

**TOWNSHIP OF SOUTH FAYETTE
ALLEGHENY COUNTY, PENNSYLVANIA**

ORDINANCE NO. 7 OF 2018

**AN ORDINANCE OF THE TOWNSHIP OF SOUTH FAYETTE,
ALLEGHENY COUNTY, PENNSYLVANIA, REPEALING
CHAPTER 215, SUBDIVISION AND LAND DEVELOPMENT,
SECTION 215-78, STORMWATER MANAGEMENT, OF THE
SOUTH FAYETTE CODE AND REPLACING THE SAME WITH AN
AMENDED AND RESTATED STORMWATER MANAGEMENT
ORDINANCE**

WHEREAS, Pennsylvania’s Stormwater Management Act, P.L. 864, October 4, 1978, P.L. 864, codified at Pa. Stat. Ann. tit. 32, § 680.1 et seq. (2016) (“Act 167”), requires counties to prepare and adopt a stormwater management plan for each watershed location in each county within the Commonwealth; and

WHEREAS, Act 167 further requires each municipality within a county to adopt, amend and implement a stormwater management ordinance and regulations to regulate development within a municipality within six (6) months of the Pennsylvania Department of Environmental Protection’s (“PADEP”) adoption and approval of a county’s stormwater management plan; and

WHEREAS, through consultation with the Township’s municipal engineer, the Township has caused to be prepared an Amended and Restated Stormwater Management Ordinance, the form and content are attached hereto and made part hereof as Exhibit “A”; and

WHEREAS, the Commissioners of the Township of South Fayette believe that the Amended and Restated Stormwater Management Ordinance is appropriate and necessary and addresses the requirements of both the Pennsylvania Stormwater Management Act and Pennsylvania Department of Environmental Protection.

NOW THEREFORE, be it **ORDAINED**, it is hereby **ORDAINED** by the Commissioners of the Township of South Fayette, Allegheny County, Commonwealth of Pennsylvania, and it is hereby **ENACTED** and **ORDAINED** by authority of same as follows:

1. The recitals set forth herein above are incorporated herein by reference thereto;

2. The Township does hereby adopt an Amended and Restated Stormwater Management Ordinance in the form and content attached hereto and made part hereof as Exhibit "A".
3. This Ordinance shall become effective upon passage of this Ordinance.
4. Any Ordinance or Resolution, or portion thereof, conflicting with the provisions of this Ordinance shall be and the same is hereby repealed, insofar as the same affects this Ordinance.
5. This Ordinance is intended to and does replace in its entirety the provisions of Chapter 215, Subdivision and Land Development, Section 215-78, Stormwater Management, of the South Fayette Code.

ORDAINED AND ENACTED INTO LAW this 14th day of November 2018.

ATTEST:



Miles Truitt
Acting Township Secretary

TOWNSHIP OF SOUTH FAYETTE:



Ray Pitetti, President
Board of Commissioners

STORMWATER MANAGEMENT ORDINANCE

ORDINANCE NO. 7 of 2018

TOWNSHIP OF SOUTH FAYETTE

ALLEGHENY COUNTY, PENNSYLVANIA

Adopted at a Public Meeting Held on

NOVEMBER 14, 2018

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ARTICLE I - GENERAL PROVISIONS

Section 101. Short Title

This Ordinance shall be known and may be cited as the "Township of South Fayette Stormwater Management Ordinance."

Section 102. Statement of Findings

The governing body of the Municipality finds that:

- A. Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases runoff volumes, flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines flood plain management and flood control efforts in downstream communities, reduces groundwater recharge, threatens public health and safety, and increases nonpoint source pollution of water resources.
- B. A comprehensive program of stormwater management (SWM), including regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, and welfare and the protection of people of the Commonwealth, their resources, and the environment.
- C. Stormwater is an important water resource that provides groundwater recharge for water supplies and supports the base flow of streams.
- D. The use of green infrastructure (GI) and low impact development (LID) are intended to address the root cause of water quality impairment by using systems and practices which use or mimic natural processes to: 1) infiltrate and recharge, 2) evapotranspire, and/or 3) harvest and use precipitation near where it falls to earth. Green infrastructure practices and LID contribute to the restoration or maintenance of pre-development hydrology.
- E. 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) program.

Section 103. Purpose

The purpose of this Ordinance is to promote health, safety, and welfare within the Municipality and its watershed by minimizing the harms and maximizing the benefits described in Section 102 of this Ordinance, through provisions designed to:

- A. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code 93 to protect, maintain, reclaim, and restore the existing and designated uses of the waters of this Commonwealth.
- B. Preserve natural drainage systems.
- C. Manage stormwater runoff close to the source, reduce runoff volumes and mimic predevelopment hydrology.
- D. Provide procedures and performance standards for stormwater planning and management.
- E. Maintain groundwater recharge to prevent degradation of surface and groundwater quality and to otherwise protect water resources.
- F. Prevent scour and erosion of stream banks and streambeds.
- G. Provide proper operation and maintenance of all stormwater best management practices (BMPs) that are implemented within the Municipality.
- H. Provide standards to meet NPDES permit requirements.

Section 104. Statutory Authority

The Municipality is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended, and/or the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, The Stormwater Management Act.

Section 105. Applicability

All regulated activities and all activities that may affect stormwater runoff, including land development and earth disturbance activity, are subject to regulation by this Ordinance.

Section 106. Repealer

Any other ordinance provision(s) or regulation of the Municipality inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

Section 107. Severability

In the event that a court of competent jurisdiction declares any section or provision of this Ordinance invalid, such decision shall not affect the validity of any of the remaining provisions of this Ordinance.

Section 108. Compatibility with Other Requirements

Approvals issued and actions taken under this Ordinance do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other code, law, regulation or ordinance.

Section 109. Erroneous Permit

Any permit or authorization issued or approved based on false, misleading or erroneous information provided by an applicant is void without the necessity of any proceedings for revocation. Any work undertaken or use established pursuant to such permit or other authorization is unlawful. No action may be taken by a board, agency or employee of the Municipality purporting to validate such a violation.

Section 110. Waivers

- A. If the Municipality determines that any requirement under this Ordinance cannot be achieved for a particular regulated activity the Municipality may, after an evaluation of alternatives, approve measures other than those in this Ordinance, subject to Section 110, paragraph B. **The proposed area of disturbance shall be less than one (1) acre.** The request for a modification or waiver shall originate with the Landowner, shall be in writing, and shall accompany the Stormwater Management Site Plan submitted to the Municipality. The request shall provide the facts on which the request is based, the provisions of the Ordinance involved, and the proposed modification. The Designated Plan Reviewer shall review the request to determine if it meets the requirements of the Ordinance, including paragraph B below. If acceptable to the Municipality, the Municipality may grant the waiver or modification.
- B. Waivers or modifications of the requirements of this Ordinance may be approved by the Municipality if enforcement will exact undue hardship because of unique physical circumstances or conditions peculiar to the land in question, provided that the modifications will not be contrary or detrimental to the public interest and will achieve the intended outcome, and that the purpose of the Ordinance is preserved. Hardship must be due to such unique physical circumstances or conditions and not to circumstances or conditions generally created by the provisions of the Stormwater Management Ordinance. Cost or financial burden shall not be considered a hardship. Modifications shall not substantially or permanently impair the appropriate use or development of adjacent property. A request for modifications shall be in writing and accompany the Stormwater Management Site Plan submission, as directed in Section 110, paragraph A above.
- C. No waiver or modification of any regulated stormwater activity involving earth disturbance greater than or equal to one (1) acre may be granted by the Municipality.
- D. This Section shall not apply to requests for waiver or modification to the provisions of Section V – Design Criteria.

All requests for waivers or modifications from Section V shall be reviewed by the Municipality for applications of any size earth disturbance.

Section 111. Version of Regulations and Standards

Any reference to a statute, regulation or standard, shall be interpreted to refer to the latest or most current version of that document.

Section 112. Disclaimer of Liability

- A. For regulatory purposes, the degree of stormwater management sought by the provisions of this Chapter is considered reasonable. This Chapter shall not impose upon the Municipality any legal duty in addition to those duties otherwise imposed under the Stormwater Management Act upon the Municipality, any appointed or elected official, employee or representative of the Municipality. It is not the intention of the Municipality to guarantee the elimination of harm resulting from stream flow, floods, rain, snow, or stormwater runoff; or erosion resulting therefrom. It is the intention of the Municipality to create reasonable stormwater management regulations which balance several competing interests in an appropriate fashion with the emphasis on public safety.
- B. This Chapter does not imply that areas within or outside any identified flood-prone area will be free from flooding or flood damages.
- C. Neither the granting of any approval under this Ordinance, nor the compliance with the provisions of this Ordinance, or with any condition imposed by the Municipality or a Municipality official hereunder, shall relieve any person from any responsibility for damage to persons or property resulting therefrom, or as otherwise imposed by law, nor impose any liability upon the Municipality for damages to person or property.
- D. The granting of a permit which includes any stormwater management facilities shall not constitute a representation, guarantee, or warranty of any kind by the Municipality, or by an official, employee, or consultant thereof, of the practicability or safety of any structure, use, or other plan proposed, and shall create no liability upon or cause of action against the Municipality, or an official, employee, or consultant thereof, for any damage that may result pursuant thereto.

ARTICLE II – DEFINITIONS

For the purposes of this Ordinance, 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 words “shall” and “must” are mandatory; the words “may” and “should” are permissive.

These definitions do not necessarily reflect the definitions contained in pertinent regulations or statutes and are intended for this Ordinance only.

Act 167 - The Municipality is empowered to regulate land use activities that affect runoff and surface and groundwater quality and quantity by the authority of the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, the “Storm Water Management Act.”

Agricultural Activity – Activities associated with agriculture such as agricultural cultivation, agricultural operation, and animal heavy use areas. This includes the work of producing crops including tillage, land clearing, plowing, disking, harrowing, planting, harvesting crops or pasturing and raising of livestock and installation of conservation measures. Construction of new buildings or impervious area is not considered an agricultural activity.

Applicant – A landowner, developer, or other person who has filed an application to the Municipality for approval to engage in any regulated activity at a project site in the Municipality.

Best Management Practice (BMP) – Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one of two broad categories or measures: “structural” or “non-structural.” In this Ordinance, non-structural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff, whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural stormwater BMPs are permanent appurtenances to the project site.

Conservation District – A conservation district, as defined in Section 3(c) of the Conservation District Law (3 P. S. § 851(c)) that has the authority under a delegation agreement executed with DEP to administer and enforce all or a portion of the regulations promulgated under 25 Pa. Code 102.

Design Storm – The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a 5-year storm) and duration (e.g., 24 hours) used in the design and evaluation of stormwater management systems. Also see Return Period.

Designated Plan Reviewer – A Qualified Professional as defined herein, or organization such as the Allegheny County Conservation District, that has been designated by the Municipality to be the reviewer of SWM Site Plans for the Municipality, and shall be understood to be the reviewer where indicated as the Municipality within this ordinance.

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 in a designed period after a rainfall event, and to become dry until the next rainfall event.

Detention Volume – The volume of runoff that is captured and released into the waters of the Commonwealth at a controlled rate.

DEP – The Pennsylvania Department of Environmental Protection.

Development Site (Site) – See Project Site.

Disturbed Area – An unstabilized land area where an earth disturbance activity is occurring or has occurred.

Earth Disturbance Activity – A construction or other human activity which disturbs the surface of the land, including, but not limited to: clearing and grubbing; grading; excavations; embankments; road maintenance; building construction; and the moving, depositing, stockpiling, or storing of soil, rock, or earth materials.

Erosion – The natural process by which the surface of the land is worn away by water, wind, or chemical action.

Existing Condition – The dominant land cover during the 5-year period immediately preceding a proposed regulated activity.

FEMA – Federal Emergency Management Agency.

Floodplain – Any land area susceptible to inundation by water from any natural source or delineated by applicable FEMA maps and studies as being a special flood hazard area. Also includes areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania DEP Technical Manual for Sewage Enforcement Officers (as amended or replaced from time to time by DEP).

Floodway – The channel of the watercourse and those portions of the adjoining floodplains that are reasonably required to carry and discharge the 100-year flood. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the 100-year floodway, it is assumed--absent evidence to the contrary--that the floodway extends from the stream to 50 feet from the top of the bank of the stream.

Forest Management/Timber Operations – Planning and activities necessary for the management of forestland. These include conducting a timber inventory, preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation, and reforestation.

Green Infrastructure – Systems and practices that use or mimic natural processes to infiltrate, evapotranspire, or reuse stormwater on the site where it is generated.

Groundwater – Water beneath the earth's surface that supplies wells and springs and is within the saturated zone of soil and rock.

Groundwater Recharge – The replenishment of existing natural underground water supplies from precipitation or overland flow.

Hydrologic Soil Group (HSG) – Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSGs (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The NRCS defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of the development site may be identified from a soil survey report that can be obtained from local NRCS offices or conservation district offices. Soils become less pervious as the HSG varies from A to D (NRCS^{1,2}).

Impervious Surface (Impervious Area) – A surface that prevents the infiltration of water into the ground. Impervious surfaces (or areas) shall include, but not be limited to: roofs; additional indoor living spaces, patios, garages, storage sheds and similar structures; and any new streets or sidewalks. Decks, parking areas, and driveway areas are counted as impervious areas if they directly prevent infiltration. Any surface areas designed to initially be gravel or crushed stone shall be assumed to be impervious surfaces. In addition, any surface designed to be constructed of permeable, pervious or porous concrete, asphalt, or pavers shall be considered an impervious surface.

Invasive Species – DCNR defines invasive plants as those species that are not native to the state, grow aggressively, and spread and displace native vegetation. (see http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_010314.pdf for a list of invasive species.

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.

Land Development (Development) – Inclusive of any or all of the following meanings: (i) the improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving (a) a group of two or more buildings or (b) the division or allocation of land or space 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; (ii) any subdivision of land; (iii) development in accordance with Section 503(1.1) of the PA Municipalities Planning Code.

Low Impact Development (LID) – Site design approaches and small-scale stormwater management practices that promote the use of natural systems for infiltration, evapotranspiration, and reuse of rainwater. LID can be applied to new development, urban retrofits, and revitalization projects. LID utilizes design techniques that infiltrate, filter, evaporate, and store runoff close to its source. Rather than rely on costly large-scale conveyance and treatment systems, LID addresses stormwater through a variety of small, cost-effective landscape features located on-site.

Municipality – Township of South Fayette, Allegheny County, Pennsylvania.

Native Vegetation – Plant species that have historically grown in Pennsylvania and are not invasive species as defined herein.

NRCS – USDA Natural Resources Conservation Service (previously SCS).

Peak Discharge – The maximum rate of stormwater runoff from a specific storm event.

Pervious Area – Any area not defined as impervious.

Project Site – The specific area of land where any regulated activities in the Municipality are planned, conducted, or maintained.

Qualified Professional – Any person licensed by the Pennsylvania Department of State or otherwise qualified under Pennsylvania law to perform the work required by this Ordinance.

Regulated Activities – Any earth disturbance activities or any activities that involve the alteration or development of land in a manner that may affect stormwater runoff.

Regulated Earth Disturbance Activity – Activity involving earth disturbance subject to regulation under 25 Pa. Code 92, 25 Pa. Code 102, or the Clean Streams Law.

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.

Release Rate District – A watershed or portion of a watershed for which a release rate has been established by an adopted Act 167 Stormwater Management Plan.

Retention Volume/Removed Runoff – The volume of runoff that is captured and not released directly into the surface waters of this Commonwealth during or after a storm event.

Return Period – The average interval, in years, within which a storm event of a given magnitude can be expected to occur one time. For example, the 25-year return period rainfall would be expected to occur on average once every 25 years; or stated in another way, the probability of a 25-year storm occurring in any one year is 0.04 (i.e., a 4% chance).

Riparian Buffer – A permanent vegetated area of trees and shrubs located adjacent to streams, lakes, ponds and wetlands.

Runoff – Any part of precipitation that flows over the land.

Sediment – Soils or other materials transported by surface water as a product of erosion.

State Water Quality Requirements – The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code and the Clean Streams Law.

Stormwater – Drainage runoff from the surface of the land resulting from precipitation or snow or ice melt.

Stormwater Management Facility – Any structure, natural or man-made, that, due to its condition, design, or construction, conveys, stores, or otherwise affects stormwater runoff. Typical stormwater management facilities include, but are not limited to: detention and retention basins; open channels; storm sewers; pipes; and infiltration facilities.

Stormwater Management Site Plan – The plan prepared by the developer or the developer's representative indicating how stormwater runoff will be managed at the development site in accordance with this Ordinance. **Stormwater Management Site Plan** will be designated as **SWM Site Plan** throughout this Ordinance.

Stream - A channel or conveyance of surface water having a defined bed and banks, whether natural or artificial, with perennial or intermittent flow.

Subdivision – As defined in The Pennsylvania Municipalities Planning Code, Act of July 31, 1968, P.L. 805, No. 247.

USDA – United States Department of Agriculture.

Waters of this Commonwealth – Any and all rivers, streams, creeks, rivulets, impoundments, 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 this Commonwealth.

Watercourse – See Stream.

Watershed – Region or land area drained by a river, watercourse, or other surface water of this Commonwealth to a downstream point.

Wetland – 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, including swamps, marshes, bogs, and similar areas.

ARTICLE III – STORMWATER MANAGEMENT STANDARDS

Section 301. General Requirements

- A. For all regulated activities, unless preparation of an SWM Site Plan is specifically exempted in Section 302:
1. Preparation and implementation of an approved SWM Site Plan is required.
 2. No regulated activities shall commence until the Municipality issues written approval of an SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance.
- B. SWM Site Plans approved by the Municipality, in accordance with Section 406, shall be on site throughout the duration of the regulated activity.
- C. These standards apply to the landowner and any person engaged in regulated activities.
- D. For all regulated earth disturbance activities, erosion and sediment control BMPs shall be designed, implemented, operated, and maintained during the regulated earth disturbance activities (e.g., during construction) to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code and the Clean Streams Law. Various BMPs and their design standards are listed in the *Erosion and Sediment Pollution Control Program Manual (E&S Manual⁴)*, No. 363-2134-008, as amended and updated. Comment on the adequacy of the Erosion and Sedimentation Controls may be provided by the Municipality per the requirements of Allegheny County Conservation District.
- E. Impervious areas:
1. The measurement of impervious areas shall include all of the impervious areas in the total proposed development even if development is to take place in stages.
 2. For development taking place in stages, the entire development plan must be used in determining conformance with this Ordinance.
 3. For projects that add impervious area to a parcel, the total impervious area on the parcel is subject to the requirements of this Ordinance; except that the volume controls in Section 303 and the peak rate controls of Section 304 do not need to be retrofitted to existing impervious areas that are not being altered by the proposed regulated activity.
- F. Stormwater flows onto adjacent or downstream property shall not be created, increased, decreased, relocated, impeded, or otherwise altered without written notification of the affected property owner(s). Notification shall include a description of the proposed development and the stormwater flows that are being created, increased, decreased, relocated, impeded, or otherwise altered. Adjacent property shall at a minimum include any property having a shared boundary with the subject property of the SWM Site Plan, however, if in the judgement of the Designated Plan Reviewer additional properties are being affected, additional notifications may be required. Proof of notification (signed postal receipt for example) shall be included as part of the SWM Plan submission to the Municipality. Such stormwater flows shall be subject to the requirements of this Ordinance.
- G. All regulated activities shall include such measures as necessary to:
1. Protect health, safety, and property.
 2. Meet the water quality goals of this Ordinance by implementing measures to:
 - a. Minimize disturbance to floodplains, wetlands, and wooded areas.
 - b. Maintain or extend riparian buffers.
 - c. Avoid erosive flow conditions in natural flow pathways.
 - d. Minimize thermal impacts to waters of this Commonwealth.

- e. Disconnect impervious surfaces by directing runoff to pervious areas, wherever possible.
3. Incorporate methods described in the *Pennsylvania Stormwater Best Management Practices Manual* (BMP Manual³). If methods other than green infrastructure and LID methods are proposed to achieve the volume and rate controls required under this Ordinance, the SWM Site Plan must include a detailed justification, acceptable to the Designated Plan Reviewer, demonstrating that the use of LID and green infrastructure is not practicable.
- H. Infiltration BMPs should be dispersed throughout the project site at strategic locations, made as shallow as practicable, and located to maximize use of natural on-site infiltration features while still meeting the other requirements of this Ordinance.
 - I. Normally dry, open top, storage facilities should completely drain both the volume control and rate control capacities over a period of time not less than 24 and not more than 72 hours from the end of the design storm. Infiltration tests performed at the facility locations and proposed basin bottom depths, in accordance with the BMP Manual, must support time-to-empty calculations if infiltration is a factor.
 - J. The design storm precipitation depths to be used in the analysis of peak rates of discharge shall be as obtained in PennDOT's Drainage Manual, Publication 584, Appendix 7A; or obtained from the latest version of the Precipitation-Frequency Atlas of the United States, National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Hydrometeorological Design Studies Center, Silver Spring, Maryland. NOAA's Atlas 14⁵ can be accessed at: <http://hdsc.nws.noaa.gov/hdsc/pfds/>.
 - K. For all regulated activities, SWM BMPs shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Storm Water Management Act.
 - L. Various BMPs and their design standards are listed in the BMP Manual³.
 - M. The municipality may, after consultation with DEP, approve measures for meeting the state water quality requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, state law including, but not limited to, the Clean Streams Law.

Section 302. Exemptions

- A. Regulated activities that result in cumulative earth disturbances less than one-quarter (0.25) acre and propose an increase in impervious area of less than 5,000 square feet are exempt from the requirements in Section 401 of this ordinance except as provided in paragraph B below.
- B. Earth disturbances between one-twentieth (0.05) acre (2,178 square feet) and one-quarter (0.25) acre (10,890 square feet) of earth disturbance must submit a SWM Site Plan to the Municipality which shall consist of the following items and related supportive material needed to determine compliance with Sections 303 through 305. The applicant can use the protocols in the Small Project Stormwater Management Site Plan (Appendix C).
 - a. General description of proposed stormwater management techniques, including construction specifications of the materials to be used for stormwater management facilities.
 - b. An erosion and sediment control plan, including all reviews and letters of adequacy from the Conservation District where appropriate.
 - c. Limits of earth disturbance, including the type and amount of impervious area that is proposed; proposed structures, roads, paved areas, and buildings; and a statement, signed by the Applicant, acknowledging that any revision to the approved drainage plan must be approved by the Municipality, and that a revised erosion and sediment control plan must be submitted to the Municipality or Conservation District for approval.
 - d. All stormwater management facilities must be located on a plan and described in detail; and all calculations, assumptions, and criteria used in the design of the stormwater management facilities must be shown.
- C. Agricultural activity is exempt from the SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

- D. Forest management and timber operations are exempt from the SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.
- E. Roadway resurfacing and maintenance projects, which do not increase impervious area, and underground infrastructure projects are exempt from the provisions of this Ordinance, provided the activities meet the requirements of all other Municipal, State and Federal requirements. Exemptions from any provisions of this Ordinance shall not relieve the applicant from the requirements in Sections 301.D. through J.
- F. The Municipality may deny or revoke any exemption pursuant to this Section at any time for any project that the Municipality believes may pose a threat to public health and safety or the environment.
- G. Voluntary Green Stormwater Infrastructure (GSI) retrofit projects that are solely intended to better manage runoff from existing development and are not part of new development or redevelopment, are exempt from the stormwater management provisions of this Ordinance. This does not exempt such projects from any other municipal, state, or federal regulation.
- H. Use of land for home gardening or landscaping improvements, provided that such improvements do not significantly alter the runoff characteristics of the land.

Section 303. Volume Controls

The green infrastructure and low impact development practices provided in the BMP Manual³ shall be utilized for all regulated activities wherever possible. Water volume controls shall be implemented using the *Design Storm Method* in Subsection A or the *Simplified Method* in Subsection B below. Water volume controls shall be implemented using the Design Storm Method in Subsection A or the Simplified Method in Subsection B below, or alternative design criteria as allowed by PA Code Title 25, Chapter 102.

- A. The *Design Storm Method* (CG-1 in the BMP Manual³) is applicable as a method to any size of regulated activity. This method requires detailed modeling based on site conditions. The following shall be incorporated into the CG-1 method:
 - 1. Do not increase the post-development total runoff volume for all storms equal to or less than the 2-year 24-hour duration precipitation.
 - 2. At least the first one inch of runoff from the net increase in impervious surfaces shall be permanently removed from the runoff flow, i.e., it shall not be released into the surface waters of this Commonwealth. Removal options include reuse, evaporation, transpiration, and infiltration. If the developer provides justification that the listed removal options are not feasible, and the Designated Plan Reviewer agrees, runoff shall be detained in a facility designed for a 48 to 72 hour dewatering time in an area with a dedicated stormwater system (not contributory to a combined sewer system) and shall be detained in a facility designed for a 72 hour dewatering time in an area contributory to a combined sewer system before discharge to local stormwater systems or the environment. Justification, as prepared and sealed by a qualified professional, for assertion that permanent removal is not feasible must be provided, at a minimum, in the form of field measured infiltration rate testing and geotechnical evaluation of the existing site soils with regard to the impact of proposed infiltration. Applications omitting this justification, including infiltration rate testing will be considered incomplete. BMPs proposing use of extended detention in lieu of permanent reduction through the listed methods shall include a valve to adjust or regulate dewatering time to achieve the performance standards noted herein. The valve system shall include an inspection/monitoring port for review of dewatering.
 - 3. For modeling purposes:
 - a. Existing (predevelopment) non-forested pervious areas must be considered meadow in good condition.
 - b. 20% of existing impervious area, when present, shall be considered meadow in good condition in the model for existing conditions.
- B. The *Simplified Method* (CG-2 in the BMP Manual³) provided below is independent of site conditions and should be used if the *Design Storm Method* is not followed. This method is not applicable to regulated activities greater than one acre or for projects that require design of stormwater storage facilities. For new impervious surfaces:

1. Stormwater facilities shall capture at least the first two (2) inches of runoff from the net increase in impervious surfaces.
2. At least the first one inch of runoff from the net increase in impervious surfaces shall be permanently removed from the runoff flow, i.e., it shall not be released into the surface waters of this Commonwealth. Removal options include reuse, evaporation, transpiration, and infiltration. If the developer provides justification that the listed removal options are not feasible, and the Designated Plan Reviewer agrees, runoff shall be detained in a facility designed for a 24 hour dewatering time in an area with a dedicated stormwater system (not contributory to a combined sewer system) and shall be detained in a facility designed for a 72 hour dewatering time in an area contributory to a combined sewer system before discharge to local stormwater systems or the environment.
3. Wherever possible, infiltration facilities should be designed to accommodate infiltration of the entire permanently removed runoff; however, in all cases at least the first 0.5 inch of the permanently removed runoff should be infiltrated.
4. This method is exempt from the requirements of Section 304, Rate Controls, if the project qualifies for exemption by the provisions of Section 302.A.

Section 304. Rate Controls

- A. For areas not covered by a release rate map from an approved Act 167 Stormwater Management Plan:

Post-development discharge rates shall not exceed the pre-development discharge rates for the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storm events. This is the equivalent to a 100% release rate area when compared to those rates shown in the maps contained in Appendix A (Release Rate Management Districts). This Pre-development to Post-development control is not to be misconstrued as the same as the "Conditional Direct Discharge" areas on the Release Rate maps. For comparison of peak flow rates, flows shall be rounded to a tenth of a cubic foot per second (cfs). If it is shown that the peak rates of discharge indicated by the post-development analysis are less than or equal to the peak rates of discharge indicated by the pre-development analysis for 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storms, then the requirements of this section have been met. Otherwise, the applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement. Peak flows should be computed using the methods included in the Chapter titled "Stormwater Calculations and Methodology" of the PADEP Stormwater Management BMP Manual. Except, however, where documented downstream flooding problems exist, the Municipality may impose a 50% reduced release rate criteria.

- B. For areas covered by a release rate map from an approved Act 167 Stormwater Management Plan:

For the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storm events, the post-development peak discharge rates will follow the applicable approved release rate maps. These maps are contained in Appendix A (Release Rate Management Districts) of this Ordinance. For comparison of peak flow rates, flows shall be rounded to a tenth of a cubic foot per second (cfs). For any areas not shown on the release rate maps, the post-development discharge rates shall not exceed the pre-development discharge rates for the specified design events. Peak flows should be computed using the methods included in Chapter 8 of the PADEP Stormwater Management BMP Manual.

Section 305. Riparian Buffers

- A. In order to protect and improve water quality, a Riparian Buffer Easement shall be created and recorded as part of any subdivision or land development that encompasses a Riparian Buffer. The intent of this ordinance in establishing a Riparian Buffer is to protect and improve stream water quality. The Riparian Buffer is intended to slow overland flow to the stream through the presence of native grasses, trees and shrubs, allowing infiltration/groundwater recharge; causing deposition of sediment, nutrients, pesticides, and other pollutants in the buffer rather than in the stream; and reducing erosion by providing stream bank stabilization. The trees provide shade for streams; keeping waters cooler and reducing evaporation.
- B. Except as required by PA Code Title 25 Chapter 102, the Riparian Buffer Easement shall be required for all streams (as defined in Article II) with a contributing watershed area of greater than 10 acres. The Riparian Buffer Easement shall be measured to be a minimum of 35 feet from the top of the streambank (on each side).
- C. Minimum Management Requirements for Riparian Buffers.

1. No use or construction within the Riparian Buffer shall be permitted that is inconsistent with the intent of the Riparian Buffer as described in Section 305.A.
 2. Existing native vegetation shall be protected and maintained within the Riparian Buffer Easement.
 3. Whenever practicable, invasive vegetation shall be actively removed and the Riparian Buffer Easement shall be planted with native trees, shrubs and other vegetation to create a diverse native plant community appropriate to the intended ecological context of the site.
- D. The Riparian Buffer Easement shall be enforceable by the Municipality and shall be recorded in the appropriate County Recorder of Deeds Office, so that it shall run with the land and shall limit the use of the property located therein. The easement shall allow for the continued private ownership and shall count toward the minimum lot area required by Zoning, unless otherwise specified in the municipal Zoning Ordinance.
- E. Any permitted use within the Riparian Buffer Easement shall be conducted in a manner that will maintain the extent of the existing 100-year floodplain, improve or maintain the stream stability, and preserve and protect the ecological function of the floodplain.
- F. Stormwater drainage pipes shall be permitted within the Riparian Buffer Easement, but they shall cross the Easement in the shortest practical distance. Other structural stormwater management facilities are not permitted within the Riparian Buffer Easement.
- G. The following conditions shall apply when public and/or private recreation trails are permitted by the Municipality within Riparian Buffers:
1. It is preferred that trails be designed to be permeable and for non-motorized use only; however, impermeable trails are permitted provided they have adequate drainage
 2. Trails shall be designed to have the least impact on native plant species and other sensitive environmental features.
- H. Septic drainfields and sewage disposal systems shall not be permitted within the Riparian Buffer Easement and shall comply with setback requirements established under 25 Pa. Code Chapter 73.
- I. Underground utilities shall be permitted within the Riparian Buffer Easement; however, work shall be performed to minimize disturbance area and removal of trees. Restoration within the Riparian Buffer Easement shall be with native species of trees, grasses, and other plantings. One tree shall be planted for each tree removed and the restoration shall be designed by a Registered Professional with the requisite experience. Aboveground utilities shall only be permitted to cross the Easement perpendicular to the Easement or in the shortest practical distance. Existing utilities may remain and be maintained as required.

ARTICLE IV – STORMWATER MANAGEMENT (SWM) SITE PLAN REQUIREMENTS

Section 401. Plan Requirements

Appropriate sections from the Municipality's Subdivision and Land Development Ordinance, and other applicable local ordinances, shall be followed in preparing the SWM Site Plans.

The Municipality shall not approve any SWM Site Plan that is deficient in meeting the requirements of this Ordinance. At its sole discretion and in accordance with this Article, when a SWM Site Plan is found to be deficient, the Municipality may either disapprove the submission and require a resubmission, or in the case of minor deficiencies, the Municipality may accept submission of modifications.

The following items shall be included in the SWM Site Plan:

A. Provisions for permanent access or maintenance easements for all physical SWM BMPs, such as ponds and infiltration structures, as necessary to implement the Operation and Maintenance (O&M) Plan discussed in paragraph C.9 below.

B. The following signature block for the Municipality:

"(Municipal official or Designated Plan Reviewer (Section 403.A)), on this date (Signature date), has reviewed and hereby certifies that the SWM Site Plan meets all design standards and criteria of the Municipal Ordinance No. (_____), except where waivers have been granted as noted on the Plan. The review is based on a survey and plan prepared by others and assumes that all information is correct and valid as submitted."

C. The SWM Site Plan shall provide the following information:

1. The overall stormwater management concept for the project.
2. A determination of site conditions in accordance with the BMP Manual³. A detailed site evaluation shall be completed for projects proposed in environmentally sensitive areas, such as brownfields.
3. A key map showing the development site's location within the Municipality's stormwater management districts, watersheds and subareas. On all site drawings, show the boundaries of the district(s), watershed(s) and subarea(s) as they are located on the development site and identify their district and watershed names and applicable subarea numbers.
4. Location of the one hundred year floodplain on the development site based on the municipal current Flood Insurance Rate Maps.
5. Stormwater runoff design computations and documentation as specified in this Ordinance, or as otherwise necessary to demonstrate that the maximum practicable measures have been taken to meet the requirements of this Ordinance, including the recommendations and general requirements in Section 301.
6. Expected project time schedule.
7. A soil erosion and sediment control plan, where applicable, as prepared for and submitted to the approval authority.
8. The effect of the project (in terms of runoff volumes, water quality, and peak flows) on surrounding properties and aquatic features and on any existing stormwater conveyance system that may be affected by the project.
9. Plan and profile drawings and details of all SWM BMPs, including drainage structures, pipes, open channels, and swales.
10. SWM Site Plan shall show the property lines, dimensions of the site and the locations of existing and proposed on-lot wastewater facilities and water supply wells, property boundaries, existing and proposed topography, point(s) of interest, utilities, and potential utility conflicts.

11. The SWM Site Plan shall include an O&M Plan for all existing and proposed physical stormwater management facilities. This plan shall address long-term ownership and responsibilities for O&M including type and schedule/frequency of maintenance activities, personnel and equipment requirements, estimated annual maintenance costs, and method of financing continuing O&M.
12. A justification, acceptable to the Designated Plan Reviewer, must be included in the SWM Site Plan if BMPs other than green infrastructure methods and LID practices are proposed to achieve the volume, rate and water quality controls under this Ordinance.
13. Certification and seal of the qualified professional responsible for the preparation of the plans and report.
14. Watershed maps delineating pre-development and post-development watershed boundaries and land cover conditions, as well as the flow path and segments used to determine time of concentrations for each watershed
15. Storm sewer calculations and watershed maps delineating all sub-areas used to size and compute flow for storm sewer system.
16. Existing contours at intervals of two (2) feet except in areas with slopes greater than fifteen percent (15%), in which case five (5) foot contour intervals may be used.
17. Contours of the finished project site at intervals of two (2) feet, except in areas with slopes greater than fifteen percent (15%), in which case, five (5) foot contour intervals may be used.

Section 402. Plan Submission

Up to two copies of the SWM Site Plan shall be submitted as follows:

1. Two copies to the Municipality.
2. Digital copy

Section 403. Plan Review

- A. The Municipality has designated the Municipal Engineer as the Designated Plan Reviewer of SWM Site Plans for the Municipality, and shall be understood to be the reviewer where indicated as the Municipality within this ordinance.
- B. SWM Site Plans shall be reviewed by the Municipality for consistency with the provisions of this Ordinance.
- C. The Municipality shall notify the applicant in writing within 45 days whether the SWM Site Plan is approved or disapproved or requires additional documentation. If the SWM Site Plan involves a Subdivision and Land Development Plan, the notification shall occur within the time period allowed by the Municipalities Planning Code (90 days). If a longer notification period is provided by other statute, regulation, or ordinance, the applicant will be so notified by the Municipality.
- D. For any SWM Site Plan that proposes to use any BMPs other than green infrastructure and LID practices to achieve the volume and rate controls required under this Ordinance, the Municipality will not approve the SWM Site Plan unless it determines that green infrastructure and LID practices are not practicable.
- E. If the Municipality disapproves the SWM Site Plan, the Municipality will state the reasons for the disapproval in writing. The Municipality also may approve the SWM Site Plan with conditions and, if so, shall provide the acceptable conditions for approval in writing.
- F. The applicable review fee, in accord with Article VII, must accompany a resubmission of a disapproved SWM site plan.

Section 404. Modification of Plans

A modification to a submitted SWM Site Plan that involves a change in SWM BMPs or techniques, or that involves the relocation or redesign of SWM BMPs, or that is necessary because soil or other conditions are not as stated on the SWM Site Plan, as determined by the Designated Plan Reviewer, shall require a resubmission of the modified SWM Site Plan in accordance with this Article.

Section 405. Resubmission of Disapproved SWM Site Plans

A disapproved SWM Site Plan may be resubmitted, with the revisions addressing the Municipality's concerns, to the Municipality in accordance with this Article. The applicable review fee, in accord with Article VII, must accompany a resubmission of a disapproved SWM Site Plan.

Section 406. Authorization to Construct and Term of Validity

The Municipality's approval of an SWM Site Plan authorizes the regulated activities contained in the SWM Site Plan for a maximum term of validity of 5 years following the date of approval. The Municipality may specify a term of validity shorter than 5 years in the approval for any specific SWM Site Plan. Terms of validity shall commence on the date the Municipality signs the approval for an SWM Site Plan. If an approved SWM Site Plan is not completed according to Section 407 within the term of validity, then the Municipality may consider the SWM Site Plan disapproved and may revoke any and all permits. SWM Site Plans that are considered disapproved by the Municipality shall be resubmitted in accordance with Section 405 of this Ordinance.

Section 407. Record Drawings, Completion Certificate, and Final Inspection

- A. The developer shall be responsible for providing record drawings of all SWM BMPs included in the approved SWM Site Plan, including, but not limited to BMP grading, outlet structure configuration and emergency spillway configuration. The record drawings and an explanation of any discrepancies with the construction plans shall be submitted to the Municipality.
- B. The record drawing submission shall include a certification of completion signed by a qualified professional verifying that all permanent SWM BMPs have been constructed according to the approved plans and specifications. The latitude and longitude coordinates for all permanent SWM BMPs must also be submitted, at the central location of the BMPs. If any licensed qualified professionals contributed to the construction plans, then a licensed qualified professional must sign the completion certificate. The certification shall include documentation confirming field reviewed dewatering times for rate and volume control BMPs. Record Drawings shall be provided in both hard copy and electronic (AutoCAD, latest edition) format.
- C. The Municipality may conduct inspections during construction as it deems appropriate. If inspections performed by the Municipality reveal deficiencies from the submitted and approved SWM Site Plan, the Municipality may request corrective actions. Any corrective action shall be at the cost of the stormwater facility owner.
- D. After receipt of the completion certification by the Municipality, the Municipality may conduct a final inspection.

conveyance system within the development. The storm sewer system shall be interpreted as the conduits, culverts, inlets and appurtenant features for the conveying of stormwater to, through or from a development site to the point of final discharge or control facility. The Rational Method shall not be used in the analysis of stormwater runoff from the development in its entirety or in conjunction with the design of any retention/detention facilities or other runoff control measures.

- H. Points of interest for analysis of pre- and post-development runoff must be selected to demonstrate compliance with the requirements of Sections 303 and 304 is achieved at all points where runoff exits the perimeter of the property.
- I. Stormwater runoff shall not be transferred from one watershed to another unless the watersheds are sub-areas of a larger watershed that are tributary to a common point of interest within or near the perimeter of the property. Transfer of runoff from one watershed to another under any other circumstances shall only be approved at the discretion of the Municipality. Documentation shall be provided that peak flow rates are not increased following development and there will be no detrimental impact in downstream areas.
- J. The Stormwater Management Plan shall consider all of the stormwater runoff flowing over the project site. Runoff calculations shall be made to ensure that runoff from the upstream watershed area can be accommodated by the pipes, drainage easements and watercourses, etc. on the site.

Section 502. Design and Construction Standards – Collection and Conveyance Facilities

- A. All stormwater collection and conveyance facilities (pipes, swales, and structures) shall be designed for a 100-year design storm event, unless the runoff would naturally drain overland to a stormwater detention facility, in which case a 25-year design storm event may be used. The hydraulic gradeline must be a minimum of two (2) feet below the surface elevation of structures and within the pipe. Swales and channels shall provide at least one foot of freeboard above the energy gradeline. Backwater effects of pipes discharging under surcharge conditions shall be included.
- B. Runoff calculations shall include complete hydrology and hydraulic analysis of all downstream swales and pipe facilities to permanent stream discharge point, to the municipal boundary or connection to a State or County owned conveyance system.
- C. Manholes shall not be spaced more than three hundred (300) feet apart for pipe sizes up to twenty-four (24) inches in diameter and not more than four hundred fifty (450) feet apart for larger pipe sizes.
- D. No public stormwater pipe shall be less than 15-inches in diameter that conveys surface runoff. The minimum pipe slope shall be 1.0% grade or maintain velocity of 2 ft/s. For public storm sewer systems, only pipes related to construction of stormwater BMPs may be less than 15 inches in diameter.
- E. All workmanship and materials shall conform to the Municipality's Construction Standards. In addition, all workmanship and materials shall conform to the latest edition of PennDOT Form 408 and be supplied by manufacturers or suppliers listed in PennDOT's Bulletin 15.
- F. Manhole and inlet castings shall conform to the Pennsylvania Department of Transportation Form 408 and PennDOT Standards for Roadway Construction. Inlet grates shall be bicycle safe. Frames and grates shall be cast iron or structural steel. Concrete frames shall not be permitted.
- G. All connections to existing storm sewer pipes shall be made by construction of a suitable junction box (inlet or manhole) to provide access for cleanout. No blind connections shall be permitted.
- H. The discharge of stormwater runoff shall be to a well-defined drainage course, which has a defined bed and bank. If stormwater runoff cannot be discharged to a defined drainage course, documentation of written permission from each downstream property owner shall be provided for all properties between the source of discharge and the defined drainage course. The use of level spreaders or similar BMPs that promote sheet flow may be permitted if the applicant provides documentation that the peak post-development 100-year discharge is no greater than pre-development 2-year discharge and a letter from the Geotechnical Engineer of Record regarding slope stability of the downstream area is provided. Use of a level spreader requires a waiver to be granted by the Municipality.

ARTICLE V – DESIGN CRITERIA

Section 501. Calculation Methodology

- A. All computations used in conjunction with the analysis and design of stormwater management facilities shall be based on one (1) or more of the following methods, or as otherwise approved in advance by the Municipality:
1. TR-55-Soil Conservation Service (SCS) Technical Release No. 55
 2. TR-20-Soil Conservation Service (SCS) Technical Release No. 20
 3. Modified Rational Method
 4. Penn State Runoff Model
 5. Virginia Tech / Penn State Runoff Model
- B. These methods for determining peak discharge shall be used to:
1. Determine pre-development runoff conditions;
 2. Analyze the impact of development; and
 3. Perform calculations in the design of any detention/retention facilities used in controlling runoff.
- C. The SCS, Type II Rainfall Distribution shall be used for all analyses. The design storm frequencies for the watershed are:

Design Storm	24 Hour Rainfall Depth
1-Year	1.97
2-Year	2.35
5-Year	2.88
10-Year	3.30
25-Year	3.90
50-Year	4.40
100-Year	4.92

- D. Pre-Development Conditions: The cover type for all sites will be considered to be the dominant land cover during the 5-year period immediately preceding a proposed regulated activity:
1. For the purposes of pre-development peak flow rate and volume determination, existing non-forested pervious areas conditions shall be considered as meadow (good condition). Forested land areas shall be considered in good condition.
 2. For the purposes of pre-development peak flow rate and volume determination, 20 percent of existing disturbed impervious area, when present, shall be considered meadow (good condition).
- E. Post-Development Conditions: The hydrologic parameters used to develop peak flow rates shall be reflective of anticipated soil runoff characteristics following grading and development of the site.
- F. Time of Concentration: The minimum time of concentration for any watershed shall be 6 minutes. A minimum 6-minute time of concentration may be assumed for any post development watershed. Calculations must be provided for all pre-development times of concentrations. A minimum time of concentration cannot be assumed for predevelopment conditions.
- G. The use of the Basic Rational Method in estimating runoff may be employed in the design of the storm sewer

Section 503. Design and Construction Standards – Stormwater Detention Facilities

- A. All retention/detention facilities shall be equipped with multistage outlet structures to provide discharge control for each designated storm frequency. Provisions shall also be made to safely pass the post-development one-hundred year storm runoff in the event of an outlet structure failure without damaging or impairing the continued function of the facilities (i.e., impairing the continued function of) the facilities. The facility(ies) must have an emergency outlet which is able to discharge the post-development one-hundred year peak flow. Should any stormwater management facilities qualify as a dam under PaDEP Chapter 105 criteria, the facility shall be designed in accordance with those regulations and meet the regulations concerning dam safety.
- B. Any stormwater management facility designed to store runoff shall provide an emergency spillway designed to convey the unattenuated 100-year post- development peak rate flow with a blocked primary outlet structure and an inundation stormwater to the invert elevation of the spillway, with a minimum one-foot freeboard to the crest of the embankment.
- C. Woody vegetation shall not be permitted on the embankments or within 25 feet of the emergency spillway.
- D. The water depth of a storage facility which is not fenced shall be limited to 2 feet unless approved by the Municipality. Otherwise, appropriate fencing at least 4 feet in height shall be required.
- E. Side slopes of storage facilities shall not exceed a ratio of three to one (3:1) horizontal to vertical dimension. The crest of the embankment shall have a minimum width of not less than 10 feet.
- F. The facility shall be equipped with an access road at least ten (10) feet wide and with a maximum of grade of 15% that extends to the bottom of the detention facility. Access roads greater than 12% grade must be paved. Access roads 12% or less shall have a minimum 6" depth non-eroding aggregate surface. A gate with a minimum opening of 10 feet shall be provided for maintenance access. An access easement with a minimum width of 20 feet to all stormwater detention facilities shall be provided. The access easement shall include a statement on the recorded plan from the owner/operator of the facility granting access to the Municipality.
- G. All stormwater facility outlet structures shall have suitable gaskets to prevent leakage and piping of water through the facility embankment. All storm pipe installed through the facility embankment must be constructed of reinforced concrete pipe. Use of high-performance polypropylene pipe may be permitted with documentation of pipe manufacturer's backfill requirements.
- H. A geotechnical investigation report for the construction of the stormwater detention/retention and infiltration facilities must be provided including design recommendation for embankment construction, interior and exterior slopes, drainage swales and infiltration areas.
- I. Basin outlet structures shall have non-clogging trash racks over all design openings. Periodic cleaning of debris from trash racks shall be included in the operation and maintenance plan.
- J. Inlet structures and outlet structures shall be separated to the greatest extent possible in order to maximize the flow path through the basin.
- K. BMPs must be designed to protect and maintain existing uses (e.g., drinking water use; cold water fishery use) and maintain the level of water quality necessary to protect those uses in all streams, and to protect and maintain water quality in "Special Protection" streams, as required by statewide regulations at 25 Pa.Code, Chapter 93 (collectively referred to herein as "State Water Quality Requirements").
- L. Anti-flotation calculations shall be provided for primary outlet structure providing a minimum factor of safety of 1.5.

ARTICLE VI – OPERATION AND MAINTENANCE

Section 601. Responsibilities of Developers and Landowners

- A. The Municipality shall make the final determination on the continuing maintenance responsibilities prior to final approval of the SWM Site Plan. The Municipality may require a dedication of such facilities as part of the requirements for approval of the SWM Site Plan. Such a requirement is not an indication that the Municipality will accept the facilities. The Municipality reserves the right to reject or accept the ownership and operating responsibility for any portion of the stormwater management controls.
- B. Facilities, areas, or structures used as SWM BMPs shall be enumerated as permanent real estate appurtenances and recorded as deed restrictions or conservation easements that run with the land.
- C. The O&M Plan shall be recorded as a restrictive deed covenant that runs with the land.
- D. The Municipality may take enforcement actions against an owner for any failure to satisfy the provisions of this Article.

Section 602. Operation and Maintenance Agreements

- A. Prior to final approval of the SWM Site Plan, the property owner shall sign and record an Operation and Maintenance (O&M) Agreement (see Appendix B) covering all stormwater control facilities which are to be privately owned.
 - 1. The owner, successor and assigns shall maintain all facilities in accordance with the approved maintenance schedule in the O&M Agreement.
 - 2. The owner shall convey to the Municipality conservation easements to assure access for periodic inspections by the Municipality and maintenance, as necessary.
 - 3. The owner shall keep on file with the Municipality the name, address, and telephone number of the person or company responsible for maintenance activities; in the event of a change, new information shall be submitted by the owner to the Municipality within ten (10) working days of the change.
- B. The owner is responsible for operation and maintenance (O&M) of the SWM BMPs. If the owner fails to adhere to the O&M Agreement, the Municipality may perform the services required and charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.

Section 603. Performance Guarantee

- A. For SWM Site Plans that involve subdivision and land development, the applicant shall provide a financial guarantee to the Municipality for the timely installation and proper construction of all stormwater management controls as required by the approved SWM Site Plan and this Ordinance in accordance with the provisions of Sections 509, 510, and 511 of the Pennsylvania Municipalities Planning Code.
- B. For facilities turned over to the Municipality, financing shall be provided for 10 years at present worth.

ARTICLE VII – FEES AND EXPENSES

Section 701. General

The Municipality may include all costs incurred into the review fee charged to an applicant.

The review fee may include, but not be limited to, costs for the following:

- A. Administrative/clerical processing.
- B. Review of the SWM Site Plan.
- C. Review of a SWM Site Plan resubmission.
- D. Attendance at meetings.
- E. Inspections.

ARTICLE VIII – PROHIBITIONS

Section 801. Prohibited Discharges and Connections

- A. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter a regulated small MS4 or to enter the surface waters of this Commonwealth is prohibited.
- B. No person shall allow, or cause to allow, discharges into a regulated small MS4, or discharges into waters of this Commonwealth, which are not composed entirely of stormwater, except (1) as provided in paragraph C below and (2) discharges authorized under a state or federal permit.
- C. The following discharges are authorized unless they are determined to be significant contributors to pollution of a regulated small MS4 or to the waters of this Commonwealth:
 - 1. Discharges or flows from firefighting activities.
 - 2. Discharges from potable water sources including water line flushing and fire hydrant flushing, if such discharges do not contain detectable concentrations of Total Residual Chlorine (TRC).
 - 3. Non-contaminated irrigation water, water from lawn maintenance, landscape drainage and flows from riparian habitats and wetlands.
 - 4. Diverted stream flows and springs.
 - 5. Non-contaminated pumped ground water and water from foundation and footing drains and crawl space pumps.
 - 6. Non-contaminated HVAC condensation and water from geothermal systems.
 - 7. Residential (i.e., not commercial) vehicle wash water where cleaning agents are not utilized.
 - 8. Non-contaminated hydrostatic test water discharges, if such discharges do not contain detectable concentrations of TRC.
 - 9. Dechlorinated swimming pool and hot tub discharges, as long as the PADEP guidelines for swimming pool water discharge are followed.
- D. In the event that the Municipality or DEP determines that any of the discharges identified in Subsection C significantly contribute pollutants to a regulated small MS4 or to the waters of this Commonwealth, the Municipality or DEP will notify the responsible person(s) to cease the discharge.

Section 802. Roof Drains and Sump Pumps

- A. Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs wherever feasible.
- B. Unless otherwise approved by the Municipality, no stormwater from roofs or driveway drains shall be discharged to the street surface or curb.
- C. Roof drains shall be a minimum of 6 inches in diameter and provide cleanouts at 50 feet intervals or at horizontal and vertical changes.

Section 803. Alteration of SWM BMPs

No person shall modify, remove, fill, landscape, or alter any SWM BMPs, facilities, areas, drainage easements, or structures that were installed as a requirement of this Ordinance without the written approval of the Municipality.

ARTICLE IX – ENFORCEMENT AND PENALTIES

Section 901. Right of Entry

Upon presentation of proper credentials, the Municipality or its designated agent may enter at reasonable times upon any property within the Municipality to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.

Section 902. Inspection

The landowner or the owner's designee (including the Municipality for dedicated and owned facilities) shall inspect SWM BMPs, facilities and/or structures installed under this Ordinance according to the following frequencies, at a minimum, to ensure the BMPs, facilities and/or structures continue to function as intended:

- a. Annually for the first 5 years.
- b. Once every 3 years thereafter.
- c. During or immediately after the cessation of a 10-year or greater storm.

Inspections should be conducted during or immediately following precipitation events. A written inspection report shall be created to document each inspection. The inspection report shall contain the date and time of the inspection, the individual(s) who completed the inspection, the location of the BMP, facility or structure inspected, observations on performance, and recommendations for improving performance, if applicable. Inspection reports shall be submitted to the Municipality within 30 days following completion of the inspection.

Section 903. Enforcement

- A. It shall be unlawful for a person to undertake any regulated activity except as provided in an approved SWM Site Plan, unless specifically exempted in Section 302.
- B. It shall be unlawful to violate Section 803 of this Ordinance.
- C. Inspections regarding compliance with the SWM Site Plan are a responsibility of the Municipality.

Section 904. Suspension and Revocation

- A. Any approval or permit issued by the Municipality pursuant to this Ordinance may be suspended or revoked for:
 1. Non-compliance with or failure to implement any provision of the approved SWM Site Plan or O&M Agreement.
 2. A violation of any provision of this Ordinance or any other applicable law, ordinance, rule, or regulation relating to the Regulated Activity.
 3. The creation of any condition or the commission of any act during the Regulated Activity which constitutes or creates a hazard, nuisance, pollution, or endangers the life or property of others.
- B. A suspended approval may be reinstated by the Municipality when:
 1. The Municipality has inspected and approved the corrections to the violations that caused the suspension.
 2. The Municipality is satisfied that the violation has been corrected.
- C. An approval that has been revoked by the Municipality cannot be reinstated. The applicant may apply for a new approval under the provisions of this Ordinance.

- D. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the Municipality may provide a limited time period for the owner to correct the violation. In these cases, the Municipality will provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the Municipality may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.

Section 905. Penalties

- A. Anyone violating the provisions of this Ordinance shall be guilty of a summary offense, and upon conviction, shall be subject to a fine of not more than \$500.00 for each violation, recoverable with costs. Each day that the violation continues shall be a separate offense and penalties shall be cumulative.
- B. In addition, the Municipality may institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. 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.

Section 906. Appeals

- A. Any person aggrieved by any action of the Municipality or its designee, relevant to the provisions of this Ordinance, may appeal to the Municipality within 30 days of that action.
- B. Any person aggrieved by any decision of the Municipality, relevant to the provisions of this Ordinance, may appeal to the County Court of Common Pleas in the county where the activity has taken place within 30 days of the Municipality's decision.

ARTICLE X – REFERENCES

1. U.S. Department of Agriculture, National Resources Conservation Service (NRCS). *National Engineering Handbook*. Part 630: Hydrology, 1969-2001. Originally published as the *National Engineering Handbook*, Section 4: Hydrology. Available from the NRCS online at: <http://www.nrcs.usda.gov/>.
2. U.S. Department of Agriculture, Natural Resources Conservation Service. 1986. *Technical Release 55: Urban Hydrology for Small Watersheds*, 2nd Edition. Washington, D.C.
3. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual*. Harrisburg, PA.
4. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (March 31, 2012), as amended and updated. *Erosion and Sediment Pollution Control Program Manual*. Harrisburg, PA.
5. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Hydrometeorological Design Studies Center. 2004-2006. *Precipitation-Frequency Atlas of the United States, Atlas 14*, Volume 2, Version 3.0, Silver Spring, Maryland. Internet address: <http://hdsc.nws.noaa.gov/hdsc/pfds/>.

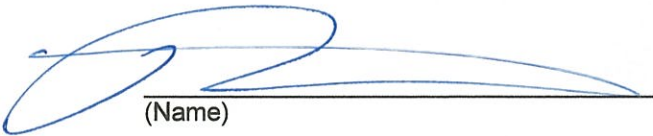
Township of South Fayette Stormwater Management Ordinance

Ordinance Number

ENACTED and **ORDAINED** at a regular meeting of the
Board of Commissioners of the Township of South Fayette

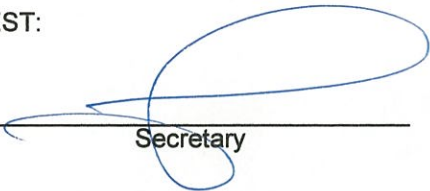
on this 14th day of NOVEMBER, 2018.

This Ordinance shall take effect immediately.


(Name)

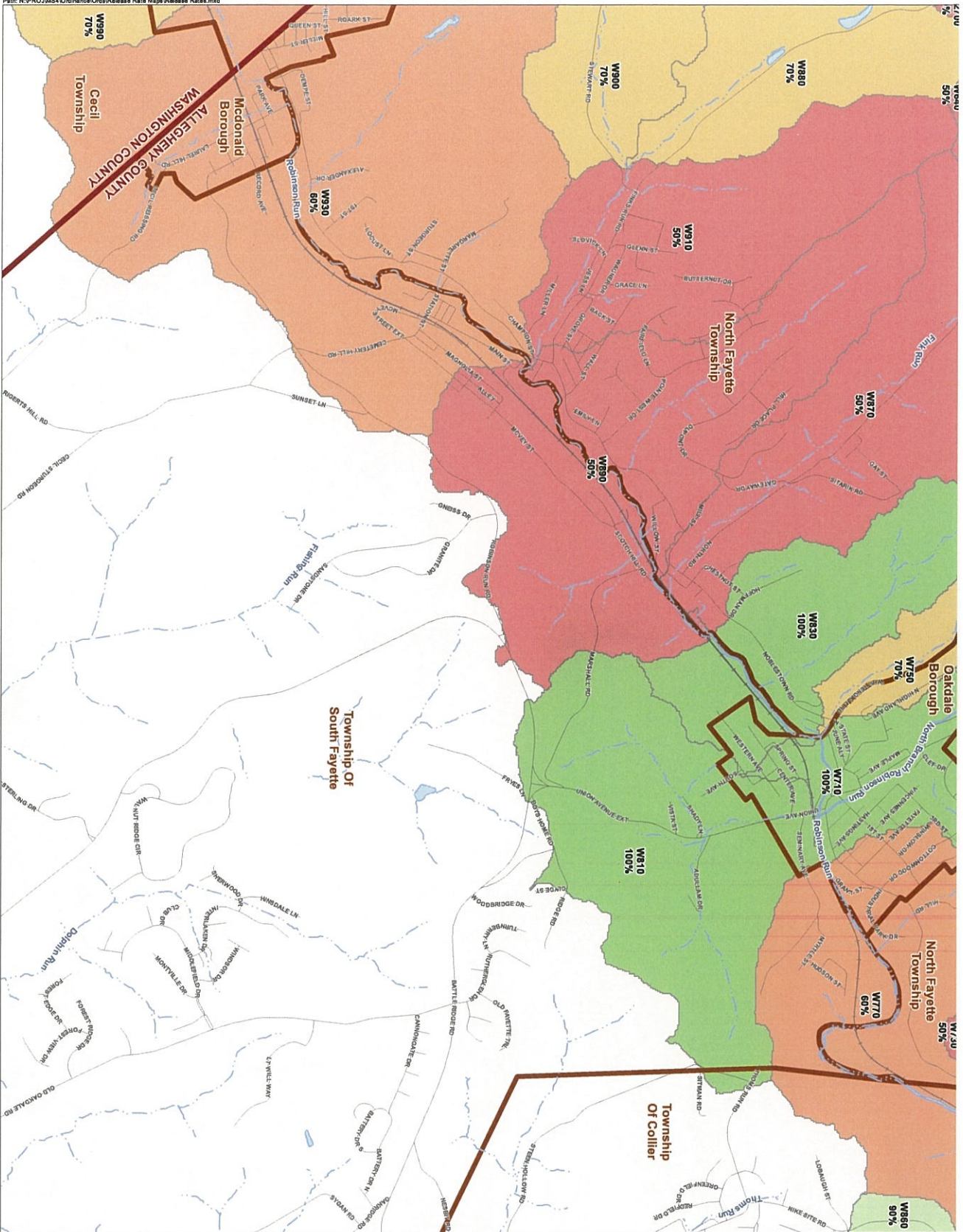
PRESIDENT
(Title)

ATTEST:


Secretary

APPENDIX A

RELEASE RATE MANAGEMENT DISTRICTS (MAPS)



Release Rate Map
 Robinson Run
 South Fayette Township

- Legend**
- County Boundary
 - Municipal Boundary
 - ~~~~~ Streams
 - Roads
 - Railroad
- Release Rates**
- 50%
 - 60%
 - 70%
 - 90%
 - 100%

Subshed Number #
 Release Rate 100%

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



1 inch = 1,500 feet

Lennon, Smith, Souleret
 Engineering, Inc.
 546 4th Avenue
 Carnegie, Pennsylvania 15106
 Phone: 412-264-1200
 Fax: 412-264-1202
 Email: info@lss.com

APPENDIX B

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

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

WITNESSETH

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

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

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

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

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

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

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

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

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

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

For the Landowner:

ATTEST:

_____(City, Borough, Township)

County of _____, Pennsylvania

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

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

NOTARY PUBLIC

(SEAL)

APPENDIX C

SMALL PROJECT STORMWATER MANAGEMENT SITE PLAN GUIDANCE

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

A. What is an applicant required to submit?

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

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

B. Determination of Required Volume Control and Sizing Stormwater Facilities

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

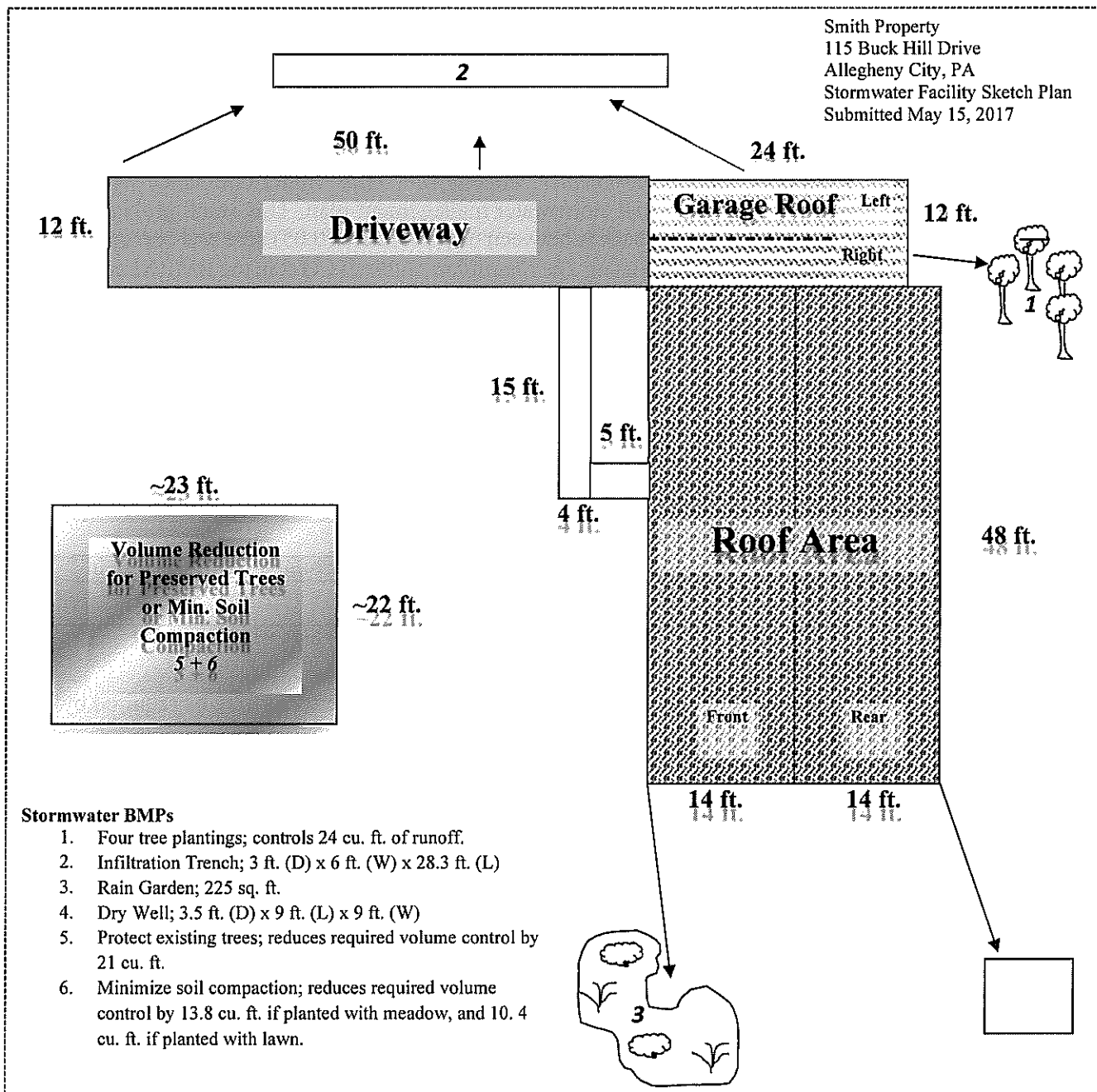
Site Plan Example: Controlling runoff volume from a proposed home site

Step 1: Determine Total Impervious Surfaces

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

	Total Imp.		3000 sq. ft.

Figure 1: Sample Site Sketch Plan



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

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

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

Example continued:

Step 3: Sizing the Selected Volume Control BMP

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

Structural BMPs

1. Infiltration Trench

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

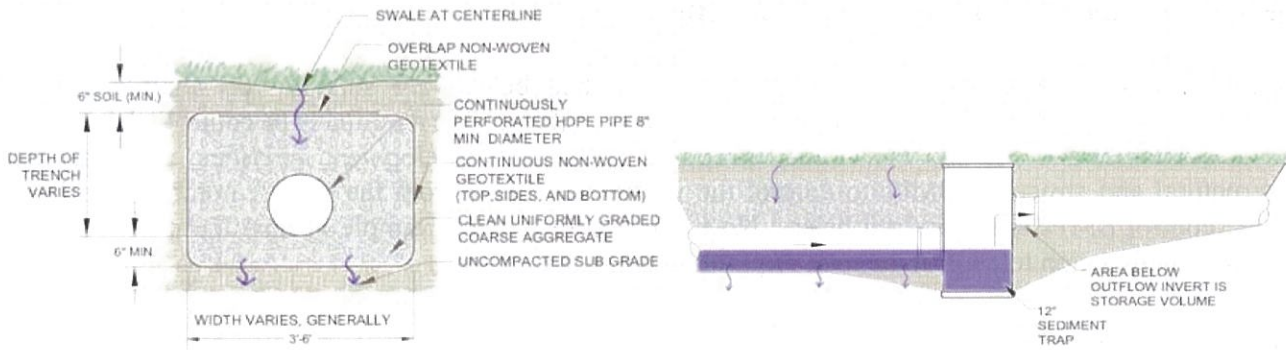
Design Considerations:

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

Maintenance:

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

Figure 2: Infiltration Trench Diagram



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

Figure 3: Example of Infiltration Trench Installation



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

Sizing Example for Infiltration Trench

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

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

2. Determine the required infiltration volume:
 $(1224 \text{ sq. ft.} \times 2 \text{ inches of runoff}) / 12 \text{ ft.} = 204 \text{ cu. ft.} / 0.4^* = 510 \text{ cu. ft.}$
 (*0.4 assumes 40% void ratio in gravel bed)

3. Sizing the infiltration trench facility:
 Volume of Facility = Depth x Width x Length

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

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

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

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

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

2. Rain Garden

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

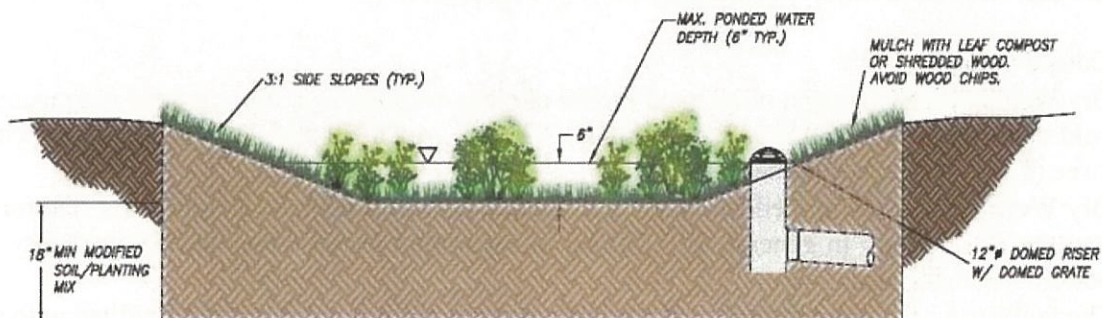
Design Considerations:

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

Maintenance:

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

Figure 4: Rain Garden Diagram



Source: PA BMP Guidance Manual, Chapter 6 Page 50

Sizing Example for Rain Garden

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

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

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

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

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

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

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

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

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

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

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

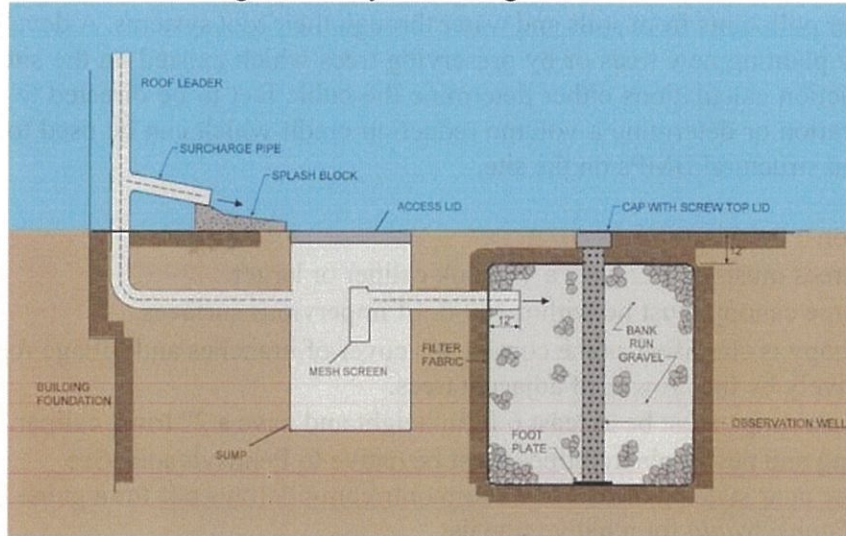
Design Considerations:

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

Maintenance:

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

Figure 5: Dry Well Diagram



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

Sizing Example for Dry Wells:

1. Determine contributing impervious surface area:

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

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

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

3. Sizing the dry well:

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

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

Dimensions = 3.5 ft. (D) x 9 ft. (L) x 9 ft. (W)

NonStructural BMPs

1. Tree Plantings and Preservation

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

Tree Considerations:

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

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

1. Determine contributing impervious surface area:

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

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

3. Determine the number of tree plantings:

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

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

Determining the volume reduction for preserving existing trees:

1. Calculate approximate area of the existing tree canopy:

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

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

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

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

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

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

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

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

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

2. Minimize Soil Compaction and Replant with Lawn or Meadow

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

Design Considerations:

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

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

1. Calculate approximate area of preserved meadow:
~22 sq. ft. x ~23 sq. ft. = 500 sq. ft.

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

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

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

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

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

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

Alternative BMP to Capture and Reuse Stormwater

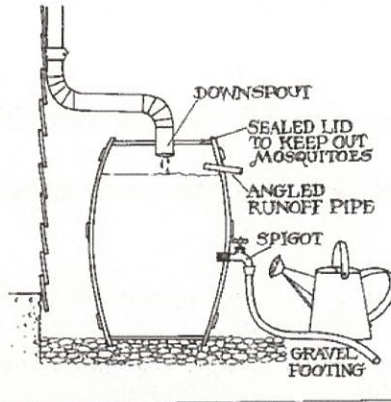
Rain Barrels

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

Design Considerations:

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

Figure 6: Rain Barrel Diagram and Examples



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

Sizing Example for a Rain Barrel

1. Determine contributing impervious surface area:

Garage Roof (Right)	6 ft. x 24 ft.	=	144 sq. ft.
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2. Determine the amount of rainfall to be captured by the Rain Barrel. A smaller storm, no more than 2", is recommended to calculate the runoff to be captured. This example chose the 1" storm event.

3. Calculate the volume to be captured and reused:
 $(144 \text{ sq. ft.} \times 1 \text{ inch of runoff}) / 12 \text{ inches} = 12 \text{ cu. ft.}$

4. Size the rain barrel:

1 cu. ft. = 7.48 gallons

12 cu. ft. x 7.48 = 90 gallons

90 gallons x (0.25*) = 22.5 gallons (*assuming that the rain barrel is always at least 25% full)

90 gallons + 22.5 gallons = 112 gallons

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

REFERENCES:

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

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

Sons. NY, NY, 2004 Department of Environmental Protection. (2006). *Pennsylvania*

Stormwater Best Management Practices Manual.

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

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

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

SMALL DEVELOPMENT STORMWATER MANAGEMENT PLAN APPLICATION

Small Project Stormwater Management Submission

Calculation of Impervious Area

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

Table 1: Calculation of Impervious Surfaces

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

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

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

Small Project SWM Plan Worksheet

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

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

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



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

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

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

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

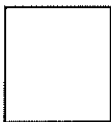
Table 5: Non-Structural BMP - Preservation of Trees					
Distance from Impervious Area	Tree Canopy Area (sf)	X	Rainfall Depth Managed (in)	=	Volume Managed (cu ft)
Within 20 Feet		x	1	=	
Within 20 Feet		x	1	=	
Within 20 Feet		x	1	=	
Within 20 Feet		x	1	=	
Within 20 Feet		x	1	=	
Within 100 Feet		x	0.5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

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

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



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



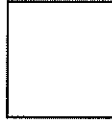
Site Sketch Plan showing:

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



Operations and Maintenance Agreement

- Execute and record a Stormwater Maintenance and Agreement



Application Review Fee

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

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

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

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

Owner _____

Date _____