera benzoin*  
 Sweet pepperbush—*Clethra alnifolia*

\*Pennsylvania's state flower

When purchasing plants, pay close attention to the scientific names to ensure the correct species are selected.

# Wildflower Meadow



**W**ildflower meadows present excellent opportunities for stormwater management, promoting groundwater infiltration, water quality treatment, and even flood control. Also, when using native plants in a meadow you are not only providing an aesthetically pleasing landscape, but preserving native species and biodiversity, and creating habitat for wildlife. Meadows allow you to spend less time mowing, less time applying fertilizers and lawn chemicals, and less time watering in the summer months. This low maintenance structure helps protect our nearby local streams from pollutants and other chemicals, in addition to flooding conditions, thereby helping to protect the Delaware and Schuylkill Rivers, the source of our drinking water in Philadelphia.

## **Creating a Wildflower Meadow**

**Step 1. Site Selection:** First, you need to choose a suitable location, preferably an open sunny site that gets at least six hours of sun every day. It should have good air movement. This helps keep diseases down, and the movement caused by wind will make plants sturdier, and stems stronger. The site should have few weeds. An already cultivated site such as a field or garden plot is ideal. A lawn can work too. The hardest is an overgrown garden bed, or old field full of aggressive weeds and grasses. A site next to such an area to transform is also difficult, due to weed seeds blowing in. A site next to a formal landscape may also be a hard sell. In such formal areas, an informal transition area may be necessary.

**Step 2. Plant Selection:** Plant selection is important for long bloom, as noted already, but more importantly for species that will last under your conditions. Soil type is not as important as whether the site is dry or moist. A dry site is best. The key is to have a diversity of species, as found in nature, with a mix of graminoides (grasses and grass-like plants) and forbs (flowering meadow wildflowers). If you don't create your own mixture, buy a good quality seed mix from a reputable supplier. When it comes to these seeds, you truly get what you pay for. Inexpensive mixes often contain mainly annuals which are gone after the first year, contain non-native species, seeds that have poor germination, potential weedy species, or just a lot of seed debris. Another consideration under species selection, whether you buy a mix or make your own mixture, is whether you want a short term (1 to 5 years) or longer term meadow. In the former you may have more annuals for color up front, but keep in mind that they may be out competed with weeds after a few years. A long term meadow may have mainly perennials which may take several years to begin a good display, but will last and out compete many weeds.

# Wildflower Meadow



The number of plants of any one type will depend on how you will be viewing the meadow. If seeing it from a distance, you'll want to use larger numbers of each plant type, and place them in sweeping masses. If creating a small area, or one viewed at close range, you may have few of any one type plant, and have them all mixed.

**Step 3. Site Preparation:** This is the step often overlooked, yet the key to success or failure. Since these wildflowers are usually less competitive than weeds, the site should contain no weeds or weed seeds. Unless the site has been cultivated already, with few to no weeds, there are several methods you may use.

You may smother vegetation with black plastic for a whole growing season. You may also smother existing growth with thick layers of leaves, grass clippings, or newspapers. Another method is to plant a summer buckwheat crop, cut and tilled in before going to seed, followed by fall planting of winter wheat, cut and tilled in late winter. You may need to repeat this a second season. Or you may repeat deep soil tillage every three weeks for a full growing season. If it's a lawn with no weeds, remove the sod using a sod-cutter that can be rented from equipment rental firms. Many use a systemic herbicide, but avoid those that are residual (last in the soil).

**Step 4. Sowing or Planting:** You may sow in spring or early summer, which favors grasses over the forbs. Keep the spring-sown meadow watered as you would a newly seeded lawn, often for a month or two. Sowing in early fall favors the forbs, as some grass seeds rot then. Since many seeds will either not germinate until the following spring, or germinate and not grow until then, you should also use annual rye as a winter cover crop with fall sowings. Avoid sowing in mid to late summer when there may be droughts or seeds drying out before germinating. For sowing, aim for about 80 seeds per square foot. In several years this will result in one or two plants in this space. Of this number per square foot, for spring sowing use about 60 forb and 20 grass seeds. This is about 9 lbs. and 3 lbs. per acre. For fall sowing, use a higher proportion of grass seeds.

For small areas (for instance under 1000 square feet), consider using already-germinated small plants you can buy in trays as "plugs." These are more costly than seeds, but will establish more quickly. You can find these at specialty suppliers, either local, mail-order, or online.

**Step 5. Post-planting management:** In the first two years, seeds of annual and biennial weeds still in the soil or blown in will grow faster than your perennial wildflowers. Don't allow such weeds the first year to get above one foot tall before cutting back to four to six inches high. The wildflowers will, for the most part, remain short and below this height. The second year, cut back to about one foot high since plants will be larger. A weed or string trimmer works well for this. Don't pull weeds, as this may also disturb wildflower seedlings. Don't use herbicides as these may drift, killing large patches of both weeds and wildflowers!

In the third and future years, mow it close to the ground. This should be done in late fall or early spring, removing the debris from mowing. This exposes the soil to the rapid warmth from the sun in spring, encouraging your wildflowers over cool-season weeds. Learn your wildflowers, and over the years you can selectively weed out any weeds or woody plant seedlings.

# Dry Well



Please read the Disclaimer on the inside cover, if you are interested in installing this project.

## Materials

- Measuring tape
- Shovel
- Saw
- Wheelbarrow
- Vinyl downspout elbow to fit your downspout (typically 3 in. or 4 in.)
- Landscape non-woven geotextile fabric
  - Make sure the fabric is porous enough to allow water to pass through it.
- Crushed stone
  - Use stone that is approximately 1–1½ in. diameter.
  - Wash the stone to make sure that it is clean. You can use a sieve to remove fine material if the stone seems to have a lot of small particles.
  - It is important that the stone is washed (no dust or particles) and that the stone is uniformly the same size.
  - The stone does not have to be very large; it just has to be roughly of a similar size to get the maximum amount of void space in the stone while maintaining the structure of the well.

**D**ry wells are small, excavated pits, filled with stone or gravel that temporarily stores stormwater runoff until it infiltrates (soaks) into the surrounding soil. The stormwater can come straight off of the roof of your house via a downspout that either indirectly or directly connects to the dry well. It can travel indirectly to the dry well through a grassy swale or it can travel directly into the well through a pipe. This design guide describes how you can disconnect your downspout to a swale and dry well that is sized based on the included sizing table (noted below). Dry wells help protect our rivers and streams in combined and separate sewered areas. They help add capacity to Philadelphia's sewer system during heavy rainfalls by helping prevent the stormwater runoff from reaching the system and instead allowing the runoff to soak into the surrounding soil. In separate sewered areas, the impact of stormwater runoff on neighborhood streams, is reduced. By infiltrating the stormwater runoff on land, the combined (sewage and stormwater) sewer overflows into the Delaware and Schuylkill Rivers are reduced, thereby decreasing pollution in our streams, lessening flooding impacts and improving water quality in our rivers, our drinking water source. Dry wells also recharge groundwater through infiltration, which leads to more flow in streams during dry weather (when it is not raining) and less streambank erosion during wet weather (when it is raining).

## Building a Dry Well

### Site Preparation

- Conduct an Infiltration Test (see pages 24–25) to determine if your soil conditions are suitable for a dry well.
- Make sure buried electrical, telephone, and TV cables and gas piping are not going to be a problem in the area that you will be digging your dry well. If you don't know where they are located, call PA One Call at 1-800-242-1776 at least three days before you dig.
- Install leaf guards to prevent leaves and other plant material from entering the downspout and clogging the dry well.
- Determine the size of the well. Read through the Dry Well Sizing section of this fact sheet.
- Determine the volume of crushed stone you will need.  
Volume of Stone = Dry Well Area x 1½ feet  
For example: 33 square feet x 1½ feet = 49.5 cubic feet of stone.

# Dry Well

## Dry Well Sizing

- Refer to the sizing table. Decide what size storm you would like to store and infiltrate in your dry well. Find the closest number in Column A. About one-third of storms in the Philadelphia area are 0.25 inches or less, 60% are 0.5 inches or less, and 85% are 1.0 inch or less.
- Estimate the roof area draining to the dry well (length [ft.] x width [ft.] = area in square feet). Find the closest value in Column B for the storm depth you have chosen. At this point, you have narrowed your choice down to just one line of the table.
- Find the area required for your dry well in Column D. When you multiply your dry well length and width, the resulting number (area) needs to be at least as great as the number in Column D. Columns E and F show examples of lengths and widths that will work.
- Determine whether your yard and budget will allow you to build a dry well of this size with a safe overflow. If not, choose a smaller storm and repeat the steps. Storing a larger storm provides a greater benefit, but also requires more space and costs more. Storing even the smallest storm in the table will provide benefits.
- **The dry well should have a safe overflow**, such as an overflow to your yard drain. In larger storms, your dry well will fill up, and you need to make sure that the overflow doesn't damage your property or your neighbors' properties. Keep in mind that the yard drain has to be slightly downhill from the dry well.
- **The dry well should be at least 10 feet from your house** and any other buildings that are level with yours. It should be at least 25 feet from buildings that are downhill from the dry well.

### Example

Storm Depth =  
0.5 inches (Lines 4-6, Column A)

Roof Area =  
250 square feet (Line 5, Column B)

Dry Well Area =  
19 square feet (Line 5, Column D)

Possible Dimensions:  
7 feet long by 3 feet wide =  
21 square feet  
(Line 5, Columns E and F)

4 feet long by 5 feet wide =  
20 square feet

6 feet long by 3.5 feet wide =  
21 square feet

	A Storm Depth (in.)	B Roof Area Draining to Dry Well (sq. ft.)	Dry Well Dimensions			
			C Depth (ft.)	D Area (sq. ft.)	E Example Length (ft.)	F Example Width (ft.)
1	0.25	100	1.5	3.8	2	3
2	0.25	250	1.5	9.4	4	3
3	0.25	500	1.5	19	7	3
4	0.5	100	1.5	7.5	3	3
5	0.5	250	1.5	19	7	3
6	0.5	500	1.5	38	13	3
7	1.0	100	1.5	15.1	6	3
8	1.0	250	1.5	38	13	3
9	1.0	500	1.5	75	26	3

# Dry Well

Step 1. Modify your downspout. Cut your existing downspout close to the ground using a saw so that a vinyl downspout elbow can fit over the disconnected downspout (usually 3 or 4 inches). The elbow should aim the stormwater runoff into the swale

Step 2. Dig a swale—a small channel or ditch starting from the point below the disconnected downspout to the dry well location. The swale should be just a few inches deep and wide. The swale should slope downward from the downspout to the dry well. The runoff draining from the disconnected downspout through the swale should drain readily toward the dry well.

Step 3. After preparing the site and determining the size of your well, shape the well, using the Dry Well Sizing Table.

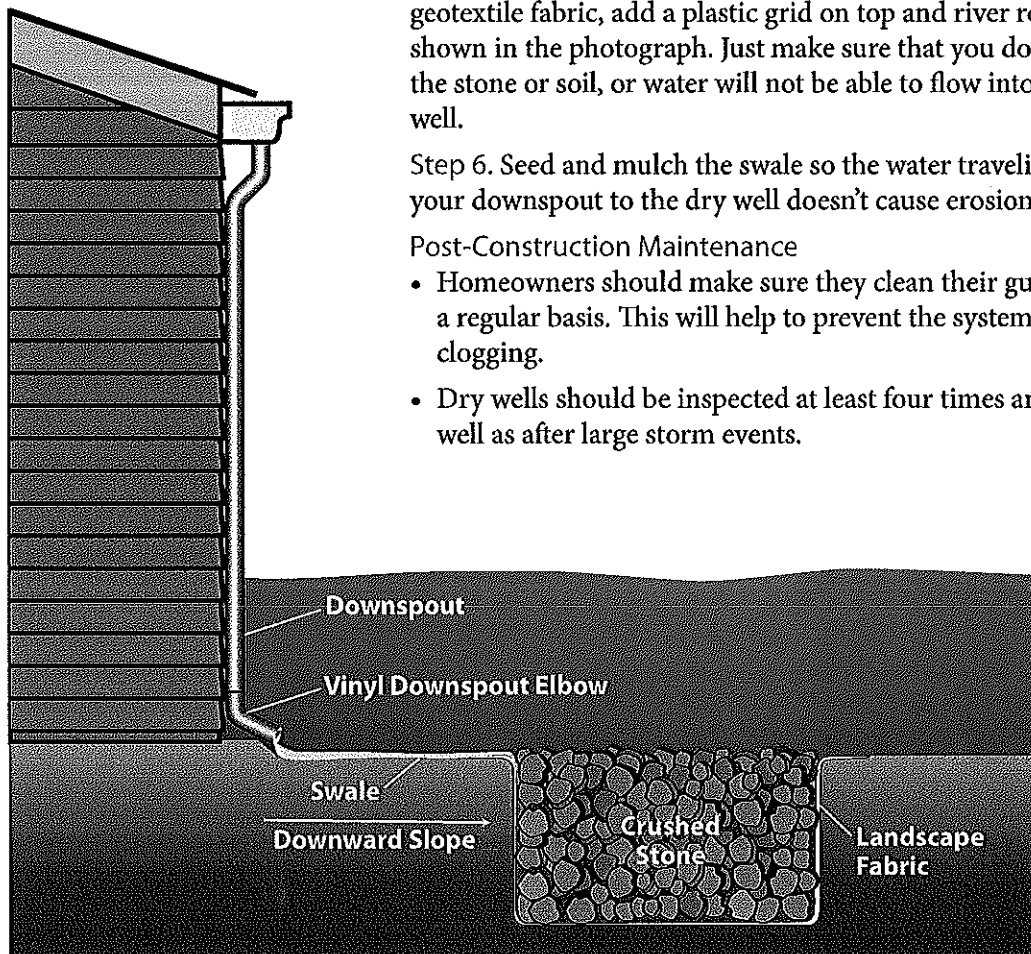
Step 4. Line the well with landscape fabric (non-woven geotextile fabric or filter cloth). Make sure it is porous enough to allow water to pass through it. Also, excess fabric should be folded over the edges of the well. The fabric prevents surrounding soil from getting into the system and clogging it up.

Step 5. Fill the well with the crushed stone. You can either a) fill the well with stones all of the way to the top until flush with the surrounding soil, b) fill the well with stones just a few inches from the top of the well, add a layer of geotextile fabric and backfill over the well with soil to plant in it (make sure the layer of fabric is between the stone and soil), or c) fill the well with stones just a few inches from the top of the well, add a layer of geotextile fabric, add a plastic grid on top and river rocks, as shown in the photograph. Just make sure that you don't mound the stone or soil, or water will not be able to flow into your dry well.

Step 6. Seed and mulch the swale so the water traveling from your downspout to the dry well doesn't cause erosion.

## Post-Construction Maintenance

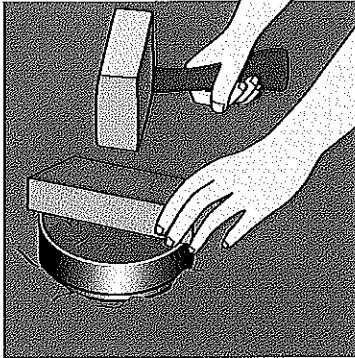
- Homeowners should make sure they clean their gutters on a regular basis. This will help to prevent the system from clogging.
- Dry wells should be inspected at least four times annually as well as after large storm events.



# Infiltration Test

**It is important that water infiltrate well even during saturated conditions. Conduct your infiltration test after a rain storm.**

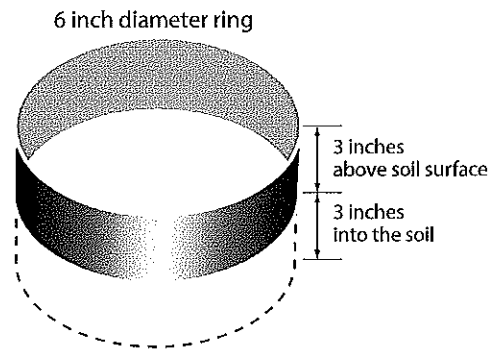
An infiltration test will help you determine if the soil on your property is suitable for certain types of stormwater management measures, such as a dry well or rain garden. An infiltration test measures how quickly water can soak in and flow through the soil. It is important to know how your soil infiltrates water before building a dry well, rain garden or any other stormwater management structure.



*Figure 1*  
Using the hand sledge and block of wood, drive the 6 inch diameter ring, beveled edge down, to a depth of three inches.

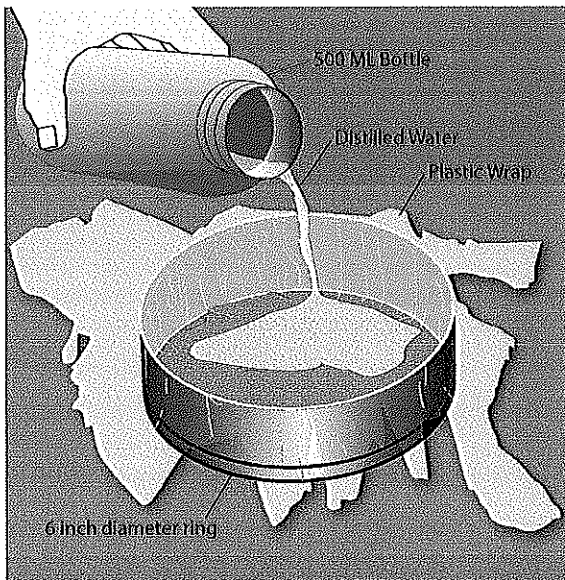
## Materials

- 6 inch diameter ring
- Hand sledge and wood block
- Plastic wrap
- 500 mL plastic bottle or graduated cylinder
- Water
- Stopwatch or timer
- Pen and paper



## Step 1. Drive Ring into Soil:

- Clear the sampling area of surface residue, etc. If the site is covered with vegetation, trim it as close to the soil surface as possible.



*Figure 2*  
Pour the 444 mL of water (1 inch of water) into the ring lined with plastic wrap.

- Using the hand sledge and block of wood, drive the 6 inch diameter ring, beveled edge down, to a depth of three inches (see Figure 1).
- If the soil contains rock fragments, and the ring cannot be inserted to the depth, gently push the ring into the soil until it hits a rock fragment.

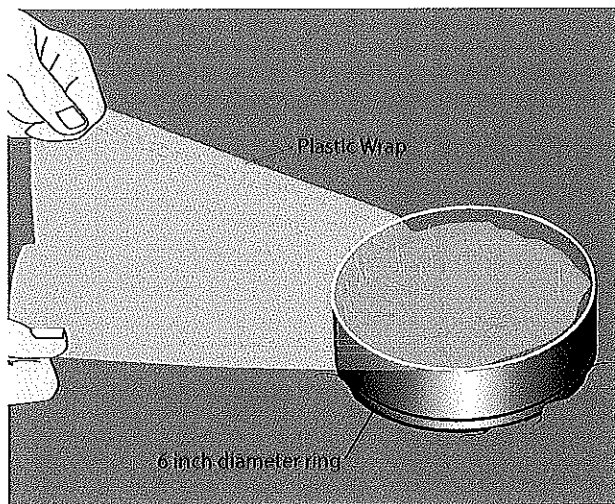
## Step 2. Firm Soil:

- With the 6 inch diameter ring in place, use your finger to gently firm the soil surface only around the inside edges of the ring to prevent extra seepage. Minimize disturbance to the rest of the soil surface inside the ring.

## Step 3. Line Ring with Plastic Wrap:

- Line the soil surface inside the ring with a sheet of plastic wrap to completely cover the soil and ring as shown in Figure 2. This procedure prevents disturbance to the soil surface when adding water.

# Infiltration Test



*Figure 3*  
Remove the plastic wrap by gently pulling it out, leaving the water in the ring.

## Step 4. Add Water:

- Fill the plastic bottle or graduated cylinder to the 444 mL (1 inch) mark with water. Pour the 444 mL of water (1 inch of water) into the ring lined with plastic wrap as shown in Figure 2.

## Step 5. Remove Wrap and Record Time:

- Remove the plastic wrap by gently pulling it out, leaving the water in the ring (Figure 3). Note the time. Record the amount of time (in minutes) it takes for the 1 inch of water to infiltrate the soil. Stop timing when the surface is just glistening. If the soil surface is

uneven inside the ring, count the time until half of the surface is exposed and just glistening. Record the time.

## Step 6. Repeat Infiltration Test:

- In the same ring, perform Steps 3, 4, & 5 with a second inch of water. Record the number of minutes elapsed for the second infiltration measurement. Repeat the test (Steps 3, 4, & 5) a few more times. All of the tests should be conducted consecutively. If the test continues to yield the same results, you will have a good idea of the saturated infiltration rate. If the soil infiltrates the water under 1 hour, your soil is ready for a dry well, rain garden or any of the other structural projects in this manual.

# Photo Credits

## Vehicle Maintenance

Washington State Puget Sound Action Team

## Lawn & Garden Care

Washington State Puget Sound Action Team

## Pet Waste

Washington State Puget Sound Action Team

## Vehicle Washing

Washington State Puget Sound Action Team

## Tree Planting

page 8 – TreeVitalize

## Backyard Stream

NAM Planning & Design

## Winter De-icing

Chuck Leonard

## Planter Boxes

Multiple planters – Miriam Manon  
Single planter – Clint Bautz

## Rain Barrels

page 15 – Three Rivers Wet Weather Demonstration Program  
page 16 – Michael Pickel

## Rain Gardens

page 19-20 – Roger Bannerman, Wisconsin Department of Natural Resources

## Creating a Wildflower Meadow

Robin Sasek, CDM

## Dry Wells

Wissahickon Valley Watershed Association

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# TreeVitalize

A partnership to restore tree cover in Southeast PA

To stop your rain from going down the drain, plant more trees. Trees catch rainfall on leaves, branches and trunks. A single London Plane tree will intercept over 130 gallons during a minor (1/4 inch) rainstorm.

Plus, trees help conserve water.



For more info on TreeVitalize planting projects, Tree Tender education classes and homeowner rebates go to [www.treevitalize.net](http://www.treevitalize.net).

## TreeVitalize Partners





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# Stormwater Management

## An Overview for Auto Recyclers



You work in the **No.1** recycling industry in America:  
>> **Auto Recycling** <<

**Most auto dismantlers don't think of themselves as environmentalists, but the auto dismantling industry is very important for the environment.**

Did you know that the automobile is the number one recycled product in America? Over 75% of the materials from cars are recycled. Recycled vehicles generate over 12 million tons of recycled steel, saving enough energy to power over 18 million homes for a full year. Your work makes a real difference to the environment.

On the other hand, if you handle wrecked cars or trucks without proper care, it can cause environmental damage. Fortunately, there are some commonsense measures you can take to protect the environment and the business where you work.

### **How can your work on wrecked vehicles damage the environment?**

When it rains or snows, the flowing water can carry oils, antifreeze, and metals off your facility. These materials can end up in streams, rivers, lakes, and bays, killing aquatic life and seriously polluting water bodies in your area where people swim, fish, and boat.

It may be hard to see the connection between what happens at your facility and the effect on the environment. But polluted runoff is real. When polluted by oil, antifreeze, pesticides, animal waste, and a range of other materials, stormwater from business and residential property can add up to a big problem that affects entire communities.

### **What can YOU do?**

You can follow these commonsense practices to do your part to prevent stormwater pollution.

It's just a matter of changing a few habits and acting responsibly, all the time.



# Stormwater Management

## An Overview for Auto Recyclers

### Only Rain in the Drain

If you follow this motto, you're well on your way toward successful stormwater management. Your goal should be to prevent oil, grease, antifreeze, and any other material from mixing with stormwater. Here's how:

#### 1. Prevent spills and leaks.

**Visually inspect vehicles entering the facility for leaks.** If you see a leak, contain it with a drip pan or absorbent material (such as dry sweep or kitty litter) and clean up the residue from the ground.

When removing vehicle fluids, always use a drain pan, drain tables, or pump or suction system to capture the fluids.

#### 2. Clean up spills immediately.

**When spills and leaks happen, clean up as much of the fluid as you can,** as quickly as possible. For small spills use shop rags, oil dry, or absorbent materials. For larger spills use absorbent socks, pads, and pillows.

Spill kits that include absorbent materials like oil dry and/or absorbent pads, socks, and pillows should be placed conveniently around the shop, and you should know where the kits are at all times. Keep brooms, shovels, or scoops near your spill kit.

Place used absorbents in a designated container for proper disposal. Check with your manager before putting used absorbent in a dumpster.

#### 3. Handle fluids properly.

**After you remove vehicle fluids, store the fluids in clearly marked containers.** These containers should have some type of secondary containment (such as a larger drum or a concrete curb) to prevent a large spill from spreading. Make sure not to mix oils with antifreeze or solvents—that can create a hazardous waste, which can't be recycled and is expensive to get rid of. Also make sure to use the right size funnels when pouring fluids into a storage drum. Check the drums regularly for leaks.

#### 4. Drain, cover, and contain all oily parts stored outside.

**If you store oily parts outside or in vehicles that are outside, ensure they are covered to prevent contact with rain or snow. Inspect these areas regularly for spills and leaks.**

### Stick to these practices!

It is important to *always* implement these practices, and to pay special attention to these issues during wet weather.

Be proud of the work you do to protect the environment. What you do in the yard matters to your business and to your community. You can make a difference!

# Stormwater and the Construction Industry

## Protect Natural Features



**Bad**



**Good**

- Minimize clearing.
- Minimize the amount of exposed soil.
- Identify and protect areas where existing vegetation, such as trees, will not be disturbed by construction activity.
- Protect streams, stream buffers, wild woodlands, wetlands, or other sensitive areas from any disturbance or construction activity by fencing or otherwise clearly marking these areas.

## Construction Phasing



**Bad**



**Good**

- Sequence construction activities so that the soil is not exposed for long periods of time.
- Schedule or limit grading to small areas.
- Install key sediment control practices before site grading begins.
- Schedule site stabilization activities, such as landscaping, to be completed immediately after the land has been graded to its final contour.

## Vegetative Buffers



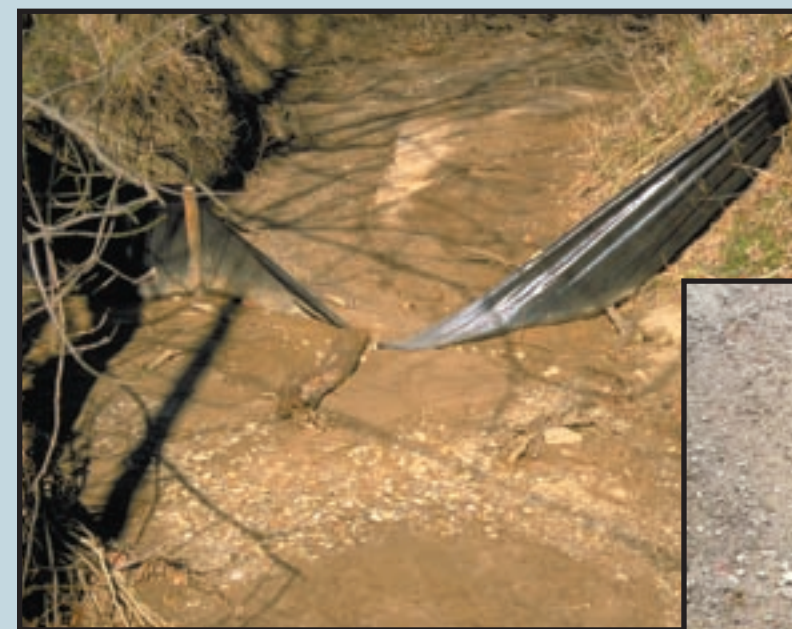
**Bad**



**Good**

- Protect and install vegetative buffers along waterbodies to slow and filter stormwater runoff.
- Maintain buffers by mowing or replanting periodically to ensure their effectiveness.

## Silt Fencing



**Bad**



**Good**

- Inspect and maintain silt fences after each rainstorm.
- Make sure the bottom of the silt fence is buried in the ground.
- Securely attach the material to the stakes.
- Don't place silt fences in the middle of a waterway or use them as a check dam.
- Make sure stormwater is not flowing around the silt fence.

## Site Stabilization



**Bad**



**Good**

- Vegetate, mulch, or otherwise stabilize all exposed areas as soon as land alterations have been completed.

# Maintain your BMPs!

[www.epa.gov/npdes/menuofbmps](http://www.epa.gov/npdes/menuofbmps)

## Construction Entrances



**Bad**



**Good**

- Remove mud and dirt from the tires of construction vehicles before they enter a paved roadway.
- Properly size entrance BMPs for all anticipated vehicles.
- Make sure that the construction entrance does not become buried in soil.

## Slopes



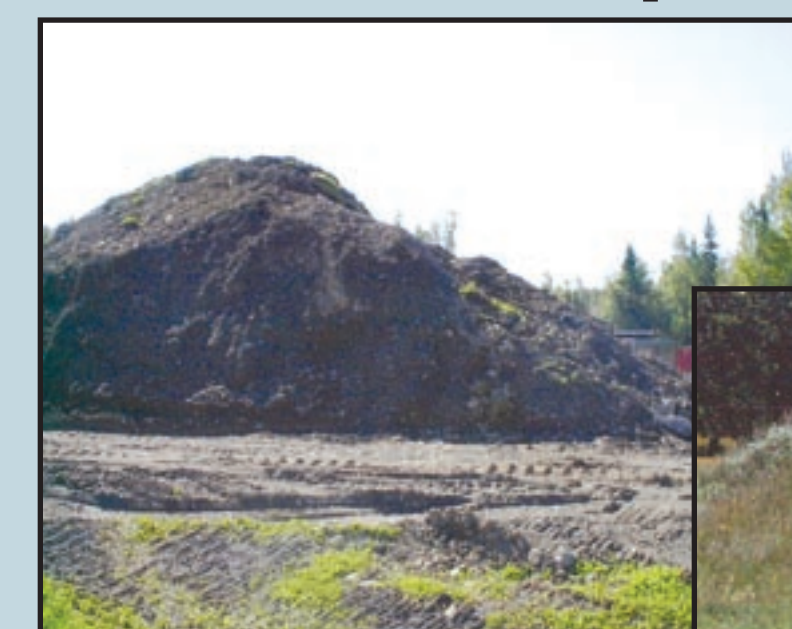
**Bad**



**Good**

- Rough grade or terrace slopes.
- Break up long slopes with sediment barriers, or under drain, or divert stormwater away from slopes.

## Dirt Stockpiles



**Bad**



**Good**

- Cover or seed all dirt stockpiles.

## Storm Drain Inlet Protection



**Bad**

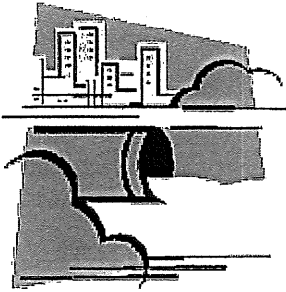


**Good**

- Use rock or other appropriate material to cover the storm drain inlet to filter out trash and debris.
- Make sure the rock size is appropriate (usually 1 to 2 inches in diameter).
- If you use inlet filters, maintain them regularly.

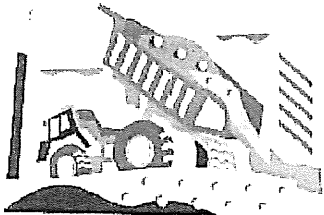
## What is Stormwater?

Stormwater is rain that falls on roofs, lawns and paved areas, like driveways and roads, and is carried away by a system of stormwater pipes, culverts and ditches. As it flows over the land, stormwater picks up or is contaminated by debris, chemicals, dirt and other pollutants. This untreated water is discharged into the waterbodies we use for swimming, fishing and drinking water.



## How Do Construction Activities Pollute Stormwater?

Construction activities can cause soil erosion and downstream problems with sedimentation. Erosion at construction sites may affect a relatively small percentage of land in the watershed, but can contribute significantly to the erosion rates in the watershed.<sup>1</sup> Development resulting from construction activities can increase the amount of impervious surfaces thus increasing runoff to lakes, rivers and streams. This heightened flow rate may result in erosion and sedimentation problems downstream as well.



<sup>1</sup> Brady, N.C., and R.R. Weil. 1999. *The Nature and Properties of Soils*. 12th ed. Prentice Hall. Upper Saddle River, NJ.

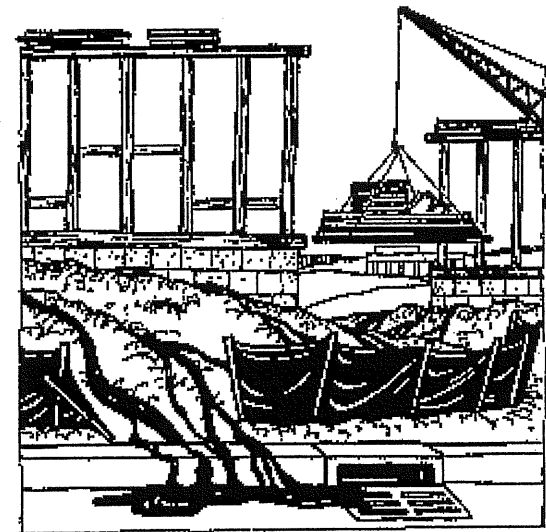
## Additional Information

Pennsylvania State Dept. of Environmental Protection  
<http://www.dep.state.pa.us>

United States Environmental Protection Agency  
<http://www.epa.gov/npdes>

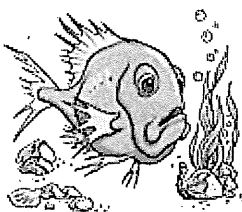


# Stormwater Pollution Prevention: The influence of construction activities



## How Does Stormwater and Sedimentation Impact Water Quality?

- Sediments increase turbidity and reduce light availability which can cause a decline in aquatic plants and organisms.
- Fish eggs are covered, spawning beds and pools are filled in with sediment and food supplies are reduced.
- Boating and other recreational activities are also impaired due to effects such as decreased water clarity and fisheries decline.
- Sedimentation reduces the depth of streams and can cause an increase in flooding.
- Nutrients, microbiological inputs and toxicants adhere to sediment. Excess nutrients promote the growth of too much aquatic vegetation and deplete oxygen levels for other organisms. Microbiological inputs and toxicants can affect wildlife and threaten human health.



## Builder, Contractor, Owner and Construction Site Operator Responsibilities

You are responsible for:

- Impacts to the storm system and damage caused by pollutants from your work site.
- Developing and implementing a Stormwater Pollution Prevention Plan (SWPPP) in compliance with the statewide Phase II Stormwater permit for construction activities.
- Complying with stormwater management requirements of the local government having jurisdiction over the project.

## BMP's to Prevent Erosion and Sedimentation

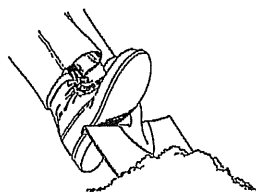
### Construction Phasing

- Sequence construction activities so that the soil is not exposed for long periods of time.
- Schedule or limit grading to small areas.
- Install key sediment control practices before site grading begins.
- Schedule site stabilization activities, such as landscaping, to be completed immediately after the land has been graded to its final contour.



### Site Stabilization

- Vegetate or mulch all exposed areas as soon as land alterations have been completed.
- Use rock or other appropriate material to cover the storm drain inlet to filter out trash and debris.
- Inspect and maintain silt fences after each rainstorm.
- Don't place silt fences in the middle of a waterway or use them as a check dam.



- Make sure storm water is not flowing around the silt fence or other vegetative buffers.
- Cover or seed all dirt piles.

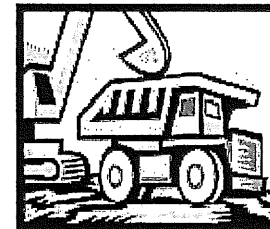
### Protect Natural Features

- Minimize the amount of vegetation that is cleared from the site.
- Identify and protect areas where existing vegetation, such as trees, will not be disturbed by construction activity.
- Minimize the amount of exposed soil.
- Protect and install vegetative buffers along waterbodies to slow and filter stormwater runoff.
- Maintain buffers by mowing or replanting periodically to ensure their effectiveness.



### Storm Drain Inlet Protection

- Rough grade or terrace slopes.
- Break up long slopes with sediment barriers. Under drain or divert stormwater away from slopes.
- Install structural BMP's to trap sediment on the downslope sides of the lot.
- Remove mud and dirt from the tires of construction vehicles before they enter a paved roadway.
- Control driveway access to limit tracking of mud onto streets.
- Properly size entrance BMP's for all anticipated vehicles.
- Make sure that the construction entrance does not become buried in soil.



## *Canines for Clean Creeks*

Dogs are great companions for fresh air, exercise, and a wonderful way to enjoy our natural surroundings. However, pet waste has a negative impact on streams, walking trails, and natural areas. Recent studies by Chester Ridley Crum Watersheds Association, Pennsylvania Department of Environmental Protection, and Villanova University have documented that our local creeks frequently have levels of fecal coliform bacteria three or more times the state recommended maximums for safe water contact. Studies by the Center for Watershed Protection have found that a significant portion of fecal coliform bacteria in residential stormwater originates from dog waste. These levels escalate when stormwater washes contamination from pet droppings into storm drains.



One average size dog dropping contains 3 billion fecal coliform bacteria. Multiply that by the fact that 40% of households have a dog, you can see how this problem “piles up”, and adds to the challenge of treating much of our creek water for drinking water.

Do your part to make your dog a friend of our creeks, fellow walkers, and our natural environment:

- Scoop up after your pet and dispose the waste properly- in a trash can or toilet
- Keep your pet on a leash and on trails in natural areas and avoid contact with wildlife
- Remain within off leash areas when off leash
- Encourage your friends and family to do the same!

**Source: Center for Watershed Protection, [www.cwp.org](http://www.cwp.org) .** This message is brought to you by your municipality and Chester Ridley Crum Watersheds Association, [www.crcwatersheds.org](http://www.crcwatersheds.org).

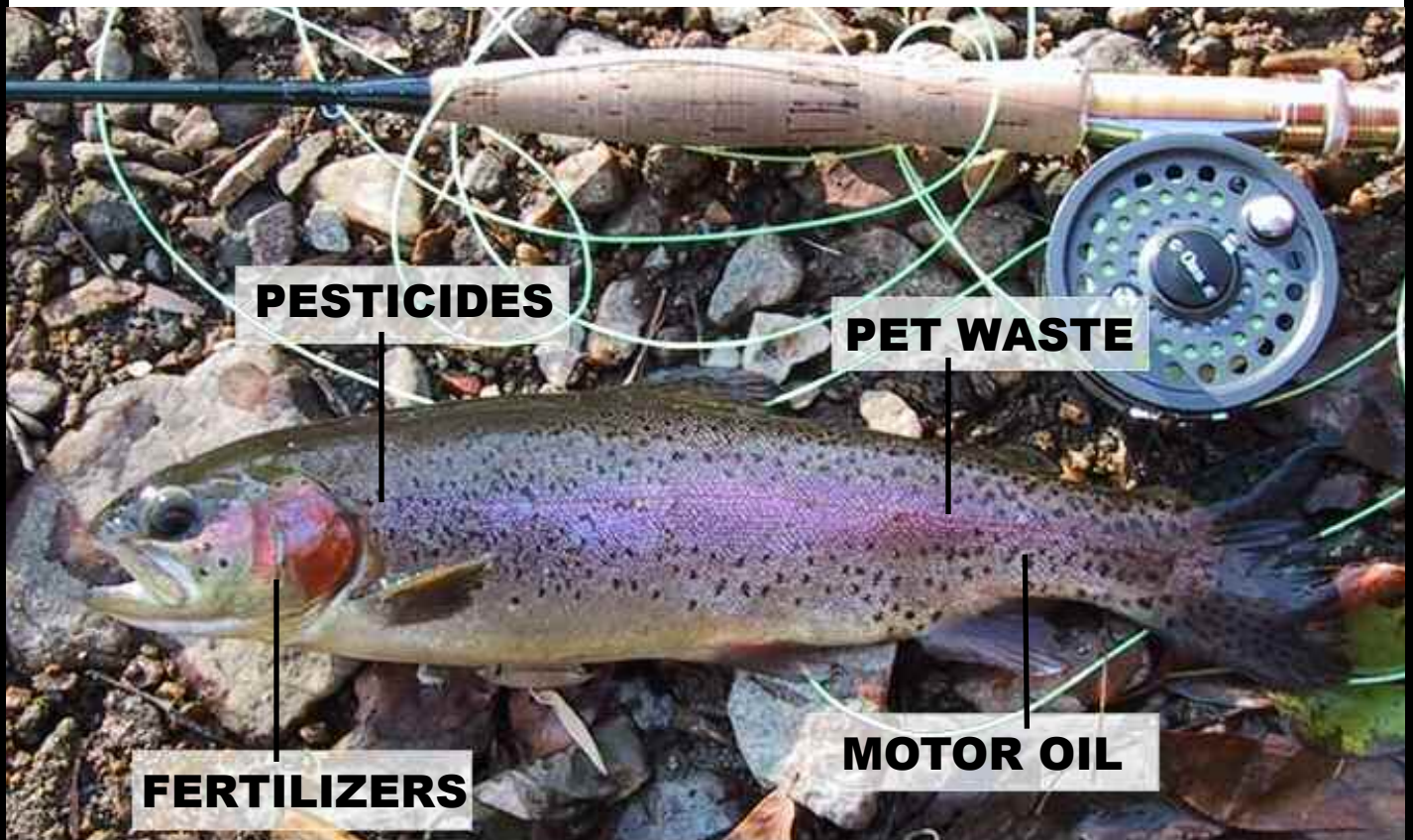
**WHEN YOU'RE WASHING YOUR CAR IN  
THE DRIVEWAY, REMEMBER YOU'RE  
NOT JUST WASHING YOUR CAR  
IN THE DRIVEWAY.**



All the soap, scum, and oily grit runs along the curb. Then into the storm drain and directly into our lakes, streams and into coastal waters including the Chesapeake Bay. And that causes pollution which is unhealthy for fish. So how do you avoid this whole mess? Easy. Wash your car on grass or gravel instead of the street. Or better yet, take it to a car wash where the water gets treated and recycled.

If you have questions regarding storm water, please contact your municipality or Pennsylvania Department of Environmental Protection's Regional Office.  
For general questions, you may also contact DEP's Bureau of Water Management at (717) 772-5661 or visit [www.dep.state.pa.us](http://www.dep.state.pa.us).  
Thanks to the Washington State Water Quality Consortium for permission to adapt and use this poster.

# Catch of the Day?



*Ridley Creek, Rainbow Trout. Photo courtesy of Delco Manning Trout Unlimited #320*

## DO YOUR PART FOR HEALTHY STREAMS

- Use a slow release fertilizer on your lawn and plants.
- Clean up after your pet.
- Capture and recycle all motor oil.
- Minimize pesticide use and select less toxic alternatives.
- Pick up and properly dispose of all litter, including cigarette butts.

*This message is brought to you by your municipality and Chester Ridley Crum Watersheds Association, [www.crcwatersheds.org](http://www.crcwatersheds.org).*

**WHEN YOUR PET GOES ON THE LAWN,**

**REMEMBER IT DOESN'T JUST**

**GO ON THE LAWN.**

*www.DelawareEstuary.org*



When your pets leave those little surprises, rain washes all that pet waste and bacteria into our storm drains.

This pollutes our waterways.

So, what can you do? Simple.

Dispose of it properly (preferably in the toilet). Then that little surprise gets treated like it should.

Thanks to the Washington State Department of Ecology, King County, and the cities of Bellevue, Seattle, and Tacoma.

**WHAT CAN YOU DO?**

- 💧 Scoop up pet waste. As long as the droppings are not mixed with litter or other materials, flush it down the toilet. This is best because then a sewage treatment plant or your septic system treats the pet waste.
- 💧 Bag your pet's waste and put it in the trashcan.
- 💧 Never put pet waste into the storm drain.
- 💧 If your community does not regulate pet waste (e.g. "scooper" law), try to make it a priority of your local governing body.
- 💧 Encourage your neighborhood to provide pet waste stations for collection and disposal of waste. Check to see if the parks in your neighborhood have them.

**FOR MORE INFORMATION  
VISIT THESE WEB SITES:**

[www.delcoco.org](http://www.delcoco.org)

[www.chesco.org](http://www.chesco.org)

[www.pa.dep.us](http://www.pa.dep.us)

*Reprinted with permission from:*



# RAIN GARDENS

A how-to manual  
for homeowners





# RAIN GARDENS

## Your personal contribution to cleaner water

**H**omeowners in many parts of the country are catching on to rain gardens – landscaped areas planted to wild flowers and other native vegetation that soak up rain water, mainly from the roof of a house or other building. The rain garden fills with a few inches of water after a storm and the water slowly filters into the ground rather than running off to a storm drain. Compared to a conventional patch of lawn, a rain garden allows about 30% more water to soak into the ground.

Why are rain gardens important? As cities and suburbs grow and replace forests and agricultural land, increased stormwater runoff from impervious surfaces becomes a problem. Stormwater runoff from developed areas increases flooding; carries pollutants from streets, parking lots and even lawns into local streams and lakes; and leads to costly municipal improvements in stormwater treatment structures.

By reducing stormwater runoff, rain gardens can be a valuable part of changing these trends. While an individual rain garden may seem like a small thing, collectively they produce substantial neighborhood and community environmental benefits. Rain gardens work for us in several ways:

- 🌿 Increasing the amount of water that filters into the ground, which recharges local and regional aquifers;
- 🌿 Helping protect communities from flooding and drainage problems;
- 🌿 Helping protect streams and lakes from pollutants carried by urban stormwater – lawn fertilizers and pesticides, oil and other fluids that leak from cars, and numerous harmful substances that wash off roofs and paved areas;
- 🌿 Enhancing the beauty of yards and neighborhoods;
- 🌿 Providing valuable habitat for birds, butterflies and many beneficial insects.



## Who should use this manual?

This manual provides homeowners and landscape professionals with the information needed to design and build rain gardens on residential lots. Guidelines presented in this manual can also be used to treat roof runoff at commercial and institutional sites. However, the manual should not be used to design rain gardens for parking lots, busy streets and other heavily used paved areas where stormwater would require pretreatment before entering a rain garden.

## Frequently asked questions

**Does a rain garden form a pond?**

**No.** The rain water will soak in so the rain garden is dry between rainfalls. (Note: some rain gardens can be designed to include a permanent pond, but that type of rain garden is not addressed in this publication).

**Are they a breeding ground for mosquitoes?**

**No.** Mosquitoes need 7 to 12 days to lay and hatch eggs, and standing water in the rain garden will last for a few hours after most storms. Mosquitoes are more likely to lay eggs in bird baths, storm sewers, and lawns than in a sunny rain garden. Also rain gardens attract dragonflies, which eat mosquitoes!

**Do they require a lot of maintenance?**

Rain gardens can be maintained with little effort after the plants are established. Some weeding and watering will be needed in the first two years, and perhaps some thinning in later years as the plants mature.

**Is a rain garden expensive?**

It doesn't have to be. A family and a few friends can provide the labor. The main cost will be purchasing the plants, and even this cost can be minimized by using some native plants that might already exist in the yard or in a neighbor's yard.





## Step 1 Sizing and Siting the Rain Garden

This section of the manual covers rain garden basics – where to put the rain garden, how big to make it, how deep to dig it, and what kind of soils and slope are best. Following the instructions in this section is the best way to ensure a successful rain garden project.

If you already know the size you want your rain garden to be, then skip ahead to the section about building the rain garden. However, take time read the pointers about location, and do find the slope of the lawn. If the location has a slope more than about 12%, it's best to pick a different location because of the effort it will take to create a level rain garden.



An extension of PVC pipe helps direct downspout water to this rain garden.

### Where should the rain garden go?

Home rain gardens can be in one of two places – near the house to catch only roof runoff or farther out on the lawn to collect water from the lawn and roof. (Figure 1 shows the possible locations on a residential lot.) To help decide where to put a rain garden, consider these points:

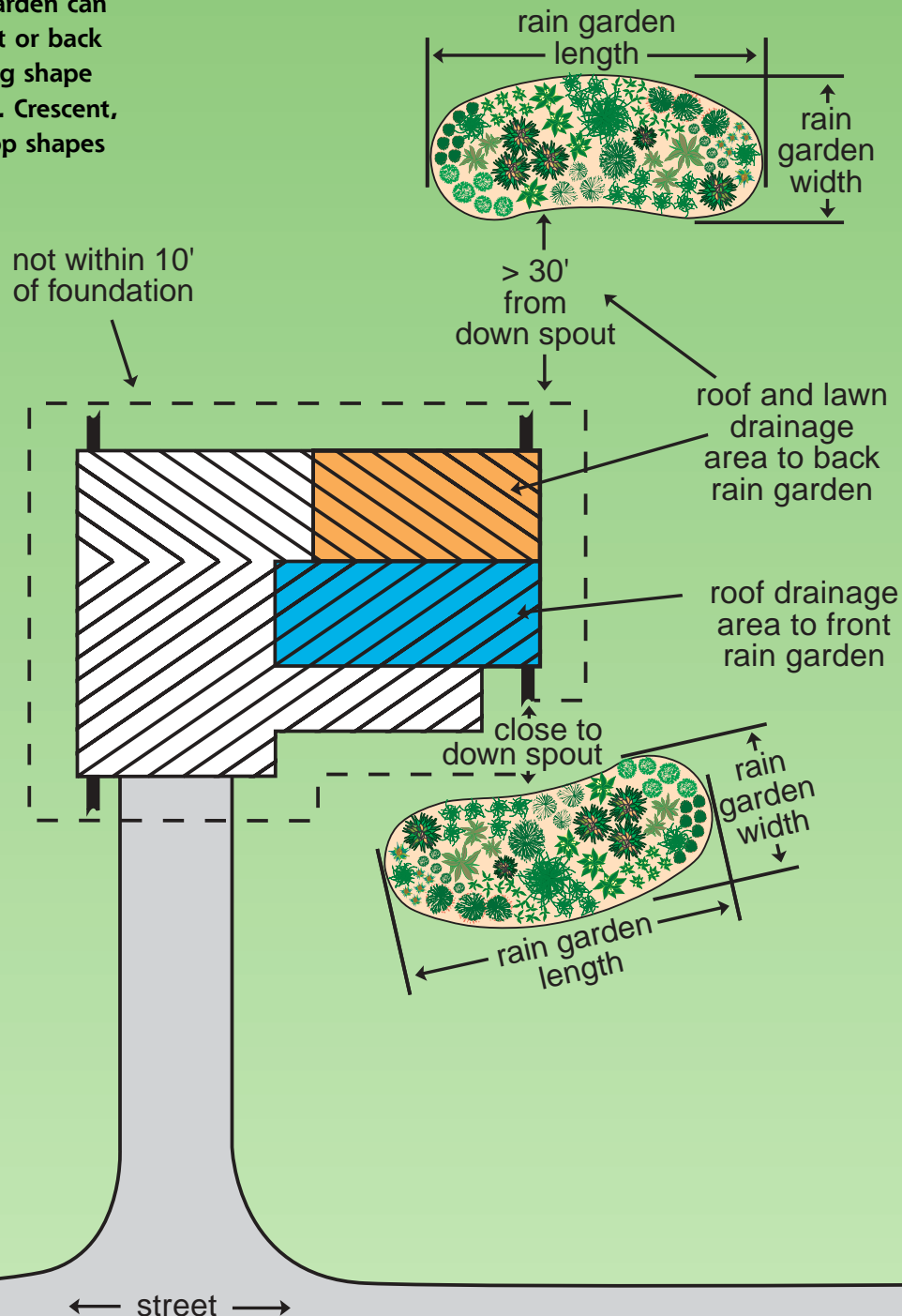
- The rain garden should be at least 10 feet from the house so infiltrating water doesn't seep into the foundation.
- Do not place the rain garden directly over a septic system.
- It may be tempting to put the rain garden in a part of the yard where water already ponds. Don't! The goal of a rain garden is to encourage infiltration, and your yard's wet patches show where infiltration is slow.
- It is better to build the rain garden in full or partial sun, not directly under a big tree.
- Putting the rain garden in a flatter part of the yard will make digging much easier. For example, a rain garden 10 feet wide on a 10% slope must be 12 inches deep to be level, unless you import topsoil or use cut and fill.

# Consider your overall landscape

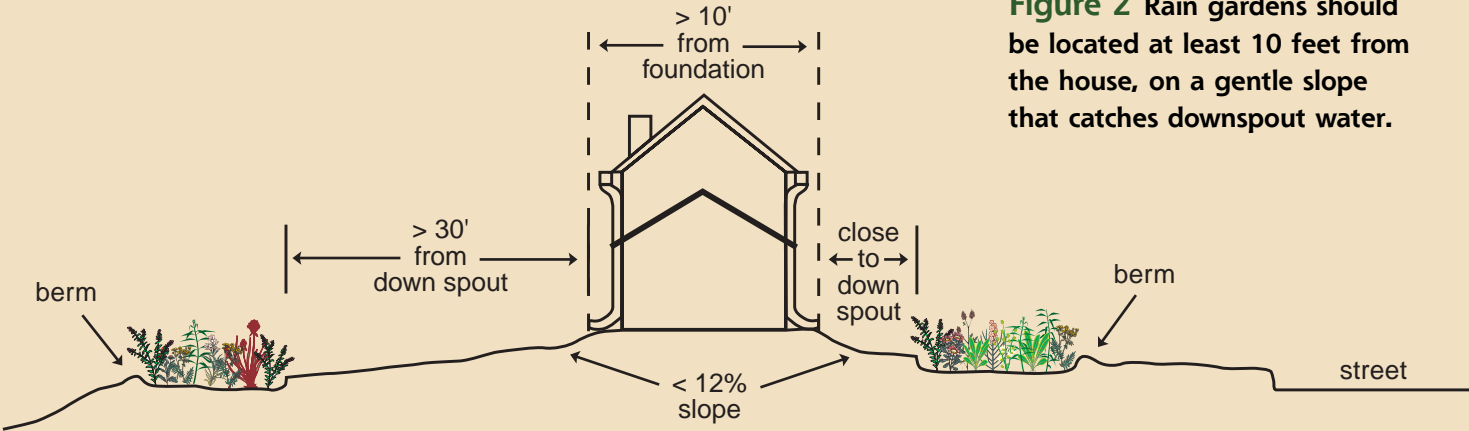
When considering placement of your rain garden, design with the end in mind. Carefully consider how the rain garden can be integrated into existing and future landscaping. Also, pay attention to views from inside the house as well as those

throughout the landscape. Determine how far or how close you want your rain garden to outdoor gathering spaces or other play areas. Why not locate it near a patio where you can take advantage of the colors and fragrances for hours on end!

**Figure 1** A rain garden can be built in the front or back yard. Pick a pleasing shape for the rain garden. Crescent, kidney, and teardrop shapes seem to work well.



**Figure 2** Rain gardens should be located at least 10 feet from the house, on a gentle slope that catches downspout water.



### How big should the rain garden be?

The surface area of the rain garden can be almost any size, but time and cost will always be important considerations in sizing decisions. Any reasonably sized rain garden will provide some stormwater runoff control. A typical residential rain garden ranges from 100 to 300 square feet. Rain gardens can be smaller than 100 square feet, but very small gardens have little plant variety. If a rain garden is larger than 300 square feet it takes a lot more time to dig, is more difficult to make level, and could be hard on your budget.

The size of the rain garden will depend on

- how deep the garden will be,
- what type of soils the garden will be planted in, and
- how much roof and/or lawn will drain to the garden.

This information, along with the sizing factor from the tables on page 9, will determine the surface area of the rain garden.

### Guidelines are not rules...

The sizing guidelines described in this manual are based on a goal of controlling 100% of the runoff for the average rainfall year while keeping the size of the rain garden reasonable. Establishing a 100% runoff goal helps compensate for some of the errors that creep into the design and construction of any rain garden.

If you follow the guidelines in the manual and decide the calculated surface area is just too large for your goals, it is perfectly acceptable to make the rain garden smaller. The rain garden can be up to 30% smaller and still control almost 90% of the annual runoff. On the other hand, it is fine to make the rain garden bigger than the guidelines indicate.

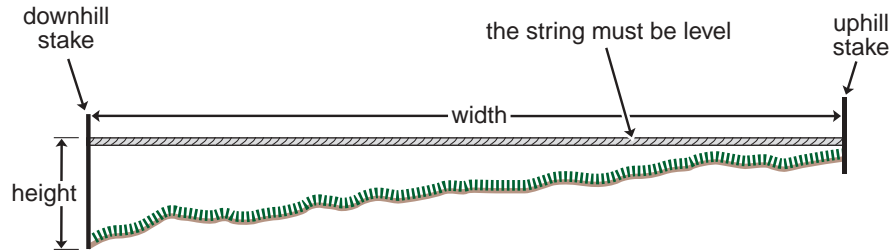
Digging with a rented backhoe.



## How Deep Should the Rain Garden Be?

A typical rain garden is between four and eight inches deep. A rain garden more than eight inches deep might pond water too long, look like a hole in the ground, and present a tripping hazard for somebody stepping into it. A rain garden much less than four inches deep will need an excessive amount of surface area to provide enough water storage to infiltrate the larger storms.

No matter what the depth of the rain garden, the goal is to keep the garden level. Digging a very shallow rain garden on a steep lawn will require bringing in extra topsoil to bring the downslope part of the garden up to the same height as the up-slope part of the garden. As the slope gets steeper, it is easier to dig the rain garden a little deeper to make it level.



**Figure 3** The string should be tied to the base of the uphill stake, then tied to the downhill stake at the same level.

The slope of the lawn should determine the depth of the rain garden. Find the slope of your lawn by following these steps. (Figure 3 shows how the stakes and string should look.)

1. Pound one stake in at the uphill end of your rain garden site and pound the other stake in at the downhill end. The stakes should be about 15 feet apart.
2. Tie a string to the bottom of the uphill stake and run the string to the downhill stake.
3. Using a string level or the carpenter's level, make the string horizontal and tie the string to the downhill stake at that height.
4. Measure the width (in inches) between the two stakes.
5. Now measure the height (in inches) on the downhill stake between the ground and string.
6. Divide the height by the width and multiply the result by 100 to find the lawn's percent slope. If the slope is more than 12%, it's best to find another site or talk to a professional landscaper.

Using the slope of the lawn, select the depth of the rain garden from the following options:

- If the slope is less than 4%, it is easiest to build a 3 to 5-inch deep rain garden.
- If the slope is between 5 and 7%, it is easiest to build one 6 to 7 inches deep.
- If the slope is between 8 and 12%, it is easiest to build one about 8 inches deep.

### ✓ EXAMPLE

Todd measures the length of the string between the stakes; it is 180 inches long. The height is 9 inches. He divides the height by the width to find his lawn's percent slope.

$$\frac{\text{height}}{\text{width}} \times 100 = \% \text{ slope} \qquad \frac{9 \text{ inches}}{180 \text{ inches}} \times 100 = 5\% \text{ slope}$$

With a 5% slope, Todd should build a 6 inch deep rain garden.

## What type of soils are on the rain garden site?

After choosing a rain garden depth, identify the lawn's soil type as sandy, silty, or clayey. Sandy soils have the fastest infiltration; clayey soils have the slowest. Since clayey soils take longer to absorb water, rain gardens in clayey soil must be bigger than rain gardens in sandy or silty soil. If the soil feels very gritty and coarse, you probably have sandy soil. If your soil is smooth but not sticky, you have silty soil. If it is very sticky and clumpy, you probably have clayey soil.

## How big is the area draining to the rain garden?

The next step in choosing your rain garden size is to find the area that will drain to the rain garden. As the size of the drainage area increases so should the size of the rain garden. There is some guesswork in determining the size of a drainage area, especially if a large part of the lawn is up-slope from the proposed garden site. Use the suggestions below to estimate the drainage area without spending a lot of time.

### Rain gardens less than 30 feet from the downspout

1. In this case, where the rain garden is close to the house, almost all water will come from the roof downspout. Walk around the house and estimate what percent of the roof feeds to that downspout. Many houses have four downspouts, each taking about 25% of the roof's runoff.
2. Next find your home's footprint, the area of the first floor. If you don't already know it, use a tape measure to find your house's length and width. Multiply the two together to find the approximate area of your roof.
3. Finally, multiply the roof area by the percent of the roof that feeds to the rain garden downspout. This is the roof drainage area.

### Rain gardens more than 30 feet from the downspout

1. If there is a significant area of lawn uphill that will also drain to the rain garden, add this lawn area to the roof drainage area. First find the roof drainage area using the steps above for a rain garden less than 30' from the downspout.
2. Next find the area of the lawn that will drain to the rain garden. Stand where your rain garden will be and look up toward the house. Identify the part of the lawn sloping into the rain garden.
3. Measure the length and width of the uphill lawn, and multiply them to find the lawn area.
4. Add the lawn area to the roof drainage area to find the total drainage area.

### EXAMPLE

Todd's house is 60 feet by 40 feet, so the roof area is 2400 square feet. He estimates that the downspout collects water from 25% of the roof, so he multiplies 2400 by 0.25 to get a downspout drainage area of 600 square feet.

Roof Area: 60 ft by 40 ft = 2400 square ft.

Drainage Area: 2400 square ft. x 0.25 = 600 square ft.

► If the rain garden is far from the house, and you don't want a swale or downspout cutting across the lawn, run a PVC pipe underground from the downspout to the rain garden. In this case do calculations as for a rain garden less than 30 feet from the house.



## Simple soil tests

Two small tests can ensure your soil can handle a rain garden:

- Dig a hole about 6 inches deep where the rain garden is to go and fill the hole with water. If the water takes more than 24 hours to soak in, the soil is not suitable for a rain garden.
- Take a handful of soil and dampen it with a few drops of water. After kneading the soil in your fingers, squeeze the soil into a ball. If it remains in a ball, then work the soil between your forefinger and thumb, squeezing it upward into a ribbon of uniform thickness. Allow the ribbon to emerge and extend over the forefinger until it breaks from its own weight. If the soil forms a ribbon more than an inch long before it breaks, and it also feels more smooth than gritty, the soil is not suitable for a rain garden.



The map is a starting point for assessing what type of soils you might find in your yard. However, the soil on a small plot of a yard can be very different from the soils indicated on the map. Use the simple soil test described here for a more accurate representation of the soils in the possible rain garden location. More information about sampling and testing lawn and garden soils can be obtained at county UW-Extension offices.

## Using the Rain Garden Size Factors

Having estimated the drainage area, soil type, and depth for your rain garden, use Table 1 or Table 2 to determine the rain garden's surface area. Use Table 1 if the rain garden is less than 30 feet from the downspout, and use Table 2 if it is more than 30 feet from the downspout.

**Table 1** Rain gardens less than 30 feet from downspout.

	3-5 in. deep	6-7 in. deep	8 in. deep
Sandy soil	0.19	0.15	0.08
Silty soil	0.34	0.25	0.16
Clayey soil	0.43	0.32	0.20

**Table 2** Rain gardens more than 30 feet from downspout.

	Size Factor, for all depths
Sandy soil	0.03
Silty soil	0.06
Clayey soil	0.10

1. Find the size factor for the soil type and rain garden depth.
2. Multiply the size factor by the drainage area. This number is the recommended rain garden area.
3. If the recommended rain garden area is much more than 300 square feet, divide it into smaller rain gardens.

### EXAMPLE

Todd's rain garden is less than 30 feet from the downspout, and his lawn has a 5% slope, so he will have a 6-inch deep rain garden. His lawn is silty, so Table 1 recommends a size factor of 0.25. He multiplies the downspout drainage area, 600 square feet, by 0.25 to find the recommended rain garden area, 150 square feet.

$$600 \text{ square ft. by } 0.25 = 150 \text{ square ft.}$$



Runoff flows into a new rain garden (shown before plants are fully grown).

## How long and how wide should the rain garden be?

Before building the rain garden, think about how it will catch water. Runoff will flow out of a downspout and should spread evenly across the entire length of the rain garden. The rain garden must be as level as possible so water doesn't pool at one end and spill over before it has a chance to infiltrate.

The longer side of the rain garden should face upslope; that is, the length of the rain garden should be perpendicular to the slope and the downspout. This way the garden catches as much water as possible. However, the rain garden should still be wide enough for the water to spread evenly over the whole bottom and to provide the space to plant a variety of plants. A good rule of thumb is that the rain garden should be about twice as long (perpendicular to the slope) as it is wide.

When choosing the width of the garden, think about the slope of the lawn. Wide rain gardens and rain gardens on steep slopes will need to be dug very deep at one end in order to be level. If the rain garden is too wide, it may be necessary to bring in additional soil to fill up the downhill half. Experience shows that making a rain garden about 10 feet wide is a good compromise between the effect of slope and how deep the rain garden should be. A rain garden should have a maximum width of about 15 feet, especially for lawns with more than about an 8 percent slope.

To determine the length of the rain garden:

1. Pick the best rain garden width for your lawn and landscaping.
2. Divide the size of your rain garden by the width to find your rain garden's length.

### ✓ EXAMPLE

Todd wants a 10-foot wide rain garden, so he divides 150 by 10 to find the rain garden length, 15 feet.

$$\frac{\text{rain garden area}}{\text{width}} = \text{length} \quad \frac{150 \text{ ft}^2}{10 \text{ ft}} = 15 \text{ ft}$$

## Choose a size that is best for your yard

Remember that these are only guidelines. The size of the rain garden also depends on how much money you want to spend, how much room you have in your yard, and how much runoff you want to control. Again, you can reduce the size of your rain garden by as much as 30% and still control almost 90% of the runoff. If the sizing table suggests that the rain garden be 200 square feet, but there is only enough room for a 140-square-foot rain garden, that's fine. A smaller rain garden will usually work to control most stormwater runoff, although some bigger storms might over-top the berm.



## Step 2 Building the Rain Garden

**N**ow that the size and place for the rain garden are set, it's time to get a shovel and start digging. Working alone, it will take about six hours to dig an average-size rain garden. If friends help it will go much faster, possibly only an hour or two.

Before you start digging, call Digger's Hotline at 1-800-242-8511.

► If you are building the rain garden into an existing lawn, digging time can be reduced by killing the grass first. A chemical such as Round-Up can be used, but a more environmentally friendly approach is to place black plastic over the lawn until the grass dies. Also, the best time to build the rain garden is in the spring. It will be easier to dig, and the plants are more likely to thrive.



## A note on tools

The following tools will help in building the rain garden. Some of the tools are optional.



• Tape measure

• Shovels

• Rakes



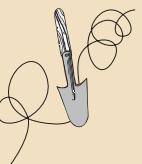
• Trowels

• Carpenter's level



• Wood stakes, at least 2 ft long

• String



• 2x4 board, at least 6 ft long (optional)

• Small backhoe with caterpillar treads (optional)

# Leveling the rain garden

One way to check the level of the rain garden is to just “eyeball” it. To do it more accurately follow these steps:

- When the whole area has been dug out to about the right depth, lay the 2x4 board in the rain garden with the carpenter’s level sitting on it. Find the spots that aren’t flat. Fill in the low places and dig out the high places.
- Move the board to different places and different directions, filling and digging as necessary to make the surface level.
- When the rain garden is as level as you can get it, rake the soil smooth.



The perimeter of a rain garden is defined with string before digging.

## Digging the rain garden

While digging the rain garden to the correct depth, heap the soil around the edge where the berm will be. (The berm is a low “wall” around three sides of the rain garden that holds the water in during a storm.) On a steeper lawn the lower part of the rain garden can be filled in with soil from the uphill half, and extra soil might need to be brought in for the berm.

Start by laying string around the perimeter of your rain garden. Remember that the berm will go outside the string. Next, put stakes along the uphill and downhill sides, lining them up so that each uphill stake has a stake directly downhill. Place one stake every 5 feet along the length of the rain garden.

Start at one end of the rain garden and tie a string to the uphill stake at ground level. Tie it to the stake directly downhill so that the string is level. Work in 5-foot-wide sections, with only one string at a time. Otherwise the strings will become an obstacle.

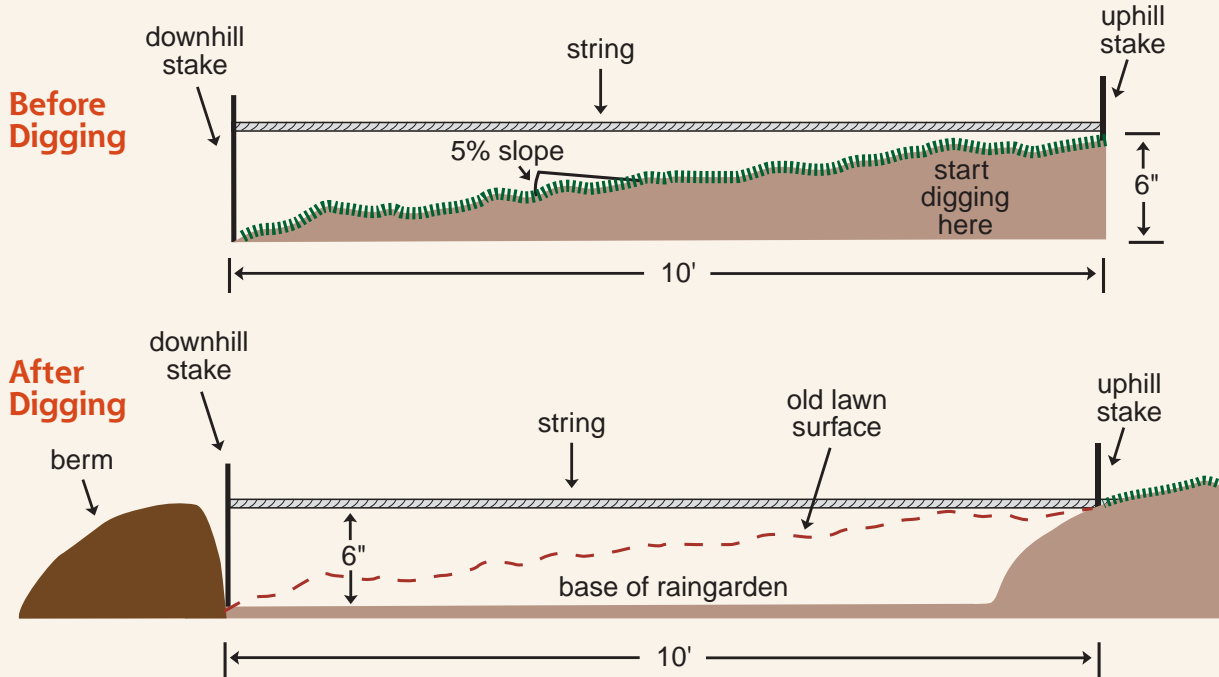
Start digging at the uphill side of the string. Measure down from the string and dig until you reach the depth you want the rain garden to be. If the rain garden will be four inches deep, then dig four inches down from the string. Figure 4 shows how.

If the lawn is almost flat, you will be digging at the same depth throughout the rain garden and using the soil for the berm. If the lawn is steeper, the high end of the rain garden will need to be dug out noticeably more than the low end, and some of the soil from the upper end can be used in the lower end to make the rain garden level. Continue digging and filling one section at a time across the length of your rain garden until it is as level as possible.

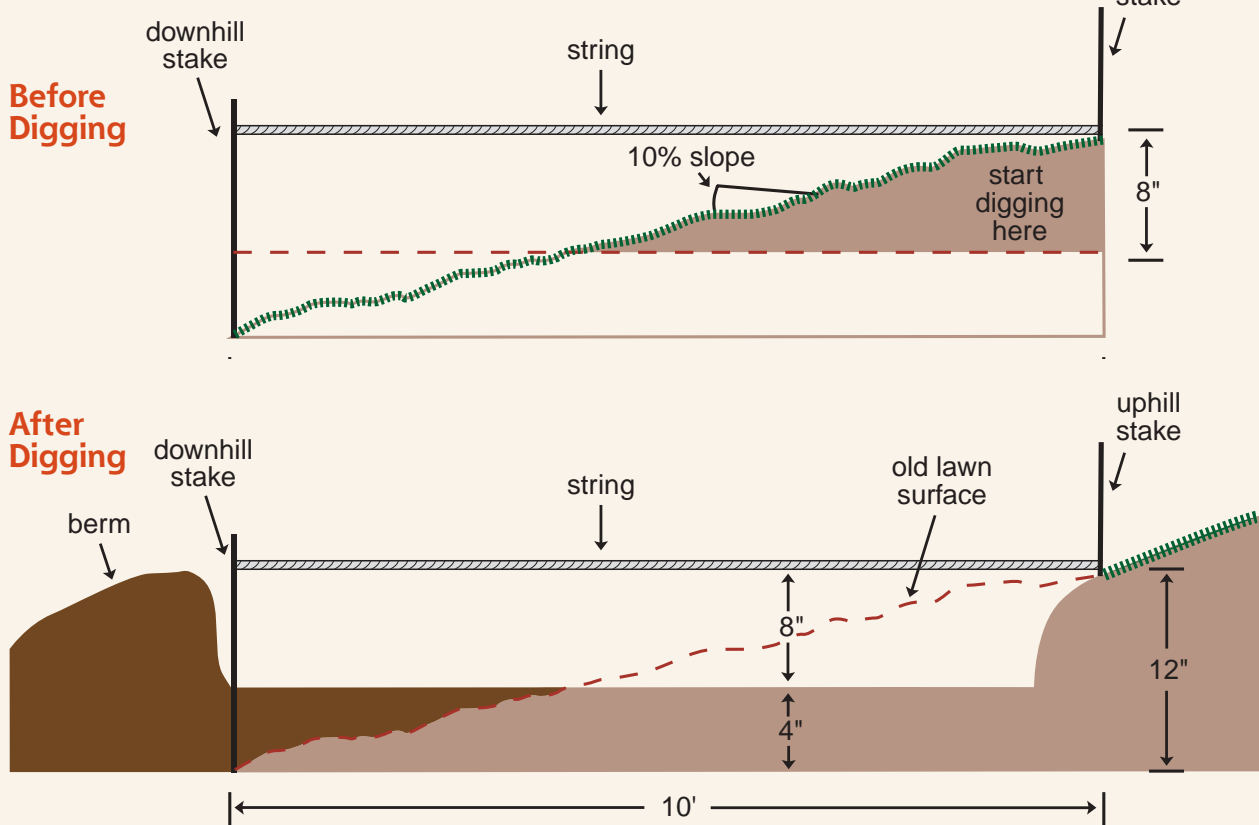
In any garden, compost will help the plants become established and now is the time to mix in compost if needed. Using a roto-tiller can make mixing much easier, but isn’t necessary. If you do add compost, dig the rain garden a bit deeper. To add two inches of compost, dig the rain garden one to two inches deeper than planned.

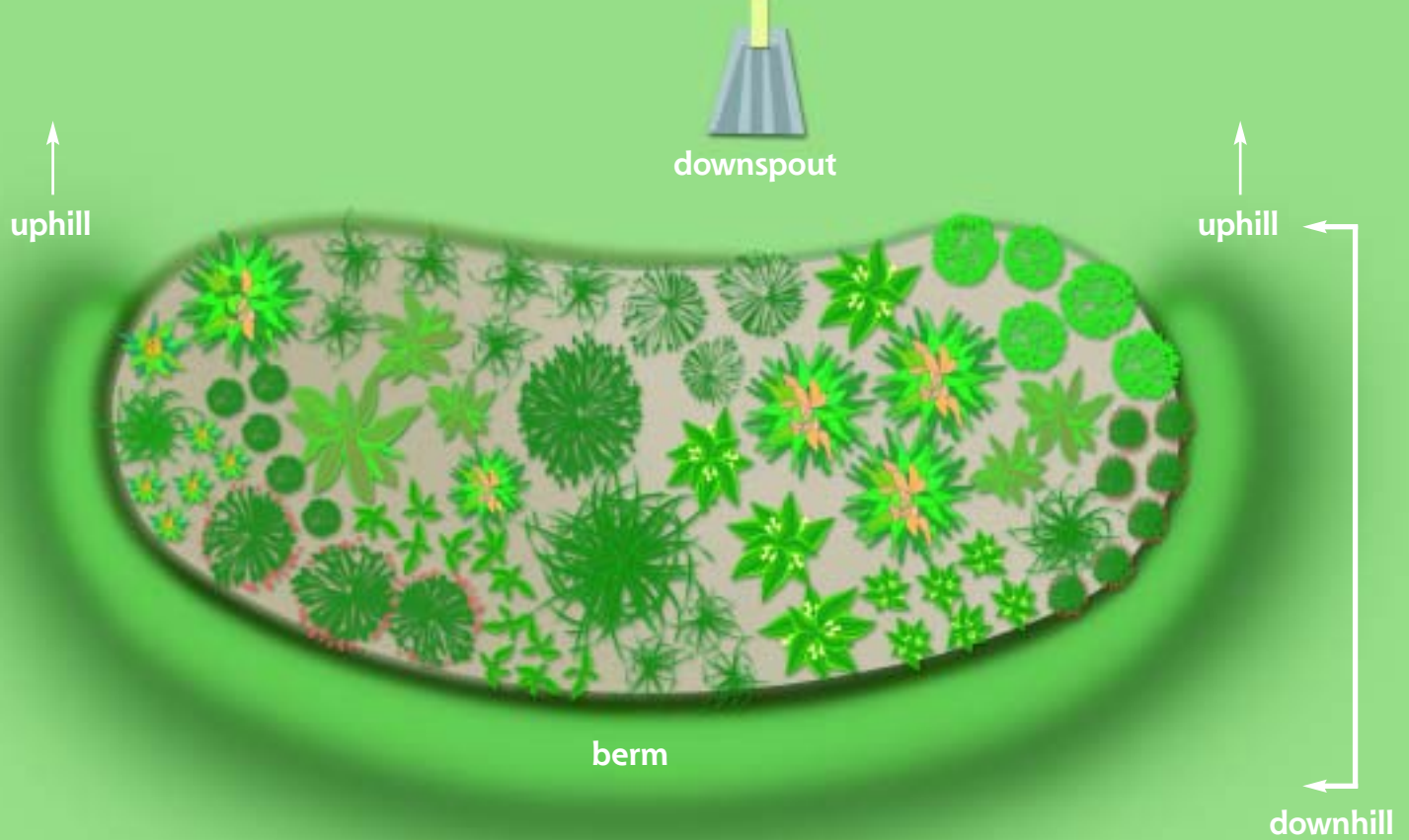
**Figure 4** Where to dig and where to put the soil you've dug.

**a. Between 3% and 8% slope lawn**



**b. Greater than 8% slope lawn**





**Figure 5** The top of the downhill part of the berm should come up to the same elevation as the entry to the rain garden at the uphill end.

### Making the Berm

Water flowing into the rain garden will naturally try to run off the downhill edge. A berm is needed to keep the water in the garden. The berm is a "wall" across the bottom and up the sides of the rain garden. The berm will need to be highest at the downhill side. Up the sides of the rain garden, the berm will become lower and gradually taper off by the time it reaches the top of the rain garden. Figure 5 shows how the berm should look.

On a flat slope there should be plenty of soil from digging out the rain garden to use for a berm. On a steeper slope, most of the soil from the uphill part of the rain garden was probably used to fill in the downhill half, and soil will have to be brought in from somewhere else. After shaping the berm into a smooth ridge about a foot across, stomp on it. It is very important to have a well-compacted berm, so stomp hard. The berm should have very gently sloping sides; this helps smoothly integrate the rain garden with the surrounding lawn and also makes the berm less susceptible to erosion.

To prevent erosion, cover the berm with mulch or plant grass. Use straw or erosion-control mat to protect the berm from erosion while the grass is taking root.

If you don't want to plant grass or mulch over the outside of the berm, you can also plant dry-tolerant prairie species. Some potential berm species are prairie dropseed, little bluestem, prairie smoke, blue-eyed grass, prairie phlox, and shooting star.

Note: If the downspout is a few feet from the entry to the rain garden, make sure the water runs into the garden by either digging a shallow grass swale or attaching an extension to the downspout.



**On a gentle slope, soil from digging out the garden can be used to create the berm. This rain garden is 4 inches deep.**

# Tips for designing an attractive rain garden

While rain gardens are a highly functional way to help protect water quality, they are also gardens and should be an attractive part of your yard and neighborhood. Think of the rain garden in the context of your home's overall landscape design. Here are a few tips:

When choosing native plants for the garden, it is important to consider the height of each plant, bloom time and color, and its overall texture. Use plants that bloom at different times to create a long flowering season. Mix heights, shapes, and textures to give the garden depth and dimension. This will keep the rain garden looking interesting even when few wildflowers are in bloom.

When laying plants out, randomly clump individual species in groups of 3 to 7 plants to provide a bolder statement of color. Make sure to repeat these individual groupings to create repetition and cohesion in a planting. This will provide a more traditional formal look to the planting.

Try incorporating a diverse mixture of sedges, rushes, and grasses with your flowering species (forbs). This creates necessary root competition that will allow plants to follow their normal growth patterns and not outgrow or out-compete other species. In natural areas, a diversity of plant types not only adds beauty but also create a thick underground root matrix that keeps the entire plant community in balance. In fact, 80% of the plant mass in native prairie communities is underground. Once the rain garden has matured and your sedges, rushes and grasses have established a deep, thick root system, there will be less change in species location from year to year, and weeds will naturally decline.

Finally, consider enhancing the rain garden by using local or existing stone, ornamental fences, trails, garden benches, or additional wildflower plantings. This will help give the new garden an intentional and cohesive look and provide a feeling of neatness that the neighbors will appreciate.





## Step 3

# Planting and Maintaining the Rain Garden

**P**lanting the rain garden is the fun part! A number of planting designs and lists of suggested plants are included at the end of this publication. Use these for ideas, but don't be afraid to be creative – there's no single best way to plant a rain garden. Anyone who has ever done any gardening will have no problem planting a rain garden, but a few basic reminders are listed below.

### Planting the rain garden

Select plants that have a well established root system. Usually one or two-year-old plants will have root systems that are beginning to circle or get matted. (Note: use only nursery-propagated plants; do not collect plants from the wild).

Make sure to have at least a rough plan for which plants will be planted where. Lay out the plants as planned one foot apart in a grid pattern, keeping them in containers if possible until they are actually planted to prevent drying out before they get in the ground.

Dig each hole twice as wide as the plant plug and deep enough to keep the crown of the young plant level with the existing grade (just as it was growing in the cell pack or container). Make sure the crown is level and then fill the hole and firmly tamp around the roots to avoid air pockets.

Apply double-shredded mulch evenly over the bed approximately two inches thick, but avoid burying the crowns of the new transplants. Mulching is usually not necessary after the second growing season unless the "mulched look" is desired.

Stick plant labels next to each individual grouping. This will help identify the young native plants from non-desirable species (weeds) as you weed the garden.

As a general rule plants need one inch of water per week. Water immediately after planting and continue to water twice a week (unless rain does the job) until the plugs are established. You should not have to water your rain garden once the plants are established. Plugs can be planted anytime during the growing season as long as they get adequate water.

### Fire safety

**Make sure burning is allowed in your locale. If so, be sure to notify the local fire department and obtain a burn permit if needed. It's also wise – not to mention neighborly – to make sure the neighbors know that you're burning and that all safety precautions are being taken. Basic fire precautions include:**

- **Make sure there is a fire-break (non-burnable area, such as turf-grass) at least 10-feet wide surrounding the area to be burned.**
- **Never burn on windy days.**
- **Never leave an actively burning fire unattended.**
- **Keep a garden hose handy in case fire strays where it is not wanted. Also have a metal leaf rake in hand to beat out flames that creep beyond the burn zone.**



## Maintaining the rain garden

Weeding will be needed the first couple of years. Remove by hand only those plants you are certain are weeds. Try to get out all the roots of the weedy plants. Weeds may not be a problem in the second season, depending on the variety and tenacity of weeds present. In the third year and beyond, the native grasses, sedges, rushes, and wildflowers will begin to mature and will out-compete the weeds. Weeding isolated patches might still be needed on occasion.

After each growing season, the stems and seedheads can be left for winter interest, wildlife cover and bird food. Once spring arrives and new growth is 4-6-inches tall, cut all tattered plants back. If the growth is really thick, hand-cut the largest plants and then use a string trimmer to mow the planting back to a height of six to eight inches. Dead plant material can also be removed with a string trimmer or weed whacker (scythe) and composted or disposed of as appropriate.

The best way to knock back weeds and stimulate native plant growth is to burn off the dead plant material in the rain garden. However, burning is banned in most municipalities. Another option is to mow the dead plant material. If the mowing deck of your lawn mower can be raised to a height of six inches or so, go ahead and simply mow your rain garden. Then, rake up and compost or properly dispose of the dead plant material.

If the mower deck won't raise that high, use a string trimmer or weed-eater to cut the stems at a height of 6-8 inches. On thicker stems, such as cup plant, goldenrods and some asters, a string trimmer may not be strong enough. For these, use hand clippers or pruning shears to cut the individual stems.

## What does a rain garden cost?

The cost of a rain garden will vary depending on who does the work and where the plants come from. If you grow your own plants or borrow plants from neighbors there can be very little or no cost at all. If you do all the work but use purchased prairie plants, a rain garden will cost approximately \$3 to \$5 per square foot. If a landscaper does everything, it will cost approximately \$10 to \$12 per square foot.

**It might seem easiest to sow native wildflower seed over the garden, but experience shows that seeding a rain garden has its problems. Protecting the seeds from wind, flooding, weeds, and garden pests is very difficult, and the rain garden will be mostly weeds for the first two years. Growing plugs from seed indoors or dividing a friend's plants is much better. If you grow plugs, start them about four months before moving them to the rain garden. When the roots have filled the pot and the plants are healthy, they may be planted in the rain garden**

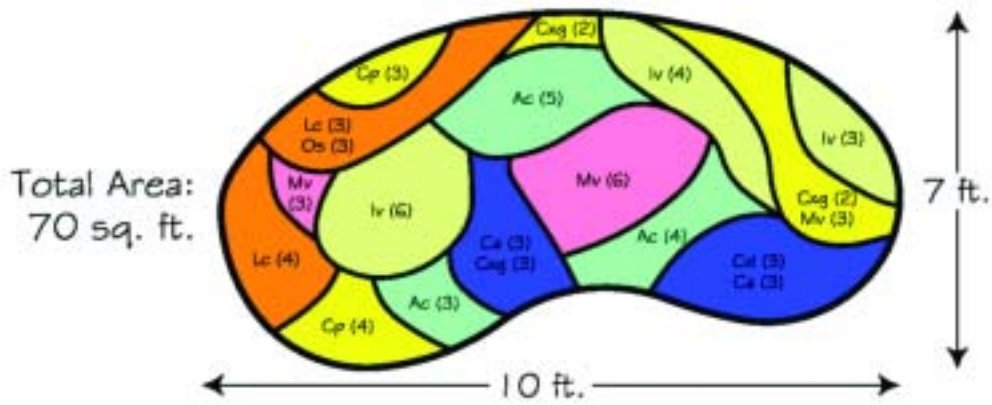
## Rain Garden Designs and Plant Lists

The following pages contain conceptual planting designs and plant lists for rain gardens with varying sun and soil conditions. Keep in mind that design possibilities for rain gardens are almost limitless. Many landscape nurseries, particularly those specializing in native plants and landscaping, can provide other ideas, designs and suggested plants.

The following eight designs and plant lists have been provided by Applied Ecological Services, Inc., Brodhead, WI.

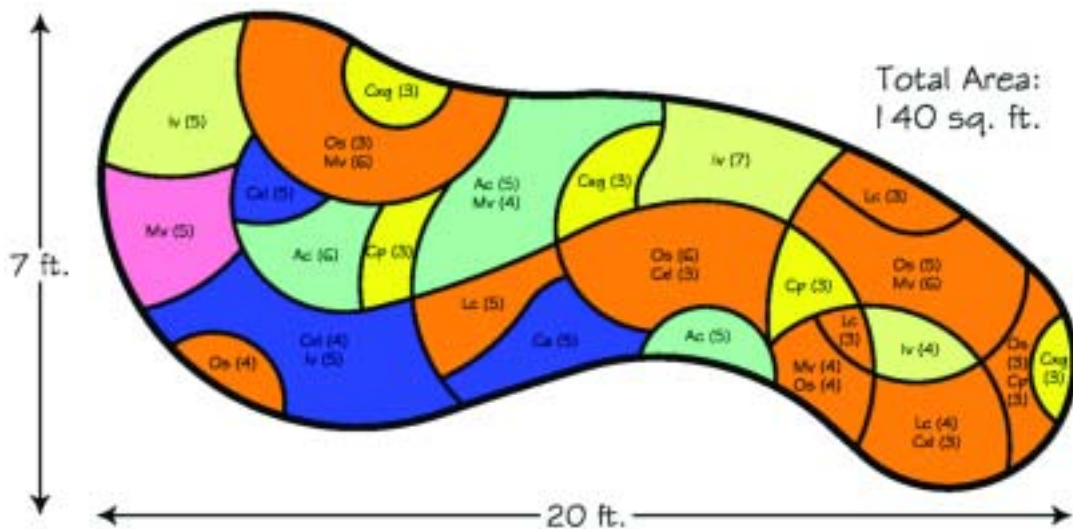


10 feet wide;  
full to partial shade with clay soils



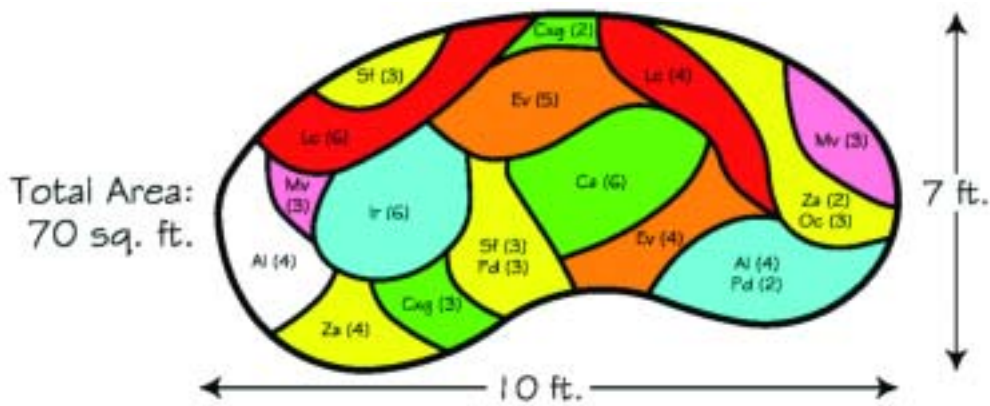
Symbol	Species Name	Common Name	No. of Plants
Ac	<i>Acorus calamus</i>	Sweet flag	12
Ca	<i>Campanula americana</i>	Tall bellflower	6
Cp	<i>Caltha palustris</i>	Marsh marigold	7
Cxg	<i>Carex Grayi</i>	Bur sedge	7
Cxl	<i>Carex lupulina</i>	Hop sedge	3
Iv	<i>Iris virginica-shrevei</i>	Wild blue flag iris	13
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	7
Mv	<i>Mertensia virginica</i>	Virginia bluebells	12
Os	<i>Onoclea sensibilis</i>	Sensitive fern	3
Total Plants Needed			70

20 feet wide;  
full to partial shade with clay soils



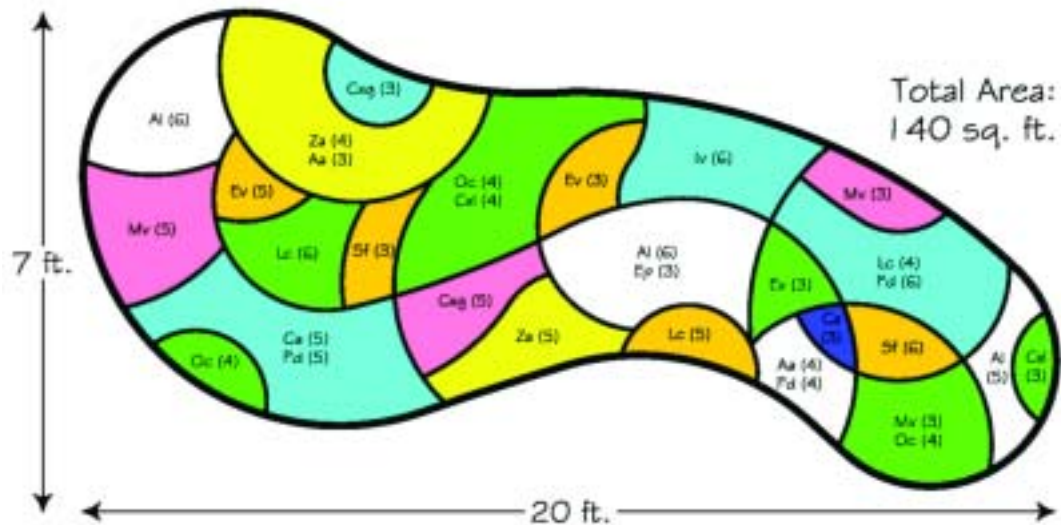
Symbol	Species Name	Common Name	No. of Plants
Ac	<i>Acorus calamus</i>	Sweet flag	16
Cp	<i>Caltha palustris</i>	Marsh marigold	9
Ca	<i>Campanula americana</i>	Tall bellflower	5
Cxg	<i>Carex Grayi</i>	Bur sedge	9
Cxl	<i>Carex lupulina</i>	Hop sedge	15
Iv	<i>Iris virginica-shrevei</i>	Wild blue flag iris	21
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	15
Mv	<i>Mertensia virginica</i>	Virginia bluebells	25
Os	<i>Onoclea sensibilis</i>	Sensitive fern	25
Total Plants Needed			140

10 feet wide;  
full to partial shade  
with silty & sandy soils



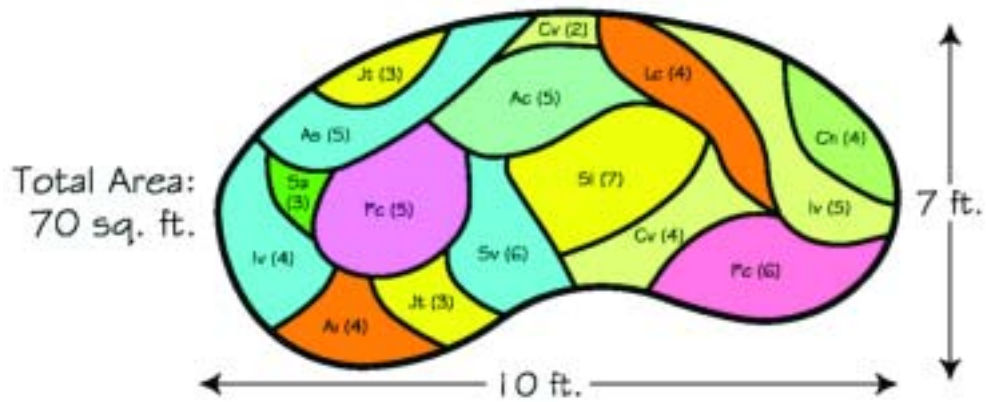
Symbol	Species Name	Common Name	No. of Plants
Ai	Aster lateriflorus	Side-flowering aster	8
Ca	Campanula americana	Tall bellflower	6
Cxg	Carex Grayi	Bur sedge	5
Ev	Elymus virginicus	Virginia wild rye	9
Lv	Ins virginica-shrevei	Wild blue flag ins	6
Lc	Lobelia cardinalis	Cardinal flower	10
Mv	Mertensia virginica	Virginia bluebells	6
Oc	Osmunda clayoniana	Interrupted fern	3
Pd	Phlox divaricata	Woodland phlox	5
Sf	Solidago flexicaulis	Zig zag goldenrod	6
Za	Zizia aurea	Golden Alexander	6
Total Plants Needed			70

20 feet wide;  
full to partial shade  
with silty & sandy soils



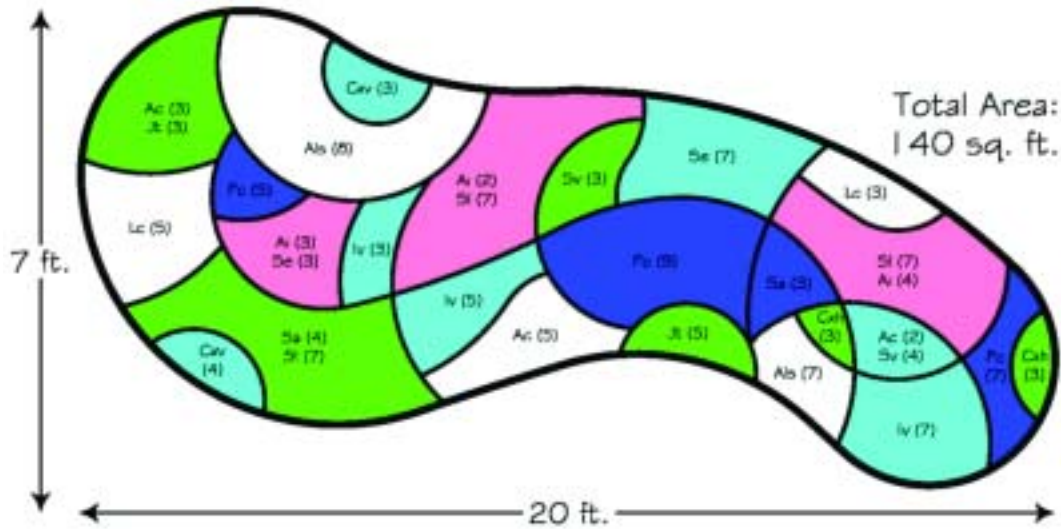
Symbol	Species Name	Common Name	No. of Plants
Aa	Ansaema atrorubens	Jack-in-the-pulpet	7
Ai	Aster lateriflorus	Side-flowering aster	17
Ca	Campanula americana	Tall bellflower	8
Cxg	Carex Grayi	Bur sedge	8
Cxl	Carex lupulina	Hop sedge	7
Ev	Elymus virginicus	Virginia wild rye	11
Ep	Eupatorium purpureum	Purple Joe-Pye weed	3
Lv	Ins virginica-shrevei	Wild blue flag ins	6
Lc	Lobelia cardinalis	Cardinal flower	15
Mv	Mertensia virginica	Virginia bluebells	11
Oc	Osmunda clayoniana	Interrupted fern	12
Pd	Phlox divaricata	Woodland phlox	15
Sf	Solidago flexicaulis	Zig zag goldenrod	9
Za	Zizia aurea	Golden Alexander	14
Total Plants Needed			143

10 feet wide;  
full to partial sun  
with clay soils



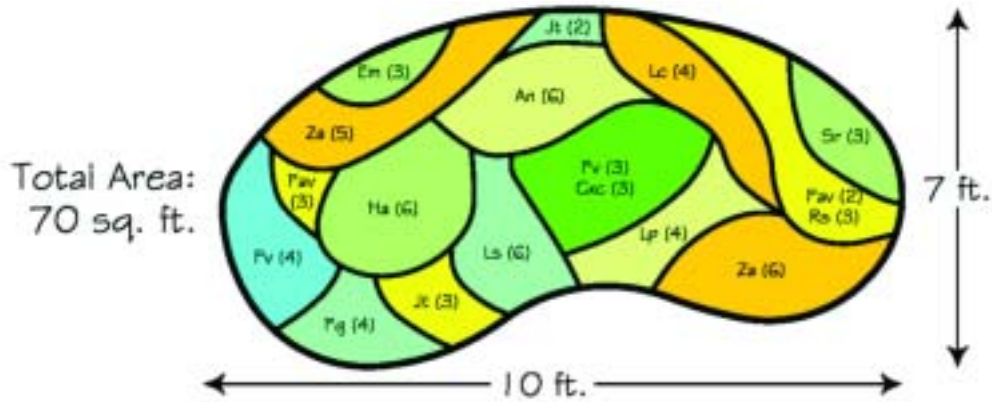
Symbol	Species Name	Common Name	No. of Plants
Ac	<i>Aconis calamus</i>	Sweet flag	5
As	<i>Asclepias incarnata</i>	Swamp milkweed	4
Als	<i>Alisma subcordatum</i>	Water plantain	5
Cxh	<i>Carex hystericina</i>	Bottle brush sedge	4
Cxv	<i>Carex vulpinoidea</i>	Fox sedge	6
Iv	<i>Iris virginica-shrevei</i>	Wild blue flag iris	9
Jt	<i>Juncus torreyi</i>	Torrey's rush	6
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	4
Pc	<i>Pontedaria cordata</i>	Pickeral weed	11
Si	<i>Sagittaria latifolia</i>	Arrowhead	7
Sa	<i>Scirpus atrovirens</i>	Green bulrush	3
Sv	<i>Scirpus validus creber</i>	Soft-stemmed bulrush	6
Total Plants needed			70

20 feet wide;  
full to partial sun  
with clay soils



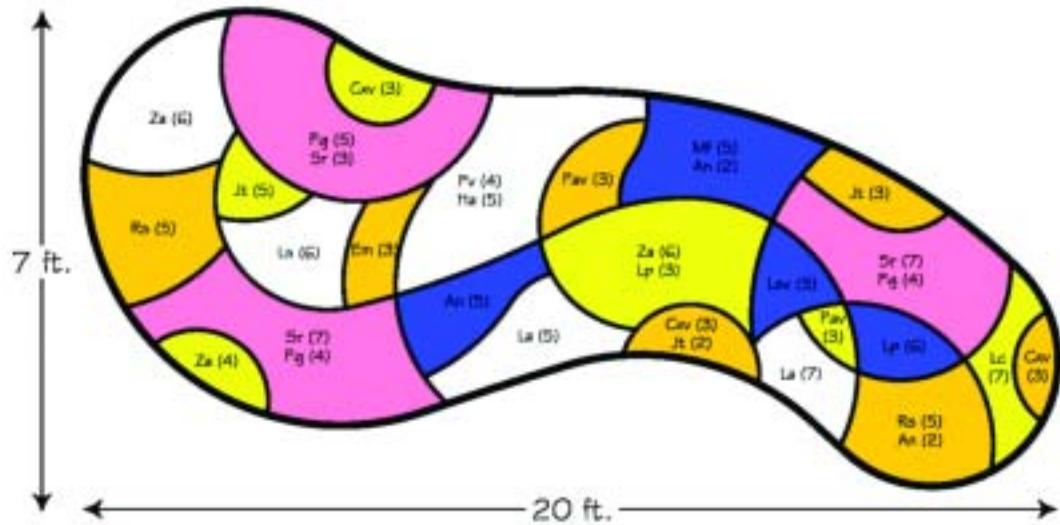
Symbol	Species Name	Common Name	No. of Plants
Ac	<i>Aconis calamus</i>	Sweet flag	10
Ai	<i>Asclepias incarnata</i>	Swamp milkweed	9
Als	<i>Alisma subcordatum</i>	Water plantain	15
Cxh	<i>Carex hystericina</i>	Bottle brush sedge	6
Cxv	<i>Carex vulpinoidea</i>	Fox sedge	7
Iv	<i>Iris virginica-shrevei</i>	Wild blue flag iris	15
Jt	<i>Juncus torreyi</i>	Torrey's rush	8
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	8
Pc	<i>Pontedaria cordata</i>	Pickeral weed	21
Si	<i>Sagittaria latifolia</i>	Arrowhead	21
Sa	<i>Scirpus atrovirens</i>	Green bulrush	7
Sv	<i>Scirpus validus creber</i>	Soft-stemmed bulrush	7
Se	<i>Sparganium eurycarpum</i>	Common bur-reed	10
Total Plants needed			144

10 feet wide;  
full to partial sun with silt and sandy soils



Symbol	Species Name	Common Name	No. of Plants
An	<i>Aster novae-angliae</i>	New England Aster	6
Cxc	<i>Carex comosa</i>	Bottlebrush sedge	3
Ep	<i>Eupatorium maculatum</i>	Spotted Joe-Pye weed	3
Ha	<i>Helenium autumnale</i>	Sneezeweed	6
Jt	<i>Juncus torreyi</i>	Torrey's rush	5
Lp	<i>Liatris pycnostachya</i>	Gayfeather	4
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	4
Ls	<i>Lobelia siphilitica</i>	Great blue lobelia	6
Pav	<i>Panicum virgatum</i>	Switch grass	5
Pg	<i>Phlox glaberrima</i>	Marsh phlox	4
Pv	<i>Pycnanthemum virginianum</i>	Mountain mint	7
Rs	<i>Rudbeckia subtomentosa</i>	Sweet coneflower	5
Sr	<i>Solidago Riddellii</i>	Riddell's goldenrod	3
Za	<i>Zizia aurea</i>	Golden Alexander	11
Total Plants needed			72

20 feet wide;  
full to partial sun with silt and sandy soils



Symbol	Species Name	Common Name	No. of Plants
An	<i>Aster novae-angliae</i>	New England Aster	9
Cvx	<i>Carex vulpinoidea</i>	Fox sedge	9
Ep	<i>Eupatorium maculatum</i>	Spotted Joe-Pye weed	3
Ha	<i>Helenium autumnale</i>	Sneezeweed	5
Jt	<i>Juncus torreyi</i>	Torrey's rush	10
Lp	<i>Liatris pycnostachya</i>	Gayfeather	9
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	7
Ls	<i>Lobelia siphilitica</i>	Great blue lobelia	9
La	<i>Lythrum alatum</i>	Winged loosestrife	12
Mf	<i>Monarda fistulosa</i>	Wild Bergamot	5
Pav	<i>Panicum virgatum</i>	Switch grass	6
Pg	<i>Phlox glaberrima</i>	Marsh phlox	13
Pv	<i>Pycnanthemum virginianum</i>	Mountain mint	4
Rs	<i>Rudbeckia subtomentosa</i>	Sweet coneflower	10
Sr	<i>Solidago Riddellii</i>	Riddell's goldenrod	17
Za	<i>Zizia aurea</i>	Golden Alexander	16
Total Plants needed			144

The following three designs and plant lists have been provided by Prairie Nursery, Inc., Westfield, WI





## RAIN GARDEN FOR CLAY SOILS AND FULL SUN

AREA: 192 Square Feet

Designed to thrive through conditions of periodic water infiltrations as well as dry periods  
 Designed to control 45% of annual runoff from an average sized rooftop (500 to 700 square feet)  
 Install at least 10' from your foundation, in-line with a down-spout and/or downslope to intercept the rooftop water  
 Depth of the garden designed to be 3.5" to 4" deep to hold about 200 gallons of water during periods of heavy rainfall

LATIN NAME	COMMON NAME	AMT	BLOOM TIME	BLOOM COLOR	HEIGHT	SPACING
<i>Asclepias incarnata</i>	Red Milkweed	7	early summer	red	3'-5'	1'
<i>Baptisia lactea</i>	White False Indigo	1	early summer	white	3'-5'	2'
<i>Iris versicolor</i>	Blue Flag Iris	7	early summer	blue	2'-3'	1'
<i>Penstemon digitalis</i>	Smooth Penstemon	7	early summer	white	2'-3'	1'
<i>Liatris pycnostachya</i>	Prairie Blazingstar	8	summer	pink	3'-5'	1'
<i>Parthenium integrifolium</i>	Wild Quinine	8	summer	white	3'-5'	1'
<i>Ratibida pinnata</i>	Yellow Coneflower	8	summer	yellow	3'-6'	1'
<i>Boltonia asteroides</i>	False Aster	8	late summer	white/pink	2'-4'	1'
<i>Rudbeckia subtomentosa</i>	Sweet Black-Eyed Susan	2	late summer	yellow	4'-6'	2'
<i>Vernonia fasciculata</i>	Ironweed	8	late summer	magenta	4'-6'	1'
<i>Aster novae-angliae</i>	New England Aster	12	fall	pink/purple	3'-6'	1'
<i>Solidago rigida</i>	Stiff Goldenrod	12	fall	yellow	3'-5'	1'
<i>Carex vulpinoidea</i>	Fox Sedge	96			1'-3'	1'

**184 plants**



## RAIN GARDEN FOR LOAM TO SANDY/LOAM SOILS AND FULL SUN

AREA: 192 Square Feet

Designed to thrive through conditions of periodic water infiltrations as well as dry periods  
 Designed to control 90% of annual runoff from an average sized rooftop (500 to 700 square feet)  
 Install at least 10' from your foundation, in-line with a down-spout and/or downslope to intercept the rooftop water  
 Depth of the garden designed to be 3.5" to 4" deep to hold about 400 gallons of water during periods of heavy rainfall

LATIN NAME	COMMON NAME	AMT	BLOOM TIME	BLOOM COLOR	HEIGHT	SPACING
<i>Asclepias incarnata</i>	Red Milkweed	7	early summer	red	3'-5'	1'
<i>Baptisia lactea</i>	White False Indigo	1	early summer	white	3'-5'	2'
<i>Iris versicolor</i>	Blue Flag Iris	7	early summer	blue	2'-3'	1'
<i>Penstemon digitalis</i>	Smooth Penstemon	7	early summer	white	2'-3'	1'
<i>Allium cernuum</i>	Nodding Pink Onion	16	summer	pink	1'-2'	6"
<i>Liatrix pycnostachya</i>	Prairie Blazingstar	8	summer	pink	3'-5'	1'
<i>Parthenium integrifolium</i>	Wild Quinine	8	summer	white	3'-5'	1'
<i>Boltonia asteroides</i>	False Aster	8	late summer	white/pink	2'-4'	1'
<i>Rudbeckia subtomentosa</i>	Sweet Black-Eyed Susan	2	late summer	yellow	4'-6'	2'
<i>Vernonia fasciculata</i>	Ironweed	8	late summer	magenta	4'-6'	1'
<i>Aster novae-angliae</i>	New England Aster	12	fall	pink/purple	3'-6'	1'
<i>Solidago ohioensis</i>	Ohio Goldenrod	12	fall	yellow	3'-4'	1'
<i>Carex vulpinoidea</i>	Fox Sedge	96			1'-3'	1'

**192 plants**



## RAIN GARDEN FOR SANDY SOILS AND FULL SUN

AREA: 128 Square Feet

Designed to thrive through conditions of periodic water infiltrations as well as dry periods  
 Designed to control 90% of annual runoff from an average sized rooftop (500 to 700 square feet)  
 Install at least 10' from your foundation, in-line with a down-spout and/or downslope to intercept the rooftop water  
 Depth of the garden designed to be 3.5" to 4" deep to hold about 400 gallons of water during periods of heavy rainfall

LATIN NAME	COMMON NAME	AMT	BLOOM TIME	BLOOM COLOR	HEIGHT	SPACING
<i>Asclepias incarnata</i>	Red Milkweed	4	early summer	red	3'-5'	1'
<i>Baptisia lactea</i>	White False Indigo	1	early summer	white	3'-5'	2'
<i>Iris versicolor</i>	Blue Flag Iris	4	early summer	blue	2'-3'	1'
<i>Penstemon digitalis</i>	Smooth Penstemon	4	early summer	white	2'-3'	1'
<i>Allium cernuum</i>	Nodding Pink Onion	18	summer	pink	1'-2'	6"
<i>Liatis pycnostachya</i>	Prairie Blazingstar	5	summer	pink	3'-5'	1'
<i>Parthenium integrifolium</i>	Wild Quinine	5	summer	white	3'-5'	1'
<i>Boltonia asteroides</i>	False Aster	4	late summer	white/pink	2'-4'	1'
<i>Rudbeckia subtomentosa</i>	Sweet Black-Eyed Susan	2	late summer	yellow	4'-6'	2'
<i>Vernonia fasciculata</i>	Ironweed	4	late summer	magenta	4'-6'	1'
<i>Aster novae-angliae</i>	New England Aster	8	fall	pink/purple	3'-6'	1'
<i>Solidago ohioensis</i>	Ohio Goldenrod	8	fall	yellow	3'-4'	1'
<i>Carex vulpinoidea</i>	Fox Sedge (sedge)	64			1'-3'	1'

**128 plants**

---

## Special Rain Garden Locations



In addition to conventional lawns, there are other locations where rain gardens can be created. A rectangular-shaped rain garden (above) was located in a narrow sideyard between two homes. A new rain garden (below), now helps control runoff that would flow into a parking lot.



Rain garden designs and plant lists provided by John Gishnock, Applied Ecological Services, Inc. (pages 19-22) and Jennifer Baker, Prairie Nursery Inc. (pages 24-29).



# RAIN GARDENS

A how-to manual for homeowners



A frosted rain garden  
in autumn.

**This publication developed by Roger Bannerman, Wisconsin Department of Natural Resources and Ellen Considine, U.S. Geological Survey. Special thanks to John Gishnock, Applied Ecological Services, Inc., Jennifer Baker, Prairie Nursery Inc. and Joyce Powers, CRM Ecosystems Inc.**

Photos by Roger Bannerman, Wisconsin Department of Natural Resources.

Layout design/production by Jeffrey Strobel, and editorial assistance by Bruce Webendorfer, University of Wisconsin–Extension Environmental Resources Center.

This publication is available from county UW-Extension offices, Cooperative Extension Publications, 1-877-947-7827 and from DNR Service Centers.

The publication can also be viewed and printed from pdf format on the web at [clean-water.uwex.edu/pubs/raingarden](http://clean-water.uwex.edu/pubs/raingarden)

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**Wisconsin Department of Natural Resources  
DNR Publication PUB-WT-776 2003**

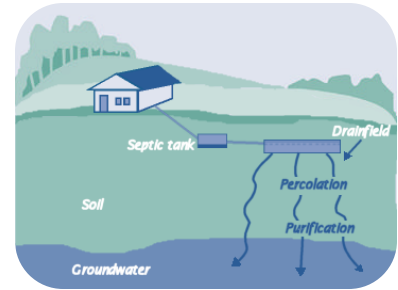


**University of Wisconsin–Extension  
UWEX Publication GWQ037  
1-06-03-5M-100-S**

# TIPS FOR SEPTIC SYSTEM OWNERS

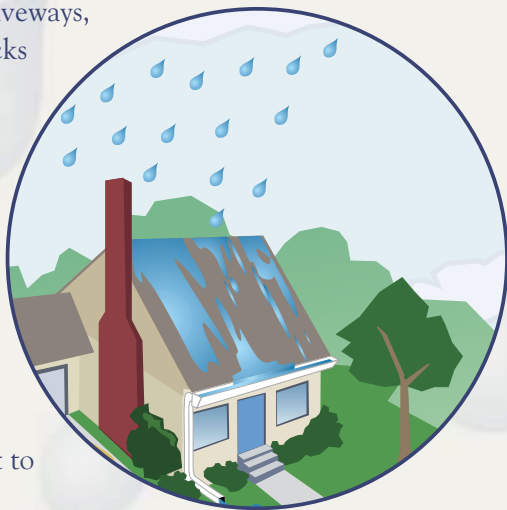
One source of bacterial pollution to our local creeks appears to be pollutants leaking from septic fields. Here is an important checklist for septic system owners to review:

- Do not connect foundation sump pumps or other “clean water” discharges to your septic systems.
- Inspect your septic tanks and any distribution pumps every year. Measure the level of sludge build-up and inspect the baffles for scum. Pump your septic tank at least every 3 years (or sooner as indicated by your annual inspection of the tank).
- Avoid using a garbage disposal.
- Do not pour old medicines or strong cleaning agents down the drain. They will kill beneficial bacteria that break down the waste in your system.
- Keep trees and shrubs at least 35 feet away from your field to prevent roots from plugging or breaking pipes.
- Route surface water drainage and snowmelt away from your absorption field to avoid inundation of your field.
- Locate your absorption field as far away as possible from surface water to reduce its potential of becoming a source of contamination.



*Source:* Lake Notes, PA Association of Conservation Districts

As stormwater flows over driveways, lawns, and sidewalks, it picks up debris, chemicals, dirt, and other pollutants. Stormwater can flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water. Polluted runoff is the nation's greatest threat to clean water.



By practicing healthy household habits, homeowners can keep common pollutants like pesticides, pet waste, grass clippings, and automotive fluids off the ground and out of stormwater. Adopt these healthy household habits and help protect lakes, streams, rivers, wetlands, and coastal waters. Remember to share the habits with your neighbors!

## Healthy Household Habits for Clean Water

### Vehicle and Garage

- Use a commercial car wash or wash your car on a lawn or other unpaved surface to **minimize** the amount of dirty, soapy water flowing into the storm drain and eventually into your local waterbody.



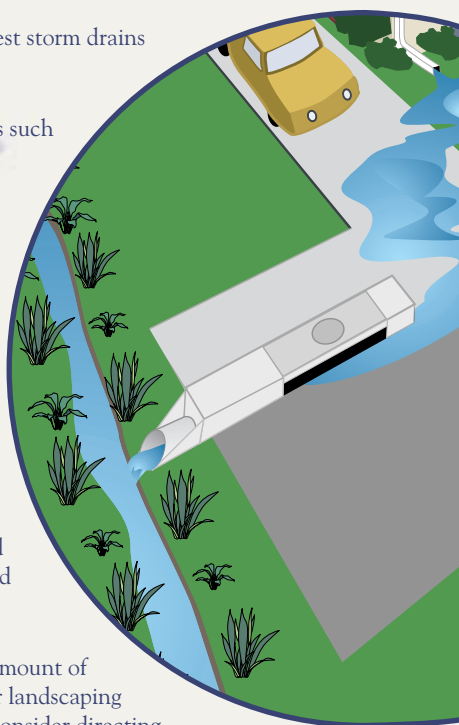
- Check your car, boat, motorcycle, and other machinery and equipment for leaks and spills. Make repairs as soon as possible. Clean up **spilled fluids** with an absorbent material like kitty litter or sand, and don't rinse the spills into a nearby storm drain. Remember to properly dispose of the absorbent material.
- **Recycle** used oil and other automotive fluids at participating service stations. Don't dump these chemicals down the storm drain or dispose of them in your trash.

### Lawn and Garden

- Use pesticides and fertilizers **sparingly**. When use is necessary, use these chemicals in the recommended amounts. Avoid application if the forecast calls for rain; otherwise, chemicals will be washed into your local stream.
- Select **native** plants and grasses that are drought- and pest-resistant. Native plants require less water, fertilizer, and pesticides.
- **Sweep up** yard debris, rather than hosing down areas. Compost or recycle yard waste when possible.
- Don't overwater your lawn. Water during the **cool** times of the day, and don't let water run off into the storm drain.
- Cover piles of dirt and mulch being used in landscaping projects to prevent these pollutants from blowing or washing off your yard and into local waterbodies. **Vegetate** bare spots in your yard to prevent soil erosion.

### Home Repair and Improvement

- Before beginning an outdoor project, locate the nearest storm drains and **protect** them from debris and other materials.
- **Sweep up** and properly dispose of construction debris such as concrete and mortar.
- Use hazardous substances like paints, solvents, and cleaners in the **smallest amounts possible**, and follow the directions on the label. Clean up spills **immediately**, and dispose of the waste safely. Store substances properly to avoid leaks and spills.
- Purchase and use **nontoxic, biodegradable, recycled, and recyclable** products whenever possible.
- **Clean** paint brushes in a sink, not outdoors. Filter and reuse paint thinner when using oil-based paints. Properly dispose of excess paints through a household hazardous waste collection program, or donate unused paint to local organizations.
- **Reduce** the amount of paved area and increase the amount of vegetated area in your yard. Use native plants in your landscaping to reduce the need for watering during dry periods. Consider directing downspouts away from paved surfaces onto lawns and other measures to increase infiltration and reduce polluted runoff.





Make your home  
The  
SOLUTION  
TO STORMWATER  
POLLUTION!  
A homeowner's guide to healthy  
habits for clean water



**Remember: Only rain down the drain!**

For more information, visit  
[www.epa.gov/npdes/stormwater](http://www.epa.gov/npdes/stormwater)  
or  
[www.epa.gov/nps](http://www.epa.gov/nps)



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**Storm drains connect to waterbodies!**

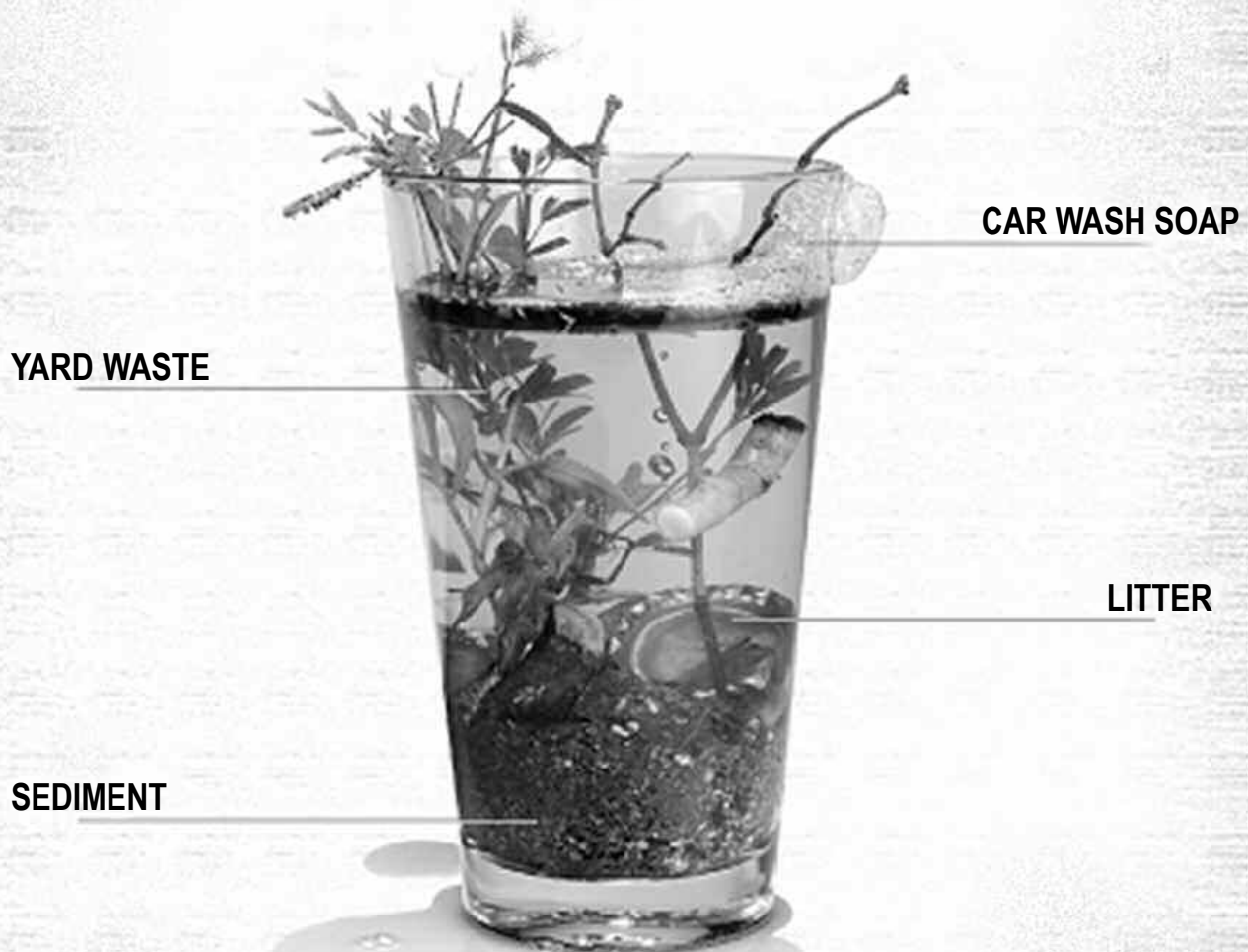
- Flush responsibly. Flushing household chemicals like paint, pesticides, oil, and antifreeze can destroy the biological treatment taking place in the system. Other items, such as diapers, paper towels, and cat litter, can clog the septic system and potentially damage components.
- Care for the septic system drainfield by **not** driving or parking vehicles on it. Plant only grass over and near the drainfield to avoid damage from roots.
- Have your septic system **inspected** by a professional at least every 3 years, and have the septic tank **pumped** as necessary (usually every 3 to 5 years).
- Properly store pool and spa chemicals to **prevent** leaks and spills, preferably in a covered area to avoid exposure to stormwater.
- Whenever possible, drain your pool or spa into the **sanitary** sewer system.
- **Drain** your swimming pool only when a test kit does not detect chlorine levels.

**Swimming Pool and Spa**

- When walking your pet, remember to **pick up** the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

**Pet Care**

# THIRSTY?



**STORMWATER POLLUTANTS FIND THEIR WAY INTO WHERE WE FISH, WHERE WE SWIM AND WHAT WE DRINK.** Everything that goes into our storm drains—grass clippings, soap, pesticides, pet waste—makes its way straight to our streams. Stormwater pollution is our biggest source of water pollution. It all adds up.

## **DO YOUR PART TO PROMOTE CLEAN STREAMS AND SAFE DRINKING WATER**

- Pick up and properly dispose of pet waste.
- Use a commercial car wash.
- Pick up litter and compost yard waste.
- Maintain your vehicle so it does not leak oil.
- Redirect your downspouts to grassy areas or a rain barrel to lessen the amount of stormwater leaving your property and eroding nearby streambanks.

**For more information, view or download:**

- 1) Downspout disconnection instructions: [www.toronto.ca/water/protecting\\_quality/downspout\\_diy.htm](http://www.toronto.ca/water/protecting_quality/downspout_diy.htm)
- 2) "Homeowner's Guide to Stormwater Management," [www.crcwatersheds.org/resources](http://www.crcwatersheds.org/resources)

*This message is brought to you by your municipality and Chester Ridley Crum Watersheds Association, [www.crcwatersheds.org](http://www.crcwatersheds.org).*

*Graphic courtesy of North Carolina Department of Environment and Natural Resources.*

**WHEN YOUR CAR'S LEAKING OIL ON  
THE STREET, REMEMBER IT'S NOT  
JUST LEAKING OIL ON THE STREET.**

*www.DelawareEstuary.org*



Leaking oil goes from your car onto the street. Rain washes oil into storm drains and into the Schuylkill and Delaware Rivers. Now, imagine the number of cars in our region and you can imagine the amount of oil that finds its way into our local waterways. So please, maintain your car and always recycle used motor oil.

Thanks to the Washington State Department of Ecology, King County, and the cities of Bellevue, Seattle, and Tacoma.

**WHAT CAN YOU DO?**

- Check your car or truck for drips and oil leaks regularly and fix them promptly. Keep your vehicle tuned to reduce oil use.
- Use ground cloths or drip pans under your vehicle if you have leaks or are doing engine work. Clean up spills immediately and properly dispose of clean up materials.
- Collect all used oil in containers with tight-fitting lids. Old plastic jugs are excellent for this purpose.
- Do not mix waste oil with gasoline, solvents, or other engine fluids. This contaminates the oil which may be reused, increases the volume of the waste, and may form a more hazardous chemical.
- Never dump motor oil, antifreeze, transmission fluid or other engine fluids into road gutters, down the storm drain or catch basin, onto the ground, or into a ditch.
- Recycle used motor oil. Many auto supply stores, car care centers, and gas stations will accept used oil. Many communities have hazardous waste collection days where used oil can be brought in for proper disposal. Recycling just one gallon of used oil can generate enough electricity to run the average household for almost 24 hours.

**FOR MORE INFORMATION  
VISIT THESE WEB SITES:**

[www.delcocd.org](http://www.delcocd.org)

[www.chesco.org](http://www.chesco.org)

[www.pa.dep.us](http://www.pa.dep.us)

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## Winter Deicing Tips for Residents

Excess salt and other deicing chemicals can harm aquatic life in our streams and impact drinking water supplies. This winter, you can help by following these *environmentally-friendly* snow removal practices:

- Shovel snow before it turns to ice to limit the need for deicing chemicals like rock salt
- Shovel snow onto permeable surfaces including gently sloping and level landscape and grassy areas so as the snow melts it will soak into the ground rather than flow directly into a nearby storm drain or stream.

### If you must use deicing chemicals, follow these suggestions...

- Control application of chemical deicers and avoid over application.
- Limit chemical applications near environmentally-sensitive areas including springs, streams, ponds, wetlands, and water supply areas and sensitive landscape and vegetation
- Sand and sawdust can be used as an environmentally-friendly alternative to commonly used salt products.
- Use salt substitutes that are less harmful including Calcium Chloride ( $\text{CaCl}_2$ ) and Calcium Magnesium Acetate (CMA).
- For larger areas, apply salt as a brine solution to prevent drift off of paved surfaces.
- After snowmelt, sweep up residues, including sand, to prevent it from washing into storm drains and streams

### Why should I limit my use of salt and other chemical deicing products?

Deicing products contain chemical constituents that can be harmful to the environment including water resources and drinking water supplies. For example, sodium can break down soil structure and decrease soil permeability, which adversely impacts vegetation and soil microbes; chloride mobilizes heavy metals and impacts fresh water supplies including ground and surface waters; and heavy metal components can adversely impact water quality, plant and aquatic life.



# New Hanover Township Pennsylvania

[HOME](#) [GOVERNMENT](#) [DEPARTMENTS](#) [INFORMATION](#) [RESOURCES](#)

**TOWNSHIP TIDBIT:**  
Up until about 1850, every church had its parochial school beside it. The school house of the Swamp Reformed Church (Leidy Road and Swamp Pike) was demolished about 1955.

## Planning

[Active Plans](#)

[Approved Plans](#)

[Code of Ordinances](#)

[Subdivision and Land Development](#)

[Stormwater Management](#)

[Popular Pages](#)

# Stormwater Management

## OVERVIEW

Stormwater runoff is generated when precipitation from rain and snow flow over land and impervious surfaces and does not infiltrate into the ground. The runoff from streets, lawns, farms, and construction and industrial sites pick up fertilizers, dirt, pesticides, oil, grease and many other pollutants and discharge into our lakes, streams and rivers. This untreated discharge is detrimental to our water quality as it can adversely affect our drinking water supply and environment. Many detention/retention/infiltration basins are already in place to help keep our water clean.

[The Montgomery County Conservation District presented on this topic. [Click here - especially if you are considering developing in our municipality.](#)]

The Township regulates its stormwater management through a permit that is obtained from the [Pennsylvania Department of Environmental Protection \(PA DEP\)](#) through the National Pollution and Discharge Elimination System Phase II (NPDES)/Municipal Separate Storm Sewer System (MS4). This is a federal requirement from the [United States Environmental Protection Agency \(USEPA\)](#) that is administered by the state. This NPDES permit is broken up into six minimum control measures to be regulated and enforced by the Township. These minimum control measures include:

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge, Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping

The Township is monitoring and testing storm sewer outfalls that have flow during dry periods. We request that all residents cooperate with our inspectors, as some outfalls are located on private properties.

For any questions or concerns regarding stormwater or to report illicit discharges to the storm sewer system, contact the Township.

## **MORE INFORMATION**

There are many ways you can help the Township with its stormwater program, such as participating in volunteer programs that help keep trash, debris and other pollutants out of the storm sewer system. For more information on ways to get involved with your community, visit:

PennDOT: Adopt-A-Highway

<http://www.dot.state.pa.us/Internet/Bureaus/pdHwyBeau.nsf/AAHHome?OpenFrameset>

USEPA

<http://www.epa.gov/>

Stormwater Basic Information

<http://www.epa.gov/npdes/npdes-stormwater-program>

Stormwater Program

[http://cfpub.epa.gov/npdes/home.cfm?program\\_id=6](http://cfpub.epa.gov/npdes/home.cfm?program_id=6)

Stormwater Discharge from MS4's

<http://www.epa.gov/npdes/stormwater-discharges-municipal-sources#overview>

Stormwater Outreach Materials and Reference Documents

[https://cfpub.epa.gov/npdes/docs.cfm?document\\_type\\_id=3&view=Fact%2520Sheets%2520and%2520Outreach%2520Materials&program\\_id=6&sort=name](https://cfpub.epa.gov/npdes/docs.cfm?document_type_id=3&view=Fact%2520Sheets%2520and%2520Outreach%2520Materials&program_id=6&sort=name)

PA DEP

[http://www.depweb.state.pa.us/portal/server.pt/community/dep\\_home/5968](http://www.depweb.state.pa.us/portal/server.pt/community/dep_home/5968)

PA DEP Southeast Region Office

<http://www.dep.pa.gov/About/Regional/SoutheastRegion/Pages/default.aspx#.VtWfKFsrKUK>

Stormwater Management Program

<http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Pages/default.aspx#.VtWiP1srKUI>

BCCD Bucks County Conservation District

<http://www.bucksccd.org/>

FEMA Federal Emergency Management Agency

<http://www.fema.gov/>

CWP Center for Watershed Protection

<http://www.cwp.org/>

## Department of Environmental Protection

PADEP – MS4 Resources:

<http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VtWaHFsrKUK>

PADEP - MS4 Stormwater Activity Book for Children

[http://files.dep.state.pa.us/Water/BNPNSM/StormwaterManagement/MunicipalStormwater/MuniSWResources/MS4\\_Partnersrv2.pdf](http://files.dep.state.pa.us/Water/BNPNSM/StormwaterManagement/MunicipalStormwater/MuniSWResources/MS4_Partnersrv2.pdf)

DEP Southeast Regional Office:

<http://www.dep.pa.gov/About/Regional/SoutheastRegion/Pages/default.aspx#.VtWfKFsrKUK>

PA DEP Stormwater Management Program:

<http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Pages/default.aspx#.VtWiP1srKUI>

DEP – E&S for Single Family Homes and Minor Construction Projects:

<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-107599/3150-FS-DEP4096.pdf>

DEP – Snow Management and Removal:

<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-109526/3800-FS-DEP1634.pdf>

DEP – Swimming Pool Discharge Guidelines:

<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-108937/3850-FS-DEP4251.pdf>

DEP – Stream Improvement Program:

<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-108190/3130-FS-DEP2179.pdf>

DEP – Minimizing Accelerated Soil Erosion & Preventing Sediment Pollution:

<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-107595/3150-FS-DEP1841.pdf>

DEP – Reporting Requirements for Spills and Pollution Incidents under PA Clean Streams Law:

<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-101220/3800-FS-DEP4449.pdf>

DEP – Water Quality Standards:

<http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/WaterQuality/Pages/default.aspx#.VtW6syoo6Uk>

### **United States Environmental Protection Agency**

EPA – Stormwater Fact Sheets and Outreach Materials:

[https://cfpub.epa.gov/npdes/docs.cfm?document\\_type\\_id=3&view=Fact%2520Sheets%2520and%2520Outreach%2520Materials&program\\_id=6&sort=name](https://cfpub.epa.gov/npdes/docs.cfm?document_type_id=3&view=Fact%2520Sheets%2520and%2520Outreach%2520Materials&program_id=6&sort=name)

EPA - Stormwater Basic Information:

<http://www.epa.gov/npdes/npdes-stormwater-program>

EPA - Stormwater Discharges from MS4's:

<http://www.epa.gov/npdes/stormwater-discharges-municipal-sources#overview>

EPA - MS4 Overview:

<http://www3.epa.gov/npdes/pubs/fact2-0.pdf>

EPA - MS4 Fact Sheet:

<http://www3.epa.gov/npdes/pubs/fact2-1.pdf>

EPA – Urbanized Area Definition:

<http://www3.epa.gov/npdes/pubs/fact2-2.pdf>

EPA – Public Education and Outreach:

<https://www3.epa.gov/npdes/pubs/fact2-3.pdf>

EPA – Public Participation and Involvement:

<https://www3.epa.gov/npdes/pubs/fact2-4.pdf>

EPA – Illicit Discharge, Detection and Elimination:

<https://www3.epa.gov/npdes/pubs/fact2-5.pdf>

EPA - Construction Site Runoff Control:

<https://www3.epa.gov/npdes/pubs/fact2-6.pdf>

EPA – Post-Construction Runoff Control:

<https://www3.epa.gov/npdes/pubs/fact2-7.pdf>

EPA – Pollution Prevention / Good Housekeeping:

<https://www3.epa.gov/npdes/pubs/fact2-8.pdf>

EPA – National Menu of Stormwater Best Management Practices:

<http://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#edu>

EPA – Stormwater Permit Coverage for Construction Sites:

[https://www3.epa.gov/region10/pdf/water/stormwater\\_permit\\_brochure\\_print.pdf](https://www3.epa.gov/region10/pdf/water/stormwater_permit_brochure_print.pdf)

EPA – After the Storm:

[https://www3.epa.gov/npdes/pubs/after\\_the\\_storm.pdf](https://www3.epa.gov/npdes/pubs/after_the_storm.pdf)

EPA – Stormwater Management Practices:

<http://www.epa.gov/greeningepa/stormwater-management-practices-epa-facilities>

EPA – Stormwater Management:

<http://www.epa.gov/greeningepa/stormwater-management>

EPA – Green Infrastructure:

<http://www.epa.gov/green-infrastructure>

EPA Stormwater Best Management Practices (BMP) Menu:

<http://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater-documents>

EPA – Evaluating the Effectiveness of Municipal Stormwater Programs:

[https://www3.epa.gov/npdes/pubs/region3\\_factsheet\\_swmp.pdf](https://www3.epa.gov/npdes/pubs/region3_factsheet_swmp.pdf)

EPA – Water Pollution Prevention and Control:

<http://www.epa.gov/p2/learn-about-pollution-prevention>

## Miscellaneous

Perkiomen Watershed Conservancy:

<http://www.perkiomenwatershed.org/>

DEP – Raingardens and Rain Barrels:

<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-109593/3850-PA-DEP4500.pdf>

Rain Barrel Resources:

<http://www.rainbarrelresource.com/>

PADOT Adopt-a Highway:

<http://www.penndot.gov/about-us/AdoptaHighway/Pages/default.aspx#.VtSv9lsrKUK>

Homeowner's Guide to Stormwater:

<http://www.stormwaterguide.org/static/HomeownersGuide.pdf>

Green Guide for Property Management:

[http://schuylkillwaters.org/doc\\_files/Green%20Guide%20for%20Property%20Management.pdf](http://schuylkillwaters.org/doc_files/Green%20Guide%20for%20Property%20Management.pdf)

Center for Watershed Protection Municipal Pollution Prevention / Good Housekeeping Practices (Manual 9):

[http://www.in.gov/indot/files/Municipal\\_Pollution\\_Prevention\\_and\\_Good\\_Housekeeping.pdf](http://www.in.gov/indot/files/Municipal_Pollution_Prevention_and_Good_Housekeeping.pdf)



### Document Center

The Document Center provides easy access to public documents. Click on one of the categories below to see related documents or use the search function.

Search for file type:

All




Please click on one of the categories below to see uploaded documents.

## Documents & Forms 6 documents



### **Construction Site Runoff Control**

### **Illicit Discharge Detection And Elimination**



**Pollution Prevention Good Housekeeping**



**Post Construction Runoff Control**



**Public Education And Outreach**



**Public Participation And Involvement**

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**Tips for Contractors** *4 documents*

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**Tips for Residents** *16 documents*

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**GOVERNMENT**

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Board of Supervisors

Boards & Commissions

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Finance

NHT Authority

Parks & Recreation

Planning

Police

Public Works

Zoning

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**Questions?** Get in touch with us today.



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F: (610) 323-5173

[contact@newhanover-pa.org](mailto:contact@newhanover-pa.org)

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**NEW HANOVER TOWNSHIP  
ENVIRONMENTAL ADVISORY BOARD MEETING  
April 10, 2018**

**REGULAR MEETING**

**1) CALL TO ORDER**

The monthly meeting of the Environmental Advisory Board (EAB) was held on Tuesday, April 10, 2018 at 6:30 PM in the New Hanover Township (NHT) Municipal Building, 2943 N. Charlotte Street, Gilbertsville, PA 19525. The meeting was called to order at 6:30 PM and opened with a Salute to the Flag. Members present were Ross Snook, Tom Quinn, Ed Swagzdis and Lisa Nolan.

**2) PLEDGE OF ALLEGIANCE**

**3) PRESENTATIONS**

- a. **Russel Oister – PA Master Naturalist Project:** Mr. Oister discussed with the board his intention to complete a service project in order to earn recognition as a Pennsylvania “Master Naturalist.”

A Pennsylvania Master Naturalist is “an individual with a passion for the natural world who participates in an intensive training program and uses his or her knowledge by giving back to the community through volunteer service” [PAmasternaturalist.org].

Mr. Oister set forth an ambitious agenda to bring community attention to the Swamp Creek Watershed. Mr. Oister hopes to fulfill his community service project by raising awareness to organize community members and volunteers to participate in: Stream Cleanups and Restoration, Identification and Removal of Invasive Species, Promote conservation and restoration of native plant species, and cataloging the information for record. Mr. Oister distributed information with respect to his project and the Swamp Creek Watershed.

Future plans include an event to be held for Earth Day and involvement with local community groups and the Boy Scouts. EAB meeting attendees added feedback with ideas for activities and ways to promote Mr. Oister’s noble undertaking.

- b. **Slow Release Concept BMP:** Ross Snook presented and distributed information on an alternative BMP mechanism known as a “slow release concept” (SRC) which allows for attenuation and discharge of up a 2 year, 24 hour storm event to mimic the existing hydrology of receiving streams using an under-drain system and filter media. Pros and Cons of implementing the SRC were discussed among the group and the practicality of utilizing the BMP approach on currently proposed developments. Test pits and infiltration basin plans were reviewed for discussion.

**4) CONSENT ITEMS**

- a. Approval of Minutes – March 9, 2018. The motion (Snook, Swagzdis) was unanimously approved.

## 5) ANNOUNCEMENTS:

- a. Picture of the Month – The EAB is accepting outdoor photos within Township-limits to be featured on the Township website.

## 6) DISCUSSION ITEMS

- a. Requested shade tree information
- b. Trees scheduled to be planted at the Junior High East School
- c. Creek bank repairs/available funds
- d. HOA contacts for each major development in the Township
- e. Identifying sewer infiltration/inflow
- f. Previously unidentified MS4 outfalls
- g. EAB/MS4 involvement & inspections/ Previous MS4 funding
- h. Hoff Site environmental investigation

## 7) OLD BUSINESS

- a. April 2018:
  - i. Ross Snook provided updates on April's discussion items.
- b. March 2018:
  - i. New Hanover Town Center:

The EAB members discussed the proposed plan set of the New Hanover Town Center: The proposal would subdivide 208.907 acres into 852 dwelling units and 210,310 square feet of non-residential buildings and open space. A memo is to be drafted (for review by the planning commission) regarding the development plans citing the NHT EAB's concerns.

Update: Awaiting responses to EAB memo.

- ii. Review of Township's Enforcement Duties under PA CODE Title 25:

The EAB made a recommendation (in letter form to the planning commission) that the Township Solicitor, Andy Bellwoar, should review PA Title 25 (Environmental Protection) with respect to the township's duty/responsibility to enforce any applicable statutes relating to stagnant water. Note: A review of NHT local code Chapter 23 (Stormwater Management) is also advisable with respect to this topic.

Update: The item is being taken under consideration.

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The EAB Board members discussed possible ordinances to be developed and considered with respect to (w.r.t.) creating guidelines for the appropriate application and use of sump pumps. The EAB discussed the negative effects of the extensive use of sump pumps within the township, focused primarily around ponding water, illegal connection to sanitary sewer systems, and associated soil erosion and runoff into public waterways, onto public roadways, and pedestrian walkways.

Update: This has been a topic of discussion at the New Hanover Township Supervisors meetings. Proposed ordinances to be considered by the Supervisors are being drafted.

It is noted that the Hanover Woods development has been a focus or case study for considering adoption of new ordinances, as some properties within the development have already shown signs of excessive run times (up to 50% run-time per day, following heavy rains).

c. February 2018:

- i. The EAB members discussed the memo to be drafted (for review by the planning commission) regarding the proposed Pacer's Gait and Trotter's Gait land development plans.

Update: The memo has been submitted for consideration, updates to the living memo have also been included, as information is discussed and received.

- ii. Discussions were held about an active borrow pit located along Buchert Road with respect to ponded water and inadequate safety measures.

Update: On Going – The Planning Commission is aware of the issue and has included it as an agenda item and topic of discussion. Existing ordinances are being reviewed to determine if a violation has been made.

- iii. A recommendation that a review of former/abandoned/inactive gas station properties within the Township be reviewed to see what can be done to ensure they do not become an environmental concern:

Members noted that the former Keystone State auto repair/gas station located at 2406 N Charlotte St (which was reported as active 3 years ago) is currently posted for sale. Further information is needed w.r.t. the former Cava's Country Store and fueling station located at the intersection of Swamp Pike and Charlotte Street (noted as 1907 North Charlotte Street).

Update: The NHT EAB plans to contact the DEP's Tank Program and request information regarding each site's underground storage tanks. Additional inventory and identification of dilapidated/inactive gas stations (and other properties of environmental concern) is on-going.

- iv. Soils, Ground Water, Bedrock and proposed Environmental impacts from additional development within New Hanover Township - Considerations and summary of the February 2018 Presentation:

The presentation of "Soils, Ground Water, Bedrock, and their Relationship to Building Homes in New Hanover Township" was presented by EAB president Ross Snook, whom is noted as having a lifetime career in the field of geology, and is currently semi-retired. Mr. Snook provided information on local soil types to all in attendance, which included information pertaining to the Abbotstown, Buckingham, Croton, Readington and Reaville's Silt Loams. The silt loams are the prevailing major soil type in the township according to Montgomery County soil maps reviewed during the presentation and found on many of the proposed sub-division and land development (SALDO) plan sets available on the Township webpage.

A review of the underlying bedrock and ground water was also discussed, which each can be encountered at shallow depths throughout New Hanover Township, as shallow as 0 feet to 8 feet below the ground surface (bgs), depending on location.

The qualities and properties of the Readington silt loam (a prevalent soil type in New Hanover Township proposed developments) were specifically reviewed by the board members: The silty soil generally has slow permeability characteristics (which prevents surface water from infiltrating into the subsurface), and generally is not an ideal structural fill according to the information provided. The low permeability of the soil is of particular interest due to the concerns of creating ponded water in low-lying poorly drained surfaces, and creating excessive runoff on steep slopes.

A review on the impacts of developing in areas with shallow ground water resulting in the extensive use of sump pumps throughout the township took place was also discussed.

Update: For discussion and consideration when reviewing proposed plans.

d. January 2018:

- i. EAB Ordinance 99-8: Update: The NH Township Manager is working out the details w.r.t. open space acquisitions; EAB awaiting response.
- ii. Ground Water and Surface Water Issues: William R. Snook (EAB president) is heading this issue. In summary, an effort is being made to catalog neighborhoods and properties exhibiting problematic issues related to apparent shallow ground water tables; and/or neighborhoods/properties exhibiting poor drainage as a result of poor planning, improper grading, poor selection of soils, and improperly managed infiltration/detention basins (known as BMPs) as well as other related water issues. The EAB is heading this issue to draw awareness (specifically to the attention of the Planning Commission, Township Engineers and public) in attempt to prevent future issues associated with

ponded water and development on shallow ground water tables, and to make corrective action recommendations to the NHT BOS.

Update: The EAB discussed soil types and sump pumps w.r.t. this topic during the February 2018 Meeting.

## **8) NEW BUSINESS**

## **9) PUBLIC COMMENT**

- a. Russel Oister raised concerns of soil being dug out onto Charlotte Street from the Hanover Point development and other erosion control issues.

## **10) BOARD COMMENT**

- a. Ed Swagzdis: Following up on a question of the possible toxicity of a spray applied to a Hayfield located at the Swamp Creek Park, he noted the constituent of concern is 2,4-Dichlorophenoxyacetic acid.

2,4-Dichlorophenoxyacetic acid (usually called 2,4-D) is "an organic compound with the chemical formula  $C_8H_6Cl_2O_3$ . It is a systemic herbicide which selectively kills most broadleaf weeds by causing uncontrolled growth in them, but leaves most grasses such as cereals, lawn turf, and grassland relatively unaffected". [Wikipedia.org]

Mr. Swagzdis noted that is identified as a "plausible" carcinogen.

- b. For questions or additional information regarding the approved meeting minutes, NHT residents may contact the EAB Secretary Thomas Quinn or EAB President William R. Snook. Contact information is available on the Township website

## **11) ADJOURNMENT**

The meeting was adjourned at approximately 7:45 PM.

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Thomas Quinn, Secretary

**NEW HANOVER TOWNSHIP  
ENVIRONMENTAL ADVISORY BOARD MEETING  
March 13<sup>th</sup>, 2018 – 6:30 PM**

**REGULAR MEETING MINUTES**

**1) CALL TO ORDER**

The monthly meeting of the Environmental Advisory Board (EAB) was held on March 13, 2018 at 6:30 PM in the New Hanover Township (NHT) Municipal Building, 2943 N. Charlotte Street, Gilbertsville, PA 19525. The meeting was called to order at 6:30 PM and opened with a Salute to the Flag. Members present were Ross Snook, Tom Quinn, Ed Swagzdis Barb Furman and Lisa Nolan. The meeting was also attended by New Hanover Township residents Russel Oister and Bryan Lees.

**2) PLEDGE OF ALLEGIANCE.** Attendees recited the pledge to the flag.

**3) PRESENTATIONS**

Ross Snook presented and distributed living memos which have been drafted by the EAB for consideration by the township manager and planning commission for the proposed developments of the New Hanover Town Center, Trotter's Gait and Pacer's Gait. Each memo cites the environmental concerns for each proposed development noted by the EAB.

**4) CONSENT ITEMS**

- a. Approval of Minutes – February 13<sup>th</sup>, 2017. The motion (Snook, Quinn) was unanimously approved.

**5) ANNOUNCEMENTS:**

- a. Picture of the Month – The EAB is accepting outdoor photos within the township limits to be featured on the New Hanover Twp. Webpage.
- b. [From February] Montgomery County's Household Hazardous Waste Event is scheduled in NHT on April 21<sup>st</sup>, 2018 – Boyertown Jr. High East:

The event for the drop-off and disposal of household hazardous wastes is scheduled to take place in New Hanover Township at the Boyertown Junior High East School (located at 2020 Big Road, Gilbertsville, PA, 19525) is scheduled on April 21<sup>st</sup>, 2018 from 9AM to 3PM.

Interested residents are encouraged to review additional information (including acceptable wastes/quantities for collection), available on Montgomery County's Website: <https://www.montcopa.org/706/Household-Hazardous-Waste-Collection-Pro>

- c. [From February] Information on the invasive species, the Spotted Lantern Fly (*Lycorma delicatula*) has been posted at the New Hanover Township building. Additional information is available on the PA dept. of agriculture's webpage.

## 6) DISCUSSION ITEMS

- a. Wetlands: The board discussed the characteristics of wetlands, representative vegetation and the importance of maintaining existing wetlands.
- b. Battery backups for sump pumps: The board discussed the need for battery backups for sump pumps during power outages.
- c. Picture of the Month – The EAB is accepting outdoor photos within the township limits to be featured on the New Hanover Twp. Webpage.

## 7) OLD BUSINESS - DISCUSSION ITEM SUMMARY & UPDATES

### a. March 2018:

#### i. New Hanover Town Center:

The EAB members discussed the proposed plan set of the New Hanover Town Center: The proposal would subdivide 208.907 acres into 852 dwelling units and 210,310 square feet of non-residential buildings and open space. A memo is to be drafted (for review by the planning commission) regarding the development plans citing the NHT EAB's concerns.

Update: Attendees discussed and reviewed the memo.

#### ii. Review of Township's Enforcement Duties under PA CODE Title 25:

The EAB made a recommendation (in letter form to the planning commission) that the Township Solicitor, Andy Bellwoar, should review PA Title 25 (Environmental Protection) with respect to the township's duty/responsibility to enforce any applicable statutes relating to stagnant water. Note: A review of NHT local code Chapter 23 (Storm-water Management), is also advisable with respect to this topic.

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Update: This has been a topic of discussion at the New Hanover Township Supervisors meetings. Proposed ordinances to be considered by the Supervisors are being drafted.

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Update: The EAB discussed soil types and sump pumps w.r.t. this topic during the February 2018 Meeting.

## **8) NEW BUSINESS\***

\*Topics moved to Old Business – March, 2018

## **9) PUBLIC COMMENT**

- a. Russel Oister noted that he has recently obtained his PA Master Naturalist certification.
- b. Cross county traffic from a local trash company was discussed. The trash company has acquired a new lay-down yard along Swamp Pike.

## **10) BOARD COMMENT**

- a. Lisa Nolan discussed stream/wetland clean-ups taken place by local neighborhood children in the Windlestrae community, and how initiatives should be prompted to promote additional local cleanups.
- a. For questions or additional information regarding the approved meeting minutes, NHT residents may contact the EAB Secretary Thomas Quinn or EAB President William R. Snook. Contact information is available on the NHT Community webpage.

## **11) ADJOURNMENT**

The meeting was adjourned at approximately 7:45 PM.

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Thomas Quinn, Secretary

**LEGAL NOTICES**

PUBLIC NOTICE New Hanover Township MS4 Stormwater Plan New Hanover Township is preparing a permit application for a General Stormwater Permit to be submitted in September of 2017 to the PA Department of Environmental Protection (PADEP) per the Federal Clean Water National Pollutant Discharge Elimination System (NPDES), PA Clean Streams Law and the PADEP-issued Municipal Separate Stormwater Sewer System (MS4) Permit for municipalities in watersheds with Total Maximum Daily Load (TMDL) and Pollution Reduction Plan (PRP) requirements. A Public Meeting to present the Draft Plan will be held during the Supervisors regularly scheduled meeting on August 28, at 6:30 pm, at New Hanover Township Municipal Building, 2943 North Charlotte Street, Gilbertsville, PA 19525. The community is invited to provide verbal comments on the plan at the meeting. In addition, members of the community have an opportunity to review and provide written comment on the plan, including the draft Total Maximum Daily Load (TMDL) Plan and proposed Pollution Reduction Plans (PRPs). There will be a 30-Day Public Comment Period from August 2 - September 1, 2017 in order to allow the members of the public to read and submit written comments on the draft TMDL and PRP reports. A copy of the plan will be available on or before July 31, 2017 on the Township website, at [www. New Hanoverpa.org](http://www.NewHanoverpa.org) and a hardcopy can be reviewed in person at the New Hanover Township Municipal Building during normal business hours. Written comments can be submitted to the Township Manager, New Hanover Township, 2943 North Charlotte Street, Gilbertsville, PA 19525. All comments on the plan must be received by close of business, September 1, 2017. The TMDL and PRP Plans New Hanover Township has prepared describe measures and steps the Township will implement in the coming years to reduce sediment and/or nutrient pollution in streams in the Swamp Creek Watershed. The measure intended to be implemented is native tree plantings. Jamie Gwynn, Township Manager MER 7/28 a-1

Appeared in: **Mercury** on Friday, 07/28/2017

[Back](#)

**YEARS 2018-2023**  
**NEW HANOVER TOWNSHIP ILLICIT DISCHARGE FIELD SCREENING PROGRAM**  
**Data Collection Form**

**UPON INITIAL INSPECTION, HAS THIS BEEN DETERMINED TO BE AN OUTFALL?**

YES  NO  (IF NO, DO NOT PROCEED WITH THIS FORM)

**OUTFALL #:** \_\_\_\_\_ **Date:** \_\_\_\_\_ **Time:** \_\_\_\_\_

TIME SINCE LAST RAIN:  ≥ 72 hours  ≤ 72 hours TEMPERATURE \_\_\_\_\_ °

QUANTITY OF LAST RAIN:  ≥ 0.1 inches  ≤ 0.1 inches

INSPECTION TEAM: \_\_\_\_\_

**SITE DESCRIPTION:**

**LOCATION** (Narrative Description – Provide walking directions from the nearest road and a description of the outfall to be used by future inspectors): \_\_\_\_\_

(include name of Subdivision, if applicable) \_\_\_\_\_

**STRUCTURE TYPE:** OPEN CHANNEL  MANHOLE  PIPE  BOX  OTHER: \_\_\_\_\_

**STRUCTURE SHAPE:** CIRCULAR  ELLIPTICAL  BOX  SINGLE  DOUBLE  TRIPLE

TRAPEZOID  PARABOLIC  OTHER : \_\_\_\_\_

**MATERIAL:** CONCRETE  RCP  PVC  CMP  STEEL  ALUMINUM  BRICK  CLAY   
 EARTHEN  HDPE  RIP RAP  OTHER: \_\_\_\_\_

**STRUCTURAL CONDITION:** GOOD  NEEDS REPAIR  WASHOUT  INACCESSIBLE

BRIEFLY DESCRIBE CONDITION: \_\_\_\_\_

**OBSTRUCTION:** NOT OBSTRUCTED  PARTIALLY OBSTRUCTED  FULLY OBSTRUCTED

**DOMINANT WATERSHED LAND USES:** INDUSTRIAL  COMMERCIAL  RESIDENTIAL

OPEN SPACE  INSTITUTIONAL  UNKNOWN  OTHER: \_\_\_\_\_

KNOWN INDUSTRIES: \_\_\_\_\_

**OUTFALL DIMENSIONS:** PIPE SIZE: \_\_\_\_\_ OR CHANNEL TOP WIDTH: \_\_\_\_\_

CHANNEL BOTTOM WIDTH: \_\_\_\_\_ CHANNEL HEIGHT: \_\_\_\_\_

**FLOW ESTIMATION:**

**WAS FLOW OBSERVED?** NO  YES  IF YES, PLEASE ANSWER a. – e. BELOW.

a. FLOW DESCRIPTION: TRICKLE  MODERATE  SUBSTANTIAL

b. WIDTH OF WATER SURFACE (feet): \_\_\_\_\_

c. APPROXIMATE DEPTH OF WATER (feet): \_\_\_\_\_

d. APPROXIMATE FLOW VELOCITY (feet per second): \_\_\_\_\_

e. FLOW RATE (cubic feet per second) = b x c x d = \_\_\_\_\_

**VISUAL OBSERVATIONS:**

**WAS A PHOTO TAKEN?** NO  YES  (Digital Photo Number(s): \_\_\_\_\_)

**INDICATORS FOR FLOWING OUTFALLS**

**ODOR:** NONE  MUSTY  SEWAGE  ROTTEN EGGS  SOUR MILK  PETROLEUM

OTHER: \_\_\_\_\_

**SEVERITY:** 1 - FAINT  2 - EASILY DETECTED  3 – NOTICED FROM A DISTANCE

**COLOR:** CLEAR  RED  YELLOW  BROWN  GREEN  GRAY  OTHER: \_\_\_\_\_

**SEVERITY:** 1 – FAINT IN SAMPLE BOTTLE  2 – CLEARLY VISIBLE IN SAMPLE BOTTLE

3 – CLEARLY VISIBLE IN OUTFALL FLOW

**CLARITY:** CLEAR  SLIGHT CLOUDINESS  CLOUDY  OPAQUE

**FLOATABLES:** NONE  OILY SHEEN  SEWAGE  SUDS  OTHER: \_\_\_\_\_

**SEVERITY:** 1 – SLIGHT, ORIGIN NOT OBVIOUS  2 – SOME, INDICATIONS OF ORIGIN

3 – SOME, ORIGIN CLEAR

**INDICATORS FOR FLOWING & NON-FLOWING OUTFALLS**

**OUTFALL DAMAGE:** NONE  SPALLING, CRACKING OR CHIPPING  PEELING PAINT   
CORROSION

**DEPOSITS/STAINS:** NONE  SEDIMENTS  OILY  FLOW LINE  PAINT   
OTHER: \_\_\_\_\_

**VEGETATION CONDITION:** NONE  NORMAL  EXCESSIVE GROWTH  INHIBITED GROWTH

**POOR POOL QUALITY:** NONE  ODORS  COLORS  FLOATABLES  OIL SHEEN   
SUDS  EXCESSIVE ALGAE  OTHERS: \_\_\_\_\_

**BIOLOGICAL:** MOSQUITO LARVAE  BACTERIA/ALGAE  PIPE GROWTH  OTHER: \_\_\_\_\_

---

**FIELD ANALYSIS:**

WATER TEMP: \_\_\_\_\_ °F / °C

pH: \_\_\_\_\_

AMMONIA: \_\_\_\_\_ mg/L

**WAS A LABORATORY SAMPLE COLLECTED?** NO  YES  (if yes, attach copy of lab results)

**SAMPLE COLLECTED FROM:** FLOW  POOL

**INTERMITTENT FLOW TRAP SET?** NO  YES  If yes, type: OBM  CAULK DAM

**COMMENTS:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**DATA SHEET FILLED OUT BY: (signature):** \_\_\_\_\_ **DATE:** \_\_\_\_\_

# Chapter 23

## Stormwater Management

### Part 1

### GENERAL PROVISIONS

**§ 23-101 Short Title.**

**[Ord. 07-07, 7/23/2007, § 101]**

This chapter shall be known as the "New Hanover Township Stormwater Management Ordinance."

**§ 23-102 Statement of Findings.**

**[Ord. 07-07, 7/23/2007, § 102]**

1. The New Hanover Township Board of Supervisors finds that:
  - A. Inadequate management of accelerated stormwater runoff resulting from development throughout a watershed increases flood flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of existing streams and storm sewers, greatly increases the cost of public facilities to convey and manage stormwater, undermines floodplain management and flood reduction efforts in upstream and downstream communities, reduces groundwater recharge, and threatens public health and safety.
  - B. Inadequate planning and management of stormwater runoff resulting from land development throughout a watershed can also harm surface water resources by changing the natural hydrologic patterns, accelerating stream flows (which increase scour and erosion of stream beds and stream banks, thereby elevating sedimentation), destroying aquatic habitat, and elevating aquatic pollutant concentrations and loadings such as sediments, nutrients, heavy metals, and pathogens. Groundwater resources are also impacted through loss of recharge.
  - C. A comprehensive program of stormwater management, including minimization of impacts of development, redevelopment, and activities causing accelerated erosion and loss of natural infiltration, is fundamental to the public health, safety, welfare, and the protection of the people of New Hanover Township and all of the people of the commonwealth, their resources, and the environment.
  - D. Stormwater can be an important water resource by providing groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.
  - E. Impacts from stormwater runoff can be minimized by using project designs that maintain the natural hydrologic regime and sustain high water quality, groundwater recharge, stream base flow, and aquatic ecosystems. The most cost effective and environmentally advantageous way to manage stormwater runoff is through nonstructural project design that minimizes impervious surfaces and sprawl, avoids sensitive areas (i.e., stream buffers, floodplains, steep slopes), and considers topography and soils to maintain the natural hydrologic regime.
  - F. Public education on the control of pollution from stormwater is an essential component in successfully addressing stormwater.

- G. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES).
- H. Nonstormwater discharges to municipal separate storm sewer systems can contribute to pollution of waters of the commonwealth by New Hanover Township.

**§ 23-103 Purpose.**

**[Ord. 07-07, 7/23/2007, § 103]**

- 1. The purpose of this chapter is to promote the public health, safety, and welfare within New Hanover Township by maintaining the natural hydrologic regime and minimizing the impacts described in § 23-102 of this chapter through provisions designed to:
  - A. Promote alternative project designs and layouts that minimize the impacts on surface and groundwater.
  - B. Promote nonstructural best management practices (BMPs).
  - C. Minimize increases in runoff stormwater volume.
  - D. Minimize impervious surfaces.
  - E. Manage accelerated stormwater runoff and erosion and sedimentation problems and stormwater runoff impacts at their source by regulating activities that cause these problems.
  - F. Provide review procedures and performance standards for stormwater planning and management.
  - G. Utilize and preserve existing natural drainage systems as much as possible.
  - H. Manage stormwater impacts close to the runoff source, requiring a minimum of structures and relying on natural processes.
  - I. Focus on infiltration of stormwater to maintain groundwater recharge, to prevent degradation of surface and groundwater quality, and to otherwise protect water resources.
  - J. Maintain existing base flows and quality of streams and watercourses, where possible.
  - K. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code, Chapter 93.4.a, requiring protection and maintenance of "existing uses" and maintenance of the level of water quality to support those uses in all streams, and the protection and maintenance of water quality in "special protection" streams.
  - L. Address the quality and quantity of stormwater discharges from the development site.
  - M. Provide a mechanism to identify stormwater controls necessary to meet NPDES permit requirements.
  - N. Implement an illegal discharge detection and elimination program that addresses nonstormwater discharges into New Hanover Township's separate storm sewer system.
  - O. Preserve the flood-carrying capacity of streams.
  - P. Prevent scour and erosion of stream banks and stream beds.
  - Q. Provide performance standards and design criteria for watershed-wide stormwater management and

planning.

- R. Provide proper operation and maintenance of all permanent stormwater management facilities and BMPs that are implemented in New Hanover Township.

**§ 23-104 Statutory Authority.**  
**[Ord. 07-07, 7/23/2007, § 104]**

- 1. New Hanover Township is empowered to regulate land use activities that affect runoff and surface and groundwater quality and quantity by the authority of:
  - A. Act of October 4, 1978, 32 P.S., P.L. 864, Act 167, § 680.1 et seq., as amended, the Stormwater Management Act (hereinafter referred to as "the Act").
  - B. Water Resources Management Act of 2002, 27 Pa.C.S.A. § 3101 et seq., as amended.
  - C. Second Class Township Code, 53 P.S. §§ 66501 et seq., 66601 et seq.
  - D. Pennsylvania Municipalities Planning Code, Act 247, 53 P.S. § 10101 et seq., as amended.

**§ 23-105 Applicability/Regulated Activities.**

- 1. This chapter shall apply to the entire geographic area. This chapter contains only the stormwater management performance standards and design criteria that are necessary or desirable from a watershed-wide perspective. Local stormwater management design criteria (e.g., inlet spacing, inlet type, collection system design and details, outlet structure design, etc.) shall continue to be regulated by the applicable municipal ordinances and applicable state regulations.
- 2. The following activities are defined as "regulated activities" and shall be regulated by this chapter unless exempted by § **23-106**:
  - A. Land development.
  - B. Subdivisions.
  - C. Alteration of the natural hydrologic regime.
  - D. Construction or reconstruction of or addition of new impervious or semipervious surfaces (i.e., driveways, parking lots, roads, etc.)
  - E. Construction of new buildings or additions to existing buildings.
  - F. Redevelopment.
  - G. Diversion piping or encroachments in any natural or man-made channel.
  - H. Nonstructural and structural stormwater management BMPs or appurtenances thereto.
  - I. Earth disturbance activities of greater than 5,000 square feet.
  - J. Any of the above regulated activities that were approved more than five years prior to the effective date of this chapter and resubmitted for municipal approval.
  - K. Prohibited or polluted discharges.
  - L. Any other activities that may affect stormwater runoff.

3. Table 23-105.1 summarizes the applicability requirements of this chapter. "Proposed Impervious Surface" in Table 23-105.1 includes new, additional Attachment or replacement impervious surface/cover. Repaving existing surfaces without reconstruction does not constitute "replacement."

**§ 23-106 Exemptions.**

**[Ord. 07-07, 7/23/2007, § 106]**

1. Exemptions for Land Use Activities. The following land use activities are exempt from the drainage plan submission requirements of this chapter.
  - A. Use of land for gardening for home consumption.
  - B. Agriculture when operated in accordance with a conservation plan, nutrient management plan, or erosion and sedimentation control plan approved by the County Conservation District, including activities such as growing crops, rotating crops, tilling of soil, and grazing animals. Installation of new or expansion of existing farmsteads, animal housing, waste storage, and production areas having impervious surfaces that result in a net increase in earth disturbance of greater than 5,000 square feet shall be subject to the provisions of this chapter.
  - C. Forest management operations that are following the Department of Environmental Protection's (DEP) management practices contained in its publication Soil Erosion and Sedimentation Control Guidelines for Forestry and are operating under an approved erosion and sedimentation plan and must comply with the stream buffer requirements in § 23-406, Subsection 1G.
  - D. Road replacement, development, or redevelopment that has less than 1,000 square feet of new, additional, or replaced impervious surface/cover, or in the case of earth disturbance only, less than 5,000 square feet of disturbance, is exempt from this chapter.
2. Exemptions for Land Development Activities. The following land development and earthmoving activities are exempt from the drainage plan submission requirements of this chapter.
  - A. A maximum of 1,000 square feet of new, additional, or replacement proposed impervious surface. Or in the case of earth disturbance resulting in less than 1,000 square feet of impervious cover (as noted above).
  - B. Up to a maximum of 5,000 square feet of disturbed earth. These criteria shall apply to the total development even if the development is to take place in phases. The date of the municipal ordinance adoption shall be the starting point from which to consider tracts as "parent tracts" upon which future subdivisions and respective earth disturbance computations shall be cumulatively considered.

The activities exempted above are still encouraged to implement the voluntary stormwater management practices as indicated in Appendix 23-A.

3. Additional Exemption Criteria.
  - A. Exemption Responsibilities. An exemption shall not relieve the applicant from implementing such measures as are necessary to protect public health, safety, and property.
  - B. HQ and EV Streams. An exemption shall not relieve the applicant from meeting the special requirements for watersheds draining to identified high quality (HQ) or exceptional value (EV) waters and source water protection areas (SWPA) and requirements for nonstructural project design sequencing (§ 23-404).
  - C. Drainage Problems. If a drainage problem is documented or known to exist downstream of or is expected from the proposed activity, then New Hanover Township may require the applicant to comply with this chapter.

- D. Emergency Exemption. Emergency maintenance work performed for the protection of public health, safety, and welfare. A written description of the scope and extent of any emergency work performed shall be submitted to New Hanover Township within two calendar days of the commencement of the activity. If New Hanover Township finds that the work is not an emergency, then the work shall cease immediately, and the requirements of this chapter shall be addressed as applicable.
- E. Maintenance Exemption. Any maintenance to an existing stormwater management system made in accordance with plans and specifications approved by the municipal engineer or New Hanover Township.
- F. Even though the developer is exempt, he is not relieved from complying with other regulations.

**§ 23-107 Compatibility With Other Ordinances or Legal Requirements.**  
**[Ord. 07-07, 7/23/2007, § 109]**

- 1. Approvals issued pursuant to this chapter do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act, or ordinance.
- 2. In the event of conflict between the regulations of this chapter and other Township Ordinances for stormwater management, the more vigorous or more stringent requirements shall be followed. The determination of which regulations are more rigorous or stringent shall be determined by the Township Engineer.
- 3. Nothing in this chapter shall be construed to affect any of the New Hanover Township's requirements regarding stormwater matters that do not conflict with the provisions of this chapter, such as local stormwater management design criteria (e.g., inlet spacing, inlet type, collection system design and details, outlet structure design, etc.). Conflicting provisions in other municipal ordinances or regulations shall be construed to retain the requirements of this chapter addressing state water quality requirements.

## Part 2 **DEFINITIONS**

**§ 23-201 Interpretation.**  
**[Ord. 07-07, 7/23/2007, § 201]**

- 1. For the purposes of this chapter, certain terms and words used herein shall be interpreted as follows:
  - A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.
  - B. The word "includes" or "including" shall not limit the term to the specific example, but is intended to extend its meaning to all other instances of like kind and character.
  - C. The word "person" includes an individual, firm, association, organization, partnership, trust, company, corporation, unit of government, or any other similar entity.
  - D. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.
  - E. The words "used" or "occupied" include the words "intended, designed, maintained, or arranged to be used, occupied, or maintained."

§ 23-202 **Definitions.**

[Ord. 07-07, 7/23/2007, § 202]

**ACCELERATED EROSION**

The removal of the surface of the land through the combined action of man's activity and the natural processes of a rate greater than would occur because of the natural process alone.

**AGRICULTURAL ACTIVITIES**

The work of producing crops and raising livestock including tillage, plowing, disking, harrowing, pasturing, mushroom growing, nursery, and sod operations and installation of conservation measures. Construction of new buildings or impervious area is not considered an agricultural activity.

**ALTERATION**

As applied to land, a change in topography as a result of the moving of soil and rock from one location or position to another; also the changing of surface conditions by causing the surface to be more or less impervious; land disturbance.

**APPLICANT**

A person who has filed an application for approval to engage in any regulated activity defined in § 23-105 of this chapter.

**AS-BUILT DRAWINGS**

Engineering or site drawings maintained by the contractor as he constructs the project and upon which he documents the actual locations of the building components and changes to the original contract documents. These documents, or a copy of same, are turned over to the municipal engineer at the completion of the project.

**BANKFULL**

The channel at the top-of-bank or point from where water begins to overflow onto a floodplain.

**BASE FLOW**

Portion of stream discharge derived from groundwater; the sustained discharge that does not result from direct runoff or from water diversions, reservoir releases, piped discharges, or other human activities.

**BIORETENTION**

A stormwater retention area that utilizes woody and herbaceous plants and soils to remove pollutants before infiltration occurs.

**BMP (BEST MANAGEMENT PRACTICE)**

Methods, measures, or practices used to prevent or reduce surface runoff and/or water pollution including, but not limited to, structural and nonstructural stormwater management practices and operation and maintenance procedures. See also "nonstructural best management practice (BMP)."

**BUFFER**

The area of land immediately adjacent to any stream, measured perpendicular to and horizontally from the top-of-bank on both sides of a stream (see "top-of-bank").

**CHANNEL**

An open drainage feature through which stormwater flows. Channels include, but shall not be limited to, natural and man-made drainageways, swales, streams, ditches, canals, and pipes flowing partly full.

**CHANNEL EROSION**

The widening, deepening, or headward cutting of channels and waterways caused by stormwater runoff or bankfull flows.

**CISTERN**

An underground reservoir or tank for storing rainwater.

**CONSERVATION DISTRICT**

The Montgomery County Conservation District.

**CONVEYANCE**

A facility or structure used for the transportation or transmission of something from one place to another.

**CULVERT**

A structure with its appurtenant works that carries water under or through an embankment or fill.

**DAM**

A man-made barrier, together with its appurtenant works, constructed for the purpose of impounding or storing water or another fluid or semifluid. A dam may include a refuse bank, fill, or structure for highway, railroad, or other purposes which impounds or may impound water or another fluid or semifluid.

**DEPARTMENT (DEP)**

The Pennsylvania Department of Environmental Protection.

**DESIGN PROFESSIONAL (QUALIFIED)**

A Pennsylvania registered professional engineer, registered landscape architect, or registered professional land surveyor trained to develop stormwater management plans.

**DESIGN STORM**

The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a five-year storm) and duration (e.g., 24 hours), used in the design and evaluation of stormwater management systems.

**DESIGNEE**

The agent of the Montgomery County Planning Commission, Montgomery County Conservation District, and/or agent of the Board of Supervisors involved with the administration, review, or enforcement of any provisions of this chapter by contract or memorandum of understanding.

**DETENTION BASIN**

An impoundment designed to collect and retard stormwater runoff by temporarily storing the runoff and releasing it at a predetermined rate. Detention basins are designed to drain completely soon after a rainfall event and become dry until the next rainfall event.

**DEVELOPER**

A person who seeks to undertake any regulated earth disturbance activities at a project site in New Hanover Township.

**DEVELOPMENT**

Any human-induced change to improved or unimproved real estate, whether public or private including, but not limited to, land development, construction, installation, or expansion of a building or other structure, land division, street construction, drilling, and site alteration such as embankments, dredging, grubbing, grading, paving, parking or storage facilities, excavation, filling, stockpiling, or clearing. As used in this chapter, development encompasses both new development and redevelopment.

**DEVELOPMENT SITE**

The specific tract or parcel of land where any regulated activity set forth in § 23-105 is planned, conducted, or maintained.

**DIAMETER AT BREAST HEIGHT (DBH)**

The outside bark diameter at breast height which is defined as 4 1/2 feet (1.37m) above the forest floor on the uphill side of the tree.

**DIFFUSED DRAINAGE DISCHARGE**

Drainage discharge that is not confined to a single point location or channel, including sheet flow or shallow concentrated flow.

**DISCHARGE**

A. (verb) to release water from a project, site, aquifer, drainage basin, or other point of interest; B. (noun) The rate and volume of flow of water such as in a stream, generally expressed in cubic feet per second (see "peak discharge").

**DISCHARGE POINT**

The point of discharge for a stormwater facility.

**DISTURBED AREAS**

Unstabilized land area where an earth disturbance activity is occurring or has occurred.

**DITCH**

A man-made waterway constructed for irrigation or stormwater conveyance purposes.

**DOWNSLOPE PROPERTY LINE**

That portion of the property line of the lot, tract, or parcels of land being developed, located such that overland or pipe flow from the project site would be directed towards it by gravity.

**DRAINAGE CONVEYANCE FACILITY**

A stormwater management facility designed to transport stormwater runoff that includes channels, swales, pipes, conduits, culverts, and storm sewers.

**DRAINAGE EASEMENT**

A right granted by a landowner to a grantee allowing the use of private land for stormwater management purposes.

**DRAINAGE PERMIT**

A permit issued by New Hanover Township after the drainage plan has been approved.

**DRAINAGE PLAN**

The documentation of the stormwater management system, if any, to be used for a given development site, the contents of which are established in § 23-302.

**EARTH DISTURBANCE ACTIVITY**

A construction or other human activity which disturbs the surface of land including, but not limited to, clearing and grubbing, grading, excavations, embankments, land development, agricultural plowing or tilling, timber harvesting activities, road maintenance activities, mineral extraction, and the moving, depositing, stockpiling, or storing of soil, rock, or earth materials.

**EMERGENCY SPILLWAY**

A conveyance area that is used to pass peak discharge greater than the maximum design storm controlled by the stormwater facility.

**ENCROACHMENT**

A structure or activity that changes, expands, or diminishes the course, current, or cross-section of a watercourse, floodway, or body of water.

**EROSION**

The process by which the surface of the land, including water/stream channels, is worn away by water, wind, or chemical action.

**EROSION AND SEDIMENT CONTROL PLAN**

A plan that is designed to minimize accelerated erosion and sedimentation. Said plan must be submitted to and approved by the appropriate Conservation District before construction can begin.

**EXCEPTIONAL VALUE WATERS**

Surface waters of high quality that satisfy Pennsylvania Code, Title 25, "Environmental Protection," Chapter 93, "Water Quality Standards," § 93.4b(b) (relating to antidegradation).

**EXISTING CONDITIONS**

The initial condition of a project site prior to the proposed alteration. If the initial condition of the site is undeveloped land, the land use shall be considered as "meadow" unless the natural land cover is proven to generate a lower curve number or Rational "c" value, such as forested lands.

**FLOOD**

A temporary condition of partial or complete inundation of land areas from the overflow of streams, rivers, and other waters of this commonwealth.

**FLOODPLAIN**

Any land area susceptible to inundation by water from any natural source or as delineated by the applicable Department of Housing and Urban Development, Federal Insurance Administration Flood Hazard Boundary Map, as being a special flood hazard area.

**FLOODWAY**

The channel of a watercourse and those portions of the adjoining floodplains that are reasonably required to carry and discharge the one-hundred-year frequency flood. Unless otherwise specified,

the boundary of the floodway is as indicated on maps and flood insurance studies provided by the Federal Emergency Management Agency (FEMA). In an area where no FEMA maps or studies have defined the boundary of the one-hundred-year frequency floodway, it is assumed, absent evidence to the contrary, that the floodway extends from the stream to 50 feet from the top-of-bank.

### **FLUVIAL GEOMORPHOLOGY**

The study of landforms associated with river channels and the processes that form them.

### **FOREST MANAGEMENT/TIMBER OPERATIONS**

Planning and associated activities necessary for the management of forest lands. These include timber inventory and preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, and reforestation.

### **FREEBOARD**

A vertical distance between the elevation of the design high-water and the top of a dam, levee, tank, basin, swale, or diversion berm. The space is required as a safety margin in a pond or basin.

### **GRADE**

A. (noun) a slope, usually of a road, channel, or natural ground specified in percent and shown on plans as specified herein. B. (verb) To finish the surface of a roadbed, the top of an embankment, or the bottom of an excavation.

### **GRASSED WATERWAY**

A natural or man-made waterway, usually broad and shallow, covered with erosion-resistant grasses used to convey surface water.

### **GROUNDWATER**

Water beneath the earth's surface that supplies wells and springs and is often between saturated soil and rock.

### **GROUNDWATER RECHARGE**

The replenishment of existing natural underground water supplies from rain or overland flow.

### **HIGH QUALITY WATERS**

Surface waters having quality which exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water by satisfying Pennsylvania Code, Title 25, "Environmental Protection," Chapter 93, "Water Quality Standards," § 93.4b(a).

### **HOTSPOTS**

Areas where land use or activities generate highly contaminated runoff, with concentrations of pollutants in excess of those typically found in stormwater.

### **HYDROGRAPH**

A graph representing the discharge of water versus time for a selected point in the drainage system.

### **HYDROLOGIC REGIME**

The hydrologic cycle or balance that sustains quality and quantity of stormwater, base flow, storage, and groundwater supplies under natural conditions.

**HYDROLOGIC SOIL GROUP**

A classification of soils by the Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS), into four runoff potential groups. The groups range from A soils, which are very permeable and produce little runoff, to D soils, which are not very permeable and produce much more runoff.

**IMPERVIOUS SURFACE**

A surface that prevents the infiltration of water into the ground. Impervious surfaces include, but are not limited to, streets, sidewalks, pavements, driveway areas, or roofs. Any surface areas designed to be gravel or crushed stone shall be regarded as impervious surfaces.

**IMPOUNDMENT**

A retention or detention basin designed to retain stormwater runoff and release it at a controlled rate.

**INFILL**

Development that occurs on smaller parcels that remain undeveloped but are within or in very close proximity to urban or densely developed areas. Infill development usually relies on existing infrastructure and does not require an extension of water, sewer, or other public utilities.

**INFILTRATION**

Movement of surface water into the soil, where it is absorbed by plant roots, evaporated into the atmosphere, or percolated downward to recharge groundwater.

**INFILTRATION STRUCTURES**

A structure designed to direct runoff into the underground water (e.g., French drains, seepage pits, or seepage trenches).

**INFLOW**

The flow entering the stormwater management facility and/or BMP.

**INLET**

The upstream end of any structure through which water may flow.

**INTERMITTENT STREAM**

A stream that flows only part of the time. Flow generally occurs for several weeks or months in response to seasonal precipitation or groundwater discharge.

**INVERT**

The lowest surface, the floor or bottom of a culvert, drain, sewer, channel, basin, BMP, or orifice.

**LAND DEVELOPMENT**

Any of the following activities:

- A. The improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving:
  - (1) A group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure.

- (2) The division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of, streets, common areas, leaseholds, condominiums, building groups, or other features.
- B. A subdivision of land.
- C. Development in accordance with § 503(1.1) of the Pennsylvania Municipalities Planning Code, 53 P.S. § 10503(1.1).

#### **LIMITING ZONE**

A soil horizon or condition in the soil profile or underlying strata that includes one of the following:

- A. A seasonal high water table, whether perched or regional, determined by direct observation of the water table or indicated by soil mottling.
- B. A rock with open joints, fracture or solution channels, or masses of loose rock fragments, including gravel, with insufficient fine soil to fill the voids between the fragments.
- C. A rock formation, other stratum, or soil condition that is so slowly permeable that it effectively limits downward passage of water.

#### **LOT**

A designated parcel, tract, or area of land established by a plat or otherwise as permitted by law and to be used, developed, or built upon as a unit.

#### **MAIN STEM (MAIN CHANNEL)**

Any stream segment or other runoff conveyance used as a reach in watershed-specific hydrologic models.

#### **MANNING EQUATION (MANNING FORMULA)**

A method for calculation of velocity of flow (e.g., feet per second) and flow rate (e.g., cubic feet per second) in open channels based upon channel shape, roughness, depth of flow, and slope. "Open channels" may include closed conduits so long as the flow is not under pressure.

#### **MAXIMUM DESIGN STORM**

The maximum (largest) design storm that is controlled by the stormwater facility.

#### **MUNICIPAL ENGINEER**

A professional engineer licensed as such in the Commonwealth of Pennsylvania, duly appointed as the engineer for New Hanover Township, planning agency, or joint planning commission.

#### **MUNICIPALITY**

New Hanover Township, Montgomery County, Pennsylvania.

#### **NATURAL CONDITION**

Pre-development condition.

#### **NATURAL HYDROLOGIC REGIME**

See "hydrologic regime."

**NATURAL RECHARGE AREA**

Undisturbed surface area or depression where stormwater collects and a portion of which infiltrates and replenishes the underground and groundwater.

**NONPOINT SOURCE POLLUTION**

Pollution that enters a water body from diffuse origins in the watershed and does not result from discernible, confined, or discrete conveyances.

**NONSTORMWATER DISCHARGES**

Water flowing in stormwater collection facilities, such as pipes or swales, which is not the result of a rainfall event or snowmelt.

**NONSTRUCTURAL BEST MANAGEMENT PRACTICE (BMPs)**

Methods of controlling stormwater runoff quantity and quality, such as innovative site planning, impervious area and grading reduction, protection of natural depression areas, temporary ponding on site, and other techniques.

**NPDES**

National Pollutant Discharge Elimination System, the federal government's system for issuance of permits under the Clean Water Act, which is delegated to DEP in Pennsylvania.

**NRCS**

Natural Resource Conservation Service (previously SCS).

**OPEN CHANNEL**

A conveyance channel that is not enclosed.

**OUTFALL**

"Point source" as described in 40 CFR 122.2 at the point where the New Hanover Township's storm sewer system discharges to surface waters of the commonwealth.

**OUTFLOW**

The flow exiting the stormwater management facility and/or BMP.

**OUTLET**

Points of water disposal to a stream, river, lake, tidewater, or artificial drain.

**PARENT TRACT**

The parcel of land from which a land development or subdivision originates, determined from the date of municipal adoption of this chapter.

**PARKING LOT STORAGE**

Involves the use of parking areas as temporary impoundments with controlled release rates during rainstorms.

**PEAK DISCHARGE**

The maximum rate of stormwater runoff from a specific storm event.

**PENN STATE RUNOFF MODEL**

The computer-based hydrologic model developed at Pennsylvania State University.

**PIPE**

A culvert, closed conduit, or similar structure (including appurtenances) that conveys stormwater.

**PLANNING COMMISSION**

The Planning Commission of New Hanover Township.

**POINT SOURCE**

Any discernible, confined, and discrete conveyance including, but not limited to, any pipe, ditch, channel, tunnel, or conduit from which stormwater is or may be discharged, as defined in state regulations at 25 Pa. Code § 92.1.

**POST-CONSTRUCTION**

Period after construction during which disturbed areas are stabilized, stormwater controls are in place and functioning, and all proposed improvements in the approved land development plan are completed.

**PRE-CONSTRUCTION**

Prior to commencing construction activities.

**PRE-DEVELOPMENT CONDITION**

Undeveloped/natural condition.

**PRETREATMENT**

Techniques employed in stormwater BMPs to provide storage or filtering to trap coarse materials and other pollutants before they enter the system, but not necessarily designed to meet the water quality volume requirements of § 23-406.

**PROJECT SITE**

The specific area of land where any regulated activities in New Hanover Township are planned, conducted, or maintained.

**RATIONAL FORMULA**

A rainfall-runoff relation used to estimate peak flow.

**REACH**

Any stream segment or other runoff conveyance used in the watershed-specific hydrologic models.

**RECHARGE**

The replenishment of groundwater through the infiltration of rainfall, other surface waters, or land application of water or treated wastewater.

**RECONSTRUCTION**

Demolition and subsequent rebuilding of impervious surface.

**RECORD DRAWINGS**

Original documents revised to suit the as-built conditions and subsequently provided by the engineer to the client. The engineer reviews the contractor's as-builts against his/her own records for

completeness, then either turns these over to the client or transfers the information to a set of reproducible, in both cases for the client's permanent records.

### **REDEVELOPMENT**

Any development that requires demolition or removal of existing structures or impervious surfaces at a site and replacement with new impervious surfaces. Maintenance activities such as top-layer grinding and repaving are not considered to be redevelopment. Interior remodeling projects and tenant improvements are also not considered to be redevelopment.

### **REGULATED ACTIVITIES**

Actions or proposed actions that have an impact on stormwater runoff quality or quantity and that are specified in § 23-105 of this chapter.

### **REGULATED EARTH DISTURBANCE ACTIVITY**

Defined under NPDES Phase II regulations as earth disturbance activity of one acre or more with a point source discharge to surface waters or New Hanover Township's storm sewer system or five acres or more regardless of the planned runoff. This includes earth disturbance on any portion of, part, or during any stage of a larger common plan of development.

### **RELEASE RATE**

The percentage of existing conditions peak rate of runoff from a site or subarea to which the proposed conditions peak rate of runoff must be reduced to protect downstream areas.

### **REPAVING**

Replacement of the impervious surface that does not involve reconstruction of an existing paved (impervious) surface.

### **REPLACEMENT PAVING**

Reconstruction of and full replacement of an existing paved (impervious) surface.

### **RETENTION BASIN**

A structure in which stormwater is stored and not released during the storm event. Retention basins are designed for infiltration purposes and do not have an outlet. The retention basin must infiltrate stored water in four days or less.

### **RETURN PERIOD**

The average interval, in years, within which a storm event of a given magnitude can be expected to recur. For example, the twenty-five-year return period rainfall would be expected to recur on the average of once every 25 years.

### **RISER**

A vertical pipe extending from the bottom of a pond that is used to control the discharge rate from the pond for a specified design storm.

### **ROAD MAINTENANCE**

Earth disturbance activities within the existing road cross-section, such as grading and repairing existing unpaved road surfaces, cutting road banks, cleaning or clearing drainage ditches, and other similar activities.

### **ROOF DRAINS**

A drainage conduit or pipe that collects water runoff from a roof and leads it away from the structure.

### **ROOFTOP DETENTION**

The temporary ponding and gradual release of stormwater falling directly onto flat roof surfaces using controlled-flow roof drains in building designs.

### **RUNOFF**

Any part of precipitation that flows over the land surface.

### **SALDO**

Chapter 22, Subdivision and Land Development.

### **SEDIMENT BASIN**

A barrier, dam, or retention or detention basin located and designed in such a way as to retain rock, sand, gravel, silt, or other material transported by water during construction.

### **SEDIMENT POLLUTION**

The placement, discharge, or any other introduction of sediment into the waters of the commonwealth.

### **SEDIMENTATION**

The process by which mineral or organic matter is accumulated or deposited by the movement of water or air.

### **SEEPAGE PIT/SEEPAGE TRENCH**

An area of excavated earth filled with loose stone or similar coarse material into which surface water is directed for infiltration into the underground water.

### **SEPARATE STORM SEWER SYSTEM**

A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) primarily used for collecting and conveying stormwater runoff.

### **SHALLOW CONCENTRATED FLOW**

Stormwater runoff flowing in shallow, defined ruts prior to entering a defined channel or waterway.

### **SHEET FLOW**

A flow process associated with broad, shallow water movement on sloping ground surfaces that is not channelized or concentrated.

### **SOIL COVER COMPLEX METHOD**

A method of runoff computation developed by NRCS that is based on relating soil type and land use/cover to a runoff parameter called curve number (CN).

### **SOURCE WATER PROTECTION AREAS (SWPA)**

The zone through which contaminants, if present, are likely to migrate and reach a drinking water well or surface water intake.

## **SPECIAL PROTECTION SUBWATERSHEDS**

Watersheds that have been designated by DEP as EV or HQ waters.

## **SPILLWAY**

A conveyance that is used to pass the peak discharge of the maximum design storm that is controlled by the stormwater facility.

## **STATE WATER QUALITY REQUIREMENTS**

The regulatory requirements to protect, maintain, reclaim, and restore water quality under Pennsylvania Code, Title 25, and the Clean Streams Law, 35 P.S. § 691.1 et seq.

## **STORAGE INDICATION METHOD**

A reservoir routing procedure based on solution of the continuity equation (inflow minus outflow equals the change in storage) with outflow defined as a function of storage volume and depth.

## **STORM FREQUENCY**

The number of times that a given storm "event" occurs or is exceeded on the average in a stated period of years (see "return period").

## **STORM SEWER**

A system of pipes and/or open channels that conveys intercepted runoff and stormwater from other sources but excludes domestic sewage and industrial wastes.

## **STORMWATER**

The surface runoff generated by precipitation reaching the ground surface.

## **STORMWATER MANAGEMENT DISTRICT**

Those subareas of a watershed in which some type of detention is required to meet the plan requirements and the goals of Act 167.

## **STORMWATER MANAGEMENT FACILITY**

Any structure, natural or man-made, that, due to its condition, design, or construction, conveys, stores, or otherwise affects stormwater runoff quality, rate, or quantity. Typical stormwater management facilities include, but are not limited to, detention and retention basins, open channels, storm sewers, pipes, and infiltration structures.

## **STORMWATER MANAGEMENT PLAN**

The watershed plan, known as the "Swamp Creek Watershed Act 167 Stormwater Management Plan," for managing those land use activities that will influence stormwater runoff quality and quantity and that would impact the Swamp Creek watershed, adopted by Berks County and Montgomery County as required by the Act of October 4, 1978, P.L. 864, Act 167, 32 P.S. § 680.1 et seq.

## **STORMWATER MANAGEMENT SITE PLAN**

The plan prepared by the applicant or his representative indicating how stormwater runoff will be managed at the particular site of interest according to this chapter.

## **STREAM**

A natural watercourse.

**STREAM BUFFER**

The land area adjacent to each side of a stream essential to maintaining water quality (see "buffer").

**STREAM ENCLOSURE**

A bridge, culvert, or other structure in excess of 100 feet in length upstream to downstream which encloses a regulated water of the commonwealth.

**SUBAREA (SUBWATERSHED)**

The smallest drainage unit of a watershed for which stormwater management criteria have been established in the stormwater management plan.

**SUBDIVISION**

The division or redivision of a lot, tract, or parcel of land by any means into two or more lots, tracts, parcels, or other divisions of land including changes in existing lot lines for the purpose, whether immediate or future, of lease, partition by the court for distribution to heirs or devisees, transfer of ownership, or building or lot development; provided, however, that the subdivision by lease of land for agricultural purposes into parcels of more than 10 acres not involving any new street or easement of access or any residential dwelling shall be exempted.

**SURFACE WATERS OF THE COMMONWEALTH**

Any and all rivers, streams, creeks, rivulets, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface waters, or parts thereof, whether natural or artificial, within or on the boundaries of the commonwealth.

**SWALE**

A low-lying stretch of land that gathers or carries surface water runoff.

**TIMBER OPERATIONS**

See "forest management."

**TIME-OF-CONCENTRATION (TC)**

The time required for surface runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. This time is the combined total of overland flow time and flow time in pipes or channels, if any.

**TOP-OF-BANK**

Highest point of elevation in a stream channel cross-section at which a rising water level just begins to flow out of the channel and over the floodplain.

**UNDEVELOPED CONDITION**

Natural condition (see also "predevelopment condition").

**VERNAL POND**

Seasonal depressional wetlands that are covered by shallow water for variable periods from winter to spring but may be completely dry for most of the summer and fall.

**WATERCOURSE**

A channel or conveyance of surface water having a defined bed and banks, whether natural or artificial, with perennial or intermittent flow.

## **WATERS OF THE COMMONWEALTH**

Any and all rivers, streams, creeks, rivulets, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of the commonwealth.

## **WATERSHED**

Region or area drained by a river, watercourse, or other body of water, whether natural or artificial.

## **WELLHEAD**

A. A structure built over a well, B. The source of water for a well.

## **WELLHEAD PROTECTION AREA**

The surface and subsurface area surrounding a water supply well, well field, or spring supplying a public water system through which contaminants are reasonably likely to move toward and reach the water source.

## **WET BASIN**

Pond for urban runoff management that is designed to detain urban runoff and always contains water.

## **WETLAND**

Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, fens, and similar areas.

## **WOODS**

A natural ground cover with more than one viable tree of a dbh of six inches or greater per 1,500 square feet which existed within three years of application; a cover condition for which SCS curve numbers have been assigned or to which equivalent Rational Method runoff coefficients have been assigned.

## **Part 3**

# **DRAINAGE PLAN REQUIREMENTS**

### **§ 23-301 General Requirements.**

**[Ord. 07-07, 7/23/2007, § 301]**

For any of the activities regulated by this chapter, the preliminary or final approval of subdivision and/or land development plans, the issuance of any building or occupancy permit, or the commencement of any earth disturbance activity may not proceed until the property owner or applicant or his/her agent has received written approval of a drainage plan from New Hanover Township, obtained an NPDES permit for stormwater discharges associated with construction activities, if greater than one acre of land disturbance, from the local Conservation District and/or DEP, and an adequate erosion and sediment control plan review by the Conservation District.

### **§ 23-302 Drainage Plan Contents.**

**[Ord. 07-07, 7/23/2007, § 302]**

1. The drainage plan shall consist of a general description of the project including sequencing items

described in § **23-404**, calculations, maps, and plans. A note on the maps shall refer to the associated computations and erosion and sediment control plan by title and date. The cover sheet of the computations, erosion and sediment control plan, and post-construction stormwater management (PCSWM) plan shall refer to the associated maps by title and date. All drainage plan materials shall be submitted to New Hanover Township in a format that is clear, concise, legible, neat, and well organized; otherwise, the drainage plan shall not be accepted for review and shall be returned to the applicant. The drainage plan shall be provided to the Township in electronic, digital format as required by the Township. When so required by the Township, the plan shall be prepared by a licensed professional engineer.

2. The following items shall be included in the drainage plan:

A. General.

- (1) General description of the project including those areas described in § **23-404**, Subsection 2.
- (2) General description of proposed permanent stormwater management techniques, including construction specifications of the materials to be used for stormwater management facilities.
- (3) Complete hydrologic, hydraulic, and structural computations for all stormwater management facilities.
- (4) An erosion and sediment control plan, including all reviews and letters of adequacy from the Conservation District.
- (5) A general description of proposed nonpoint source pollution controls.
- (6) The drainage plan application and completed fee schedule form and associated fee (Appendix 23-B-1).
- (7) The drainage plan checklist (Appendix 23-B-2).

B. Maps. Map(s) of the project area shall be submitted on twenty-four-inch by thirty-six-inch sheets and/or shall be prepared in a form that meets the requirements for recording at the offices of the Recorder of Deeds of Montgomery County. If the SALDO has more stringent criteria than this chapter, then the more stringent criteria shall apply. The contents of the map(s) shall include, but not be limited to:

- (1) The location of the project relative to highways, municipal boundaries, or other identifiable landmarks.
- (2) Existing contours at intervals of two feet. In areas of slopes greater than 4%, five-foot contour intervals may be used.
- (3) Existing streams, lakes, ponds, or other waters of the commonwealth within the project area.
- (4) Other physical features including flood hazard boundaries, stream buffers, existing drainage courses, areas of natural vegetation to be preserved, and the total extent of the upstream area draining through the site.
- (5) The locations of all existing and proposed utilities, sanitary sewers, and water lines within 200 feet of property lines.
- (6) An overlay showing soil names, boundaries and limitations (in tabular format).
- (7) Limits of earth disturbance, including the type and amount of impervious area that would be added.

- (8) Proposed structures, roads, paved areas, and buildings.
- (9) Final contours at intervals of two feet. In areas of steep slopes (greater than 4%), five-foot contour intervals may be used.
- (10) The name of the development, the name and address of the owner of the property, and the name of the individual or firm preparing the plan.
- (11) The date of submission.
- (12) A graphic and written scale of one inch equals no more than 50 feet; for tracts of 20 acres or more, the scale shall be one inch equals no more than 100 feet.
- (13) A north arrow.
- (14) The total tract boundary and size with distances marked to the nearest foot and bearings to the nearest degree.
- (15) Existing and proposed land use(s).
- (16) A key map showing all existing man-made features beyond the property boundary that would be affected by the project.
- (17) Location of all open channels, as well as indicating where they are draining after they leave the site (storm sewer, defined drainage swale, stream channel, waters of the commonwealth, etc.).
- (18) Overland drainage patterns and swales.
- (19) A twenty-foot wide access easement around all stormwater management facilities that would provide ingress to and egress from a public right-of-way.
- (20) The location of all erosion and sediment control facilities and all postconstruction stormwater management facilities, BMPs, systems, etc.
- (21) A note on the plan indicating the location and responsibility for maintenance of stormwater management facilities that would be located off site. All offsite facilities shall meet the performance standards and design criteria specified in this chapter.
- (22) A statement, signed by the applicant, acknowledging that any revision to the approved post-construction stormwater management plan must be approved by the New Hanover Township and the Conservation District and/or DEP (if greater than one acre of land disturbance), and that a revised erosion and sediment control plan must be submitted to the Conservation District for a determination of adequacy.
- (23) The following signature block for the design engineer:

"I, (design engineer), on this date (date of signature), hereby certify that the drainage plan meets all design standards and criteria of the New Hanover Township Stormwater Management Ordinance."

C. Supplemental Information To Be Submitted to New Hanover Township.

- (1) A written description of the following information shall be submitted by the applicant and shall include:
  - (a) The overall stormwater management concept for the project designed in accordance with § **23-404**.

- (b) Stormwater runoff computations as specified in this chapter.
- (c) Stormwater management techniques to be applied both during and after development.
- (d) Expected project time schedule.
- (e) Development stages or project phases, if so proposed.
- (f) An operations and maintenance plan in accordance with § **23-702** of this chapter.
- (2) An erosion and sediment control plan.
- (3) A description of the effect of the project (in terms of runoff volumes and peak flows) on adjacent properties and on any existing municipal stormwater collection system that may receive runoff from the project site.
- (4) A declaration of adequacy and highway occupancy permit from the Pennsylvania Department of Transportation (PennDOT) District office when utilization of a PennDOT storm drainage system is proposed.

**D. Stormwater Management Facilities.**

- (1) All PCSWM BMP facilities must be located on a plan and described in detail. The PCSWM plan package should include at a minimum pre- and post-drainage area plans, an overall PCSWM plan, PCSWM details sheets, landscaping or conservation plans, etc.
- (2) When infiltration measures such as seepage pits, beds, or trenches are used, the locations of existing and proposed septic tank, infiltration areas and wells must be shown. Minimum setback distances should be identified from water supply wells, septic areas, and any adjacent or down-gradient buildings and/or structures with below grade floors or inhabitable space.
- (3) All calculations, assumptions, and criteria used in the design of the stormwater management facilities must be shown.

**§ 23-303 Plan Submission.**

**[Ord. 07-07, 7/23/2007, § 303]**

- 1. New Hanover Township shall require receipt of a complete drainage plan, as specified in this chapter.
  - A. Proof of application or documentation of required permit(s) or approvals for the programs listed below shall be part of the plan:
    - (1) NPDES permit for stormwater discharges from construction activities.
    - (2) DEP joint permit application.
    - (3) PennDOT highway occupancy permit.
    - (4) Chapter 105, "Dam Safety and Waterway Management."
    - (5) Chapter 106, "Floodplain Management."
    - (6) Any other permit under applicable state or federal regulations.
  - B. The plan shall be coordinated with the state and federal permit process and the municipal SALDO

review process.

- C. For projects that require SALDO approval, the drainage plan shall be submitted by the applicant as part of the preliminary, plan submission where applicable for the regulated activity.
- D. For regulated activities that do not require SALDO approval, see § **23-301**, General Requirements.
- E. Six copies of the drainage plan shall be submitted and distributed as follows:
  - (1) Two copies to New Hanover Township accompanied by the requisite municipal review fee, as specified in this chapter.
  - (2) Two copies to the County Conservation District.
  - (3) One copy to the municipal engineer.
  - (4) One copy to the County Planning Commission/Department.
- F. Any submissions to the agencies listed above that are found to be incomplete shall not be accepted for review and shall be returned to the applicant with a notification in writing of the specific manner in which the submission is incomplete.

**§ 23-304 Drainage Plan Review.**  
**[Ord. 07-07, 7/23/2007, § 304]**

- 1. The municipal engineer shall review the drainage plan for consistency with this chapter and the respective Act 167 Stormwater Management Plan. Any found incomplete shall not be accepted for review and shall be returned to the applicant.
- 2. The municipal engineer shall review the drainage plan for any subdivision or land development against the municipal SALDO provisions not otherwise superseded by this chapter.
- 3. The Conservation District, in accordance with established criteria and procedures, shall review the drainage plan for consistency with stormwater management and erosion and sediment pollution control requirements and provide comments to New Hanover Township. Such comments shall be considered by New Hanover Township prior to final approval of the drainage plan.
- 4. For activities regulated by this chapter, the municipal engineer shall notify the applicant and New Hanover Township in writing, within 90 calendar days, whether the drainage plan is consistent with the Act 167 Stormwater Management Plan.
  - A. If the municipal engineer determines that the drainage plan is consistent with the Act 167 Stormwater Management Plan, the municipal engineer shall forward a letter of consistency to the municipal secretary who will then forward a copy to the applicant.
  - B. If the municipal engineer determines that the drainage plan is inconsistent or noncompliant with the Act 167 Stormwater Management Plan, the municipal engineer shall forward a letter to the municipal secretary with a copy to the applicant citing the reason(s) and specific chapter sections for the inconsistency or noncompliance. Inconsistency or noncompliance may be due to inadequate information to make a reasonable judgment as to compliance with the Act 167 Stormwater Management Plan. Any drainage plans that are inconsistent or noncompliant may be revised by the applicant and resubmitted when consistent with this chapter. The municipal secretary shall then notify the applicant of the municipal engineer's findings. Any inconsistent or noncompliant drainage plans may be revised by the applicant and resubmitted consistent with this chapter.
- 5. For regulated activities specified in § **23-105** of this chapter that require a building permit, the

municipal engineer shall notify the municipal building permit officer in writing, within a time frame consistent with the municipal Building Code and/or municipal SALDO, whether the drainage plan is consistent with the Act 167 Stormwater Management Plan. The municipal building permit officer shall forward a copy of the consistency/inconsistency letter to the applicant. Any drainage plan deemed inconsistent may be revised by the applicant and resubmitted consistent with this chapter.

6. For regulated activities under this chapter that require an NPDES permit application, the applicant shall forward a copy of the municipal engineer's letter stating that the drainage plan is consistent with the Act 167 Stormwater Management Plan to the Conservation District and/or DEP. In addition, a short summary of the proposed post-construction stormwater management design and proposed BMPs should also be forwarded to the Conservation District and/or DEP. DEP and the Conservation District may consider the municipal engineer's review comments in determining whether to issue a permit.
7. New Hanover Township shall not grant preliminary or final approval to any subdivision or land development for regulated activities specified in § **23-105** of this chapter if the drainage plan has been found by the municipal engineer to be inconsistent with the Act 167 Stormwater Management Plan. All required permits from DEP must be obtained prior to approval of any subdivision or land development.
8. No building permit for any regulated activity specified in § **23-105** of this chapter shall be approved by New Hanover Township if the drainage plan has been found to be inconsistent with the Act 167 Stormwater Management Plan, as determined by the municipal engineer and Conservation District, or without considering the comments of the municipal engineer and Conservation District. All required permits from DEP must be obtained prior to issuance of a building permit.
9. The applicant shall be responsible for completing record drawings of all stormwater management facilities included in the approved drainage plan. The record drawings and an explanation of any discrepancies with the design plans shall be submitted to the municipal engineer for final approval. In no case shall New Hanover Township approve the record drawings until New Hanover Township receives a copy of an approved declaration of adequacy and/or highway occupancy permit from the PennDOT District office, NPDES permit, and any other applicable permits or approvals from DEP or the Conservation District. The above permits and approvals must be based on the record drawings.
10. New Hanover Township's approval of a drainage plan shall be valid for a period not to exceed five years commencing on the date that New Hanover Township signs the approved drainage plan. If stormwater management facilities included in the approved drainage plan have not been constructed, or if constructed, record drawings of these facilities have not been approved within this five-year time period, then New Hanover Township may consider the drainage plan inconsistent or noncompliant and may revoke any and all permits. Drainage plans that are determined to be inconsistent or noncompliant by New Hanover Township shall be resubmitted in accordance with § **23-306**.

**§ 23-305 Modification of Plans.**

**[Ord. 07-07, 7/23/2007, § 305]**

1. A modification to a submitted drainage plan under review by New Hanover Township for a development site that involves the following shall require a resubmission to New Hanover Township of a modified drainage plan consistent with § **23-303** of this chapter and be subject to review as specified in § **23-304** of this chapter:
  - A. Change in stormwater management facilities or techniques.
  - B. Relocation or redesign of stormwater management facilities.
  - C. Is necessary because soil or other conditions are not as stated on the drainage plan as determined by

the municipal engineer.

2. A modification to an already approved or inconsistent or noncompliant drainage plan shall be submitted to New Hanover Township, accompanied by the applicable municipal review and inspection fee. A modification to a drainage plan for which a formal action has not been taken by New Hanover Township shall be submitted to New Hanover Township accompanied by the applicable municipal review and inspection fee.

**§ 23-306 Resubmission of Inconsistent or Noncompliant Drainage Plans.**  
**[Ord. 07-07, 7/23/2007, § 306]**

An inconsistent or noncompliant drainage plan may be resubmitted with the revisions addressing the municipal engineer's concerns documented in writing. It must be addressed to the municipal secretary in accordance with § 23-303 of this chapter, distributed accordingly, and be subject to review as specified in § 23-304 of this chapter. The applicable municipal review and inspection fee must accompany a resubmission of an inconsistent or noncompliant drainage plan.

## Part 4

# STORMWATER MANAGEMENT

**§ 23-401 General Requirements.**  
**[Ord. 07-07, 7/23/2007, § 401]**

1. Applicants proposing regulated activities in New Hanover Township that do not fall under the exemption criteria shown in § 23-106 shall submit a drainage plan consistent with this chapter and the respective Act 167 Stormwater Management Plan to New Hanover Township for review. The stormwater management criteria of this chapter shall apply to the total proposed development even if development is to take place in stages.
2. The applicant is required to find practicable alternatives to the surface discharge of stormwater, the creation of impervious surfaces, and the degradation of waters of the commonwealth and must maintain as much as possible the natural hydrologic regime.
3. The drainage plan must be designed consistent with the sequencing provisions of § 23-404 to ensure maintenance of the natural hydrologic regime, to promote groundwater recharge, and to protect groundwater and surface water quality and quantity. The drainage plan designer must proceed sequentially in accordance with Part 4 of this chapter.
4. Stormwater drainage systems shall be designed in order to permit unimpeded flow along natural watercourses, except as modified by stormwater management facilities or open channels consistent with this chapter.
5. Existing points of concentrated drainage that discharge onto adjacent property shall not be altered in any manner which could cause property damage without permission of the affected property owner(s) and shall be subject to any applicable discharge criteria specified in this chapter.
6. Areas of existing diffused drainage discharge, whether proposed to be concentrated or maintained as diffused drainage areas, shall be subject to any applicable discharge criteria in the general direction of existing discharge, except as otherwise provided by this chapter. If diffused drainage discharge is proposed to be concentrated and discharged onto adjacent property, the applicant must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge or otherwise prove that no erosion, sedimentation, flooding, or other impacts will result from the concentrated discharge.
7. Where a development site is traversed by existing streams, drainage easements shall be provided

conforming to the line of such streams. The terms of the easement shall conform to the stream buffer requirements contained in § **23-406**, Subsection 1G, of this chapter.

8. Any stormwater management facilities regulated by this chapter that would be located in or adjacent to waters of the commonwealth or delineated wetlands shall be subject to approval by DEP through the joint permit application or the environmental assessment approval process, or where deemed appropriate, by the DEP general permit process. When there is a question as to whether wetlands may be involved, it is the responsibility of the applicant or his agent to show that the land in question cannot be classified as wetlands; otherwise, approval to work in the area must be obtained from DEP.
9. Any proposed stormwater management facilities regulated by this chapter that would be located on state highway rights-of-way shall be subject to approval by PennDOT.
10. Minimization of impervious surfaces and infiltration of runoff through seepage beds, infiltration trenches, etc., is encouraged where soil conditions permit in order to reduce the size or eliminate the need for detention facilities or other structural BMPs.
11. All stormwater runoff shall be pretreated for water quality prior to discharge to surface or groundwater.
12. All regulated activities within New Hanover Township shall be designed, implemented, operated, and maintained to meet the purposes of this chapter, through these two elements:
  - A. Erosion and sediment control during earth disturbance activities (e.g., during construction).
  - B. Water quality protection measures after completion of earth disturbance activities (i.e., after construction), including operations and maintenance.
13. No regulated earth disturbance activities within New Hanover Township shall commence until the requirements of this chapter are met.
14. Post-construction water quality protection shall be addressed as required by § **23-406**.
15. Operations and maintenance of permanent stormwater BMPs shall be addressed as required by Part 7.
16. All BMPs used to meet the requirements of this chapter shall conform to the state water quality requirements and any more stringent requirements as set forth by New Hanover Township.
17. Techniques described in Appendix 23-C, "Low Impact Development," of this chapter shall be considered because they reduce the costs of complying with the requirements of this chapter and the state water quality requirements.
18. In selecting the appropriate BMPs or combinations thereof, the applicant shall consider the following:
  - A. Total contributing area.
  - B. Permeability and infiltration rate of the site's soils.
  - C. Slope and depth to bedrock.
  - D. Seasonal high water table.
  - E. Proximity to building foundations and wellheads.

- F. Erodibility of soils.
- G. Land availability and configuration of the topography.
- H. Peak discharge and required volume control.
- I. Stream bank erosion.
- J. Effectiveness of the BMPs to mitigate potential water quality problems.
- K. The volume of runoff that will be effectively treated.
- L. The nature of the pollutant being removed.
- M. Maintenance requirements.
- N. Creation/protection of aquatic and wildlife habitat.
- O. Recreational value.
- P. The applicant may meet the stormwater management criteria through off-site stormwater management measures as long as the proposed measures are in the same subwatershed as shown in Appendix 23-A.

**§ 23-402 Permit Requirements by Other Governmental Entities.  
[Ord. 07-07, 7/23/2007, § 402]**

1. The following permit requirements may apply to certain regulated earth disturbance activities and must be met prior to commencement of regulated earth disturbance activities, as applicable:
  - A. All regulated earth disturbance activities subject to permit requirements by DEP under regulations at 25 Pa. Code, Chapter 102.
  - B. Work within natural drainageways subject to permit by DEP under 25 Pa. Code, Chapter 105.
  - C. Any stormwater management facility that would be located in or adjacent to surface waters of the commonwealth, including wetlands, subject to permit by DEP under 25 Pa. Code, Chapter 105.
  - D. Any stormwater management facility that would be located on a state highway right-of-way or require access from a state highway shall be subject to approval by PennDOT.
  - E. Culverts, bridges, storm sewers, or any other facilities which must pass or convey flows from the tributary area and any facility which may constitute a dam subject to permit by DEP under 25 Pa. Code, Chapter 105.

**§ 23-403 Erosion and Sediment Control During Regulated Earth Disturbance Activities.  
[Ord. 07-07, 7/23/2007, § 403]**

1. No regulated earth disturbance activities within New Hanover Township shall commence until New Hanover Township receives an approval from the Conservation District of an erosion and sediment control plan for construction activities.
2. DEP has regulations that require an erosion and sediment control plan for any earth disturbance activity of 5,000 square feet or more, under 25 Pa. Code § 102.4(b).
3. In addition, under 25 Pa. Code, Chapter 92, a DEP permit for stormwater discharges associated with

construction activities is required for land disturbances greater than one acre.

4. Evidence of any necessary permit(s) for regulated earth disturbance activities from the appropriate DEP regional office or County Conservation District must be provided to New Hanover Township.
5. A copy of the erosion and sediment control plan and any required permit, as required by DEP regulations, shall be available on the project site at all times.
6. Additional erosion and sediment control design standards and criteria are recommended to be applied where infiltration BMPs are proposed. They shall include the following:
  - A. Areas proposed for infiltration BMPs shall be protected from sedimentation and compaction during the construction phase to maintain maximum infiltration capacity. Additional measures, such as placement of orange construction fencing around proposed Infiltration BMPs during construction to minimize or eliminate traffic overtop of these areas, and temporary sealing off of pipes and inlet connections to Infiltration BMPs to prevent sediment clogging should be given consideration.
  - B. Infiltration BMPs shall not be constructed nor receive runoff until the entire drainage area contributory to the infiltration BMP has achieved final stabilization.

**§ 23-404 Nonstructural Project Design (Sequencing to Minimize Stormwater Impacts).  
[Ord. 07-07, 7/23/2007, § 404]**

1. The design of all regulated activities shall include the following to minimize stormwater impacts.
  - A. The applicant shall find practicable alternatives to the surface discharge of stormwater, such as those listed in Appendix 23-D, Table 23-D-4, [1] the creation of impervious surfaces, and the degradation of waters of the commonwealth and must maintain as much as possible the natural hydrologic regime of the site.
  - B. An alternative is practicable if it is available and capable of implementation after taking into consideration existing technology and logistics in light of overall project purposes and other municipal requirements.
  - C. All practicable alternatives to the discharge of stormwater are presumed to have less adverse impact on quantity and quality of waters of the commonwealth unless otherwise demonstrated.
2. The applicant shall demonstrate that the regulated activities were designed in the following sequence. The goal of the sequence is to minimize the increases in stormwater runoff and impacts to water quality resulting from the proposed regulated activity:
  - A. Prepare an existing resource and site analysis map (ERSAM) showing environmentally sensitive areas including, but not limited to, steep slopes, ponds, lakes, streams, wetlands, hydric soils, vernal pools, stream buffers, hydrologic soil groups, wooded areas, and potential infiltration areas. Land development, any existing recharge areas, and other requirements outlined in Chapter 22, Subdivision and Land Development, shall also be included.
  - B. Establish a stream buffer according to § 23-406, Subsection 1G.
  - C. Prepare a draft project layout avoiding sensitive areas identified in § 23-404, Subsection 2A.
  - D. Identify site-specific existing conditions drainage areas, discharge points, recharge areas, and hydrologic soil groups A and B (areas conducive to infiltration). Infiltration should still be considered in well draining soils listed as hydrologic soil group C, but additional soils testing should be performed to verify onsite conditions and placement of these BMPs.

- E. Evaluate nonstructural stormwater management alternatives:
  - (1) Minimize earth disturbance.
  - (2) Minimize impervious surfaces.
  - (3) Break up large impervious surfaces.
- F. Satisfy the groundwater recharge (infiltration) objective § **23-405** and provide for stormwater pretreatment prior to infiltration.
- G. Provide for water quality protection in accordance with § **23-406** water quality requirements.
- H. Provide stream bank erosion protection in accordance with § **23-407** stream bank erosion requirements.
- I. Determine into what management district the site falls (Appendix 23-A) and conduct an existing conditions runoff analysis.
- J. Prepare final project design to maintain existing conditions drainage areas and discharge points, to minimize earth disturbance and impervious surfaces, and, to the maximum extent possible, to ensure that the remaining site development has no surface or point discharge.
- K. Conduct a proposed conditions runoff analysis based on the final design that meets the management district requirements (§ **23-408**).
- L. Manage any remaining runoff prior to discharge through detention, bioretention, direct discharge, or other structural control.

**§ 23-405 Groundwater Recharge.**  
**[Ord. 07-07, 7/23/2007, § 405]**

- 1. Maximizing the groundwater recharge capacity of the area being developed is required. Design of the infiltration facilities shall consider groundwater recharge to compensate for the reduction in the recharge that occurs when the ground surface is disturbed or impervious surface is created. It is recommended that roof runoff be directed to infiltration BMPs that maybe designed to compensate for the runoff from parking areas. These measures are required to be consistent with § **23-103** and to take advantage of utilizing any existing recharge areas. Infiltration may not be feasible on every site due to site-specific limitations such as soil type. If it cannot be physically accomplished, then the design professional shall be responsible to show that this cannot be physically accomplished. Appropriate soils testing and/or geotechnical evaluation should be included as part of any documentation for infiltration BMPs. If it can be physically accomplished, then the volume of runoff to be infiltrated shall be determined from § **23-405**, Subsection **1A(2)**.
  - A. Infiltration BMPs shall meet the following minimum requirements:
    - (1) Infiltration BMPs intended to receive runoff from developed areas shall be selected based on suitability of soils and site conditions and shall be constructed on soils that have the following characteristics:
      - (a) A minimum depth of 24 inches, preferably 36 inches, between the bottom of the BMP and the top of the limiting zone (e.g., SHWT, groundwater, bedrock, etc.).
      - (b) An infiltration rate sufficient to accept the additional stormwater load and dewater completely as determined by field tests conducted by the applicant's design professional.

- (c) The infiltration facility shall be capable of completely infiltrating the recharge (infiltration) volume (Rev) within three days (72 hours) or less.
  - (d) Pretreatment shall be provided prior to infiltration.
- (2) The size of the infiltration facility shall be based upon the Net Two Year Volume Approach, where the recharge (infiltration) volume (Rev) to be captured and infiltrated shall be the volume difference between the predevelopment two-year, twenty-four-hour storm event and post-development two-year, twenty-four-hour storm event. The recharge volume calculated using this section is the minimum volume the applicant must control through an infiltration BMP facility. However, if a site has areas of soils where additional volume of recharge can be achieved, the applicant is encouraged to infiltrate as much of the stormwater runoff from the site as possible.
- B. Soils. A detailed soils evaluation of the project site shall be required to determine the suitability of infiltration facilities. The evaluation shall be performed by a qualified design professional and at a minimum address soil permeability, depth to bedrock, and subgrade stability. The general process for designing the infiltration BMP shall be:
- (1) Analyze hydrologic soil groups as well as natural and man-made features within the site to determine general areas of suitability for infiltration practices. In areas where development on fill material is under consideration, conduct geotechnical investigations of subgrade stability; infiltration may not be ruled out without conducting these tests.
  - (2) Provide field tests such as double ring infiltrometer or hydraulic conductivity tests (at the level of the proposed infiltration surface) to determine the appropriate hydraulic conductivity rate. Percolation tests are not recommended for design purposes.
  - (3) Design the infiltration structure for the required recharge (Rev) volume based on field determined capacity at the level of the proposed infiltration surface.
  - (4) If on-lot infiltration structures are proposed by the applicant's design professional, it must be demonstrated to New Hanover Township that the soils are conducive to infiltrate on the lots identified.
- C. Stormwater Hotspots. Below is a list of examples of designated hotspots. If a site is designated as a hotspot, it has important implications for how stormwater is managed. First and foremost, untreated stormwater runoff from hotspots shall not be allowed to recharge into groundwater where it may contaminate water supplies. Therefore, the Rev requirement shall not be applied to development sites that fit into the hotspot category (the entire WQv must still be treated). Second, a greater level of stormwater treatment shall be considered at hotspot sites to prevent pollutant washoff after construction. The Environmental Protection Agency's (EPA) NPDES stormwater program requires some industrial sites to prepare and implement a stormwater pollution prevention plan.
- (1) Examples of hotspots:
    - (a) Vehicle salvage yards and recycling facilities.
    - (b) Vehicle fueling stations.
    - (c) Vehicle service and maintenance facilities.
    - (d) Vehicle and equipment cleaning facilities.
    - (e) Fleet storage areas (bus, truck, etc.).
    - (f) Industrial sites based on standard industrial codes.

- (g) Marinas (service and maintenance).
  - (h) Outdoor liquid container storage.
  - (i) Outdoor loading/unloading facilities.
  - (j) Public works storage areas.
  - (k) Facilities that generate or store hazardous materials.
  - (l) Commercial container nursery.
  - (m) Other land uses and activities as designated by an appropriate review authority.
- (2) The following land uses and activities are not normally considered hotspots:
- (a) Residential streets and rural highways.
  - (b) Residential development.
  - (c) Institutional development.
  - (d) Office developments.
  - (e) Nonindustrial rooftops.
  - (f) Pervious areas, except golf courses and nurseries (which may need an integrated pest management (IPM) plan).
- (3) While large highways (average daily traffic volume (ADT) greater than 30,000 are not designated as stormwater hotspots, it is important to ensure that highway stormwater management plans adequately protect groundwater.
- D. Extreme caution shall be exercised where infiltration is proposed in SWPAs as defined by the local municipality or water authority.
- E. Infiltration facilities shall be used in conjunction with other innovative or traditional BMPs, stormwater control facilities, and nonstructural stormwater management alternatives.
- F. Extreme caution shall be exercised where salt or chloride (municipal salt storage) would be a pollutant since soils do little to filter this pollutant, and it may contaminate the groundwater. The qualified design professional shall evaluate the possibility of groundwater contamination from the proposed infiltration facility and perform a hydrogeologic justification study if necessary. Specific consideration should be given to the particular type of salt or deicing material to be used within this watershed in regards to its potential long-term effects on the soils, especially in areas that contain clay soil.
- G. The infiltration requirement in HQ or EV waters shall be subject to the Department's, 25 Pa. Code, Chapter 93, anti-degradation regulations.
- H. An impermeable liner will be required in detention basins where the possibility of groundwater contamination exists. A detailed hydrogeologic investigation maybe required by New Hanover Township.
- I. New Hanover Township shall require the applicant to provide safeguards against groundwater contamination for land uses that may cause groundwater contamination should there be a mishap or

spill.

**§ 23-406 Water Quality Requirements.**  
**[Ord. 07-07, 7/23/2007, § 406]**

1. The applicant shall comply with the following water quality requirements of this part, regardless of whether or not the affected property is located in the Swamp Creek Watershed.
  - A. No regulated earth disturbance activities within New Hanover Township shall commence until approval by New Hanover Township of a plan that demonstrates compliance with postconstruction state water quality requirements.
  - B. The BMPs shall be designed, implemented, and maintained to meet state water quality requirements and any other more stringent requirements as determined by New Hanover Township.
  - C. To control post-construction stormwater impacts from regulated earth disturbance activities, state water quality requirements can be met by BMPs, including site design, which provide for replication of pre-construction stormwater infiltration and runoff conditions so that post-construction stormwater discharges do not degrade the physical, chemical, or biological characteristics of the receiving waters. As described in the DEP Comprehensive Stormwater Management Policy (#392-0300-002, September 28, 2002), this may be achieved by the following:
    - (1) Infiltration. Replication of pre-construction stormwater infiltration conditions.
    - (2) Treatment. Use of water quality treatment BMPs to ensure filtering out of the chemical and physical pollutants from the stormwater runoff.
    - (3) Stream Bank and Stream Bed Protection. Management of volume and rate of post-construction stormwater discharges to prevent physical degradation of receiving waters (e.g., from scouring).
  - D. Developed areas shall provide adequate storage and treatment facilities necessary to capture and treat stormwater runoff. If site conditions allow for infiltration, the water quality volume and the recharge volume are the same volume and may be managed in a single facility. If infiltration can not be physically accomplished, the water quality volume should be calculated using the Net two year Volume Approach described in § 23-405, Subsection 1A(2). In this case, the water quality volume may be captured and treated by methods other than infiltration BMPs.
    - (1) This volume requirement can be accomplished by the permanent volume of a wet basin or the detained volume from other BMPs. Where appropriate, wet basins shall be utilized for water quality control and shall follow the guidelines of the BMP manuals referenced in Appendix 23-E.
    - (2) The water quality volume shall take a minimum of 24 hours to be discharged from a BMP facility. Release of the water quality volume can begin at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility). The design of the facility shall provide for protection from clogging and unwanted sedimentation.
  - E. For areas within defined special protection subwatersheds that include EV and HQ waters, the temperature and quality of water and streams shall be maintained through the use of temperature sensitive BMPs and stormwater conveyance systems.
  - F. To accomplish the above, the applicant shall submit original and innovative designs to the municipal engineer for review and approval. Such designs may achieve the water quality objectives through a combination of different BMPs.
  - G. If a perennial or intermittent stream passes through the site, the applicant shall create a stream buffer extending a minimum of 50 feet to either side of the top-of-bank of the channel. The buffer area shall

be maintained with and encouraged to use appropriate native vegetation (refer to Appendix A of the Pennsylvania Stormwater Best Management Practices Manual, latest version, for plant lists). If the applicable rear or side yard setback is less than 50 feet or a stream traverses the site, the buffer width may be reduced to 25% of the setback and/or to a minimum of 10 feet. If an existing buffer is legally prescribed (i.e., deed, covenant, easement, etc.) and it exceeds the requirements of this chapter, the existing buffer shall be maintained. This does not include lakes or wetlands.

- H. Evidence of any necessary permit(s) for regulated earth disturbance activities from the appropriate DEP regional office and/or the Montgomery County Conservation District must be provided to New Hanover Township.

**§ 23-407 Stream Bank Erosion Requirements.**  
**[Ord. 07-07, 7/23/2007, § 407]**

1. In addition to the control of water quality volume (in order to minimize the impact of stormwater runoff on downstream stream bank erosion), the primary requirement is to design a BMP to detain the proposed conditions two-year, twenty-four-hour design storm to the existing conditions one year flow using the SCS Type II distribution. Additionally, provisions shall be made (such as adding a small orifice at the bottom of the outlet structure) so that the proposed conditions one-year storm takes a minimum of 24 hours to drain from the facility from a point where the maximum volume of water from the one-year storm is captured (i.e., the maximum water surface elevation is achieved in the facility). Release of water can begin at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility).
2. The minimum orifice size in the outlet structure to the BMP shall be three inches in diameter where possible, and a trash rack shall be installed to prevent clogging. On sites with small drainage areas contributing to this BMP that do not provide enough runoff volume to allow a twenty-four-hour attenuation with the three-inch orifice, the calculations shall be submitted showing this condition. Orifice sizes less than three inches can be utilized, provided that the design will prevent clogging of the intake.

**§ 23-408 Stormwater Peak Rate Control.**  
**[Ord. 07-07, 7/23/2007, § 408]**

1. Within the Swamp Creek watershed, the criteria for peak runoff control are designed to reduce the post-development peak flow to 50% of the pre-development peak flow. Development sites must control proposed conditions runoff rates to 50% of the existing conditions runoff rates for the two-year, five-year, ten-year, twenty-five-year, fifty-year, and one-hundred-year storm events.
2. The calculated peak discharges shall apply regardless of whether the grading plan changes the drainage area by subarea. An exception to the above may be granted if discharges from multiple subareas recombine in proximity to the site. In this case, peak discharge in any direction may be a 100% release rate, provided that the overall site discharge meets the weighted average release rate.
3. Off-Site Areas. Off-site areas that drain through a proposed development site are not subject to release rate criteria when determining allowable peak runoff rates. However, on-site drainage facilities shall be designed to safely convey off-site flows through the development site.
4. Site Areas. Where the site area to be impacted by a proposed development activity differs significantly from the total site area, only the proposed impact area utilizing stormwater management measures shall be subject to the peak rate control standards noted above. In other words, unimpacted areas bypassing the stormwater management facilities would not be subject to the peak rate control standards.
5. Alternate Criteria for Redevelopment Sites. For redevelopment sites, one of the following minimum design parameters shall be accomplished, whichever is most appropriate for the given site conditions

as determined by New Hanover Township:

- A. Meet the full requirements specified by Subsections 1 through 6.
  - B. Reduce the total impervious surface on the site by at least 20%, based upon a comparison of existing impervious surface to proposed impervious surface.
6. In areas of the Township not located within the Swamp Creek Watershed, the post development discharge rates must meet the requirements established in Subsection 1, unless authorized otherwise.

**§ 23-409 Calculation Methodology.  
[Ord. 07-07, 7/23/2007, § 409]**

1. Stormwater runoff from all development sites with a drainage area of greater than 200 acres shall be calculated using a generally accepted calculation technique that is based on the NRCS Soil Cover Complex Method. Table 23-409.1 summarizes acceptable computation methods, and the method selected by the design professional shall be based on the individual limitations and suitability of each method for a particular site. Note that successors to the methods listed in Table 23-409.1 are also acceptable, such as WinTR55 for TR-55 and WinTR20 for TR-20. New Hanover Township may allow the use of the Rational Method to estimate peak discharges from drainage areas that contain less than 200 acres. The Soil Cover Complex Method shall be used for drainage areas greater than 200 acres.

**Table 23-409.1**

**Acceptable Computation Methodologies for Stormwater Management Plans**

<b>Method</b>	<b>Developed By</b>	<b>Applicability</b>
TR-20 (or commercial computer package based on TR-20)	USDA NRCS	Applicable where use of full hydrology computer model is desirable or necessary
TR-55 (or commercial computer package based on TR-55)	USDA NRCS	Applicable for land development plans where limitations described in TR-55
HEC-1/HEC-HMS	US Army Corps of Engineers	Applicable where use of a full hydrologic computer is desirable or necessary
PSRM	Penn State University	Applicable where use of a hydrologic model is desirable or necessary; simpler than TR-20 or HEC-1
Rational Method (or commercial computer package based on Rational Method)	Emil Kuichling (1889)	For sites less than 200 acres, or as approved by New Hanover Township and/or municipal engineer
Other Methods	Varies	Other computation methodologies approved by New Hanover Township and/or municipal engineer

2. All calculations consistent with this chapter using the Soil Cover Complex Method shall use the

appropriate design rainfall depths for the various return period storms according to the region in which they are located as presented in Table D-1 in Appendix 23-D of this chapter. If a hydrologic computer model such as PSRM or HEC-1/HEC-HMS is used for stormwater runoff calculations, then the duration of rainfall shall be 24 hours.

3. The following criteria shall be used for runoff calculations:
  - A. For development sites not considered redevelopment, the ground cover used in determining the existing conditions flow rates shall be as follows:
    - (1) Wooded sites shall use a ground cover of "woods in good condition." A site shall be considered to be a wooded site where a biological community dominated by trees and other woody plants exists that covers an area of 10,000 square feet or more, and contains at least 100 trees with at least 50% of those trees having a dbh of two inches or greater. (Duerksen, Christopher J., with Suzanne Richman, Tree Conservation Ordinances, Planning Advisory Service Report Number 446, American Planning Association, Chicago, Illinois, and Scenic America, Washington, D.C., August, 1993.)
    - (2) The undeveloped portion of the site, including agriculture, bare earth, and fallow ground, shall be considered as "meadow in good condition," unless the natural ground cover generates a lower curve (CN) number or Rational "c" value (i.e., woods) as listed in Tables 23-D-2 or 23-D-3 in Appendix 23-D of this chapter.
    - (3) Offsite land use conditions used to determine storm, flows for designing storm facilities shall be based on existing land uses assuming winter or poor land cover conditions.
  - B. For development considered redevelopment sites, the ground cover used in determining the existing conditions flow rates for the developed portion of the site shall be based upon actual land cover conditions.
4. All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times of concentration for overland flow and return periods presented in the appropriate curves from the PennDOT Region four Storm-Duration-Frequency Chart. Times-of-concentration for overland flow shall be calculated using the methodology presented in Chapter 3 of Urban Hydrology for Small Watersheds, NRCS, TR-55 (as amended or replaced from time to time by NRCS). Times-of-concentration for channel and pipe flow shall be computed using Manning's equation.
5. Runoff curve numbers (CN) for both existing and proposed conditions to be used in the Soil Cover Complex Method shall be obtained from Table 23-D-2 in Appendix 23-D of this chapter.
6. Runoff coefficients (c) for both existing and proposed conditions for use in the Rational Method shall be obtained from Table 23-D-3 in Appendix 23-D of this chapter.
7. Where uniform flow is anticipated, the Manning equation shall be used for hydraulic computations and to determine the capacity of open channels, pipes, and storm sewers. Values for Manning's roughness coefficient (n) shall be consistent with accepted published values.
8. Outlet structures for stormwater management facilities shall be designed to meet the performance standards of this chapter using any generally accepted hydraulic analysis technique or method.
9. The design of any stormwater detention facilities intended to meet the performance standards of this chapter shall be verified by routing the design storm hydrograph through these facilities using the Storage-Indication Method. The design storm hydrograph shall be computed using a calculation method that produces a full hydrograph. New Hanover Township may approve the use of any generally accepted full hydrograph approximation technique that shall use a total runoff volume that is consistent with the volume from a method that produces a full hydrograph.

## § 23-410 Other Requirements.

1. Any stormwater management facility (i.e., detention basin) required or regulated by this chapter designed to store runoff and requiring a berm or earthen embankment shall be designed to provide an emergency spillway to handle flow up to and including the one-hundred-year proposed conditions. The upstream edge of the emergency spillway shall provide a minimum of six inches of freeboard to the crest of the emergency spillway and an additional one foot of freeboard above the flow through of the emergency spillway to the top of the embankment when the facility functions for the one-hundred-year proposed conditions inflow. Should any stormwater management facility require a dam safety permit under DEP, 25 Pa. Code, Chapter 105, the facility shall be designed in accordance with 25 Pa. Code, Chapter 105, and meet the regulations of Chapter 105 concerning dam safety. Chapter 105 may be required to pass storms larger than the one-hundred-year event.
2. Any facilities that constitute water obstructions (e.g., culverts, bridges, outfalls, or stream enclosures) and any work involving wetlands governed by DEP, 25 Pa. Code, Chapter 105, regulations (as amended or replaced from time to time by DEP) shall be designed in accordance with Chapter 105 and will require a permit from DEP.
3. Any other drainage conveyance facility that does not fall under 25 Pa. Code, Chapter 105, regulations must be able to convey, without damage to the drainage structure or roadway, runoff from the one-hundred-year design storm with a minimum one foot of freeboard measured below the lowest point along the top of the roadway unless waived by the Township Board of Supervisors. Any facility that constitutes a dam as defined in DEP Chapter 105 regulations may require a permit under dam safety regulations. Any facility located within a PennDOT right-of-way must meet PennDOT minimum design standards and permit submission requirements.
4. Any drainage conveyance facility and/or channel not governed by Chapter 105 regulations must be able to convey, without damage to the drainage structure or roadway, runoff from the twenty-five-year design storm. Conveyance facilities to or exiting from stormwater management facilities (i.e., detention basins) shall be designed to convey the design flow to or from that structure. Roadway crossings located within designated floodplain areas must be able to convey runoff from a one-hundred-year design storm. Any facility located within a PennDOT right-of-way must meet PennDOT minimum design standards and permit submission requirements.
5. Storm sewers must be able to convey proposed conditions runoff from a twenty-five-year design storm without surcharging inlets, where appropriate. Where overflow routes to stormwater basins are not provided, the sewers must be designed to capture and convey runoff from a one-hundred-year design storm.
6. Adequate erosion protection shall be provided along all open channels and at all points of discharge.
7. The design of all stormwater management facilities shall incorporate sound engineering principles and practices. New Hanover Township reserves the right to withhold approval for any design that would result in construction of or continuation of a stormwater problem area.
8. Any stormwater management facility (i.e., detention basin) required or regulated by this chapter designed to store runoff and requiring a berm or earthen embankment shall be designed to provide the following (at a minimum):
  - A. The maximum water depth shall not exceed six feet.
  - B. The minimum top width of all dams/embankments/berms shall be 10 feet.
  - C. The side slopes shall not be greater than five horizontal to one vertical.
  - D. All basins shall be structurally sound and shall be constructed of sound and durable materials. The completed structure and the foundation of all basins shall be stable under all probable conditions of

operation. An emergency spillway shall be provided for the basin and shall be capable of discharging the one-hundred-year peak rate of runoff that enters the basin after development, in a manner that will not damage the integrity of the facility and will not create a downstream hazard. The emergency spillway must be lined with a permanent erosion control liner. Where practical, the emergency spillway shall be constructed in undisturbed ground. An easement for inspection and repair shall be provided when the conveyance structure crosses property boundaries.

- E. All basins not including groundwater recharge and/or water quality storage shall include an outlet structure to permit draining the basin to a completely dry position within 24 hours following the end of the design rainfall. All basins that do include groundwater recharge and/or water quality storage shall include an outlet structure to permit draining the basin to the level of the groundwater recharge and/or water quality storage within 24 hours following the end of the design rainfall.
- F. A cutoff trench of relatively impervious material shall be provided within all basin embankments. Anti-seep collars shall be installed around the pipe barrel within the normal saturation zone of the detention basin berms. The anti-seep collars shall extend a minimum of two feet beyond the outside of the principal pipe barrel or provide a minimum of 15% increased flow length, whichever is greater.
- G. All structures passing through Detention Basin embankments shall have properly spaced concrete cutoff collars and all piping must be watertight. All structures passing through dam embankments shall have seepage diaphragms and drains.
- H. All discharge control devices with appurtenances shall be made of reinforced concrete and stainless or hot dip galvanized steel. Bolts/fasteners are to be stainless or galvanized steel.
- I. Low flow channels shall be provided from each water carrying facility to the outlet structure for all basins that do not include groundwater recharge and/or water quality storage. Low flow channels shall be 1% minimum slope and shall be designed to enable ease of maintenance. All basins that do include groundwater recharge and/or water quality storage shall not be required to have a low flow channel.
- J. Minimum slope within a basin that does not include groundwater recharge and/or water quality storage shall be 2% positive grade to the low flow channel.
- K. Design storms for the computation of retention basins (where approved) volumes shall be based upon a twenty-four-hour storm with one-hundred-year return period (a storm with a 1% chance of occurrence each year).
- L. The effect on downstream areas if the basin embankment fails shall be considered in the design of all basins. Where possible, the basin shall be designed to minimize the potential damage caused by such failure of the embankment.
- M. All structures (detention basins, cisterns, etc.), other than those used for groundwater recharge volume and water quality volume, must completely drain within 24 hours after the end of the design storm.
- N. Soils used for the construction of basins shall have low erodibility factors ("K" factors).
- 9. Minimum floor elevations for all structures that would be affected by a basin, other temporary impoundments, or open conveyance systems where ponding may occur shall be two feet above the one-hundred-year water surface. If basement or underground facilities are proposed, detailed calculations addressing the effects of stormwater ponding on the structure and waterproofing and/or flood-proofing design information shall be submitted for approval.
- 10. All storm sewer pipes, culverts and bridges (excluding detention and retention basin outfall

structures), gutters and swales conveying water originating only from within the boundaries of the development site shall be designed for a twenty-five-year storm event. All storm sewer pipes, culverts and bridges (excluding detention and retention basin outfall structures) conveying water originating from offsite shall be designed for a one-hundred-year storm event. Drainage easements shall be provided to contain and convey the one-hundred-year frequency flood throughout the development site. Easements shall begin at the furthest upstream property line of the proposed development site in a watershed.

11. A concentrated discharge of stormwater to an adjacent property shall be within an existing natural drainage way or watercourse or otherwise an easement shall be required.
12. Storm sewer pipes other than those used as roof drains, detention basin underdrains, and street subbase underdrains, shall have a minimum diameter of 15 inches and be made of reinforced concrete pipe. Where installation conditions merit, structural calculations that address the actual design requirements will be required.
13. Storm sewer pipes and culverts shall be installed on sufficient slopes to provide a minimum velocity of three feet per second when flowing full, but in no case shall the slope be less than 0.5%.
14. All storm sewer pipe and culverts shall be laid to a minimum depth of one foot from finished subgrade to the crown of pipe in paved areas and one foot from finished grade to the crown of pipe in grassed areas.
15. Curves in pipes or box culverts without an inlet or manhole are prohibited. Tee joints, elbows and wyes are also prohibited.
16. Manholes, inlets, headwalls and endwalls proposed for dedication or located along streets or subject to vehicular traffic, shall conform to the requirements of the PennDOT, Bureau of Design, "Standards for Roadway Construction," in effect at the time the design is submitted, or as otherwise modified by New Hanover Township.
17. Headwalls and endwalls shall be used where stormwater runoff enters or leaves the storm sewer horizontally from a natural or man-made channel. PennDOT Type "DW" headwalls and endwalls shall be utilized.
18. Stormwater roof drains, sump pumps, and pipes, shall not directly discharge water into a street right-of-way or discharge into a sanitary sewer or storm sewer.
19. All existing and natural watercourses, channels, drainage systems, wetlands and areas of surface water concentration shall be maintained in their existing condition unless an alteration is approved by New Hanover Township and any other necessary approving body.
20. Flow velocities from any storm sewer may not result in erosion of the receiving channel.
21. Energy dissipators shall be placed at the outlets of all storm sewer pipes, culverts, and bridges where flow velocities exceed maximum permitted channel velocities as specified below:
  - A. Three feet per second where only sparse vegetation can be established and maintained because of shade or soil condition.
  - B. Four feet per second where normal growing conditions exist and vegetation is to be established by seeding.
  - C. Five feet per second where a dense, vigorous sod can be quickly established or where water can be temporarily diverted during establishment of vegetation. Netting and mulch or the equivalent methods for establishing vegetation shall be used.

- D. Six feet per second where there exists a well established sod of good quality.
22. The following conditions shall be met for all swales:
- A. Capacities and velocities shall be computed using the Manning equation. The design parameters shall be as follows:
    - (1) Vegetated swales shall meet the following two design considerations:
      - (a) The first shall consider swale stability based upon a low degree of retardance ("n"=0.03).
      - (b) The second shall consider swale capacity based upon a high degree of retardance ("n"=0.05).
    - (2) All vegetated swales shall have a minimum slope of 1% unless approved by the municipal engineer.
    - (3) The "n" factors to be used for paved or rip-rap swales or gutters shall be based upon accepted engineering design practices as approved by New Hanover Township.
  - B. All swales shall be designed to concentrate low flows to minimize siltation and meandering.
23. Manning "n" values used for design of pipes and culverts shall be in accordance with accepted published values.
24. All storm sewer crossings of streets shall be perpendicular or nearly perpendicular to the street center line.
25. Storm facilities not located within a public right-of-way shall be contained in and centered within an easement that shall be a minimum of 20 feet wide. Easements shall follow property boundaries where possible.
26. Adequate erosion protection shall be provided along all open channels, and at all points of discharge.
27. All groundwater recharge facilities shall be designed to empty within three days (72 hours) or less subsequent to any storm event. All water quality facilities shall be designed so that water is released slowly for a minimum of 24 hours subsequent to any storm event. All infiltration, detention or retention facilities the volume of which will be used for stormwater management (pre-development vs. post-development) shall be designed to empty within 24 hours subsequent to any storm event. Volumes that will not be available within 24 hours subsequent to any storm event shall not be used for stormwater management (pre-development vs. post-development).

## Part 5 INSPECTIONS

### § 23-501 **Inspections.** [Ord. 07-07, 7/23/2007, § 501]

- 1. The municipal engineer or his municipal designee shall inspect all phases of the installation of the permanent BMPs and/or stormwater management facilities as deemed appropriate by the municipal engineer.
- 2. During any stage of the work, if the municipal engineer or his municipal designee determines that the permanent BMPs and/or stormwater management facilities are not being installed in accordance with the approved stormwater management plan, New Hanover Township shall revoke any existing permits or other approvals and issue a cease and desist order until a revised drainage plan is submitted and approved, as specified in this chapter, and until the deficiencies are corrected.

3. A final inspection of all BMPs and/or stormwater management facilities shall be conducted by the municipal engineer or his municipal designee to confirm compliance with the approved drainage plan prior to the issuance of any occupancy permit.

## Part 6 **FEES AND EXPENSES**

### **§ 23-601 Municipality Drainage Plan Review and Inspection Fee. [Ord. 07-07, 7/23/2007, § 601]**

Fees shall be established by New Hanover Township to defray plan review and construction inspection costs incurred by New Hanover Township. All fees shall be paid by the applicant at the time of drainage plan submission. A review and inspection fee schedule shall be established by resolution of the Board of Supervisors based on the size of the regulated activity and based on New Hanover Township's costs for reviewing drainage plans and conducting inspections pursuant to § 23-501. New Hanover Township shall periodically update the review and inspection fee schedule to ensure that review costs are adequately reimbursed.

### **§ 23-602 Expenses Covered by Fees. [Ord. 07-07, 7/23/2007, § 602]**

1. The fees required by this chapter shall at a minimum cover:
  - A. Administrative costs.
  - B. The review of the drainage plan by New Hanover Township and the municipal engineer.
  - C. The site inspections.
  - D. The inspection of stormwater management facilities and drainage improvements during construction.
  - E. The final inspection upon completion of the stormwater management facilities and drainage improvements presented in the drainage plan.
  - F. Any additional work required to enforce any permit provisions regulated by this chapter, correct violations, and assure proper completion of stipulated remedial actions.

## Part 7 **MAINTENANCE RESPONSIBILITIES**

### **§ 23-701 Performance Guarantee. [Ord. 07-07, 7/23/2007, § 701]**

1. For subdivisions and land developments, the applicant shall provide a financial guarantee to New Hanover Township for the timely installation and proper construction of all stormwater management controls as:
  - A. Required by the approved drainage plan equal to or greater than the full construction cost of the required controls.
  - B. The amount and method of payment provided for in the SALDO.
2. For other regulated activities, New Hanover Township may require a financial guarantee from the applicant.

**§ 23-702 Responsibilities for Operations and Maintenance of Stormwater Controls and BMPs.  
[Ord. 07-07, 7/23/2007, § 702]**

1. No regulated earth disturbance activities within New Hanover Township shall commence until approval by New Hanover Township of a stormwater control and BMP operations and maintenance plan that describes how the permanent (e.g., post-construction) stormwater controls and BMPs will be properly operated and maintained.
2. The following items shall be included in the stormwater control and BMP operations and maintenance plan:
  - A. Map(s) of the project area, in a form that meets the requirements for recording at the offices of the Recorder of Deeds of Montgomery County, shall be submitted on twenty-four-inch by thirty-six-inch sheets. The contents of the maps(s) shall include, but not be limited to:
    - (1) Clear identification of the location and nature of permanent stormwater controls and BMPs.
    - (2) The location of the project site relative to highways, municipal boundaries, or other identifiable landmarks.
    - (3) Existing and final contours at intervals of two feet, or others as appropriate.
    - (4) Existing streams, lakes, ponds, or other bodies of water within the project site area.
    - (5) Other physical features including flood hazard boundaries, sinkholes, streams, existing drainage courses, and areas of natural vegetation to be preserved.
    - (6) The locations of all existing and proposed utilities, sanitary sewers, and water lines within 50 feet of property lines of the project site.
    - (7) Proposed final changes to the land surface and vegetative cover, including the type and amount of impervious area that would be added.
    - (8) Proposed final structures, roads, paved areas, and buildings.
  - B. A description of how each permanent stormwater control and BMP will be operated and maintained, and the identity and contact information associated with the person(s) responsible for operations and maintenance.
  - C. The name of the project site, the name and address of the owner of the property, and the name of the individual or firm preparing the plan.
  - D. A statement, signed by the landowner, acknowledging that the stormwater controls and BMPs are fixtures that can be altered or removed only after approval by New Hanover Township.
3. The stormwater control and BMP operations and maintenance plan for the project site shall establish responsibilities for the continuing operation and maintenance of all permanent stormwater controls and BMPs, as follows:
  - A. If a plan includes structures or lots that are to be separately owned and in which streets, sewers, and other public improvements are to be dedicated to New Hanover Township, stormwater controls and BMPs may also be dedicated to and maintained by New Hanover Township.

- B. If a plan includes operations and maintenance by a single ownership or if sewers and other public improvements are to be privately owned and maintained, then the operation and maintenance of stormwater controls and BMPs shall be the responsibility of the owner or private management entity.
4. New Hanover Township shall make the final determination on the continuing operations and maintenance responsibilities. New Hanover Township reserves the right to accept or reject the operations and maintenance responsibility for any or all of the stormwater controls and BMPs.

**§ 23-703 Municipal Review of a Stormwater Control and BMP Operations and Maintenance Plan.  
[Ord. 07-07, 7/23/2007, § 703]**

1. New Hanover Township shall review the stormwater control and BMP operations and maintenance plan for consistency with the purposes and requirements of this chapter and any permits issued by DEP.
2. New Hanover Township shall notify the applicant in writing whether or not the stormwater control and BMP operations and maintenance plan is approved.
3. New Hanover Township may require a "record drawing" of all stormwater controls and BMPs and an explanation of any discrepancies with the operations and maintenance plan.

**§ 23-704 Adherence to an Approved Stormwater Control and BMP Operations and Maintenance Plan.  
[Ord. 07-07, 7/23/2007, § 704]**

It shall be unlawful to alter or remove any permanent stormwater control and BMP required by an approved stormwater control and BMP operations and maintenance plan or to allow the property to remain in a condition which does not conform to an approved stormwater control and BMP operations and maintenance plan.

**§ 23-705 Operations and Maintenance Agreement for Privately Owned Stormwater Controls and BMPs.  
[Ord. 07-07, 7/23/2007, § 705]**

1. The applicant shall sign an operations and maintenance agreement with New Hanover Township covering all stormwater controls and BMPs that are to be privately owned. The maintenance agreement shall be transferred with transfer of ownership. The agreement shall be substantially the same as the agreement in Appendix 23-F of this chapter.
2. Other items may be included in the agreement where determined necessary to guarantee the satisfactory operation and maintenance of all permanent stormwater controls and BMPs. The agreement shall be subject to the review and approval of New Hanover Township.

**§ 23-706 Stormwater Management Easements.  
[Ord. 07-07, 7/23/2007, § 706]**

1. Stormwater management easements are required for all areas used for off-site stormwater control.
2. Stormwater management easements shall be provided by the applicant or property owner if necessary for access for inspections and maintenance or the preservation of stormwater runoff conveyance, infiltration, and detention areas and other stormwater controls and BMPs by persons other than the property owner. The purpose of the easement shall be specified in any agreement under § 23-705.

**§ 23-707 Maintenance Agreement for Privately Owned Stormwater Facilities.  
[Ord. 07-07, 7/23/2007, § 707]**

1. Prior to final approval of the site's drainage plan, the applicant shall sign and record the maintenance agreement contained in Appendix 23-F which is attached and made part hereof covering all stormwater control facilities that are to be privately owned.
2. Other items may be included in the agreement where determined necessary to guarantee the satisfactory maintenance of all facilities. The maintenance agreement shall be subject to the review and approval of the municipal solicitor and governing body.

**§ 23-708 Recording of an Approved Stormwater Control and BMP Operations and Maintenance Plan and Related Agreements.**

**[Ord. 07-07, 7/23/2007, § 708]**

1. The owner of any land upon which permanent stormwater controls and BMPs will be placed, constructed, or implemented, as described in the stormwater control and BMP operations and maintenance plan, shall record the following documents in the Office of the Recorder of Deeds for Montgomery County, within 15 days of approval of the stormwater control and BMP operations and maintenance plan by New Hanover Township:
  - A. The operations and maintenance plan, or a summary thereof.
  - B. Operations and maintenance agreements under § 23-705.
  - C. Easements under § 23-706.
2. New Hanover Township may suspend or revoke any approvals granted for the project site upon discovery of failure on the part of the owner to comply with this section.

**§ 23-709 Municipal Stormwater Control and BMP Operation and Maintenance Fund.**

**[Ord. 07-07, 7/23/2007, § 709]**

1. Persons installing stormwater controls or BMPs shall be required to pay a specified amount to the Municipal Stormwater Control and BMP Operation and Maintenance Fund to help defray costs of periodic inspections and maintenance expenses. The amount of the deposit shall be determined as follows:
  - A. If the stormwater control or BMP is to be privately owned and maintained, the deposit shall cover the cost of periodic inspections performed by New Hanover Township for a period of 15 years, as estimated by the municipal engineer. After that period of time, inspections will be performed at the expense of New Hanover Township.
  - B. If the stormwater control or BMP is to be owned and maintained by New Hanover Township, the deposit shall cover the estimated costs for maintenance and inspections for 15 years. The municipal engineer will establish the estimated costs utilizing information submitted by the applicant.
  - C. The amount of the deposit to the fund shall be converted to present worth of the annual series values. The municipal engineer shall determine the present worth equivalents, which shall be subject to the approval of the governing body.
2. If a stormwater control or BMP is proposed that also serves as a recreational facility (e.g., ball field or lake), New Hanover Township may reduce or waive the amount of the maintenance fund deposit based upon the value of the land for public recreational purpose.
3. If at some future time, a stormwater control or BMP (whether publicly or privately owned) is eliminated due to the installation of storm sewers or other storage facility, the unused portion of the maintenance fund deposit will be applied to the cost of abandoning the facility and connecting to the storm sewer system or other facility. Any amount of the deposit remaining after the costs of

abandonment are paid will be returned to the depositor.

4. If stormwater controls or BMPs are accepted by New Hanover Township for dedication, New Hanover Township may require persons installing stormwater controls or BMPs to pay a specified amount to the Municipal Stormwater Control and BMP Operation and Maintenance Fund to help defray costs of operations and maintenance activities. The amount may be determined as follows:
  - A. The amount shall cover the estimated costs for operations and maintenance for 10 years, as determined by New Hanover Township.
  - B. The amount shall then be converted to present worth of the annual series values.
5. If a stormwater control or BMP is proposed that also serves as a recreational facility (e.g., ball field or lake), New Hanover Township may adjust the amount due accordingly.
6. New Hanover Township may require applicants to pay a fee to the Municipal Stormwater Control and BMP Operation and Maintenance Fund to cover long-term maintenance of stormwater controls and BMPs.
7. New Hanover Township may require applicants to pay a fee to the Municipal Stormwater Control and BMP Operation and Maintenance Fund to cover stormwater related problems that may arise from the land development and earth disturbance.

## Part 8 PROHIBITIONS

### § 23-801 **Prohibited Discharges.** [Ord. 07-07, 7/23/2007, § 801]

Note: The following language taken from DEP's NPDES program and model NPDES ordinance is required to be incorporated into this chapter.

1. No person in New Hanover Township shall allow, or cause to allow, stormwater discharges into New Hanover Township's separate storm sewer system which are not composed entirely of stormwater, except: (A) as provided in Subsection 2 below; and (B) discharges allowed under a state or federal permit.
2. Discharges that may be allowed based on a finding by New Hanover Township that the discharge(s) do not significantly contribute to pollution to surface waters of the commonwealth, are:
  - A. Discharges from firefighting activities.
  - B. Potable water sources including dechlorinated water line and fire hydrant flushings.
  - C. Irrigation drainage.
  - D. Routine external building washdown (which does not use detergents or other compounds).
  - E. Air conditioning condensate.
  - F. Water from individual residential car washing.
  - G. Spring water from crawl space pumps.
  - H. Uncontaminated water from foundation or from footing drains.

- I. Flows from riparian habitats and wetlands.
  - J. Lawn watering.
  - K. Pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used.
  - L. Dechlorinated swimming pool discharges.
  - M. Uncontaminated groundwater.
3. In the event that New Hanover Township determines that any of the discharges identified in Subsection 2 significantly contribute to pollution of waters of the commonwealth, or is so notified by DEP, New Hanover Township will notify the responsible person to cease the discharge.
  4. Upon notice provided by New Hanover Township under Subsection 3, the discharger will have a reasonable time, as determined by New Hanover Township, to cease the discharge consistent with the degree of pollution caused by the discharge.
  5. Nothing in this section shall affect a discharger's responsibilities under state law.

**§ 23-802 Prohibited Connections.**  
**[Ord. 07-07, 7/23/2007, § 802]**

1. The following connections are prohibited, except as provided in § 23-801, Subsection 2, above:
  - A. Any drain or conveyance, whether on the surface or subsurface, which allows any nonstormwater discharge including sewage, process wastewater, and wash water to enter the separate storm sewer system and any connections to the storm drain system from indoor drains and sinks.
  - B. Any drain or conveyance connected from a commercial or industrial land use to the separate storm sewer system that has not been documented in plans, maps, or equivalent records and approved by New Hanover Township.

**§ 23-803 Roof Drains and Sump Pump Drains.**  
**[Ord. 07-07, 7/23/2007, § 803]**

1. Roof drains and sump pump drains shall not be connected to streets, sanitary or storm sewers, or roadside ditches in order to promote overland flow and infiltration/percolation of stormwater where advantageous to do so.
2. When it is more advantageous to connect directly to streets or storm sewers, connections of roof drains and sump pump drains to streets or roadside ditches may be permitted on a case by case basis as determined by New Hanover Township.
3. Roof drains and sump pump drains shall discharge to infiltration areas or vegetative BMPs to the maximum extent practicable.

**§ 23-804 Alteration of BMPs.**  
**[Ord. 07-07, 7/23/2007, § 804]**

1. No person shall modify, remove, fill, landscape, or alter any existing stormwater control or BMP unless it is part of an approved maintenance program without the written approval of New Hanover Township.
2. No person shall place any structure, fill, landscaping, or vegetation into a stormwater control or

BMP or within a drainage easement that would limit or alter the functioning of the stormwater control or BMP without the written approval of New Hanover Township.

## Part 9 **ENFORCEMENT AND PENALTIES**

### **§ 23-901 Right-of-Entry.**

**[Ord. 07-07, 7/23/2007, § 901]**

1. Upon presentation of proper credentials, duly authorized representatives of New Hanover Township may enter at reasonable times upon any property within New Hanover Township to inspect the implementation, condition, or operation and maintenance of the stormwater controls or BMPs in regard to any aspect governed by this chapter.
2. Stormwater control and BMP owners and operators shall allow persons working on behalf of New Hanover Township ready access to all parts of the premises for the purposes of determining compliance with this chapter.
3. Persons working on behalf of New Hanover Township shall have the right to temporarily locate on any stormwater control or BMP in New Hanover Township such devices as are necessary to conduct monitoring and/or sampling of the discharges from such stormwater control or BMP.
4. Unreasonable delays in allowing New Hanover Township access to a stormwater control or BMP is a violation of this chapter.

### **§ 23-902 Public Nuisance.**

**[Ord. 07-07, 7/23/2007, § 902]**

1. The violation of any provision of this chapter is hereby deemed a public nuisance.
2. Each day that a violation continues shall constitute a separate violation.

### **§ 23-903 Enforcement Generally.**

**[Ord. 07-07, 7/23/2007, § 903]**

1. Whenever New Hanover Township finds that a person has violated a prohibition or failed to meet a requirement of this chapter, New Hanover Township may order compliance by written notice to the responsible person. Such notice may, without limitation, require the following remedies:
  - A. Performance of monitoring, analyses, and reporting.
  - B. Elimination of prohibited connections or discharges.
  - C. Cessation of any violating discharges, practices, or operations.
  - D. Abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property.
  - E. Payment of a fine to cover administrative and remediation costs.
  - F. Implementation of stormwater controls and BMPs.
  - G. Operation and maintenance of stormwater controls and BMPs.
2. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction

of these violations(s). Said notice may further advise that, if applicable, should the violator fail to take the required action within the established deadline, the work will be done by New Hanover Township or designee, and the expense thereof shall be charged to the violator.

3. Failure to comply within the time specified shall also subject such person to the penalty provisions of this chapter. All such penalties shall be deemed cumulative and shall not prevent New Hanover Township from pursuing any and all other remedies available in law or equity.

**§ 23-904 Suspension and Revocation of Permits and Approvals.**  
**[Ord. 07-07, 7/23/2007, § 904]**

1. Any building, land development, or other permit or approval issued by New Hanover Township maybe suspended or revoked by New Hanover Township for:
  - A. Noncompliance with or failure to implement any provision of the permit.
  - B. A violation of any provision of this chapter.
  - C. The creation of any condition or the commission of any act during construction or development which constitutes or creates a hazard or nuisance, pollution, or which endangers the life, health, or property of others.
2. A suspended permit or approval shall be reinstated by New Hanover Township when:
  - A. The municipal engineer or designee has inspected and approved the corrections to the stormwater controls and BMPs or the elimination of the hazard or nuisance.
  - B. New Hanover Township is satisfied that the violation of this chapter, law, or rule and regulation has been corrected.
3. A permit or approval that has been revoked by New Hanover Township cannot be reinstated. The applicant may apply for a new permit under the procedures outlined in this chapter.

**§ 23-905 Penalties.**  
**[Ord. 07-07, 7/23/2007, § 905; as amended by Ord. 17-03, 3/27/2017]**

1. Any person, firm or corporation who shall violate any provision of this part, upon conviction thereof in an action brought before a magisterial district judge in the manner provided for the enforcement of summary offenses under the Pennsylvania Rules of Criminal Procedure, shall be sentenced to pay a fine of not more than \$1,000 plus costs and, in default of payment of said fine and costs, to a term of imprisonment not to exceed 90 days. Each day that a violation of this part continues or each section of this part which shall be found to have been violated shall constitute a separate offense.
2. In addition, New Hanover Township, through its Solicitor, may institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of this chapter. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other appropriate forms of remedy or relief.

**§ 23-906 Notification.**  
**[Ord. 07-07, 7/23/2007, § 906]**

In the event that a person fails to comply with the requirements of this chapter or fails to conform to the requirements of any permit issued hereunder, New Hanover Township shall provide written notification of the violation. Such notification shall state the nature of the violation(s) and establish a time limit for correction of these violation(s). Failure to comply within the time specified shall subject such person to the penalty provisions of this chapter. All such penalties shall be deemed cumulative and shall not prevent

New Hanover Township from pursuing any and all remedies. It shall be the responsibility of the owner of the real property on which any regulated activity is proposed to occur, is occurring, or has occurred to comply with the terms and conditions of this chapter.

**§ 23-907 Enforcement.**

**[Ord. 07-07, 7/23/2007, § 907]**

1. The municipal governing body is hereby authorized and directed to enforce all of the provisions of this chapter. All inspections regarding compliance with the drainage plan shall be the responsibility of the municipal engineer or other qualified persons designated by New Hanover Township.
  - A. A set of design plans approved by New Hanover Township shall be on file at the site throughout the duration of the construction activity. Periodic inspections may be made by New Hanover Township or designee during construction.
  - B. It shall be unlawful for any person, firm, or corporation to undertake any regulated activity under § **23-104** on any property except as provided for in the approved drainage plan and pursuant to the requirements of this chapter. It shall be unlawful to alter or remove any control structure required by the drainage plan pursuant to this chapter or to allow the property to remain in a condition that does not conform to the approved drainage plan.
  - C. At the completion of the project and as a prerequisite for the release of the performance guarantee, the owner or his representatives shall:
    - (1) Provide a certification of completion from an engineer, architect, surveyor, or other qualified person verifying that all permanent facilities have been constructed according to the plans and specifications and approved revisions thereto.
    - (2) Provide a set of as-built (record) drawings.
  - D. After receipt of the certification by New Hanover Township, a final inspection shall be conducted by the municipal engineer or designated representative to certify compliance with this chapter.
  - E. Prior to revocation or suspension of a permit and at the request of the applicant, the governing body will schedule a hearing to discuss the noncompliance if there is no immediate danger to life, public health, or property. The expense of a hearing shall be the applicant's responsibility.
  - F. Occupancy Permit. An occupancy permit shall not be issued unless the certification of completion pursuant to Subsection **1C(1)** has been secured. The occupancy permit shall be required for each lot owner and/or applicant for all subdivisions and land developments in New Hanover Township.

**§ 23-908 Appeals.**

**[Ord. 07-07, 7/23/2007, § 908]**

1. Any person aggrieved by any action of New Hanover Township or its designee may appeal to New Hanover Township's Board of Supervisors within 30 days of that action.
2. Any person aggrieved by any decision of New Hanover Township's Board of Supervisors may appeal to the Montgomery County Court of Common Pleas within 30 days of the municipal decision.

**Attachments:**

[Attachment 1 - Table 23-105.1, Chapter Applicability](#)

[Attachment 2 - Appendix 23-A, Voluntary Stormwater Management Procedures](#)

[Attachment 3 - Appendix 23-B-1, Sample Drainage Plan Application](#)

[Attachment 4 - Appendix 23-B-2, Drainage Plan Checklist](#)

[Attachment 5 - Appendix 23-C, Low Impact Development Practices](#)

[Attachment 6 - Appendix 23-D, Stormwater Management Design Criteria](#)

[Attachment 7 - Appendix 23-E, References](#)

HYPERLINK "<http://ecode360.com/attachment/NE2408/NE2408-023h Appendix 23-F.pdf>" [Attachment 8](#)

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STORMWATER MANAGEMENT

23 Attachment 1

Township of New Hanover

**Table 23-105.1  
Chapter Applicability  
[Ord. 07-07, 7/23/2007, § 105]**

Chapter Part or Section	Type of Project	Proposed Impervious Surface				Earth Disturbance	
		0-1,000 square feet	1,000 – 5,000 square feet	5,000 square feet – 1 acre	> 1 acre	5,000 square feet – 1 acre	> 1 acre
<b>Part 3</b> Drainage Plan Requirements	Development	N/A	Modified	Yes	Yes	Modified	Yes
	Redevelopment	N/A	Modified	Yes	Yes	Modified	Yes
<b>§ 23-404</b> Nonstructural Project Design	Development	N/A	Yes	Yes	Yes	Yes	Yes
	Redevelopment	N/A	Yes	Yes	Yes	Yes	Yes
<b>§ 23-405</b> Groundwater Recharge	Development	N/A	Yes	Yes	Yes	N/A	Yes
	Redevelopment	N/A	Yes	Yes	Yes	N/A	Yes
<b>§ 23-406</b> Water Quality Requirements	Development	N/A	Yes	Yes	Yes	N/A	Yes
	Redevelopment	N/A	Yes	Yes	Yes	N/A	Yes
<b>§ 23-407</b> Stream Bank Erosion Requirements	Development	N/A	Exempt	Yes	Yes	N/A	Yes
	Redevelopment	N/A	Exempt	Exempt	Yes	N/A	Yes
<b>§ 23-408</b> Stormwater Peak Rate Control and Management Districts	Development	N/A	Exempt	Yes	Yes	Yes	Yes
	Redevelopment	N/A	Exempt	Yes	Yes	Yes	Yes
Erosion and Sediment Pollution Control Plan Submission to the Conservation District	Earth Disturbance	See Earth Disturbance Requirements	See Earth Disturbance Requirements	See Earth Disturbance Requirements	See Earth Disturbance Requirements	Yes	Yes
		<b>Refer to municipal earth disturbance requirements, as applicable</b>					

## NEW HANOVER CODE

### Legend:

Yes - Drainage plan required with associated section provision.

N/A - Not applicable; exempt from drainage plan submission.

Exempt - Exempt from required section provision; drainage plan submission may still be required if other section provisions are applicable (yes in box).

Modified - Modified drainage plan required.

- Sites with less than 1,000 square feet of impervious surface, but between 5,000 square feet and one acre of earth disturbance must submit a drainage plan to the Municipality which need only consist of the items in §§ 23-302, Subsection 2A(2) and (4); 23-302, Subsection 2B(7), (8), (11) and 22; and 23-302, Subsection 2D(1) and (3) and related supportive material needed to determine compliance with §§ 23-404 and 23-408.
- Sites with more than 1,000 square feet, but less than 5,000 square feet of impervious surface must submit a drainage plan; however, it need not consist of the items in §§ 23-407 and 23-408.

## **Appendix 23-A**

**Voluntary Stormwater Management Procedures  
for Projects with less than 1,000 Square Feet Proposed Impervious  
Area or less than 5,000 Square Feet of Earth Disturbance**

## **VOLUNTARY STORMWATER MANAGEMENT PROCEDURES FOR PROJECTS MEETING THE LAND COVER EXEMPTION CRITERIA**

### **What are the Act 167 stormwater management requirements?**

Pennsylvania Act 167 was authorized on October 4, 1978 (32 P.S., P.L. 864) and gave Pennsylvania Municipalities the power to regulate activities that affect stormwater runoff and surface and groundwater quantity and quality.

### **Who is affected by these requirements?**

The Act 167 stormwater management requirements affect all new development in the Municipality individual home construction projects on single-family lots that result in less than 1,000 square feet of impervious area (including the building footprint driveway, sidewalks, and paving areas) or less than 5,000 square feet of earth disturbance are not required to submit formal drainage plans to the Municipality or County; however, they are still encouraged to address water quality and groundwater recharge criteria specified in this Chapter (§§23-405 and 23-406).

### **Do I require professional services to meet these requirements?**

This brochure has been developed to assist the individual homeowner in meeting the voluntary water quality and groundwater recharge goals of this Chapter. If the guidelines presented in this brochure are followed, the individual homeowner will not require professional services to comply with these water quality and groundwater recharge goals.

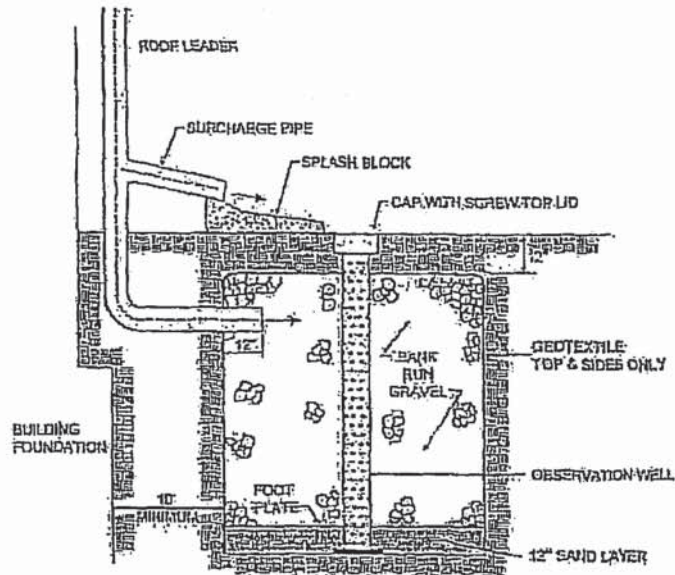
### **What do I need to send to the Municipality?**

Even though a formal drainage plan is not required for individual lot owners, a brief description of the proposed infiltration facilities, including types of material to be used, total impervious areas and volume calculations as shown above, and a simple sketch plan showing the following information shall be submitted to the contractor prior to construction:

1. Location of proposed structures, driveways, or other paved areas with approximate size in square feet.
2. Location of any existing or proposed on-site septic system and/or potable

Figure 23-A-1

Typical Dry Well Configuration



Source: Maryland Stormwater Design Manual

*Example Sizing:*

**STEP 1** - Determine Total Impervious Surfaces.

**STEP 2** - Determine Required Recharge (Infiltration) Volume ( $Re_v$ ) Using Ordinance §23-405.

**STEP 3** - Sizing of Select Infiltration Method

Volume of facility = Depth x Width x Length

Volume of facility must account for assumed 40 percent void ratio in gravel bed.

**EXAMPLE**

**STEP 1:** Suppose proposed impervious surface = 500 square feet; provide stormwater management under voluntary stormwater management procedures.

**STEP 2:** Required Recharge (Infiltration) Volume ( $Re_v$ ) is determined using ordinance §23-405. Suppose  $Re_v = 90$  cubic feet.

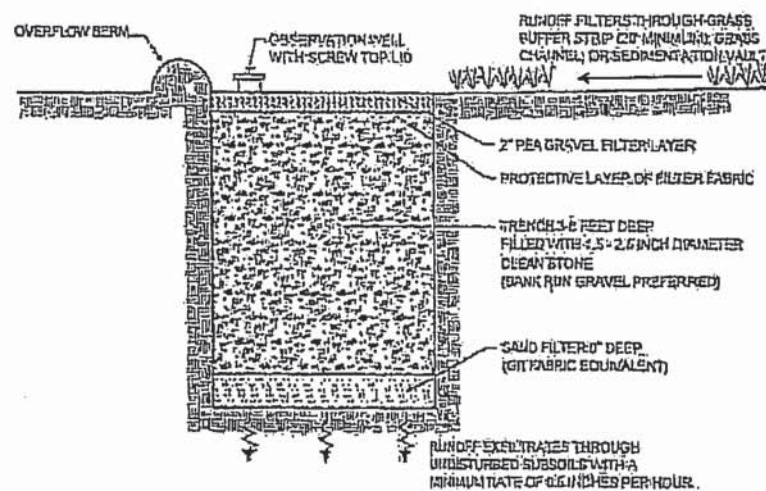
**STEP 3:** Facility volume =  $Re_v/0.40$  (accounting for void ratio in bed). Therefore, the proposed facility volume =  $90/0.40 = 225$  cubic feet.

## Infiltration Trenches

An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. Runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix. Infiltration trenches perform well for removal of fine sediment and associated pollutants. Pretreatment using buffer strips, swales, or detention basins is important for limiting amounts of coarse sediment entering the trench which can clog and render the trench ineffective.

Figure 23-A-2

### Typical Infiltration Trench Configuration



Source: Maryland Stormwater Design Manual

#### Example Sizing:

**STEP 1** - Suppose proposed impervious surface = 500 square feet; provide stormwater management under voluntary stormwater management procedures.

**STEP 2** - Required Recharge (Infiltration) Volume ( $Re_v$ ) is determined using ordinance §23-405. Suppose  $Re_v = 90$  cubic feet.

**STEP 3** - Sizing of Select Infiltration Method

Volume of facility = Depth x Width x Length

Required facility volume =  $Re_v / 0.40$  (accounting for void ratio in bed). Therefore, the proposed facility volume =  $90 / 0.40 = 225$  cubic feet.

Set  $D = 3$  ft; determined required surface area of trench

225 cu. ft. / 3 = 75 sq. ft.

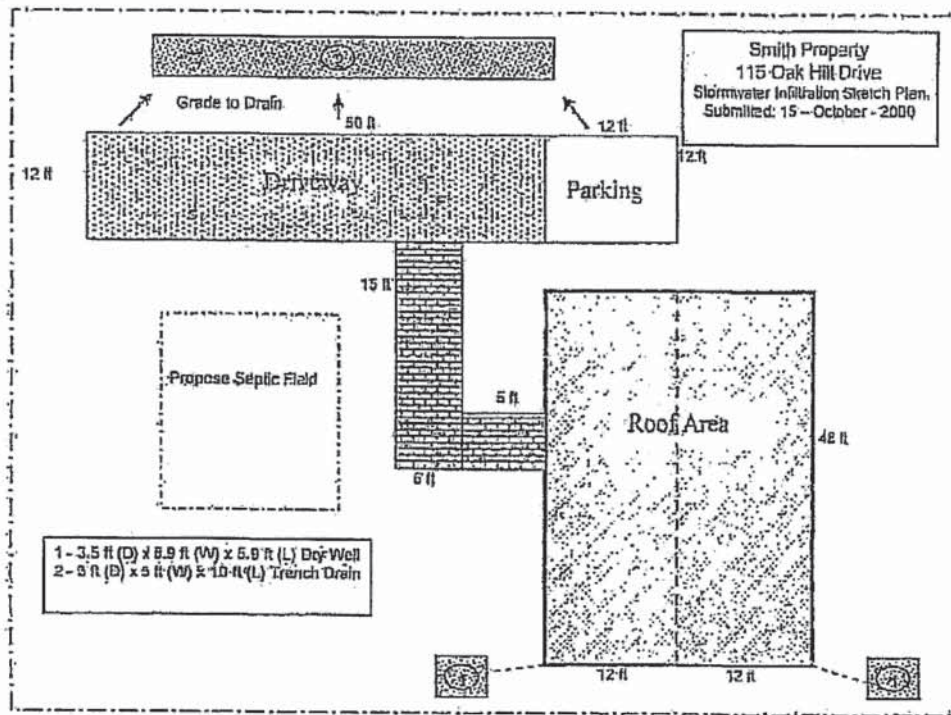
The width of the trench should be greater than 2 times its depth (2 x D); therefore, in this example a trench width of 7 feet is selected;

Determine trench length:  $L = 75 \text{ sq. ft.} / 7 = 10.8 \text{ ft.}$

Final trench dimensions: 3 ft. (D) x 7 ft. (W) x 10.8 ft. (L)

**Figure 23-A -3**

**Sample Site Sketch Plan**



Source: Maryland Stormwater Design Manual



APPENDIX 23-B-1

SAMPLE DRAINAGE PLAN APPLICATION

(To be attached to the "land subdivision plan or development plan review application" or "minor land subdivision plan review application")

Application is hereby made for review of the Stormwater Management Plan and related data as submitted herewith in accordance with the \_\_\_\_\_ Stormwater Management Ordinance.

\_\_\_\_\_ Final Plan \_\_\_\_\_ Preliminary Plan \_\_\_\_\_ Sketch Plan

Date of Submission \_\_\_\_\_ Submission No. \_\_\_\_\_

1. Name of subdivision or development \_\_\_\_\_

2. Name of applicant \_\_\_\_\_ Telephone No. \_\_\_\_\_

(if corporation, list the corporation's name and the names of two officers of the corporation

\_\_\_\_\_ Officer 1
\_\_\_\_\_ Officer 2

Address \_\_\_\_\_ Zip \_\_\_\_\_

Applicant's interest in subdivision or development (if other than property owner, give owner's name and address)

3. Name of Property Owner \_\_\_\_\_ Telephone No. \_\_\_\_\_

Address \_\_\_\_\_ Zip \_\_\_\_\_

4. Name of engineer or surveyor \_\_\_\_\_ Telephone No. \_\_\_\_\_

Address \_\_\_\_\_ Zip \_\_\_\_\_

5. Type of subdivision or development proposed:

- Single-family lots, Two-family lots, Multi-family Lots, Cluster Type Lots, Planned Residential Development, Townhouses, Garden Apartments, Mobile Home Park, Campground, Other ( ), Commercial (Multi-lot), Commercial (One lot), Industrial (Multi-lot), Industrial (One lot)

6. Linear feet of new road proposed \_\_\_\_\_ L.F.

7. Area of proposed and existing impervious area on the entire tract:

- a. Existing (to remain)                      S.F. %                      of property
- b. Proposed                                      S.F. %                      of property

8. Stormwater

- a. Does the peak rate of runoff from proposed conditions exceed that flow which occurred for existing conditions for the designated design storm? \_\_\_\_\_
- b. Design storm utilized (on-site conveyance systems) (24 hr.) \_\_\_\_\_  
 No. of Subarea \_\_\_\_\_  
 Watershed Name \_\_\_\_\_  
 Explain: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
- c. Does the submission and/or district meet the criteria for the applicable management district? \_\_\_\_\_
- d. Number of subarea(s) from Appendix 23-A of the \_\_\_\_\_  
 \_\_\_\_\_ Stormwater Management Plan or other subareas identified in other watershed stormwater management plans \_\_\_\_\_
- e. Type of proposed runoff control \_\_\_\_\_
- f. Does the proposed stormwater control criteria meet the requirements/guidelines of the Stormwater Ordinance?  
 If not, what variances/waivers are requested? \_\_\_\_\_  
 Reasons \_\_\_\_\_
- g. Does the plan meet the requirements of Part 3 of the Stormwater Ordinance?  
 \_\_\_\_\_  
 If not, what variances/waivers are requested? \_\_\_\_\_  
 Reasons why \_\_\_\_\_
- h. Was TR-55, June 1986, utilized in determining the time of concentration? \_\_\_\_\_  
 \_\_\_\_\_
- i. What hydrologic method was used in the stormwater computations? \_\_\_\_\_  
 \_\_\_\_\_
- j. Is a hydraulic routing through the stormwater control structure submitted?  
 \_\_\_\_\_
- k. Is a construction schedule or staging attached? \_\_\_\_\_
- l. Is a recommended maintenance program attached? \_\_\_\_\_

9. Erosion and Sediment Pollution Control (E&S):

- a. Has the stormwater management and E&S plan, supporting documentation, and narrative been submitted to the County Conservation District? \_\_\_\_\_  
\_\_\_\_\_
- b. Total area of earth disturbance \_\_\_\_\_ S.F.

10. Wetlands

- a. Have the wetlands been delineated by someone trained in wetland delineation? \_\_\_\_\_
- b. Have the wetland lines been verified by a State or Federal permitting authority? \_\_\_\_\_
- c. Have the wetlands been surveyed? \_\_\_\_\_
- d. Total acreage of wetland within the property \_\_\_\_\_
- e. Total acreage of wetland disturbed \_\_\_\_\_
- f. Supporting documentation \_\_\_\_\_

11. Filing

- a. Has the required fee been submitted?  
Amount \_\_\_\_\_
- b. Has the proposed schedule of construction inspection to be performed by the applicant's engineer been submitted? \_\_\_\_\_
- c. Name of individual who will be making the inspections \_\_\_\_\_
- d. General comments about stormwater management at the development  
\_\_\_\_\_



**APPENDIX 23-B-2**

**DRAINAGE PLAN CHECKLIST**

Project: \_\_\_\_\_

Municipality: \_\_\_\_\_

Engineer: \_\_\_\_\_

Submittal No.: \_\_\_\_\_

Date: \_\_\_\_\_

---

**PART 1: GENERAL PROVISIONS**

Reference: §23-105 Applicability/Regulated Activities

1. Is the Proposed Project within the Swamp Creek watershed?     Yes     No
  
2. Does the Proposed Project meet the definition of a "Regulated Activity"?  Yes  No

STOP - If you have checked no for either of the above questions, you are not required to submit a Stormwater Management Plan under the Swamp Creek Stormwater Management Ordinance.

---

**PART 1: GENERAL PROVISIONS**

Reference: §23-106 Exemptions

Note: Parent Tract refers to the total parcel configuration on the date of the Municipal Stormwater Management Ordinance and includes any subdivision of lands which may have occurred after than date.

Parent Tract Area: \_\_\_\_\_ acres

Total Existing Impervious Area (as of the date of the Municipal Stormwater Management Ordinance): \_\_\_\_\_ acres

Total New Impervious Area (all Phases):

Parcel Is Exempt       Parcel Is Not Exempt

---

PART 4: STORMWATER MANAGEMENT

Reference: §23-404 Nonstructural Project Design

1. Has an Existing Resource and Site Analysis Map (ERSAM) been prepared?  
 Yes    No, Explain \_\_\_\_\_  
\_\_\_\_\_

## APPENDIX 23-C

### LOW IMPACT DEVELOPMENT (LID) PRACTICES

#### ALTERNATIVE APPROACH FOR

#### MANAGING STORMWATER RUNOFF

Natural hydrologic conditions can be altered radically by poorly planned development practices such as introducing unnecessary impervious surfaces, destroying existing drainage swales, constructing unnecessary storm sewers, and changing local topography. A traditional drainage approach of development has been to remove runoff from a site as quickly as possible and capture it in a detention basin. This approach leads ultimately to the degradation of water quality as well as expenditure of additional resources for detaining and managing concentrated runoff at some downstream location.

The recommended alternative approach is to promote practices that will minimize proposed conditions runoff rates and volumes, which will minimize needs for artificial conveyance and storage facilities. To simulate pre-development hydrologic conditions, infiltration is often necessary to offset the loss of infiltration by creation of impervious surfaces. The ability of the ground to infiltrate depends upon the soil types and its conditions.

Preserving natural hydrologic conditions requires careful alternative site design considerations. Site design practices include preserving natural drainage features, minimizing impervious surface area, reducing the hydraulic connectivity of impervious surfaces, and protecting natural depression storage. A well-designed site will contain a mix of all of those features. The following describes various techniques to achieve the alternative approach:

- **Preserving Natural Drainage Features.** Protecting natural drainage features, particularly vegetated drainage swales and channels, is desirable because of their ability to infiltrate and attenuate flows and to filter pollutants. However, this objective is often not accomplished in land development. In fact, commonly held drainage philosophy encourages just the opposite pattern—streets and adjacent storm sewers are typically located in the natural headwater valleys and swales, thereby replacing natural drainage functions with a completely impervious system. As a result, runoff and pollutants generated from impervious surfaces flow directly into storm sewers with no opportunity for attenuation, infiltration, or filtration. Developments designed to fit site topography also minimize the amount of grading on site.
- **Protecting Natural Depression Storage Areas.** Depressional storage areas either have no surface outlet or drain very slowly following a storm event. They can be commonly seen as ponded areas in farm fields during the wet season or after large runoff events. Traditional development practices eliminate these depressions by filing or draining, thereby obliterating their ability to reduce surface runoff volumes and trap pollutants. The volume and release rate characteristics of depressions should be protected in the design of the development site. The

depressions can be protected by simply avoiding the depression or by incorporating its storage as additional capacity in required detention facilities.

- **Avoiding Introduction of Impervious Areas.** Careful site planning should consider reducing impervious coverage to the maximum extent possible. Building footprints, sidewalks, driveways, and other features producing impervious surfaces should be evaluated to minimize impacts on runoff.
- **Reducing the Hydraulic Connectivity of Impervious Surfaces.** Impervious surfaces are significantly less of a problem if they are not directly connected to an impervious conveyance system (such as a storm sewer). Two basic ways to reduce hydraulic connectivity are routing of roof runoff over lawns and reducing the use of storm sewers. Site grading should promote increasing travel time of stormwater runoff and should help reduce concentration of runoff to a single point in the development.
- **Routing Roof Runoff Over Lawns.** Roof runoff can be easily routed over lawns in most site designs. The practice discourages direct connection of downspouts to storm sewers or parking lots. The practice also discourages sloping driveways and parking lots to the street. By routing roof drains and crowning the driveway to run off to the lawn, the lawn is essentially used as a filter strip.
- **Reducing the Use of Storm Sewers.** By reducing-use of storm sewers for draining streets, parking lots, and back yards, the potential for accelerating runoff from the development can be greatly reduced. The practice requires greater use of swales and may not be practical, for some development sites, especially if there are concerns for areas that do not drain in a “reasonable” time. The practice requires educating local citizens and public works officials who expect runoff to disappear shortly after a rainfall event.
- **Reducing Street Widths.** Street widths can be reduced by either eliminating on-street parking or by reducing roadway widths. Municipal planners and traffic designers should encourage narrower neighborhood streets that ultimately could lower maintenance.
- **Limiting Sidewalks to One Side of the Street.** A sidewalk on one side of the street may suffice in low-traffic neighborhoods. The lost sidewalk could be replaced with bicycle/recreational trails that follow back-of-lot lines. Where appropriate, backyard trails should be constructed using pervious materials.
- **Using Permeable Paving Materials.** These materials include permeable interlocking concrete paving blocks or porous bituminous concrete. Such materials should be considered as alternatives to conventional pavement surfaces, especially for low use surfaces such as driveways, overflow parking lots, and emergency access roads.
- **Reducing Building Setbacks.** Reducing building setbacks reduces impervious cover associated with driveway and entry walks and is most readily accomplished along low traffic streets where traffic noise is not a problem.

- **Constructing Cluster Developments.** Cluster developments can also reduce the amount of impervious area for a given number of lots. The biggest savings occurs with street length, which also will reduce costs of the development. Cluster development groups the construction activity in less-sensitive areas without substantially affecting the gross density development.

In summary, a careful consideration of the existing topography and implementation of a combination of the above-mentioned techniques may avoid construction of costly stormwater control measures. Benefits include reduced potential for downstream flooding and water quality degradation of receiving streams/water bodies, enhancement of aesthetics, and reduction of development costs. Other benefits include more stable baseflows in receiving streams, improved groundwater recharge, reduced flood flows, reduced pollutant loads, and reduced costs for conveyance and storage.



**APPENDIX 23-D**

**STORMWATER MANAGEMENT DESIGN CRITERIA**

Table 23-D-1  
Precipitation-Frequency Atlas of the United States

Table 23-D-2  
Runoff Curve Numbers

Table 23-D-3  
Rational Runoff Coefficients

Table 23-D-4  
Nonstructural Stormwater Management Measures

Table 23-D-1

Precipitation-Frequency Atlas of the United States

Precipitation Frequency Estimates (inches)																		
ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.34	0.54	0.67	0.92	1.15	1.37	1.50	1.88	2.29	2.71	3.13	3.48	4.06	4.61	6.22	7.75	9.84	11.80
2	0.40	0.64	0.81	1.11	1.40	1.67	1.82	2.27	2.77	3.26	3.78	4.19	4.87	5.50	7.38	9.13	11.56	13.81
5	0.47	0.76	0.96	1.36	1.74	2.09	2.29	2.84	3.48	4.10	4.76	5.23	6.01	6.70	8.80	10.64	13.29	15.77
10	0.52	0.84	1.06	1.53	2.00	2.41	2.65	3.31	4.08	4.80	5.55	6.08	6.95	7.67	9.91	11.81	14.58	17.21
25	0.58	0.93	1.18	1.75	2.33	2.85	3.14	3.96	4.96	5.81	6.69	7.28	8.29	9.01	11.41	13.34	16.22	19.01
50	0.63	1.00	1.27	1.91	2.58	3.20	3.52	4.49	5.70	6.67	7.63	8.27	9.39	10.09	12.59	14.49	17.43	20.32
100	0.67	1.06	1.35	2.06	2.84	3.55	3.92	5.06	6.51	7.59	8.63	9.30	10.56	11.20	13.76	15.63	18.56	21.53
200	0.71	1.12	1.42	2.20	3.09	3.90	4.32	5.65	7.38	8.59	9.70	10.41	11.80	12.36	14.95	16.75	19.64	22.66
500	0.75	1.19	1.50	2.38	3.42	4.39	4.87	6.50	8.66	10.06	11.23	11.97	13.56	13.96	16.54	18.19	20.96	24.04
1000	0.79	1.24	1.55	2.52	3.67	4.76	5.30	7.17	9.74	11.27	12.48	13.24	14.99	15.23	17.75	19.26	21.90	25.00

Source: Atlas 14, Volume 2, US Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Hydrometeorological Design Studies Center, Silver Springs, Maryland 20910. NOAA's Atlas 14 can be found on the internet at <http://hdsc.nws.noaa.gov/hdsc/pfds/>.

Table 23-D-2

Runoff Curve Numbers

LAND USE DESCRIPTION	Hydrologic Condition	HYDROLOGIC SOIL GROUP			
		A	B	C	D
Open Space					
Grass cover < 50%	Poor	68	79	86	89
Grass cover 50% to 75%	Fair	49	69	79	84
Grass cover > 75%	Good	39	61	74	80
Meadow		30	58	71	78
Agricultural					
Pasture, grassland, or range - Continuous forage for grazing	Poor	68	79	86	89
Pasture, grassland, or range - Continuous forage for grazing	Fair	49	69	79	84
Pasture, grassland, or range - Continuous forage for grazing	Good	39	61	74	80
Brush—brush-weed-grass mixture with brush the major element	Poor	48	67	77	83
Brush—brush-weed-grass mixture with brush the major element	Fair	35	56	70	77
Brush—brush-weed-grass mixture with brush the major element	Good	30	48	65	73
Fallow Bare soil	—	77	86	91	94
Crop residue cover (CR)	Poor	76	85	90	93
Woods - grass combination (orchard or tree farm)	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30	55	70	77
Commercial	(85% impervious)	89	92	94	95
Industrial	(72% impervious)	81	88	91	93
Industrial	(50% impervious)	71	82	88	90
Residential districts by average lot size:	% Impervious:				
1/8 acre or less * (townhouses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Farmstead		59	74	82	86
Smooth surfaces (concrete, asphalt, gravel, or bare compacted soil)		98	98	98	98
Water		98	98	98	98
Mining/newly graded areas (pervious areas only)		77	86	91	94

\* Includes multi-family housing unless justified lower density can be provided.

Note: Existing site conditions of bare earth or fallow ground shall be considered as meadow when choosing a CN value.

Source: NRCS (SCS) TR-55

Table 23-D-3

Rational Runoff Coefficients

HYDROLOGIC SOIL GROUP	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
LAND USE DESCRIPTION												
Cultivated Land												
Winter Conditions	.14	.23	.34	.21	.32	.41	.27	.37	.48	.34	.45	.56
Summer Conditions	.10	.16	.22	.14	.20	.28	.19	.26	.33	.23	.29	.38
Fallow Fields												
Poor Conditions	.12	.19	.29	.17	.25	.34	.23	.33	.40	.27	.35	.45
Good Conditions	.08	.13	.16	.11	.15	.21	.14	.19	.26	.18	.23	.31
Forest/Woodland	.08	.11	.14	.10	.14	.18	.12	.16	.20	.15	.20	.25
Grass Areas												
Good Conditions	.10	.16	.20	.14	.19	.26	.18	.22	.30	.21	.25	.35
Average Conditions	.12	.18	.22	.16	.21	.28	.20	.25	.34	.24	.29	.41
Poor Conditions	.14	.21	.30	.18	.28	.37	.25	.35	.44	.30	.40	.50
Impervious Areas	.90	.91	.92	.91	.92	.93	.92	.93	.94	.93	.94	.95
Weighted Residential												
Lot Size 1/8 Acre	.29	.33	.36	.31	.35	.40	.34	.38	.44	.36	.41	.48
Lot Size 1/4 Acre	.26	.30	.34	.29	.33	.38	.32	.36	.42	.34	.38	.46
Lot Size 1/3 Acre	.24	.28	.31	.26	.32	.35	.29	.35	.40	.32	.36	.45
Lot Size 1/2 Acre	.21	.25	.28	.24	.27	.32	.27	.32	.37	.30	.34	.43
Lot Size 1 Acre	.18	.23	.26	.21	.24	.30	.24	.29	.36	.28	.32	.41

## APPENDIX 23-E

### REFERENCES

#### *BMP Manuals*

##### California

California Stormwater BMP Handbook: New Development and Redevelopment (January 2003) separate file available at <http://cabmphandbooks.org/Development.asp>

##### Georgia

Georgia Stormwater Management Manual Volume 2: Technical Handbook (August 2001)-separate file (<http://www.georgiastormwater.com/>)

##### Maryland

2000 Maryland Stormwater Design Manual –  
[http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/stormwater design/index.asp](http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/stormwater%20design/index.asp)

##### Massachusetts

Stormwater Management, Volume Two: Stormwater Technical Handbook (Massachusetts, 1997) – separate file available at  
<http://www.state.md.us/dep/brp/stormwtr/stormpub.htm>.

##### Minnesota

Minnesota Urban Small Sites BMP Manual: Stormwater Best Management Practices for Cold Climates (July 2001) –  
<http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm>

##### New Jersey

Revised Manual for New Jersey: Best Management Practices for Control of Nonpoint Source Pollution from Stormwater (Fifth Draft May 2000) –  
<http://www.state.nj.us/dep/watetshedmgt/bmpmanual.htm>

##### New York

New York State Stormwater Management Design Manual (2001) –  
<http://www.dec.state.ny.us/dep/watershedmgt/dow/swmanual/swmanual.html>

##### Pennsylvania

Pennsylvania Stormwater Best Management Practices Manual, January 2005 (draft).  
Pennsylvania Association of Conservation Districts, Pennsylvania Handbook of Best Management Practices for Developing Areas, November 14, 1997.

##### Washington

Stormwater Management Manual for Western Washington (August 2001) –  
<http://www.ecy.wa.gov/programs/wq/stormwater/manual.html>

Federal

Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring (FHWA) <http://www.fhwa.dot.gov/environment/ultraurb/3fs1.htm>

USEPA Infiltration Trench Fact Sheet (September 1999) –  
<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm>

*Riparian Buffer Reference*

Alliance for the Chesapeake Bay, Pennsylvania Department of Environmental Protection, September 2000. *Forest Buffer Toolkit*, Stream ReLeaf Program.

Penn State College of Agricultural Sciences, 1996. *Establishing Vegetative Buffer Strips along Streams to Improve Water Quality*. Publication # AGRS-67.

Fike, Jean, June 1999. *Terrestrial & Palustrine Plant Communities of Pennsylvania*, Pennsylvania Natural Diversity Inventory, The Nature Conservancy, Western Pennsylvania Conservancy, and Pennsylvania Department of Conservation and Natural Resources.

Pennsylvania Association of Conservation Districts, Inc., Keystone Chapter, Soil and Water Conservation Society, Pennsylvania Department of Environmental Protection, Natural Resources Conservation Service, 1998. *Pennsylvania Handbook of Best Management Practices for Developing Areas*. Prepared by CH2MHill.

Palone, R.S. and A.H. Todd (eds), 1997. *Chesapeake Bay Riparian Handbook. A Guide for Establishing and Maintaining Riparian Forest Buffers*. Chesapeake Bay Program and Northeastern Area State and Private Forestry. Natural Resources Conservation Service Cooperative State Research Education and Extension Services.

The Federal Interagency Stream Restoration Working Group (FISRWG, 10/1998). *Stream Corridor Restoration Principles, Processes, and Practices*. GPO Item No. 0120-A; SuDocs No. A57.6/2:EN3/PT.653. ISBN-0-934213-59-3. Published October 1998. Revised August 2000.

**APPENDIX 23-F**

**STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES  
OPERATIONS AND MAINTENANCE AGREEMENT**

**THIS AGREEMENT**, made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_, 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 stormwater controls and BMP operations and maintenance plan approved by the Municipality (hereinafter referred to as the "Plan") for the Property identified herein, which is attached hereto as Appendix 23-A and made part hereof, provides for management of stormwater within the confines of the Property through the use of Best Management Practices (BMP's); 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 stormwater BMPs be constructed and maintained on the Property; and

**WHEREAS**, for the purposes of this agreement, the following definitions shall apply:

BMP - "Best Management Practice" - activities, facilities, designs, measures or procedures used to manage stormwater impacts from land development, to protect and maintain water quality and groundwater recharge, and to otherwise meet the purposes of the municipal Stormwater Management Ordinance including, but not limited to, infiltration trenches, seepage pits, filter strips, bioretention, wet ponds, permeable paving, rain gardens, grassed swales, forested buffers, sand filters and detention basins.

Infiltration Trench - A BMP surface structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer.

Seepage Pit - An underground BMP structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer.

Rain Garden - A BMP overlain with appropriate mulch and suitable vegetation designed, constructed, and maintained for the purpose of providing infiltration or

recharge of stormwater into the soil and/or underground aquifer, and

**WHEREAS;** the Municipality requires, through the implementation of the Plan, that stormwater management BMPs as required by said Plan and the municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, his 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 BMPs shall be constructed by the Landowner in accordance with the plans and specifications identified in the Plan.
2. The Landowner shall operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality and in accordance with the specific maintenance requirements noted on the 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 identification, to inspect the BMP(s) whenever it deems necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the Property.
4. In the event that the Landowner fails to operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). This provision shall not be construed to allow the Municipality to erect any permanent structure on the land of the Landowner. 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 onsite BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect 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 interest shall release the Municipality's employees and designated representatives 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. In the event that a claim is asserted against the Municipality, its

designated representatives or employees, the Municipality shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgment or claims against the Municipality's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.

8. The Municipality shall inspect the BMP(s) at a minimum of once every 3 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 interest, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

\_\_\_\_\_

(SEAL)

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 of \_\_\_\_\_, 20\_\_\_\_, has acknowledged the same before me in my said County and State.

GIVEN UNDER MY HAND THIS \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_.

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
(Seal)



STORMWATER MANAGEMENT

23 Attachment 1

Township of New Hanover

**Table 23-105.1  
Chapter Applicability  
[Ord. 07-07, 7/23/2007, § 105]**

Chapter Part or Section	Type of Project	Proposed Impervious Surface				Earth Disturbance	
		0-1,000 square feet	1,000 – 5,000 square feet	5,000 square feet – 1 acre	> 1 acre	5,000 square feet – 1 acre	> 1 acre
<b>Part 3</b> Drainage Plan Requirements	Development	N/A	Modified	Yes	Yes	Modified	Yes
	Redevelopment	N/A	Modified	Yes	Yes	Modified	Yes
<b>§ 23-404</b> Nonstructural Project Design	Development	N/A	Yes	Yes	Yes	Yes	Yes
	Redevelopment	N/A	Yes	Yes	Yes	Yes	Yes
<b>§ 23-405</b> Groundwater Recharge	Development	N/A	Yes	Yes	Yes	N/A	Yes
	Redevelopment	N/A	Yes	Yes	Yes	N/A	Yes
<b>§ 23-406</b> Water Quality Requirements	Development	N/A	Yes	Yes	Yes	N/A	Yes
	Redevelopment	N/A	Yes	Yes	Yes	N/A	Yes
<b>§ 23-407</b> Stream Bank Erosion Requirements	Development	N/A	Exempt	Yes	Yes	N/A	Yes
	Redevelopment	N/A	Exempt	Exempt	Yes	N/A	Yes
<b>§ 23-408</b> Stormwater Peak Rate Control and Management Districts	Development	N/A	Exempt	Yes	Yes	Yes	Yes
	Redevelopment	N/A	Exempt	Yes	Yes	Yes	Yes
Erosion and Sediment Pollution Control Plan Submission to the Conservation District	Earth Disturbance	See Earth Disturbance Requirements	See Earth Disturbance Requirements	See Earth Disturbance Requirements	See Earth Disturbance Requirements	Yes	Yes
		<b>Refer to municipal earth disturbance requirements, as applicable</b>					

## NEW HANOVER CODE

### Legend:

Yes - Drainage plan required with associated section provision.

N/A - Not applicable; exempt from drainage plan submission.

Exempt - Exempt from required section provision; drainage plan submission may still be required if other section provisions are applicable (yes in box).

Modified - Modified drainage plan required.

- Sites with less than 1,000 square feet of impervious surface, but between 5,000 square feet and one acre of earth disturbance must submit a drainage plan to the Municipality which need only consist of the items in §§ 23-302, Subsection 2A(2) and (4); 23-302, Subsection 2B(7), (8), (11) and 22; and 23-302, Subsection 2D(1) and (3) and related supportive material needed to determine compliance with §§ 23-404 and 23-408.
- Sites with more than 1,000 square feet, but less than 5,000 square feet of impervious surface must submit a drainage plan; however, it need not consist of the items in §§ 23-407 and 23-408.

## **Appendix 23-A**

**Voluntary Stormwater Management Procedures  
for Projects with less than 1,000 Square Feet Proposed Impervious  
Area or less than 5,000 Square Feet of Earth Disturbance**

## **VOLUNTARY STORMWATER MANAGEMENT PROCEDURES FOR PROJECTS MEETING THE LAND COVER EXEMPTION CRITERIA**

### **What are the Act 167 stormwater management requirements?**

Pennsylvania Act 167 was authorized on October 4, 1978 (32 P.S., P.L. 864) and gave Pennsylvania Municipalities the power to regulate activities that affect stormwater runoff and surface and groundwater quantity and quality.

### **Who is affected by these requirements?**

The Act 167 stormwater management requirements affect all new development in the Municipality individual home construction projects on single-family lots that result in less than 1,000 square feet of impervious area (including the building footprint driveway, sidewalks, and paving areas) or less than 5,000 square feet of earth disturbance are not required to submit formal drainage plans to the Municipality or County; however, they are still encouraged to address water quality and groundwater recharge criteria specified in this Chapter (§§23-405 and 23-406).

### **Do I require professional services to meet these requirements?**

This brochure has been developed to assist the individual homeowner in meeting the voluntary water quality and groundwater recharge goals of this Chapter. If the guidelines presented in this brochure are followed, the individual homeowner will not require professional services to comply with these water quality and groundwater recharge goals.

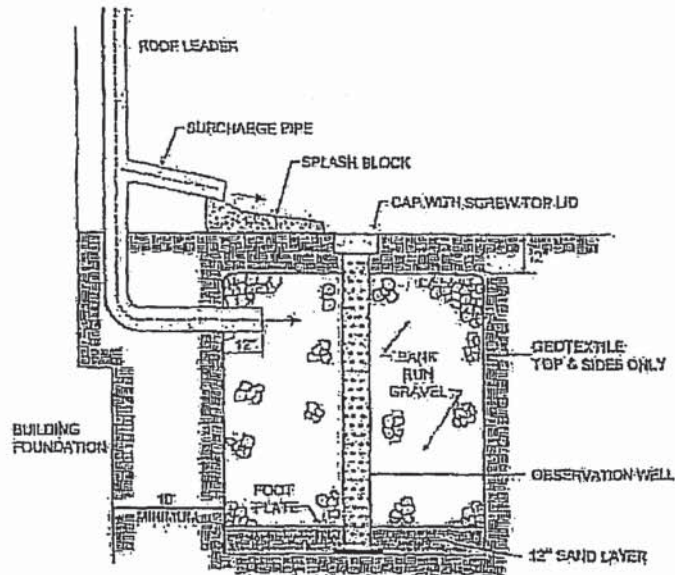
### **What do I need to send to the Municipality?**

Even though a formal drainage plan is not required for individual lot owners, a brief description of the proposed infiltration facilities, including types of material to be used, total impervious areas and volume calculations as shown above, and a simple sketch plan showing the following information shall be submitted to the contractor prior to construction:

1. Location of proposed structures, driveways, or other paved areas with approximate size in square feet.
2. Location of any existing or proposed on-site septic system and/or potable

Figure 23-A-1

Typical Dry Well Configuration



Source: Maryland Stormwater Design Manual

*Example Sizing:*

**STEP 1** - Determine Total Impervious Surfaces.

**STEP 2** - Determine Required Recharge (Infiltration) Volume ( $Re_v$ ) Using Ordinance §23-405.

**STEP 3** - Sizing of Select Infiltration Method

Volume of facility = Depth x Width x Length

Volume of facility must account for assumed 40 percent void ratio in gravel bed.

**EXAMPLE**

**STEP 1:** Suppose proposed impervious surface = 500 square feet; provide stormwater management under voluntary stormwater management procedures.

**STEP 2:** Required Recharge (Infiltration) Volume ( $Re_v$ ) is determined using ordinance §23-405. Suppose  $Re_v = 90$  cubic feet.

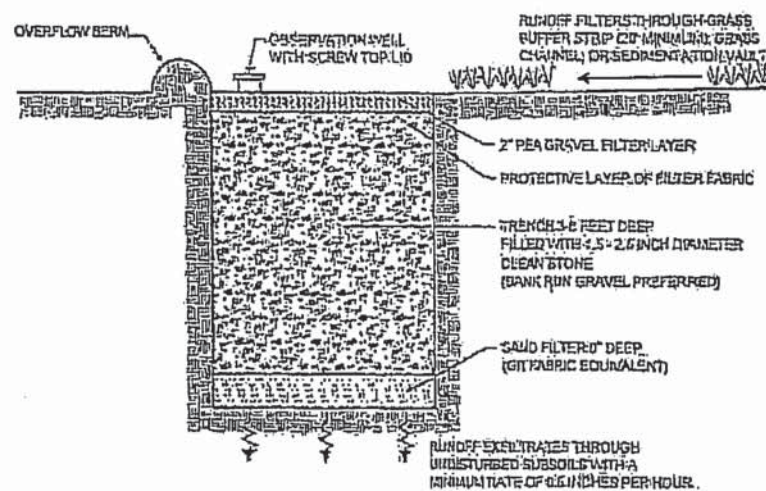
**STEP 3:** Facility volume =  $Re_v/0.40$  (accounting for void ratio in bed). Therefore, the proposed facility volume =  $90/0.40 = 225$  cubic feet.

## Infiltration Trenches

An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. Runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix. Infiltration trenches perform well for removal of fine sediment and associated pollutants. Pretreatment using buffer strips, swales, or detention basins is important for limiting amounts of coarse sediment entering the trench which can clog and render the trench ineffective.

Figure 23-A-2

### Typical Infiltration Trench Configuration



Source: Maryland Stormwater Design Manual

#### Example Sizing:

**STEP 1** - Suppose proposed impervious surface = 500 square feet; provide stormwater management under voluntary stormwater management procedures.

**STEP 2** - Required Recharge (Infiltration) Volume ( $Re_v$ ) is determined using ordinance §23-405. Suppose  $Re_v = 90$  cubic feet.

**STEP 3** - Sizing of Select Infiltration Method

Volume of facility = Depth x Width x Length

Required facility volume =  $Re_v / 0.40$  (accounting for void ratio in bed). Therefore, the proposed facility volume =  $90 / 0.40 = 225$  cubic feet.

Set  $D = 3$  ft; determined required surface area of trench

225 cu. ft. / 3 = 75 sq. ft.

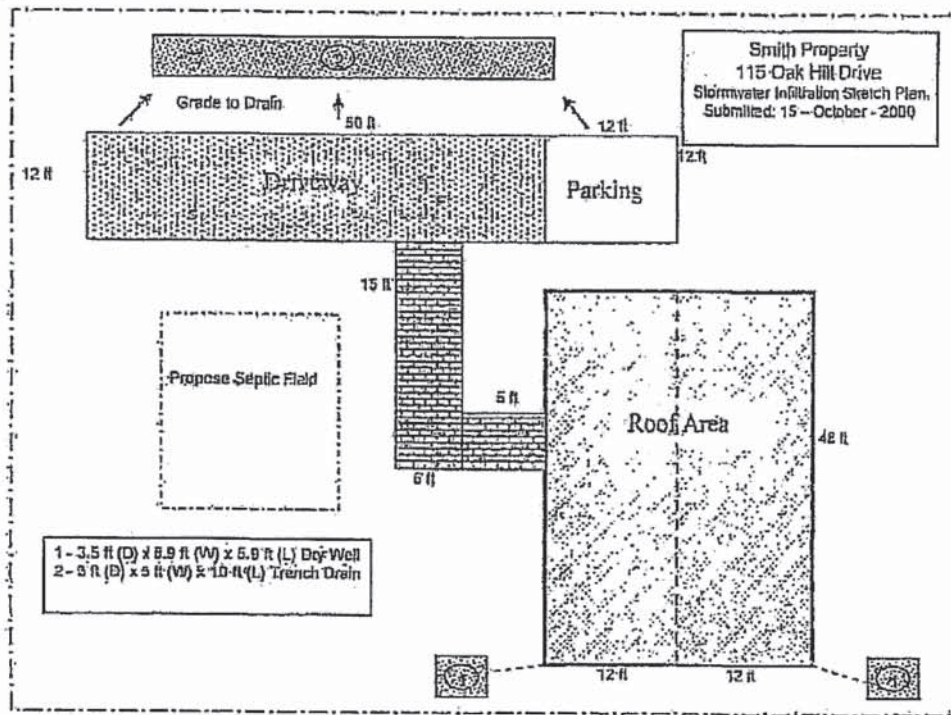
The width of the trench should be greater than 2 times its depth (2 x D); therefore, in this example a trench width of 7 feet is selected;

Determine trench length:  $L = 75 \text{ sq. ft.} / 7 = 10.8 \text{ ft.}$

Final trench dimensions: 3 ft. (D) x 7 ft. (W) x 10.8 ft. (L)

**Figure 23-A -3**

**Sample Site Sketch Plan**



Source: Maryland Stormwater Design Manual



APPENDIX 23-B-1

SAMPLE DRAINAGE PLAN APPLICATION

(To be attached to the "land subdivision plan or development plan review application" or "minor land subdivision plan review application")

Application is hereby made for review of the Stormwater Management Plan and related data as submitted herewith in accordance with the \_\_\_\_\_ Stormwater Management Ordinance.

\_\_\_\_\_ Final Plan \_\_\_\_\_ Preliminary Plan \_\_\_\_\_ Sketch Plan

Date of Submission \_\_\_\_\_ Submission No. \_\_\_\_\_

1. Name of subdivision or development \_\_\_\_\_

2. Name of applicant \_\_\_\_\_ Telephone No. \_\_\_\_\_

(if corporation, list the corporation's name and the names of two officers of the corporation

\_\_\_\_\_ Officer 1
\_\_\_\_\_ Officer 2

Address \_\_\_\_\_ Zip \_\_\_\_\_

Applicant's interest in subdivision or development (if other than property owner, give owner's name and address)

3. Name of Property Owner \_\_\_\_\_ Telephone No. \_\_\_\_\_

Address \_\_\_\_\_ Zip \_\_\_\_\_

4. Name of engineer or surveyor \_\_\_\_\_ Telephone No. \_\_\_\_\_

Address \_\_\_\_\_ Zip \_\_\_\_\_

5. Type of subdivision or development proposed:

- Single-family lots, Two-family lots, Multi-family Lots, Cluster Type Lots, Planned Residential Development, Townhouses, Garden Apartments, Mobile Home Park, Campground, Other ( ), Commercial (Multi-lot), Commercial (One lot), Industrial (Multi-lot), Industrial (One lot)

6. Linear feet of new road proposed \_\_\_\_\_ L.F.

7. Area of proposed and existing impervious area on the entire tract:

- a. Existing (to remain)                      S.F. %                      of property
- b. Proposed                                      S.F. %                      of property

8. Stormwater

- a. Does the peak rate of runoff from proposed conditions exceed that flow which occurred for existing conditions for the designated design storm? \_\_\_\_\_
- b. Design storm utilized (on-site conveyance systems) (24 hr.) \_\_\_\_\_  
 No. of Subarea \_\_\_\_\_  
 Watershed Name \_\_\_\_\_  
 Explain: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
- c. Does the submission and/or district meet the criteria for the applicable management district? \_\_\_\_\_
- d. Number of subarea(s) from Appendix 23-A of the \_\_\_\_\_  
 \_\_\_\_\_ Stormwater Management Plan or other subareas identified in other watershed stormwater management plans \_\_\_\_\_
- e. Type of proposed runoff control \_\_\_\_\_
- f. Does the proposed stormwater control criteria meet the requirements/guidelines of the Stormwater Ordinance?  
 If not, what variances/waivers are requested? \_\_\_\_\_  
 Reasons \_\_\_\_\_
- g. Does the plan meet the requirements of Part 3 of the Stormwater Ordinance?  
 \_\_\_\_\_  
 If not, what variances/waivers are requested? \_\_\_\_\_  
 Reasons why \_\_\_\_\_
- h. Was TR-55, June 1986, utilized in determining the time of concentration? \_\_\_\_\_  
 \_\_\_\_\_
- i. What hydrologic method was used in the stormwater computations? \_\_\_\_\_  
 \_\_\_\_\_
- j. Is a hydraulic routing through the stormwater control structure submitted?  
 \_\_\_\_\_
- k. Is a construction schedule or staging attached? \_\_\_\_\_
- l. Is a recommended maintenance program attached? \_\_\_\_\_

9. Erosion and Sediment Pollution Control (E&S):

- a. Has the stormwater management and E&S plan, supporting documentation, and narrative been submitted to the County Conservation District? \_\_\_\_\_  
\_\_\_\_\_
- b. Total area of earth disturbance \_\_\_\_\_ S.F.

10. Wetlands

- a. Have the wetlands been delineated by someone trained in wetland delineation? \_\_\_\_\_
- b. Have the wetland lines been verified by a State or Federal permitting authority? \_\_\_\_\_
- c. Have the wetlands been surveyed? \_\_\_\_\_
- d. Total acreage of wetland within the property \_\_\_\_\_
- e. Total acreage of wetland disturbed \_\_\_\_\_
- f. Supporting documentation \_\_\_\_\_

11. Filing

- a. Has the required fee been submitted?  
Amount \_\_\_\_\_
- b. Has the proposed schedule of construction inspection to be performed by the applicant's engineer been submitted? \_\_\_\_\_
- c. Name of individual who will be making the inspections \_\_\_\_\_
- d. General comments about stormwater management at the development  
\_\_\_\_\_

CERTIFICATE OF OWNERSHIP AND ACKNOWLEDGMENT OF APPLICATION:

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF [County Name].

On this the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_, before me, the undersigned officer, personally appeared \_\_\_\_\_ who, being duly sworn according to law, deposes and says that \_\_\_\_\_ are owners of the property described in this application and that the application was made with \_\_\_\_\_ knowledge and/or direction and does hereby agree with the said application and to the submission of the same.

\_\_\_\_\_ Property Owner

My Commission Expires \_\_\_\_\_, 20\_\_

Notary Public

THE UNDERSIGNED HEREBY CERTIFIES THAT TO THE BEST OF HIS KNOWLEDGE AND BELIEF THE INFORMATION AND STATEMENTS GIVEN ABOVE ARE TRUE AND CORRECT.

SIGNATURE OF APPLICANT

////////////////////////////////////

(Information Below This Line to Be Completed by The Municipality)

(Name of) Municipality official submission receipt:

Date complete application received \_\_\_\_\_ plan number \_\_\_\_\_

Fees \_\_\_\_\_ date fees paid \_\_\_\_\_ received by \_\_\_\_\_

Official submission receipt date \_\_\_\_\_

Received by \_\_\_\_\_

\_\_\_\_\_  
Municipality

**APPENDIX 23-B-2**

**DRAINAGE PLAN CHECKLIST**

Project: \_\_\_\_\_

Municipality: \_\_\_\_\_

Engineer: \_\_\_\_\_

Submittal No.: \_\_\_\_\_

Date: \_\_\_\_\_

---

**PART 1: GENERAL PROVISIONS**

Reference: §23-105 Applicability/Regulated Activities

1. Is the Proposed Project within the Swamp Creek watershed?     Yes     No
  
2. Does the Proposed Project meet the definition of a "Regulated Activity"?  Yes  No

STOP - If you have checked no for either of the above questions, you are not required to submit a Stormwater Management Plan under the Swamp Creek Stormwater Management Ordinance.

---

**PART 1: GENERAL PROVISIONS**

Reference: §23-106 Exemptions

Note: Parent Tract refers to the total parcel configuration on the date of the Municipal Stormwater Management Ordinance and includes any subdivision of lands which may have occurred after than date.

Parent Tract Area: \_\_\_\_\_ acres

Total Existing Impervious Area (as of the date of the Municipal Stormwater Management Ordinance): \_\_\_\_\_ acres

Total New Impervious Area (all Phases):

Parcel Is Exempt       Parcel Is Not Exempt

---

PART 4: STORMWATER MANAGEMENT

Reference: §23-404 Nonstructural Project Design

1. Has an Existing Resource and Site Analysis Map (ERSAM) been prepared?  
 Yes    No, Explain \_\_\_\_\_  
\_\_\_\_\_

## APPENDIX 23-C

### LOW IMPACT DEVELOPMENT (LID) PRACTICES

#### ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

Natural hydrologic conditions can be altered radically by poorly planned development practices such as introducing unnecessary impervious surfaces, destroying existing drainage swales, constructing unnecessary storm sewers, and changing local topography. A traditional drainage approach of development has been to remove runoff from a site as quickly as possible and capture it in a detention basin. This approach leads ultimately to the degradation of water quality as well as expenditure of additional resources for detaining and managing concentrated runoff at some downstream location.

The recommended alternative approach is to promote practices that will minimize proposed conditions runoff rates and volumes, which will minimize needs for artificial conveyance and storage facilities. To simulate pre-development hydrologic conditions, infiltration is often necessary to offset the loss of infiltration by creation of impervious surfaces. The ability of the ground to infiltrate depends upon the soil types and its conditions.

Preserving natural hydrologic conditions requires careful alternative site design considerations. Site design practices include preserving natural drainage features, minimizing impervious surface area, reducing the hydraulic connectivity of impervious surfaces, and protecting natural depression storage. A well-designed site will contain a mix of all of those features. The following describes various techniques to achieve the alternative approach:

- **Preserving Natural Drainage Features.** Protecting natural drainage features, particularly vegetated drainage swales and channels, is desirable because of their ability to infiltrate and attenuate flows and to filter pollutants. However, this objective is often not accomplished in land development. In fact, commonly held drainage philosophy encourages just the opposite pattern—streets and adjacent storm sewers are typically located in the natural headwater valleys and swales, thereby replacing natural drainage functions with a completely impervious system. As a result, runoff and pollutants generated from impervious surfaces flow directly into storm sewers with no opportunity for attenuation, infiltration, or filtration. Developments designed to fit site topography also minimize the amount of grading on site.
- **Protecting Natural Depression Storage Areas.** Depressional storage areas either have no surface outlet or drain very slowly following a storm event. They can be commonly seen as ponded areas in farm fields during the wet season or after large runoff events. Traditional development practices eliminate these depressions by filing or draining, thereby obliterating their ability to reduce surface runoff volumes and trap pollutants. The volume and release rate characteristics of depressions should be protected in the design of the development site. The

depressions can be protected by simply avoiding the depression or by incorporating its storage as additional capacity in required detention facilities.

- **Avoiding Introduction of Impervious Areas.** Careful site planning should consider reducing impervious coverage to the maximum extent possible. Building footprints, sidewalks, driveways, and other features producing impervious surfaces should be evaluated to minimize impacts on runoff.
- **Reducing the Hydraulic Connectivity of Impervious Surfaces.** Impervious surfaces are significantly less of a problem if they are not directly connected to an impervious conveyance system (such as a storm sewer). Two basic ways to reduce hydraulic connectivity are routing of roof runoff over lawns and reducing the use of storm sewers. Site grading should promote increasing travel time of stormwater runoff and should help reduce concentration of runoff to a single point in the development.
- **Routing Roof Runoff Over Lawns.** Roof runoff can be easily routed over lawns in most site designs. The practice discourages direct connection of downspouts to storm sewers or parking lots. The practice also discourages sloping driveways and parking lots to the street. By routing roof drains and crowning the driveway to run off to the lawn, the lawn is essentially used as a filter strip.
- **Reducing the Use of Storm Sewers.** By reducing-use of storm sewers for draining streets, parking lots, and back yards, the potential for accelerating runoff from the development can be greatly reduced. The practice requires greater use of swales and may not be practical, for some development sites, especially if there are concerns for areas that do not drain in a “reasonable” time. The practice requires educating local citizens and public works officials who expect runoff to disappear shortly after a rainfall event.
- **Reducing Street Widths.** Street widths can be reduced by either eliminating on-street parking or by reducing roadway widths. Municipal planners and traffic designers should encourage narrower neighborhood streets that ultimately could lower maintenance.
- **Limiting Sidewalks to One Side of the Street.** A sidewalk on one side of the street may suffice in low-traffic neighborhoods. The lost sidewalk could be replaced with bicycle/recreational trails that follow back-of-lot lines. Where appropriate, backyard trails should be constructed using pervious materials.
- **Using Permeable Paving Materials.** These materials include permeable interlocking concrete paving blocks or porous bituminous concrete. Such materials should be considered as alternatives to conventional pavement surfaces, especially for low use surfaces such as driveways, overflow parking lots, and emergency access roads.
- **Reducing Building Setbacks.** Reducing building setbacks reduces impervious cover associated with driveway and entry walks and is most readily accomplished along low traffic streets where traffic noise is not a problem.

- **Constructing Cluster Developments.** Cluster developments can also reduce the amount of impervious area for a given number of lots. The biggest savings occurs with street length, which also will reduce costs of the development. Cluster development groups the construction activity in less-sensitive areas without substantially affecting the gross density development.

In summary, a careful consideration of the existing topography and implementation of a combination of the above-mentioned techniques may avoid construction of costly stormwater control measures. Benefits include reduced potential for downstream flooding and water quality degradation of receiving streams/water bodies, enhancement of aesthetics, and reduction of development costs. Other benefits include more stable baseflows in receiving streams, improved groundwater recharge, reduced flood flows, reduced pollutant loads, and reduced costs for conveyance and storage.



**APPENDIX 23-D**

**STORMWATER MANAGEMENT DESIGN CRITERIA**

Table 23-D-1  
Precipitation-Frequency Atlas of the United States

Table 23-D-2  
Runoff Curve Numbers

Table 23-D-3  
Rational Runoff Coefficients

Table 23-D-4  
Nonstructural Stormwater Management Measures

Table 23-D-1

Precipitation-Frequency Atlas of the United States

Precipitation Frequency Estimates (inches)																		
ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.34	0.54	0.67	0.92	1.15	1.37	1.50	1.88	2.29	2.71	3.13	3.48	4.06	4.61	6.22	7.75	9.84	11.80
2	0.40	0.64	0.81	1.11	1.40	1.67	1.82	2.27	2.77	3.26	3.78	4.19	4.87	5.50	7.38	9.13	11.56	13.81
5	0.47	0.76	0.96	1.36	1.74	2.09	2.29	2.84	3.48	4.10	4.76	5.23	6.01	6.70	8.80	10.64	13.29	15.77
10	0.52	0.84	1.06	1.53	2.00	2.41	2.65	3.31	4.08	4.80	5.55	6.08	6.95	7.67	9.91	11.81	14.58	17.21
25	0.58	0.93	1.18	1.75	2.33	2.85	3.14	3.96	4.96	5.81	6.69	7.28	8.29	9.01	11.41	13.34	16.22	19.01
50	0.63	1.00	1.27	1.91	2.58	3.20	3.52	4.49	5.70	6.67	7.63	8.27	9.39	10.09	12.59	14.49	17.43	20.32
100	0.67	1.06	1.35	2.06	2.84	3.55	3.92	5.06	6.51	7.59	8.63	9.30	10.56	11.20	13.76	15.63	18.56	21.53
200	0.71	1.12	1.42	2.20	3.09	3.90	4.32	5.65	7.38	8.59	9.70	10.41	11.80	12.36	14.95	16.75	19.64	22.66
500	0.75	1.19	1.50	2.38	3.42	4.39	4.87	6.50	8.66	10.06	11.23	11.97	13.56	13.96	16.54	18.19	20.96	24.04
1000	0.79	1.24	1.55	2.52	3.67	4.76	5.30	7.17	9.74	11.27	12.48	13.24	14.99	15.23	17.75	19.26	21.90	25.00

Source: Atlas 14, Volume 2, US Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Hydrometeorological Design Studies Center, Silver Springs, Maryland 20910. NOAA's Atlas 14 can be found on the internet at <http://hdsc.nws.noaa.gov/hdsc/pfds/>.

Table 23-D-2

Runoff Curve Numbers

LAND USE DESCRIPTION	Hydrologic Condition	HYDROLOGIC SOIL GROUP			
		A	B	C	D
Open Space					
Grass cover < 50%	Poor	68	79	86	89
Grass cover 50% to 75%	Fair	49	69	79	84
Grass cover > 75%	Good	39	61	74	80
Meadow		30	58	71	78
Agricultural					
Pasture, grassland, or range - Continuous forage for grazing	Poor	68	79	86	89
Pasture, grassland, or range - Continuous forage for grazing	Fair	49	69	79	84
Pasture, grassland, or range - Continuous forage for grazing	Good	39	61	74	80
Brush—brush-weed-grass mixture with brush the major element	Poor	48	67	77	83
Brush—brush-weed-grass mixture with brush the major element	Fair	35	56	70	77
Brush—brush-weed-grass mixture with brush the major element	Good	30	48	65	73
Fallow Bare soil	—	77	86	91	94
Crop residue cover (CR)	Poor	76	85	90	93
Woods - grass combination (orchard or tree farm)	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30	55	70	77
Commercial	(85% impervious)	89	92	94	95
Industrial	(72% impervious)	81	88	91	93
Industrial	(50% impervious)	71	82	88	90
Residential districts by average lot size:	% Impervious:				
1/8 acre or less * (townhouses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Farmstead		59	74	82	86
Smooth surfaces (concrete, asphalt, gravel, or bare compacted soil)		98	98	98	98
Water		98	98	98	98
Mining/newly graded areas (pervious areas only)		77	86	91	94

\* Includes multi-family housing unless justified lower density can be provided.

Note: Existing site conditions of bare earth or fallow ground shall be considered as meadow when choosing a CN value.

Source: NRCS (SCS) TR-55

Table 23-D-3

Rational Runoff Coefficients

HYDROLOGIC SOIL GROUP	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
LAND USE DESCRIPTION												
Cultivated Land												
Winter Conditions	.14	.23	.34	.21	.32	.41	.27	.37	.48	.34	.45	.56
Summer Conditions	.10	.16	.22	.14	.20	.28	.19	.26	.33	.23	.29	.38
Fallow Fields												
Poor Conditions	.12	.19	.29	.17	.25	.34	.23	.33	.40	.27	.35	.45
Good Conditions	.08	.13	.16	.11	.15	.21	.14	.19	.26	.18	.23	.31
Forest/Woodland	.08	.11	.14	.10	.14	.18	.12	.16	.20	.15	.20	.25
Grass Areas												
Good Conditions	.10	.16	.20	.14	.19	.26	.18	.22	.30	.21	.25	.35
Average Conditions	.12	.18	.22	.16	.21	.28	.20	.25	.34	.24	.29	.41
Poor Conditions	.14	.21	.30	.18	.28	.37	.25	.35	.44	.30	.40	.50
Impervious Areas	.90	.91	.92	.91	.92	.93	.92	.93	.94	.93	.94	.95
Weighted Residential												
Lot Size 1/8 Acre	.29	.33	.36	.31	.35	.40	.34	.38	.44	.36	.41	.48
Lot Size 1/4 Acre	.26	.30	.34	.29	.33	.38	.32	.36	.42	.34	.38	.46
Lot Size 1/3 Acre	.24	.28	.31	.26	.32	.35	.29	.35	.40	.32	.36	.45
Lot Size 1/2 Acre	.21	.25	.28	.24	.27	.32	.27	.32	.37	.30	.34	.43
Lot Size 1 Acre	.18	.23	.26	.21	.24	.30	.24	.29	.36	.28	.32	.41

## APPENDIX 23-E

### REFERENCES

#### *BMP Manuals*

##### California

California Stormwater BMP Handbook: New Development and Redevelopment (January 2003) separate file available at <http://cabmphandbooks.org/Development.asp>

##### Georgia

Georgia Stormwater Management Manual Volume 2: Technical Handbook (August 2001)-separate file (<http://www.georgiastormwater.com/>)

##### Maryland

2000 Maryland Stormwater Design Manual –  
[http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/stormwater design/index.asp](http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/stormwater%20design/index.asp)

##### Massachusetts

Stormwater Management, Volume Two: Stormwater Technical Handbook (Massachusetts, 1997) – separate file available at  
<http://www.state.md.us/dep/brp/stormwtr/stormpub.htm>.

##### Minnesota

Minnesota Urban Small Sites BMP Manual: Stormwater Best Management Practices for Cold Climates (July 2001) –  
<http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm>

##### New Jersey

Revised Manual for New Jersey: Best Management Practices for Control of Nonpoint Source Pollution from Stormwater (Fifth Draft May 2000) –  
<http://www.state.nj.us/dep/watetshedmgt/bmpmanual.htm>

##### New York

New York State Stormwater Management Design Manual (2001) –  
<http://www.dec.state.ny.us/dep/watershedmgt/dow/swmanual/swmanual.html>

##### Pennsylvania

Pennsylvania Stormwater Best Management Practices Manual, January 2005 (draft).  
Pennsylvania Association of Conservation Districts, Pennsylvania Handbook of Best Management Practices for Developing Areas, November 14, 1997.

##### Washington

Stormwater Management Manual for Western Washington (August 2001) –  
<http://www.ecy.wa.gov/programs/wq/stormwater/manual.html>

Federal

Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring (FHWA) <http://www.fhwa.dot.gov/environment/ultraurb/3fs1.htm>

USEPA Infiltration Trench Fact Sheet (September 1999) –  
<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm>

*Riparian Buffer Reference*

Alliance for the Chesapeake Bay, Pennsylvania Department of Environmental Protection, September 2000. *Forest Buffer Toolkit*, Stream ReLeaf Program.

Penn State College of Agricultural Sciences, 1996. *Establishing Vegetative Buffer Strips along Streams to Improve Water Quality*. Publication # AGRS-67.

Fike, Jean, June 1999. *Terrestrial & Palustrine Plant Communities of Pennsylvania*, Pennsylvania Natural Diversity Inventory, The Nature Conservancy, Western Pennsylvania Conservancy, and Pennsylvania Department of Conservation and Natural Resources.

Pennsylvania Association of Conservation Districts, Inc., Keystone Chapter, Soil and Water Conservation Society, Pennsylvania Department of Environmental Protection, Natural Resources Conservation Service, 1998. *Pennsylvania Handbook of Best Management Practices for Developing Areas*. Prepared by CH2MHill.

Palone, R.S. and A.H. Todd (eds), 1997. *Chesapeake Bay Riparian Handbook. A Guide for Establishing and Maintaining Riparian Forest Buffers*. Chesapeake Bay Program and Northeastern Area State and Private Forestry. Natural Resources Conservation Service Cooperative State Research Education and Extension Services.

The Federal Interagency Stream Restoration Working Group (FISRWG, 10/1998). *Stream Corridor Restoration Principles, Processes, and Practices*. GPO Item No. 0120-A; SuDocs No. A57.6/2:EN3/PT.653. ISBN-0-934213-59-3. Published October 1998. Revised August 2000.

**APPENDIX 23-F**

**STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES  
OPERATIONS AND MAINTENANCE AGREEMENT**

**THIS AGREEMENT**, made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_, 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 stormwater controls and BMP operations and maintenance plan approved by the Municipality (hereinafter referred to as the "Plan") for the Property identified herein, which is attached hereto as Appendix 23-A and made part hereof, provides for management of stormwater within the confines of the Property through the use of Best Management Practices (BMP's); 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 stormwater BMPs be constructed and maintained on the Property; and

**WHEREAS**, for the purposes of this agreement, the following definitions shall apply:

BMP - "Best Management Practice" - activities, facilities, designs, measures or procedures used to manage stormwater impacts from land development, to protect and maintain water quality and groundwater recharge, and to otherwise meet the purposes of the municipal Stormwater Management Ordinance including, but not limited to, infiltration trenches, seepage pits, filter strips, bioretention, wet ponds, permeable paving, rain gardens, grassed swales, forested buffers, sand filters and detention basins.

Infiltration Trench - A BMP surface structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer.

Seepage Pit - An underground BMP structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer.

Rain Garden - A BMP overlain with appropriate mulch and suitable vegetation designed, constructed, and maintained for the purpose of providing infiltration or

recharge of stormwater into the soil and/or underground aquifer, and

**WHEREAS;** the Municipality requires, through the implementation of the Plan, that stormwater management BMPs as required by said Plan and the municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, his 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 BMPs shall be constructed by the Landowner in accordance with the plans and specifications identified in the Plan.
2. The Landowner shall operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality and in accordance with the specific maintenance requirements noted on the 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 identification, to inspect the BMP(s) whenever it deems necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the Property.
4. In the event that the Landowner fails to operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). This provision shall not be construed to allow the Municipality to erect any permanent structure on the land of the Landowner. 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 onsite BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect 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 interest shall release the Municipality's employees and designated representatives 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. In the event that a claim is asserted against the Municipality, its

designated representatives or employees, the Municipality shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgment or claims against the Municipality's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.

8. The Municipality shall inspect the BMP(s) at a minimum of once every 3 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 interest, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

\_\_\_\_\_

(SEAL)

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 of \_\_\_\_\_, 20\_\_\_\_, has acknowledged the same before me in my said County and State.

GIVEN UNDER MY HAND THIS \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_.

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
(Seal)



## Stormwater Management BMP Locations - (TO BE VERIFIED)

	PROPERTY OWNER	BMP Name	DA	Lat	Long	installation date	% imp	Tax # prefix	Tax Parcel ID	System Location-If Different	Owner Address	City	State	Zip	System	O+M Requirements
1	Benedict, Craig & Maria							47 000-	5968042	Same	313 Renninger Road	Perkiomenville	PA	18074	Stormwater Mgmt.	
2	Beyer, Amy							47 000-	5968051	Same	355 Renninger Road	Perkiomenville	PA	18074	Stormwater Mgmt.	
3	Black, Richard & Kandice							47 000-	2392009	Same	2314 Hill Road	Perkiomenville	PA	18074	Stormwater Mgmt.	
4	Bonhage, Matthew							47 000-	6672004		645 Schultz Road	Perkiomenville	PA	18074	Stormwater Mgmt.	
5	Boyer, Philip & Jennifer							47 000-	3952015		2803 Stacie Drive	Gilbertsville	PA	19525	Stormwater Mgmt.	
6	Brown, Heath & Conrad,Debra							47 000-	5968084		361 Renninger Road	Perkiomenville	PA	18074	Stormwater Mgmt.	
7	Burpee, Bradley Wendy							47 000-	2264011	Same	2196 Hill Road	Perkiomenville	PA	18074	Stormwater Mgmt.	
8	Camp, Laura & Fred							47 000-	7612009		582 Swamp Pinic Road					
9	Carl, D.J.							47 000-	3269005	2104 Colflesh Rd	2325 Little Road	Perkiomenville	PA	18074	Stormwater Mgmt.	
10	Coyle, Michael & Jennifer							47 000-	5644006	Same	2221 Deep Creek Rd	Perkiomenville	PA	18074	Stormwater Mgmt.	
11	Delp, Robert M & Nancy K							47 000-	3848002	Same	2985 N. Charlotte St.	Gilbertsville	PA	19525	Stormwater Mgmt.	
12	Donovan, Chad & Jessica							47 000-	724003	Same	382 Buchert Road	Pottstown	PA	19464	Stormwater Mgmt.	
13	Farrell Limited Partnership							47 000-	112003		2079 Big Road	Gilbertsville	PA	19525	Stormwater Mgmt.	
14	Freas, Jacob T Jr. & Lois E							47 000-	6028558	2480 Rhoads Road	2481 Rhoads Road	Gilbertsville	PA	19525	Stormwater Mgmt.	
15	Fischer, Andrea & Richard							47 000-	724004	Same	384 Buchert Road	Pottstown	PA	19464	Stormwater Mgmt.	
16	Fioravanti, Nicholas							47 000-	1720006	2606 Faust Rd.	2241 Hill Road	Perkiomenville	PA	18074	Stormwater Mgmt.	
17	Frattarelli, David							47 000-	724021	Same	380 Buchert Road	Pottstown	PA	19464	Stormwater Mgmt.	
18	Godshall, Barry							47 000-	4224004	815 Lee Rd.	815 Lee Rd.	Perkiomenville	PA	18074	Stormwater Mgmt.	
19	Green, Howard & Deann							48 000-	6448012	2430 Schaffer Road	172 Stone Hill Drive	Pottstown	PA	19464	Stormwater Mgmt.	
20	Groves, Janet (Omnipoint)							47 000	7156006		2615 Swamp Pike	Pottstown	PA	19464	Stormwater Mgmt.	
21	Halteman, Mark L.							47 000-	7252009	1804 Swamp Pike	1976 Chestnut Hill Rd.	Pottstown	PA	19464	Stormwater Mgmt.	
22	Heebner, Timothy & Tracy							47 000-	1145005		2350 N Hanover Sq Rd	Gilbertsville	PA	19525	Stormwater Mgmt.	
23	Heist, Robert							47 000-	6146107	2497 Rhoads Rd.	183 Roberta Blvd.	Royersford	PA	19468	Stormwater Mgmt.	
24	Heist, Robert							47 000-	6146116	2499 Rhoads Rd.	184 Roberta Blvd.	Royersford	PA	19468	Stormwater Mgmt.	
25	Heist, Robert							47 000-	5968042	2507 Rhoads Rd.	185 Roberta Blvd.	Royersford	PA	19468	Stormwater Mgmt.	
26	Heist, Robert							47 000-	6146413	2509 Rhoads Rd.	186 Roberta Blvd.	Royersford	PA	19468	Stormwater Mgmt.	
27	Hiester, Heather (Wood)							47 000-	2903002		922 Kulp Road	Perkiomenville	PA	18074	Stormwater Mgmt.	
28	Howard, Dusty M.							47 000-	724012	Same	378 Buchert Road	Pottstown	PA	19464	Stormwater Mgmt.	
29	Kingssepp Wm-Kane, Kathleen							47 000-	1815802		2682 Faust Road	Gilbertsville	PA	19525	Stormwater Mgmt.	
30	Koch, Brandon & Amanda							47 000	1624003		312 Erb Road	Perkiomenville	PA	18074	Stormwater Mgmt.	
31	Koch, Jarred & Keintz, Jill							47 000-	6028504		2482 Rhoads Road	Gilbertsville	PA	19525	Stormwater Mgmt.	
32	Kramer, Earl							47 000-	3240007	2103 Little Rd.	P O Box 65	Sassamansville	PA	19472	Stormwater Mgmt.	
33	Kulp Car Rental							47 000-	7333009		1828 Swamp Pike	Gilbertsville	PA	19525	Stormwater Mgmt.	
34	Lewis, Joshua & Monique							47 000-	2264011	Same	2196 Hill Road	Perkiomenville	PA	18074	Stormwater Mgmt.	
35	Link, James & Laura							47 000-	1140001		2394 N Hanover Sq	Gilbertsville	PA	19525	Stormwater Mgmt.	
36	Minckler, Mike & Joan							47 000-	2551453	Same	2411 Hoffmansville	Frederick	PA	19435	Stormwater Mgmt.	
37	Moser, Craig & Janet							47 000-	3952024		2802 Stacie Drive	Gilbertsville	PA	19525	Stormwater Mgmt.	
38	Moyer, Scott & Jennifer							47 000-	2228002	2571 Hill Rd.	2571 Hill Rd.	Perkiomenville	PA	18074	Stormwater Mgmt.	
39	Orff, David & Susan							47 000-	3192001	961 Layfield Road	195 Paper Mill Road	Barto	PA	19504	Stormwater Mgmt.	
40	Petkosh, Damian & Kozak, Carla							48 000-	488005		2232 Broomstick Road	Green Lane	PA	18054	Stormwater Mgmt.	
41	Potson, Andrew & Julie							47 000-	5968015	Same	303 Renninger Road	Perkiomenville	PA	18074	Stormwater Mgmt.	
42	Roberts, Robert & Campisi, Desiree							47 000-	1720006	Same	2606 Faust Road	Gilbertsville	PA	19525	Stormwater Mgmt.	
43	Rubright, Ryan							47 000-	2596012		1850 Hoffmansville Rd	Frederick	PA	19435	Stormwater Mgmt.	
44	Rurode, Ronald							47 000-	7844054		520 Stone Road	Barto	PA	19504	Stormwater Mgmt.	
45	RMG Properties										Rhoads Road	Gilbertsville	PA	19525		
46	RML									2571 Hill Road	21 Rand Drive	Perkiomenville	PA	18074		





Alta Planning + Design  
243 Bridge St. Suite 101  
Phoenixville, PA 19460

Krista Brown, Environmental Compliance Specialist  
PADEP, SE Regional Office  
2 E Main Street  
Norristown, PA 19401

BMP TO BE FIELD VERIFIED AND ADDED TO SWM BMP DATABASE

Subdivision	BMP Type	Address	Owner	Comments
Pleasant Run	Basin	681 KINGSWOOD VALE	HAND CHARLES R & MICHELE S	
New Hanover Elementary	Basin	2547 BIG RD	BASD	
WINDLESTRAE PHASE 1 TO 5 & 7 TO 9	2 Basins	Middle Creek RD	WINDLESTRAE INVESTMENT LLC	
WINDLESTRAE PHASE VI	Basin	Tulip Lne	EAST MABEL INVESTMENTS LLC	
McSurdy	Basin	1831 SWAMP PIKE	MCSURDY LP	
Office Center	Basin	1806 -1810 SWAMP PIKE	MCSURDY LP	
Wawa	Basin (ug)	Swamp Pike	Wawa INC	
CVS	Basin (ug)	2852 N. Charlotte St	SCP 2002E-54 LLC	
HAWTHORNE ESTATES (min. creek Farms)	Basin	Holbrook Ln.	HAWTHORNE ESTATES COMMUNITY ASSOCIATION	
Country Fields	Basin	3014 BURTON DR	FRANKENFIELD LARRY A JR &	
Acorn Hills	Open Channel	Between Louisa and Donna Way	LAPIO SAL INC	
Acorn Hills	Basin	Golf Course off Jessica DR	ACORN HILLS LP	
Acorn Hills	2 Basins	Samantha Way	LAPIO SAL INC	
Country Fields	Basin	2865 HOMESTEAD CT	REYNOLDS ROBERT H III & MELISSA	
Colonial Ridge	Basin	2598 CHERRY CT	DIMARZIO ANTHONY	
Sterling Tract	Basin	2306 STERLING DR	REFFNER BRENT & CHRISTINA L	
Heather estates	Basin	2207 MARTIN DR	CARLIN WILLIAM H JR & HEATHER A	
Heather estates	basin	2174 HEATHER LN	SALKOVITZ ALAN V & DIANA L	
Heather estates	Basin	2172 MARTIN DR	FOSTER AARON & ANN MARIE	
Hunters Run	Basin	CHARLES DR	DRATAX HANOVER INC	Also two TWP owned basins within this subdivision
HOPE COMMUNITY CHURCH	Basin	2732 N CHARLOTTE ST	HOPE COMMUNITY CHURCH	
KINGSTON HILL	Basin	Rhoads RD	TH PROPERTIES	
KINGSTON HILL II, PHASE IV	Basin	COURTSIDE AVE	KINGSTON HILL II COMMUNITY ASSOCIATION	
KINGSTON HILL II, PHASE IV	2 Basins	CANYON CREEK	KINGSTON HILL II COMMUNITY ASSOCIATION	
Kingston Hill	Basin	LOMARA Dr	KINGSTON HILL COMMUNITY ASSN	
Cianculli Tract	Basin	Anthony Dr	AUTUMN BROOK COMMUNITY ASSN	
Willow Woods	Basin	2651 SHADY LN	KELLY ANDREW M & MARY KATE	
Covered Bridge Estates	Basin	406 SUNNY RIDGE RD	KUKULSKI FRANK C &	
Covered Bridge Estates	Basin	437 SUNNY RIDGE RD	SULZBACH CHARLES P & ESTHER	
Covered Bridge Estates	Basin	534 BOW LN	MELCHER JOSEPH G & JENNIFER J	
Windy Creek Estates	Basin	483 WINDY HILL RD	SUTHERLAND JOSEPH	
Covered Bridge Estates	Basin	363 KELMAN RD	ZEIGLER SCOTT C & AMY E	
Covered Bridge Estates	Basin	2761 ST ANTHONY WAY	GUERRE-CHALEY PROSPER & JOSEPHINE	
	Basin	945 Parestis RD	NAZZARO SALVATORE D & BRITTANY E	Not in subdivision