

**THORNBURY TOWNSHIP
CHESTER COUNTY, PENNSYLVANIA**

ORDINANCE NO. 2014-2

**AN ORDINANCE OF THORNBURY TOWNSHIP,
CHESTER COUNTY, ADDING TO THE CODE OF
ORDINANCES CHAPTER 116 TO PROVIDE FOR THE
MANAGEMENT OF STORMWATER WITHIN THE
TOWNSHIP OF THORNBURY**

WHEREAS, the Township of Thornbury, Chester County ("Township") desires to amend its Code of Ordinances, in specific adding Chapter 116 Thornbury Township MS4 Stormwater Management;

Be it **ORDAINED** and **ENACTED** by the Board of Supervisors of Thornbury Township, Chester County, Pennsylvania, by the authority of same as follows:

Chapter 116. STORMWATER MANAGEMENT

ARTICLE I. GENERAL PROVISIONS

§116-1. Short title.

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

§116-2. Statement of findings.

The governing body of the municipality finds that:

- A. Inadequate management of accelerated stormwater runoff resulting from land disturbance and development throughout a watershed increases flooding, flows and velocities, contributes to erosion and sedimentation, overtaxes the capacity of streams and storm sewers, greatly increases the cost of public facilities to convey and manage stormwater, undermines floodplain management and flood reduction efforts in upstream and downstream communities, reduces infiltration and groundwater recharge, increases nonpoint source pollution to waterways, and threatens public health and safety.

- B. Inadequate planning and management of stormwater runoff resulting from land disturbance and development throughout a watershed can harm surface water resources by changing the natural hydrologic patterns, accelerating stream flows (which increase scour and erosion of streambeds and stream banks, thereby elevating sedimentation), destroying aquatic habitat, and elevating aquatic pollutant concentrations and loadings

such as sediments, nutrients, heavy metals, and pathogens. Groundwater resources are also impacted through loss of recharge.

- C. A comprehensive program of stormwater management, including minimization of impacts of new development, redevelopment, and other earth disturbance activities causing accelerated runoff and erosion and loss of natural infiltration, is fundamental to the public health, safety, and general welfare of the people of the municipality and all of the people of the commonwealth, their resources, and the environment.
- D. Stormwater is an important water resource that provides infiltration and groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.
- E. Impacts from stormwater runoff can be minimized by reducing the volume of stormwater generated and by using project designs that maintain the natural hydrologic regime and sustain high water quality, infiltration, stream base flow, and aquatic ecosystems. Cost-effective and environmentally sensitive stormwater management can be achieved through the use of nonstructural site design techniques that minimize impervious surfaces, reduce disturbance of land and natural resources, avoid sensitive areas (i.e., riparian buffers, floodplains, steep slopes, wetlands, etc.), and consider topography and soils to maintain the natural hydrologic regime.
- F. Public education on the control of pollution from stormwater is an essential component in successfully addressing stormwater.
- G. Federal and state regulations require the municipality to implement a program of stormwater controls. The municipality is required to obtain a permit and comply with its provisions for stormwater discharges from its separate storm sewer system under the National Pollutant Discharge Elimination System (NPDES).
- H. Non-stormwater discharges to municipal or other storm sewer systems can contribute to pollution of the waters of the commonwealth.

§116-3. Purpose.

The purpose of this chapter is to protect public health, safety and general welfare, property and water quality by implementing drainage and stormwater management practices, criteria, and provisions included herein for land development, construction and earth disturbance activities, to achieve the following throughout the municipality:

- A. Reduce the frequency and magnitude of flooding and stormwater impacts affecting people, property, infrastructure and public services.

- B. Sustain or improve the natural hydrologic characteristics and water quality of groundwater and surface waters.
- C. Protect natural resources, including riparian and aquatic living resources and habitats.
- D. Maintain the natural hydrologic regime of land development sites and their receiving watersheds.
- E. Minimize land disturbance and protect and incorporate natural hydrologic features, drainage patterns, infiltration, and flow conditions within land development site designs.
- F. Reduce and minimize the volume of stormwater generated, and manage and release stormwater as close to the source of runoff as possible.
- G. Provide infiltration and maintain natural groundwater recharge to protect groundwater supplies and stream base flows, to prevent degradation of surface water and groundwater quality, and to otherwise protect water resources.
- H. Reduce stormwater pollutant loads to protect and improve the chemical, physical, and biological quality of ground and surface waters.
- I. Reduce scour, erosion and sedimentation of stream channels.
- J. Reduce flooding impacts and preserve and restore the natural flood-carrying capacity of streams and their floodplains.
- K. Protect adjacent and downgradient lands from adverse impacts of direct stormwater discharges.
- L. Minimize impervious surfaces and connected impervious surfaces to promote infiltration and reduce the volume and impacts of stormwater runoff.
- M. Provide proper long-term operation and maintenance of all permanent stormwater management facilities, BMPs and conveyances that are implemented within the municipality.
- N. Reduce the impacts of runoff from existing developed land undergoing redevelopment while encouraging new development and redevelopment in urban areas and areas designated for growth.

- O. Implement an illicit discharge detection and elimination program that addresses non-stormwater discharges.
- P. Provide performance standards and design criteria based on watershed-based stormwater management planning.
- Q. Provide standards to meet certain NPDES stormwater permit requirements.
- R. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code Chapter 93, to protect, maintain, reclaim and restore the existing and designated uses of the waters of the commonwealth.
- S. Implement the requirements of total maximum daily load (TMDL) where applicable to waters within or impacted by the municipality.
- T. Provide review procedures and performance standards for stormwater planning and management.
- U. Fulfill the purpose and requirements of PA Act 167 (PA Act 167, Section 3).
 - (1) Encourage planning and management of stormwater runoff in each water which is consistent with sound water and land use practices.
 - (2) Authorize a comprehensive program of stormwater management designed to preserve and restore the flood-carrying capacity of commonwealth stream preserve to the maximum extent practicable natural stormwater runoff regime and natural course, current and cross section of water of the commonwealth to protect and conserve groundwaters and groundwater recharge areas.
 - (3) Encourage local administration and management of stormwater consistent with the commonwealth's duty as trustee of natural resources and the public's constitutional right to the preservation of natural, economic, scenic, aesthetic recreational and historic values of the environment."

§116-4. Statutory authority.

The municipality is empowered or required to regulate land use activities that affect runoff and surface water and groundwater quality and quantity by the authority of:

- A. The Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. § 680.1 et seq., as amended, the Storm Water Management Act (hereinafter referred to as "the Act");
- B. The Second Class Township Code, 53 P.S. § 65101 et seq.;

- C. The Act of July 31, 1968, P.L. 805, No. 247, 53 P.S. § 10101 et seq., as amended, the Pennsylvania Municipalities Planning Code, Act 247 (hereinafter referred to as the "MPC").

§116-5. Applicability.

- A. The following activities are regulated by this chapter:
- (1) All regulated activities as defined in this chapter, including, but not limited to, new development, redevelopment, and earth disturbance activities that are located within the municipality shall be subject to regulation by this chapter.
 - (2) When a building and/or grading permit is required for any regulated activity on an existing parcel or approved lot created by a subdivision and/or improved as a land development project, issuance of the permit shall be conditioned upon adherence to the terms of this chapter.
 - (3) This chapter contains the stormwater management performance standards and design criteria that are necessary from a watershed-based perspective. The municipality's stormwater management conveyance and system design criteria (e.g., inlet spacing, inlet type, collection system design and details, outlet structure design, etc.) shall continue to be regulated by Chapter 115 of the Code of Thornbury Township, titled "Subdivision and Land Development."
 - (4) The provisions of Article VIII of this chapter, titled "Prohibitions," are applicable to all properties located in Thornbury Township.
- B. Duty of persons engaged in a regulated activity. Notwithstanding any provision(s) of this chapter, including exemptions, any landowner or any person engaged in a regulated activity, including but not limited to the alteration or development of land, which may affect stormwater runoff characteristics, shall implement such measures as are reasonably necessary to prevent injury to health, safety, or other property. Such measures also shall include actions as are required to manage the rate, volume, direction, and quality of resulting stormwater runoff in a manner which otherwise adequately protects health, property, and water quality of waters of the commonwealth.
- C. Phased and incremental project requirements.
- (1) Any regulated activity (including but not limited to new development, redevelopment, or earth disturbance) that is to take place incrementally or in phases, or occurs in sequential projects on the same parcel or property, shall be subject to regulation by this chapter if the cumulative proposed impervious surface or earth disturbance exceeds the corresponding threshold for exemption

(as presented in Table 116-6.1, Thresholds for Regulated Activities Exempt from Chapter Provisions).

- (2) October 21, 2003 (the date of adoption of the previous Thornbury Stormwater Management Ordinance, Ordinance No. 129-M-03), shall be the starting point from which to consider tracts as parent tracts relative to future subdivisions and from which impervious surface and earth disturbance computations shall be cumulatively considered.
- (3) For example, if, after October 21, 2003, an applicant proposes construction of a six-hundred-square-foot garage, that project would be exempted from the requirements of this chapter as noted in Table 116-6.1. If, at a later date, an applicant proposes to construct a nine-hundred-square-foot room addition on the same property, the applicant would then be required to implement the stormwater management and plan submission requirements of this chapter for the cumulative total of 1,500 square feet of additional impervious surface added to the property since October 21, 2003.

§116-6. Exemptions; small-project requirements.

A. Requirements for exempt activities.

- (1) An exemption from any requirement of this chapter shall not relieve the applicant from implementing all other applicable requirements of this chapter or from implementing such measures as are necessary to protect public health, safety, and welfare, property and water quality.
- (2) An exemption shall not relieve the applicant from complying with the requirements for state-designated special-protection waters designated by PADEP as high quality (HQ) or exceptional value (EV) waters or any other current or future state or municipal water quality protection requirements.
- (3) An exemption under this chapter shall not relieve the applicant from complying with all other applicable municipal ordinances or regulations.

B. General exemptions.

Regulated activities that (1) involve less than 500 square feet of proposed impervious surfaces and less than 5,000 square feet of earth disturbance, or (2) are listed in Subsection C are exempt from those (and only those) requirements of this chapter that are included in the sections and Articles listed in Table 116-6.1. Exemptions are for the items noted in Table 116-6.1 only and shall not relieve the landowner from other applicable requirements of this chapter. Exemption shall not relieve the applicant from implementing such measures as are necessary to protect health, safety, and welfare, property, and water quality.

Table 116-6.1

Thresholds for Regulated Activities Exempt from Chapter Provisions

Chapter Article/Section	Activities Listed in §116-6C	<500 Square Feet of Proposed Impervious Surfaces and <5,000 Square Feet of Earth Disturbance	≥500 Square Feet of Proposed Impervious Surfaces or ≥5,000 Square Feet of Earth Disturbance
Article I	Not exempt	Not exempt	Not exempt
Article II	Not exempt	Not exempt	Not exempt
Sections 116-16, 116-17, and 116-25	Not exempt	Not exempt	Not exempt
Sections 116-15, 116-18, 116-19, 116-20, 116-21, 116-22, 116-23, and 116-24	Exempt	Exempt	Not exempt
Article IV	Exempt	Exempt	Not exempt
Article V	Exempt	Exempt	Not exempt
Article VI	Exempt	Exempt	Not exempt
Article VII	Exempt	Exempt	Not exempt
Article VIII	Not exempt	Not exempt	Not exempt
Article IX	Not exempt	Not exempt	Not exempt
Other erosion, sediment	Must comply with Title 25, Chapter 102, of the Pa. Code and Streams Law		

NOTES:

- Specific activities listed in Subsection C are exempt from the indicated requirements, regardless of size.

NOTES:

- A proposed regulated activity must be less than both the proposed impervious surfaces and proposed earth disturbance thresholds to be eligible for exemption from the requirements listed in this table.
- "Proposed impervious surface": as defined in this chapter.
- "Exempt": Regulated activities are exempt from the requirements of listed section(s) only; all other provisions of this chapter apply.

C. Exemptions for specific activities. The following specific regulated activities are exempt from the requirements of Sections 116-15, 116-18, 116-19, 116-20, 116-21, 116-22, 116-23, and 116-24 and Article IV, Article V, Article VI and Article VII of this chapter (as shown in Table 116-6.1), unless otherwise noted below. All other conveyance and system design standards established by the municipality in other codes or ordinances shall be required, and all other provisions of this chapter shall apply.

- (1) Emergency exemption. Emergency maintenance work performed for the protection of public health, safety and welfare. This exemption is limited to repair of the existing facility; upgrades, additions or other improvements are not exempt. A written description of the scope and extent of any emergency work performed shall be submitted to the municipality within two calendar days of the commencement of the activity. A detailed plan shall be submitted no later than 30 days following commencement of the activity. If the municipality finds that the work is not an emergency, then the work shall cease immediately, and the requirements of this chapter shall be addressed as applicable.
- (2) Maintenance. Any maintenance to an existing stormwater management system, facility, BMP or conveyance made in accordance with plans and specifications approved by the Municipal Engineer or municipality.
- (3) Existing landscaping. Use of land for maintenance, replacement or enhancement of existing landscaping.
- (4) Gardening. Use of land for gardening for home consumption.
- (5) Agricultural related activities.
 - (a) Agricultural activities (as defined in Article II).
 - (b) Conservation practices (as defined in Article II) that do not involve construction of any new or expanded impervious surfaces.
- (6) Forest management. Forest management operations, which are consistent with a sound forest management plan as filed with the municipality and which comply

with the Pennsylvania Department of Environmental Protection's management practices contained in its publication "Soil Erosion and Sedimentation Control Guidelines for Forestry" (as amended or replaced by subsequent guidance). Such operations are required to have an erosion and sedimentation control plan which meets the requirements of 25 Pa. Code Chapter 102 and meets the erosion and sediment control standards of §116-17 of this chapter.

- (7) Maintenance of existing paved surfaces. Replacement of existing paved surfaces shall meet the erosion and sediment control requirements of 25 Pa. Code Chapter 102 and §116-17 of this chapter and is exempt from all other requirements of this chapter listed in Subsection C above. Resurfacing of existing paved surfaces is exempt from the requirements of this chapter listed above. Construction of new or additional impervious surfaces shall comply with all requirements of this chapter as indicated in Table 116-6.1.
- (8) Municipal roadway shoulder improvements. Shoulder improvements conducted within the existing roadway cross section of municipal owned roadways, unless an NPDES permit is required, in which case the proposed work must comply with all requirements of this chapter.
- (9) In-place replacement of residential dwelling unit. The replacement in the exact footprint of an existing one- or two-family dwelling unit.
- (10) In-place replacement, repair, or maintenance of residential impervious surfaces. The replacement of existing residential patios, decks, driveways, pools, garages, and/or sidewalks that are accessory to an existing one- or two-family dwelling unit in the exact footprint of the existing impervious surface.

D. Small-project requirements.

- (1) Regulated activities that involve 500 to 2,000 square feet of proposed impervious surfaces and 5,000 to 10,000 square feet of proposed earth disturbance may apply the modified requirements presented in the "Simplified Approach to Stormwater Management for Small Projects" (Simplified Approach) (Appendix A) to comply with the requirements of §§116-15, 116-18, 116-19, 116-20, 116-21, 116-22, 116-23, and 116-24 and Article IV, Article V, Article VI and Article VII of this chapter (as shown in Table 116-6.2).
- (2) The applicant shall first contact the municipality to confirm that the proposed project is eligible for use of the Simplified Approach and is not otherwise exempt from these chapter provisions; to determine what components of the proposed project are to be considered as impervious surfaces; and to determine if other known site or local conditions exist that may preclude the use of any techniques included in the Simplified Approach.
- (3) Appendix A includes instructions and procedures for preparation, submittal, review and approval of documents required when using the Simplified Approach

and shall be adhered to by the applicant. All other provisions of this chapter shall apply.

Table 116-6.2

Thresholds for Regulated Activities Eligible for Small Project Requirements for Listed Chapter Provisions

Chapter Article/Section	Activities Listed in §116-6D
Article I	All provisions apply
Article II	All provisions apply
Sections 116-16, 116-17, and 116-25	All provisions apply
Sections 116-15, 116-18, 116-19, 116-20, 116-21, 116-22, 116-23, and 116-24	Exempt if small project requirements of §116-6D are applied
Article IV	Exempt if modified requirements of §116-6D are applied
Article V	Exempt if modified requirements of §116-6D are applied
Article VI	Exempt if modified requirements of §116-6D are applied
Article VII	Exempt if modified requirements of §116-6D are applied
Article VIII	All provisions apply
Article IX	All provisions apply
Other erosion, sediment and pollution control requirements	Must comply with Title 25, Chapter 102, of the Pa. Code and other applicable state and municipal codes, including the Clean Streams Law

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- "Small project requirements": Regulated activities listed within the subsections of this chapter noted in Table 116-6.2 are eligible for exemption only from the indicated sections and subsections of this chapter and only if the modified requirements of §116-6D are met to the satisfaction of the municipality; all other provisions of this chapter apply.

§116-7. Repealer.

The Thornbury Township Stormwater Management Ordinance which was adopted by the Board of Supervisors on October 21, 2003, as Ordinance No. 129-M-03 is repealed and replaced with this chapter. Any other ordinance or ordinance provision of the municipality inconsistent with any of the provisions of this chapter is hereby repealed to the extent of the inconsistency only.

§116-8. Severability.

If any sentence, clause, section or part of this chapter is for any reason found to be unconstitutional, illegal or invalid, such unconstitutionality, illegality or invalidity shall not affect or impair any of the remaining provisions, sentences, clauses, sections or parts of this chapter. It is hereby declared the intent of the governing body of the municipality that this chapter would have been adopted had such unconstitutional, illegal or invalid provision, sentence, clause, section or part thereof not been included herein.

§116-9. Compatibility with other ordinances or legal requirements.

- A. Approvals issued and actions taken pursuant to this chapter do not relieve the applicant of the responsibility to secure and comply with other required permits or approvals for activities regulated by any other applicable code, rule, act, law, regulation, or ordinance.
- B. To the extent that this chapter imposes more rigorous or stringent requirements for stormwater management than any other code, rule, act, law, regulation or ordinance, the specific requirements contained in this chapter shall take precedence.
- C. Nothing in this chapter shall be construed to affect any of the municipality's requirements regarding stormwater matters that do not conflict with the provisions of this chapter, such as local stormwater management design criteria (e.g., inlet spacing, inlet type, collection system design and details, outlet structure design, etc.).
- D. The requirements of this chapter shall supersede any conflicting requirements in other municipal ordinances or regulations.

§116-10. Financial security.

For all activities requiring submittal of a stormwater management (SWM) site plan that involve subdivision or land development, the applicant shall post financial security with the municipality for the timely installation and proper construction of all stormwater management facilities as required by the approved SWM site plan and this chapter, and such financial security shall:

- A. Be equal to or greater than the full construction cost of the required facilities except to the extent that financial security for the cost of any of such improvements is required to be and is posted with the Pennsylvania Department of Transportation in connection with a highway occupancy permit application; and
- B. Be determined, collected, applied and enforced in accordance with Sections 509 to 511 of the MPC and the provisions of the municipality's Subdivision and Land Development Ordinance (SALDO).

§116-11. Waivers.

- A. General. The requirements of this chapter are essential and shall be strictly adhered to. For any regulated activity where, after a close evaluation of alternative site designs, it proves to be impracticable to meet any one or more of the mandatory minimum standards of this chapter on the site, the municipality may approve measures other than those in this chapter, subject to Subsections B and C.
- B. The governing body shall have the authority to waive or modify the requirements of one or more provisions of this chapter if the literal enforcement will exact undue hardship because of peculiar conditions pertaining to the land in question, provided that such modification will not be contrary to the public interest and that the purpose and intent of the chapter is observed. Cost or financial burden shall not be considered a hardship. Modification may also be considered if an alternative standard or approach can be demonstrated to provide equal or better achievement of the results intended by the chapter. A request for modification shall be in writing and accompany the SWM site plan submission. The request shall state in full the grounds and facts on which the request is based, the provision or provisions of the chapter involved and the minimum modification necessary.
- C. PADEP approval required. For any proposed regulated activity involving earth disturbance equal to or greater than one acre, the municipality may approve measures for minimum volume and infiltration control other than those required in this chapter only after consultation with and evaluation by PADEP that the alternate site design meets state

water quality requirements and does not conflict with state law, including, but not limited to, the Pennsylvania Clean Streams Law, 35 P.S. § 691.1 et seq.

§116-12. 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.

Article II. DEFINITIONS

§116-13. Interpretation.

For the purposes of this chapter, certain terms and words used herein shall be interpreted as follows:

- A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender, and words of feminine gender include masculine gender.
- B. The words "includes" or "including" shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.
- C. The word "person" includes an individual, partnership, public or private association or corporation, firm, trust, estate, municipality, governmental unit, public utility or any other legal entity whatsoever which is recognized by law as the subject of rights and duties. Whenever used in any section prescribing or imposing a penalty, the term "person" shall include the members of a partnership, the officers, members, servants and agents of an association, officers, agents and servants of a corporation, and the officers of a municipality.
- D. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.
- E. The words "used" or "occupied" include the words "intended, designed, maintained, or arranged to be used, occupied, or maintained."
- F. The definitions in this chapter are for the purposes of enforcing the provisions of this chapter and have no bearing on other municipal regulations or ordinances.

§116-14. Definitions.

As used in this chapter, the following terms shall have the meanings indicated:

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, plowing, disking, harrowing, planting or harvesting crops, or the 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 as defined in this chapter.

AS-BUILT PLANS (DRAWINGS)

Engineering or site plans or drawings that document the actual locations, dimensions and elevations of the improvements, and building components, and changes made to the original design plans. The final version of these documents, or a copy of same, are signed and sealed by a qualified licensed professional and submitted to the municipality at the completion of the project, as per the requirements of §116-33 of this chapter, as "final as-built plans."

BANKFULL

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

BASE FLOW

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

BMP (BEST MANAGEMENT PRACTICE)

Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities, to provide water quality treatment, infiltration, volume reduction, and/or peak rate control, to promote groundwater recharge, and to otherwise meet the purposes of this chapter. Stormwater BMPs are commonly grouped into one of two broad categories or measures: "structural" or "nonstructural." In this chapter, nonstructural 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 site.

BUFFER

See "riparian buffer."

CARBONATE GEOLOGY or CARBONATE ROCK FORMATIONS

See "karst."

CFS

Cubic feet per second.

CHANNEL

A natural or artificial open drainage feature that conveys, continuously or periodically, flowing water and through which stormwater flows. Channels include, but shall not be limited to, natural and man-made drainage ways, swales, streams, ditches, canals, and pipes flowing partly full.

CN

Curve number.

COMMONWEALTH

The Commonwealth of Pennsylvania.

CONSERVATION DISTRICT

The Chester County Conservation District.

CONSERVATION PLAN

A plan written by a planner certified by NRCS that identifies conservation practices and includes site-specific BMPs for agricultural plowing or tilling activities and animal heavy-use areas.

CONSERVATION PRACTICES

Practices installed on agricultural lands to improve farmland, soil and/or water quality which have been identified in a current conservation plan.

CONVEYANCE

A natural or man-made, existing or proposed facility, feature or channel used for the transportation or transmission of stormwater from one place to another. For the purposes of this chapter, "conveyance" shall include pipes, drainage ditches, channels and swales (vegetated and other), gutters, stream channels, and like facilities or features.

DESIGN STORM

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

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 shortly after any given rainfall event.

DETENTION or TO DETAIN

Capture and temporary storage of runoff in a stormwater management facility for release at a controlled rate.

DETENTION VOLUME

The volume of runoff that is captured and released into the waters of the commonwealth at a controlled rate.

DEVELOPER

A person who seeks to undertake any regulated activities at a site in the municipality.

DIAMETER AT BREAST HEIGHT (DBH)

The outside bark diameter of a tree at breast height which is defined as 4.5 feet 1.37 meter above the forest floor on the uphill side of the tree.

DISTURBED AREA

Land area disturbed by or where an earth disturbance activity is occurring or has occurred.

DRAINAGE AREA

That land area contributing runoff to a single point (including but not limited to the point/line of interest used for hydrologic and hydraulic calculations) and that is enclosed by a natural or man-made ridgeline.

EARTH DISTURBANCE or 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; land development; building construction; and the moving, depositing, stockpiling, or storing of soil, rock, or earth materials.

EASEMENT

A right of use granted by a landowner to allow a grantee the use of the designated portion of land for a specified purpose, such as for stormwater management or other drainage purposes.

EROSION

The process by which the surface of the land, including water/stream channels, is worn away by water, wind, or chemical action.

EROSION AND SEDIMENT CONTROL PLAN

A plan required by the Conservation District or the municipality to minimize accelerated erosion and sedimentation and that must be prepared and approved per the applicable requirements.

FEMA

The Federal Emergency Management Agency.

FLOOD

A temporary condition of partial or complete inundation of land areas from the overflow of streams, rivers, and other waters of this commonwealth.

FLOODPLAIN

Any land area susceptible to inundation by water from any natural source or delineated by applicable FEMA maps and studies as being a special flood hazard area.

FLOODWAY

The channel of the watercourse and those portions of the adjoining floodplains that are reasonably required to carry and discharge the one-hundred-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 one-hundred-year floodway, it is assumed, absent evidence to the contrary, that the floodway extends from the center line of the stream and to 50 feet beyond the top of the bank of the stream on both sides.

FOREST MANAGEMENT/TIMBER OPERATIONS

Planning and activities necessary for the management of forestlands. These include timber inventory, preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation, and reforestation.

FREEBOARD

A vertical distance between the design high-water elevation and the elevation of the top of a dam, levee, tank, basin, swale, or diversion berm. The space is required as a safety margin in a pond or basin.

GEOTEXTILE

A fabric manufactured from synthetic fiber that is used to achieve specific objectives, including infiltration, separation between different types of media (i.e., between soil and stone), or filtration.

GOVERNING BODY

The Board of Supervisors of Thornbury Township.

GRADE/GRADING

- A. (noun) A slope, usually of a road, channel, or natural ground, specified in percent and shown on plans as specified herein.
- B. (verb) To finish the surface of a roadbed, the top of an embankment, or the bottom of an excavation.

GROUNDWATER

Water that occurs in the subsurface and fills or saturates the porous openings, fractures and fissures of underground soils and rock units.

GROUNDWATER RECHARGE

The replenishment of existing natural groundwater supplies from infiltration of rain or overland flow.

HEC-HMS

The U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC) - Hydrologic Modeling System (HMS).

HEC-1

The U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC) hydrologic runoff model.

HOTSPOTS

Areas where prior or existing land use or activities can potentially generate highly contaminated runoff with concentrations of pollutants in excess of those typically found in stormwater.

HYDROLOGIC REGIME

The hydrologic system, cycle or balance that sustains the quality and quantity of stormwater, stream base flow, storage, and groundwater supplies under natural conditions.

HYDROLOGIC SOIL GROUP (HSG)

A classification of soils by the Natural Resources Conservation Service (NRCS) into four runoff potential groups. The groups range from A soils, which are very permeable and produce little runoff, to D soils, which are not very permeable and produce much more runoff.

IMPERVIOUS SURFACE

A surface that has been compacted or covered with a layer of material so that it prevents or is resistant to infiltration of water, including but not limited to structures such as roofs, buildings, storage sheds; other solid, paved or concrete areas such as streets, driveways, sidewalks, parking lots, patios, decks, tennis or other paved courts; or athletic playfields comprised of synthetic turf materials. For the purposes of determining compliance with this chapter, compacted soils or stone surfaces used for vehicle parking and movement shall be considered impervious. Surfaces that were designed to allow infiltration (i.e., areas of porous pavement) will be considered on a case-by-case basis by the Municipal Engineer, based on appropriate documentation and condition of the material, etc.

INFILTRATION

Movement of surface water into the soil, where it is absorbed by plant roots, evaporated into the atmosphere, or percolated downward to recharge groundwater.

INFILTRATION FACILITY

A stormwater BMP designed to collect and discharge runoff into the subsurface in a manner that allows infiltration into underlying soils and groundwater (e.g., french drains, seepage pits, or seepage trenches, etc.).

INTERMITTENT STREAM

A defined channel in which surface water is absent during a portion of the year, in response to seasonal variations in precipitation or groundwater discharge.

INVERT

The lowest surface, the floor or bottom of a culvert, pipe, drain, sewer, channel, basin, BMP, or orifice.

KARST

A type of topography that is formed over limestone or other carbonate rock formations by dissolving or solution of the rock by water and that is characterized by closed depressions,

sinkholes, caves, a subsurface network of solution conduits and fissures through which groundwater moves, and no perennial surface drainage features.

LAND DEVELOPMENT

Any of the following activities:

- A. The improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving:
 - (1) A group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure; or
 - (2) The division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of, streets, common areas, leaseholds, condominiums, building groups, or other features.
- B. A subdivision of land.
- C. Development in accordance with Section 503(1.1) of the Pennsylvania Municipalities Planning Code (as amended).

LANDOWNER

The legal or beneficial owner or owners of land, including the holder of an option or contract to purchase (whether or not such option or contract is subject to any condition), a lessee if he or she is authorized under the lease to exercise the rights of the landowner, or other person having a proprietary interest in the land.

LICENSED PROFESSIONAL

A Pennsylvania registered professional engineer, registered landscape architect, registered professional land surveyor, or registered professional geologist, or any person licensed by the Pennsylvania Department of State and qualified by law to perform the work required by the chapter within the Commonwealth of Pennsylvania.

LIMITING ZONE

A soil horizon or condition in the soil profile or underlying strata that includes one of the following:

- A. A seasonal high water table, whether perched or regional, determined by direct observation of the water table or indicated by other subsurface or soil conditions.

- B. A rock with open joints, fracture or solution channels, or masses of loose rock fragments, including gravel, with insufficient fine soil to fill the voids between the fragments.
- C. A rock formation, other stratum, or soil condition that is so slowly permeable that it effectively limits downward passage of water.

MPC

The Act of July 31, 1968, P.L. 805, No. 247, 53 P.S. § 10101 et seq., as amended, the Pennsylvania Municipalities Planning Code, Act 247.

MFEMP

Mushroom farm environmental management plan.

MS4

Municipal separate storm sewer system.

MAINTENANCE

The action taken to restore or preserve the as-built functional design of any facility or system.

MUNICIPAL ENGINEER

A professional engineer licensed as such in the Commonwealth of Pennsylvania, duly appointed as the engineer for a municipality, planning agency, or joint planning commission.

MUNICIPALITY

Thornbury Township, Chester County, Pennsylvania.

NOAA

The National Oceanic and Atmospheric Administration.

NEW DEVELOPMENT

Any regulated activity involving placement or construction of new impervious surface or grading over existing pervious land areas not classified as redevelopment as defined in this chapter.

NONPOINT SOURCE POLLUTION

Pollution that enters a water body from diffuse origins in the watershed and does not result from discernible, confined, or discrete conveyances.

NON-STORMWATER DISCHARGES

Water flowing in stormwater collection facilities, such as pipes or swales, which is not the result of a rainfall event or snowmelt.

NONSTRUCTURAL BEST MANAGEMENT PRACTICE (BMP)

See "(BMP) best management practice."

NPDES

National Pollutant Discharge Elimination System, the federal government's system for issuance of permits under the Clean Water Act, which is delegated to PADEP in Pennsylvania.

NRCS

The Natural Resources Conservation Service (previously the Soil Conservation Service, SCS), an agency of the U.S. Department of Agriculture.

PADEP

The Pennsylvania Department of Environmental Protection.

PARENT TRACT

The parcel of land from which a land development or subdivision originates, determined from the date of municipal adoption of this chapter.

PEAK DISCHARGE

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

PENNDOT

The Pennsylvania Department of Transportation.

**PENNSYLVANIA STORMWATER BEST MANAGEMENT PRACTICES MANUAL
(PADEP BMP Manual)**

Document No. 363-0300-002 (December 2006, and as subsequently amended).

PERVIOUS SURFACE or PERVIOUS AREA

Any area not defined as impervious surface.

PLANNING COMMISSION

The Planning Commission of Thornbury Township.

POINT SOURCE

Any discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, or conduit from which stormwater is or may be discharged, as defined in state regulations at 25 Pa. Code § 92.1.

POST CONSTRUCTION

Period after construction during which disturbed areas are stabilized, stormwater controls are in place and functioning, and all proposed improvements approved by the municipality are completed.

PREDEVELOPMENT

Land cover conditions assumed to exist within the proposed disturbed area prior to commencement of the regulated activity for the purpose of calculating the predevelopment water quality volume, infiltration volume, and peak flow rates as required in this chapter.

PRETREATMENT

Techniques employed in stormwater BMPs to provide storage or filtering, or other methods to trap or remove coarse materials and other pollutants before they enter the stormwater system, but may not necessarily be designed to meet the entire water quality volume requirements of this chapter.

PROPOSED IMPERVIOUS SURFACE

All new, additional and replacement impervious surfaces.

RAINFALL INTENSITY

The depth of accumulated rainfall per unit of time.

RECHARGE

The replenishment of groundwater through the infiltration of rainfall, other surface waters, or land application of water or treated wastewater.

REDEVELOPMENT

Any regulated activity that involves demolition, removal, reconstruction, or replacement of existing impervious surface(s).

REGULATED ACTIVITY

Any earth disturbance activity(ies) or any activity that involves the alteration or development of land in a manner that may affect stormwater runoff.

REGULATED EARTH DISTURBANCE ACTIVITY

Any activity involving earth disturbance subject to regulation under 25 Pa. Code Chapter 92, Chapter 102, or the Clean Streams Law.

RETENTION BASIN

An impoundment that is designed to temporarily detain a certain amount of stormwater from a catchment area and which may be designed to permanently retain stormwater runoff from the catchment area; retention basins always contain water.

RETENTION or TO RETAIN

The prevention of direct discharge of stormwater runoff into surface waters or water bodies during or after a storm event by permanent containment in a pond or depression; examples include systems which discharge by percolation to groundwater, exfiltration, and/or evaporation processes and which generally have residence times of less than three days.

RETENTION VOLUME/REMOVED RUNOFF

The volume of runoff that is captured and not released directly into the surface waters of the 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 twenty-five-year-return-period rainfall would be expected to occur on average once every 25 years, or stated in another way, the probability of a twenty-five-year storm occurring in any one year is 0.04 (i.e., a four-percent chance).

RIPARIAN

Pertaining to anything connected with or immediately adjacent to the banks of a stream or other body of water.

RIPARIAN BUFFER

An area of land adjacent to a body of water and managed to maintain vegetation to protect the integrity of stream channels and shorelines, to reduce the impact of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals, and to supply food, cover and thermal protection to fish and other aquatic species and wildlife.

RUNOFF

Any part of precipitation that flows over the land surface.

SALDO

See "Subdivision and Land Development Ordinance."

SCS

The Soil Conservation Service, now known as the Natural Resources Conservation Service.

SEDIMENT

Soil or other materials transported by, suspended in or deposited by surface water as a product of erosion.

SEPARATE STORM SEWER SYSTEM

A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) primarily used for collecting and conveying stormwater runoff.

SHEET FLOW

A flow process associated with broad, shallow water movement on sloping ground surfaces that is not channelized or concentrated.

SITE

Total area of land in the municipality where any proposed regulated activity, as defined in this chapter, is planned, conducted, or maintained or that is otherwise impacted by the regulated activity.

SOIL COVER COMPLEX METHOD

A method of runoff computation developed by NRCS that is based on relating soil type and land use/cover to a runoff parameter called "curve number" (CN).

STATE WATER QUALITY REQUIREMENTS

The regulatory requirements to protect, maintain, reclaim, and restore water quality under Pennsylvania Code Title 25 and the Clean Streams Law.

STORM FREQUENCY

See "return period."

STORMWATER

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

STORMWATER MANAGEMENT FACILITY

Any feature, natural or man-made, that, due to its condition, design, or construction, conveys, stores, or otherwise affects stormwater runoff quality, rate, or quantity. Typical stormwater management facilities include, but are not limited to, detention and retention basins, open channels, storm sewers, pipes, and infiltration facilities.

STORMWATER MANAGEMENT (SWM) SITE PLAN

The plan prepared by the applicant or its representative, in accordance with the requirements of Article IV of this chapter, indicating how stormwater runoff will be managed at a particular site

in accordance with this chapter, and including all necessary design drawings, calculations, supporting text, and documentation to demonstrate that ordinance requirements have been met, herein referred to as "SWM site plan." All references in this chapter to "final" or "approved" SWM site plans shall incorporate the approved SWM site plan and all subsequent approved revisions thereto.

STREAM

A natural watercourse.

STRUCTURAL STORMWATER MANAGEMENT PRACTICES

See "BMP (best management practice)."

SUBDIVISION

The division or redivision of a lot, tract, or parcel of land as defined in the Pennsylvania Municipalities Planning Code, Act of July 31, 1968, P.L. 805, No. 247, as amended.

SUBDIVISION AND LAND DEVELOPMENT ORDINANCE

The Subdivision and Land Development Ordinance of Thornbury Township, Chester County, Pennsylvania, as amended.

SWALE

An artificial or natural waterway or low-lying stretch of land that gathers and conveys stormwater or runoff and is generally vegetated for soil stabilization, stormwater pollutant removal, and infiltration.

SWM SITE PLAN

See "stormwater management (SWM) site plan."

TIMBER OPERATIONS

See "forest management/timber operations."

TOP-OF-BANK

Highest point of elevation of the bank of a stream or channel cross section at which a rising water level just begins to flow out of the channel and into the floodplain.

TOWNSHIP

Thornbury Township, Chester County, Pennsylvania.

USDA

United States Department of Agriculture.

WATERCOURSE

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

WATERSHED

Region or area drained by a river, watercourse, or other body of water, whether natural or artificial.

WATERS OF THE 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 the commonwealth.

WATER TABLE

The uppermost level of saturation of pore space or fractures by groundwater. "Seasonal high water table" refers to a water table that rises and falls with the seasons due either to natural or man-made causes.

WETLAND

Those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, fens, and similar areas.

WOODS

Any land area of at least 0.25 acre with a natural or naturalized ground cover (excluding manicured turf grass) and that has an average density of two or more viable trees per 1,500 square feet with a DBH of six inches or greater. The land area to be considered woods shall be measured from the outer driplines of the outer trees.

Article III. STORMWATER MANAGEMENT STANDARDS

§116-15. General requirements.

- A. Applicants proposing regulated activities in the municipality which are not exempt under §116-6 shall submit a stormwater management site plan (SWM site plan) to the municipality for review and approval in accordance with Articles III and IV. SWM site plans approved by the municipality shall be on site throughout the duration of the regulated activity.

- B. The stormwater management and runoff control criteria and standards in this chapter shall apply to the total proposed regulated activity, even if it is to take place in stages. The measurement of impervious surfaces shall include all of the impervious surfaces in the total proposed regulated activity even if the development is to take place in stages.
- C. No regulated activity within the municipality shall commence until:
 - (1) The municipality issues approval of a SWM site plan, which demonstrates compliance with the requirements of this chapter; and
 - (2) The applicant has received a letter of adequacy or approval for the erosion and sediment control plan review by the municipality and the Conservation District (if required) and has received all other local, state and federal permit approvals required for the project involving the regulated activity.
- D. Neither submission of an SWM site plan under the provisions herein nor compliance with the provisions of this chapter shall relieve any person from responsibility for damage to any person or property otherwise imposed by law.
- E. The applicant shall design the site to minimize disturbances to land, site hydrology, and natural resources and to maintain the natural hydrologic regime, drainage patterns and flow conditions. The applicant shall apply the procedures set forth in §§116-18 for the overall site design and for selection, location and design of features and BMPs to be used to comply with the requirements of this chapter.
- F. To the maximum extent practicable, postconstruction stormwater shall be discharged within the drainage area of the same stream or water body receiving the runoff prior to construction of the proposed regulated activity.
- G. Persons proposing to construct regulated activities with one acre or more of proposed earth disturbance that do not discharge directly to waters of the commonwealth shall provide the municipality with a copy of the easement authorizing such discharge or confirmation from PADEP that an easement is not required.
- H. Areas located outside of the site (i.e., areas outside of the regulated activity) that drain through a proposed site are not subject to water quality and volume control, infiltration, stream channel protection, or peak flow rate control requirements (as presented in §§116-19, 116-20, 116-21 and 116-22). Drainage facilities located on the site shall be designed to safely convey flows from outside of the site through the site.

- I. If site conditions preclude capture of runoff from limited portions of the disturbed area for achieving water quality volume control standards, stream channel protection standards, and the two-year, five-year, and ten-year storm event peak runoff rate reduction standards for new development required by this chapter, the applicant shall propose alternate methods to mitigate the bypass of the BMPs, subject to the approval of the Municipal Engineer. In no case shall resulting peak rate be greater than the predevelopment peak rate for the equivalent design storm.
- J. For all regulated activities, erosion and sediment control BMPs shall be designed, implemented, operated, and maintained during the regulated activities (i.e., during construction) as required to meet the purposes and requirements of this chapter, to meet the erosion and sediment control requirements of the municipality, if applicable, and to meet all requirements under Title 25 of the Pennsylvania Code and the Clean Streams Law.
- K. For all regulated activities, permanent BMPs and conveyances shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this chapter and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Storm Water Management Act.
- L. The design of all BMPs and conveyances shall incorporate sound engineering principles and practices in a manner that does not aggravate existing stormwater problems as identified by the municipality. The municipality reserves the right to disapprove any design that would result in construction in an area affected by existing stormwater problem(s) or continuation of an existing stormwater problem(s).
- M. Existing wetlands, either on the site or on an adjacent property, shall not be used to meet the minimum design requirements for stormwater management or stormwater runoff quality treatment. Stormwater discharges to existing wetlands shall not degrade the quality or hydrologic integrity of the wetland.
- N. Hotspot runoff controls. Specific structural or pollution prevention practices may be required, as determined to be necessary by the Municipal Engineer, to pretreat runoff from hotspots prior to infiltration. Following is a list of examples of hotspots:
 - (1) Vehicle salvage yards and recycling facilities.
 - (2) Vehicle fueling stations.
 - (3) Vehicle service and maintenance facilities.
 - (4) Vehicle and equipment cleaning facilities.
 - (5) Fleet storage areas (bus, truck, etc.).

- (6) Industrial sites based on standard industrial classification codes.
 - (7) Marinas (service and maintenance areas).
 - (8) Outdoor liquid container storage.
 - (9) Outdoor loading/unloading facilities.
 - (10) Public works storage areas.
 - (11) Facilities that generate or store hazardous materials.
 - (12) Commercial container nursery.
 - (13) Contaminated sites/brownfields.
 - (14) Other land uses and activities as designated by the municipality.
- O. Contaminated and brownfield sites. Where BMPs may contribute to the migration of contaminants in groundwater, the water quality and runoff volume, stream channel protection, and peak rate control standards shall be met; however, at the Municipal Engineer's discretion, the minimum infiltration requirement may be reduced or eliminated commensurate with the contaminated area, and the required water quality and runoff control measures may be increased to mitigate the reduced infiltration requirement for the contaminated area.
- P. Additional water quality requirements. The municipality may require additional stormwater control measures for stormwater discharges to special management areas, including, but not limited to:
- (1) Water bodies listed as "impaired" by PADEP.
 - (2) Any water body or watershed with an approved total maximum daily load (TMDL).
 - (3) Areas of known existing flooding problems.
 - (4) Critical areas with sensitive resources (e.g., state-designated special protection waters, cold-water fisheries, carbonate geology or other groundwater recharge areas that may be highly vulnerable to contamination, drainage areas to water supply reservoirs, etc.).
- Q. Applicants shall utilize the Pennsylvania Stormwater Best Management Practices Manual (PA BMP Manual), as amended, or other sources acceptable to the Municipal Engineer, for testing and design standards for BMPs, and where there is a conflict with the provisions of this chapter, the most restrictive applies.
- R. For areas underlain by karst or carbonate geology that may be susceptible to the formation of sinkholes and other karst features, the location, type, and design of infiltration BMPs shall be based on a site evaluation conducted by a qualified licensed

professional and based on the PA BMP Manual or other design guidance acceptable to the Municipal Engineer.

- S. All regulated activities located within a special flood hazard area designated by the Federal Emergency Management Agency (FEMA) shall comply with § 240-26 of the Code of Thornbury Township and shall be designed to maintain the flood-carrying capacity of the floodway such that the base flood elevations are not increased, either upstream or downstream. The natural conveyance characteristics of the site and the receiving floodplain shall be incorporated into the stormwater management practices proposed for the site.
- T. If a perennial or intermittent stream passes through the site, the applicant shall create a riparian buffer extending a minimum of 50 feet to either side of the top of the bank of the channel. The buffer area shall be maintained with appropriate native vegetation (see a list of technical references in Appendix F).. If the applicable rear or side yard setback is less than 50 feet, the buffer width may be reduced to 25% of the setback to a minimum of 10 feet. If an existing buffer is legally prescribed (e.g., deed covenant, easement, etc.) and it exceeds the requirement of this chapter, the existing buffer shall be maintained.

§116-16. Permit requirements by other governmental entities.

The following permit or other regulatory requirements may apply to certain regulated activities and shall be met prior to (or as a condition of) final approval by the municipality of the SWM site plan and prior to commencement of any regulated activities, as applicable:

- A. All regulated activities subject to permit or regulatory requirements by PADEP under regulations at 25 Pa. Code Chapter 102 or erosion and sediment control requirements of the municipality.
- B. Work within natural drainage ways subject to permit by PADEP under 25 Pa. Code Chapter 105.
- C. Any BMP or conveyance that would be located in or adjacent to surface waters of the commonwealth, including wetlands, subject to permit by PADEP under 25 Pa. Code Chapter 105.
- D. Any BMP or conveyance that would be located on or discharge to a state highway right-of-way or require access to or from a state highway and be subject to approval by PennDOT.

- E. Culverts, bridges, storm sewers, or any other facilities which must pass or convey flows from the tributary area and any facility which may constitute a dam subject to permit by PADEP under 25 Pa. Code Chapter 105.

§116-17. Erosion and sediment control.

- A. No regulated activity within the municipality shall commence until:
 - (1) The municipality receives documentation that the applicant has received:
 - (a) A "letter of adequacy" from the Conservation District or other approval from PADEP in compliance with Title 25, Chapter 102, of the Pennsylvania Code of an erosion and sediment control plan for construction activities, if applicable;
 - (b) A PADEP NPDES construction activities permit as required under 25 Pa. Code Chapter 92, if applicable;
 - (c) Evidence of any other permit(s) or approvals required for the regulated activities; and
 - (2) An erosion and sediment control plan has been approved by the municipality, if required.
- B. A copy of the erosion and sediment control plan and any required permit(s), as required by PADEP regulations, shall be available on the site at all times.
- C. Additional erosion and sediment control measures shall be applied where infiltration BMPs are proposed, at a minimum including those required in §116-20M.

§116-18. Site design process.

For regulated activities with 10,000 or more square feet of proposed earth disturbance or 2,000 or more square feet of proposed impervious surfaces, the applicant shall design the site to minimize the disturbances to land, site hydrology, and natural resources and to maintain the natural hydrologic regime, drainage patterns and flow conditions. For regulated activities with 10,000 or more square feet of proposed earth disturbance or 2,000 or more square feet of proposed impervious surfaces, the applicant shall demonstrate in its SWM site plan (as required in §116-27C) that the design sequence, objectives and techniques described below were applied to the maximum extent practicable in the site design of the regulated activity while complying with all other requirements of this chapter. The site design shall:

- A. First, identify and delineate all existing natural resources and natural and man-made hydrologic features listed in §116-27B(8) that are located within the site or receive discharge from or may be impacted by the proposed regulated activity.

B. Second, provide a prioritized listing of these resources and features to identify:

- (1) Those to be incorporated into the site design in a manner that provides protection from any disturbance or impact from the proposed regulated activity;
- (2) Those to be protected from further disturbance or impact but for which the proposed regulated activity will provide improvement to existing conditions;
- (3) Those that can be incorporated into and utilized as components of the overall site design in a manner that protects or improves their existing conditions while utilizing their hydrologic function within the limits of their available capacity (e.g., for infiltration, evapotranspiration, or reducing pollutant loads, runoff volume or peak discharge rates, etc.) to reduce the need for or size of constructed BMPs; and
- (4) Those that may be considered for alteration, disturbance or removal.

C. Third, develop the site design to achieve the following:

- (1) Recognize and incorporate the priorities identified in §116-18B as the basis for the proposed site layout, grading, construction, and permanent ground cover design;
- (2) Minimize earth disturbance (both surface and subsurface);
- (3) Maximize protection of or improvement to natural resources and special management areas;
- (4) Minimize the disturbance of natural site hydrology, in particular natural drainage features and patterns, discharge points and flow characteristics, natural infiltration patterns and characteristics, and natural channel and floodplain conveyance capacity;
- (5) Incorporate natural hydrologic features and functions identified in §116-18B into the site design to protect and utilize those features and their hydrologic functions to reduce the need for or size of constructed BMPs;
- (6) Maximize infiltration and the use of natural site infiltration features, patterns and conditions, and evapotranspiration features;
- (7) Apply selective grading design methods to provide final grading patterns or preserve existing topography in order to evenly distribute runoff and minimize concentrated flows;
- (8) Minimize the cumulative area to be covered by impervious surfaces, and:
 - (a) Minimize the size of individual impervious surfaces;
 - (b) Separate large impervious surfaces into smaller components;
 - (c) Disconnect runoff from one impervious surface to another; and

- (d) Utilize porous materials in place of impervious wherever practicable;
 - (9) Minimize the volume and peak discharge rates of stormwater generated;
 - (10) Avoid or minimize stormwater runoff pollutant loads and receiving stream channel erosion;
 - (11) Locate infiltration and other BMPs:
 - (a) At or as near to the source of generation as possible; and
 - (b) At depths that are as shallow as possible;
 - (12) Prioritize the selection and design of BMPs as follows:
 - (a) Nonstructural and vegetation BMPs, then;
 - (b) Structural (surface and subsurface) BMPs;
 - (13) For flow volumes requiring conveyance from the source of generation to a BMP for management, give preference to open channel conveyance techniques that provide infiltration and water quality benefits and landscaped-based management in common open space areas, where practicable; and
 - (14) Consider additional guidance for incorporating natural hydrology into the site and BMP designs, methods and techniques that support the objectives of §116-18B and C. Appendix B presents additional discussion of natural hydrology site design and sources of information for conservation design, low-impact design, and sustainable design.
- D. The procedures set forth above shall be utilized to the maximum extent practicable for the overall site design and selection, location and design of features and BMPs to be used to comply with the requirements of §§116-19, 116-20, 116-21 and 116-22.

§116-19. Water quality and runoff volume requirements.

To control post-construction stormwater impacts from regulated activities and meet state water quality requirements, BMPs shall be provided in the site design that replicate predevelopment stormwater infiltration and runoff conditions, such that post-construction stormwater discharges do not degrade the physical, chemical, or biological characteristics of the receiving waters. The applicant shall comply with the following water quality and runoff volume requirements for all regulated activities, including all new development and redevelopment activities:

- A. The post-construction total runoff volume shall not exceed the predevelopment total runoff volume for all storms equal to or less than the two-year, twenty-four-hour-duration precipitation (design storm). The water quality and runoff volume to be managed shall

consist of any runoff volume generated by the proposed regulated activity over and above the predevelopment total runoff volume and shall be captured and permanently retained or infiltrated on the site. Permanent retention options may include, but are not limited to, reuse, evaporation, transpiration, and infiltration.

- B. For modeling purposes, the predevelopment ground cover conditions shall be determined using the corresponding ground cover assumptions presented in §116-23D of this chapter.
- C. The design of the facility outlet shall provide for protection from clogging and unwanted sedimentation.
- D. BMPs that moderate the temperature of stormwater shall be used to protect the temperature of receiving waters.
- E. Water quality improvement shall be achieved in conjunction with achieving the infiltration requirements of §116-20. The infiltration volume required under §116-20 may be included as a component of the water quality volume. If the calculated water quality and runoff volume is greater than the volume infiltrated, then the difference between the two volumes shall be managed for water quality and runoff volume control through other techniques or practices but shall not be discharged from the site.
- F. Runoff from the disturbed area shall be treated for water quality prior to entering existing waterways or water bodies. If a stormwater management practice does not provide water quality treatment, then water quality BMPs shall be utilized to provide pretreatment prior to the runoff entering the stormwater management practice.
- G. The municipality may require additional water quality and runoff control measures for stormwater discharging to special management areas such as those listed in §116-15P.
- H. When the regulated activity contains or is divided by multiple drainage areas, the water quality and runoff volume shall be separately addressed for each drainage area.
- I. Weighted averaging of runoff coefficients shall not be used for manual computations or input data for water quality and runoff volume calculations.
- J. Areas located outside of the site (i.e., areas outside of the regulated activity) may be excluded from the calculation of the water quality and runoff volume requirements.
- K. Water quality and volume control practices shall be selected and designed to meet the criteria of §116-18C that apply to water quality and volume control.

§116-20. Infiltration requirements.

Providing for infiltration consistent with the natural hydrologic regime is required to compensate for the reduction in the recharge that occurs when the ground surface is disturbed or impervious surface is created or expanded. The applicant shall achieve the following infiltration requirements:

- A. Wherever possible, infiltration should be designed to accommodate the entire water quality and runoff volume required in §116-19.
- B. For regulated activities involving new development, the volume of a minimum of one inch of runoff from all proposed impervious surfaces shall be infiltrated.
- C. For regulated activities involving redevelopment, whichever is less of the following volume options shall be infiltrated:
 - (1) The volume of a minimum of one inch of runoff from all proposed impervious surfaces; or
 - (2) The total water quality and runoff volume required in §116-19 of this chapter.
- D. If the requirements of Subsection B or C cannot be physically accomplished, then the applicant shall be responsible for demonstrating with data or calculations to the satisfaction of the Municipal Engineer why this infiltration volume cannot be physically accomplished on the site (e.g., shallow depth to bedrock or limiting zone, open voids, steep slopes, etc.) and what alternative volume can be infiltrated; however, in all cases at least the 0.5 inch of runoff volume shall be infiltrated.
- E. Only if a minimum of at least 0.5 inch infiltration requirement cannot be physically accomplished on the site shall a waiver from §116-20 be considered by the municipality.
- F. If site conditions preclude capture of runoff from portions of the impervious surfaces, the infiltration volume for the remaining area shall be increased an equivalent amount to offset the loss.
- G. When a project contains or is divided by multiple watersheds, the infiltration volume shall be separately addressed for each watershed.
- H. Existing impervious surfaces located in areas outside of the site (i.e., outside of the regulated activity) may be excluded from the calculation of the required infiltration volume.

- I. A detailed soils evaluation of the site shall be conducted by a qualified professional and at a minimum shall address soil permeability, depth to bedrock, and subgrade stability. The general process for designing the infiltration BMP shall be conducted by a qualified licensed professional and shall be consistent with the PA BMP Manual (as amended) (or other guidance acceptable to the Municipal Engineer) and in general shall:
- (1) Analyze hydrologic soil groups as well as natural and man-made features within the site to determine general areas of suitability for infiltration practices. In areas where development on fill material is under consideration, conduct geotechnical investigations of subgrade stability; infiltration may not be ruled out without conducting these tests.
 - (2) Provide field tests such as double ring infiltrometer or other hydraulic conductivity tests (at the elevation of the proposed infiltration surface) to determine the appropriate hydraulic conductivity rate. Standard septic/sewage percolation tests are not acceptable for design purposes.
 - (3) Design the infiltration facility for the required retention (infiltration) volume based on field-determined infiltration capacity (and apply safety factor as per applicable design guidelines) at the elevation of the proposed infiltration surface.
 - (4) On-lot infiltration features are encouraged; however, it shall be demonstrated to the Municipal Engineer that the soils are conducive to infiltration on the identified lots.
- J. Infiltration BMPs shall be selected based on suitability of soils and site conditions and shall be constructed on soils that have the following characteristics:
- (1) A minimum depth of 24 inches between the bottom of the BMP and the top of the limiting zone. Additional depth may be required in areas underlain by karst or carbonate geology.
 - (2) An infiltration rate sufficient to accept the additional stormwater volume and drain completely as determined by field tests conducted by the applicant.
 - (3) The infiltration facility shall completely drain the retention (infiltration) volume within three days (72 hours) from the end of the design storm.
- K. All infiltration practices shall:
- (1) Be selected and designed to meet the criteria of §116-18C that are applicable to infiltration.
 - (2) Be set back at least 25 feet from all buildings and features with subgrade elements (e.g., basements, foundation walls, etc.) and 15 feet from any property line or right-of-way line, unless otherwise approved by the Municipal Engineer.

- (3) For any infiltration practice that collects runoff from shared or multiple features and that is located within 25 feet of a building or feature with subgrade elements (e.g., basements, foundation walls, etc.), the bottom elevation shall be set below the elevation of the subgrade element.
- L. Infiltration facilities shall, to the maximum extent practicable, be located to avoid introducing contaminants to groundwater:
- (1) When a hotspot is located in the area draining to a proposed infiltration facility, an evaluation of the potential of groundwater contamination from the proposed infiltration facility shall be performed, including a hydrogeologic investigation (if necessary) by a qualified licensed professional to determine what, if any, pretreatment or additional design considerations are needed to protect groundwater quality.
 - (2) When located within a "wellhead protection area" of a public water supply well, infiltration practices shall be in conformance with the applicable approved source water protection assessment or source water protection plan.
 - (3) The applicant shall provide appropriate safeguards against groundwater contamination for land uses that may cause groundwater contamination should there be a mishap or spill.
- M. During site construction, all infiltration practice components shall be protected from compaction due to heavy equipment operation or storage of fill or construction material. Infiltration areas shall also be protected from sedimentation. Areas that are accidentally compacted or graded shall be remediated to restore soil composition and porosity. Adequate documentation to this effect shall be submitted to the Municipal Engineer for review. All areas designated for infiltration shall not receive runoff until the contributory drainage area has achieved final stabilization.
- N. Where sediment transport in the stormwater runoff is anticipated to reach the infiltration system, appropriate permanent measures to prevent or collect sediment shall be installed prior to discharge to the infiltration system.
- O. Where roof drains are designed to discharge to infiltration practices, they shall have appropriate measures to prevent clogging by unwanted debris (for example, silt, leaves and vegetation). Such measures shall include but are not limited to leaf traps, gutter guards and cleanouts.
- P. All infiltration practices shall have appropriate positive overflow controls.

- Q. No sand, salt or other particulate matter may be applied to a porous surface material for winter ice conditions.

- R. The following procedures and materials shall be required during the construction of all subsurface facilities:
 - (1) Excavation for the infiltration facility shall be performed with equipment that will not compact the bottom of the seepage bed/trench or like facility.
 - (2) The bottom of the bed and/or trench shall be scarified prior to the placement of aggregate.
 - (3) Only clean aggregate with documented porosity, free of fines, shall be allowed.
 - (4) The tops, bottoms and sides of all seepage beds, trenches, or like facilities shall be covered with drainage fabric. Fabric shall be nonwoven fabric acceptable to the Municipal Engineer.
 - (5) Stormwater shall be distributed throughout the entire seepage bed/trench or like facility, and provisions for the collection of debris shall be provided in all facilities.

§116-21. Stream channel protection requirements.

For regulated activities involving new development with one or more acres of earth disturbance, the applicant shall comply with the following stream channel protection requirements to minimize stream channel erosion and associated water quality impacts to the receiving waters:

- A. The peak flow rate of the post-construction two-year, twenty-four-hour design storm shall be reduced to the predevelopment peak flow rate of the one-year, twenty-four-hour-duration precipitation, using the SCS Type II distribution.

- B. To the maximum extent practicable, and unless otherwise approved by the Municipal Engineer, the post-construction one-year, twenty-four-hour storm flow shall be detained for a minimum of 24 hours and a maximum not to exceed 72 hours from a point in time when the maximum volume of water from the one-year, twenty-four-hour storm is stored in a proposed BMP (i.e., when the maximum water surface elevation is achieved in the facility). Release of water can begin at the start of the storm (i.e., the invert of the orifice is at the invert of the proposed BMP).

- C. For modeling purposes, the pre-development ground cover conditions shall be determined using the corresponding ground cover assumptions presented in §116-23D of this chapter.

- D. The minimum orifice size in the outlet structure to the BMP shall be three inches in diameter unless otherwise approved by the Municipal Engineer, and a trash rack shall be

installed to prevent clogging. For sites with small drainage areas contributing to the BMP that do not provide enough runoff volume to allow a twenty-four-hour attenuation with the three-inch orifice, the calculations shall be submitted showing this condition.

- E. When the calculated orifice size is below three inches, gravel filters (or other methods) are recommended to discharge low-flow rates subject to the Municipal Engineer's satisfaction. When filters are utilized, maintenance provisions shall be provided to ensure filters meet the design function.
- F. All proposed stormwater facilities shall make use of measures to extend the flow path and increase the travel time of flows in the facility.
- G. When a regulated activity contains or is divided by multiple drainage areas, the peak flow rate control shall be separately addressed for each drainage area.

§116-22. Stormwater peak rate control requirements.

The applicant shall comply with the following peak flow rate control requirements for all regulated activities, including those that involve new development and redevelopment that are not located in the Chester Creek watershed:

- A. Post-construction peak flow rates from any regulated activity not located in the Chester Creek watershed shall not exceed the predevelopment peak flow rates as shown for each of the design storms specified in Table 116-22.1.

Table 116-22.1

Peak Rate Control Standards for Properties Not in the Chester Creek Watershed

(Peak flow rate of the post-construction design storm shall be reduced to the peak flow rate of the corresponding predevelopment design storm shown in the table.)

Postconstruction Design Storm Frequency (24-Hour Duration)	Predevelopment Design Storm	
	New Development Regulated Activities	Redevelopment Regulated Activities
2-year	1-year	2-year
5-year	5-year	5-year
10-year	10-year	10-year

Table 116-22.1

Peak Rate Control Standards for Properties Not in the Chester Creek Watershed

(Peak flow rate of the post-construction design storm shall be reduced to the peak flow rate of the corresponding predevelopment design storm shown in the table.)

Postconstruction Design Storm Frequency (24-Hour Duration)	Predevelopment Design Storm	
	New Development Regulated Activities	Redevelopment Regulated Activities
25-year	25-year	25-year
50-year	50-year	50-year
100-year	100-year	100-year

- B. For modeling purposes, the predevelopment ground cover conditions shall be determined using the corresponding ground cover assumptions presented in §116-23D of this chapter.
- C. For regulated activities involving only redevelopment, no peak flow rate controls are required when and only if the total proposed impervious surface area is at least 20% less than the total existing impervious surface area to be disturbed by the regulated activity. In all cases where this requirement is not met, the redevelopment regulated activity shall achieve the peak flow rate controls presented in Table 116-22.1, using the redevelopment ground cover assumptions presented in §116-23D.
- D. Only the area of the proposed regulated activity shall be subject to the peak flow rate control standards of this chapter. Undisturbed areas for which the discharge point has not changed are not subject to the peak flow rate control standards.
- E. Areas located outside of the site (i.e., areas outside of the regulated activity) that drain through a proposed site are not subject to peak flow rate control requirements. Drainage facilities located on the site shall be designed to safely convey flows from outside of the site through the site.
- F. When a regulated activity contains or is divided by multiple drainage areas, the peak flow rate controls shall be separately addressed for each drainage area.

- G. The effect of structural and nonstructural stormwater management practices implemented as part of the overall site design may be taken into consideration when calculating total storage volume and peak flow rates.
- H. Chester Creek watershed new development.
 - (1) The Chester Creek watershed is divided into districts that represent three levels of stormwater management. The boundaries of the stormwater management districts are shown on an official release rate map, included as part of the Chester Creek Stormwater Management Plan (see Plate 8, Release Rate Map). A copy of the release rate map at a reduced scale is included in Appendix G. This map is for reference only. The exact location of the stormwater management district boundaries as they apply to a given development site must be determined by mapping the boundaries using the two-foot topographic contours (or the most accurate date required) provide as part of the of the drainage plan.
 - (2) Regulated activities for new development located within the Chester Creek watershed shall achieve the applicable peak flow release rate control requirements presented in the approved PA Act 167 Plan for that watershed as presented in Table 116-22.2 below and as presented in the Chester Creek Watershed Release Rate Map.
 - (3) In the Chester Creek watershed for the two-, five-, ten-, twenty-five-, fifty-, and one-hundred-year design storms, standards for new development are shown in Table 116-22.2. Development sites located in each of the districts must control post-development peak runoff rates to the specified percentage of the predevelopment runoff rates for the design storms as shown in Table 116-22.2. \

Table 116-22.2

New Development Peak Rate Control Standards for Properties in Chester Creek Watershed

Control Criteria for Stormwater Management Districts

District	Control Criteria
100%	Post-development peak discharge for all design storms must be no greater than predevelopment peak discharges
75%	Post-development peak discharge for all design storms must be no greater than 75% of the predevelopment peak discharges
50%	Post-development peak discharge for all design storms must be no greater than 50% of the predevelopment peak discharges

- I. Chester Creek watershed redevelopment. Regulated activities for redevelopment projects located within the Chester Creek watershed shall meet peak discharge requirements based on the adjusted runoff control number (RCN) or "C" values illustrated in Appendix H.

Table 116-22.3

Redevelopment Peak Rate Control Standards for Properties in the Chester Creek Watershed

Rational Formula Runoff Coefficients

Type of Drainage Area	Runoff Coefficient
Lawns:	
Sandy soil, flat <2%	0.05 to 0.10
Sandy soil, average 2% to 7%	0.10 to 0.15
Sandy soil, steep >7%	0.15 to 0.20
Heavy soil, flat <2%	0.13 to 0.17
Heavy soil, average 2% to 7%	0.18 to 0.22
Heavy soil, steep >7%	0.25 to 0.35
Business:	
Downtown areas	0.70 to 0.95
Neighborhood area	0.50 to 0.70
Residential:	
Single-family areas	0.30 to 0.50
Multi Units, detached	0.40 to 0.60
Multi units, attached	0.60 to 0.75
Suburban	0.25 to 0.70
Apartment dwelling areas	0.50 to 0.70

Table 116-22.3

Redevelopment Peak Rate Control Standards for Properties in the Chester Creek Watershed

Rational Formula Runoff Coefficients

Type of Drainage Area	Runoff Coefficient
Industrial:	
Light areas	0.50 to 0.80
Heavy areas	0.60 to 0.90
Parks, cemeteries	0.10 to 0.25
Playgrounds	0.10 to 0.35
Railroad yard areas	0.20 to 0.40
Unimproved areas	0.10 to 0.30
Streets:	
Asphalt	0.70 to 0.95
Concrete	0.80 to 0.95
Brick	0.70 to 0.85
Drives and walks	0.75 to 0.85
Roofs	0.75 to 0.95

SOURCE: Ven Te Chow, 1964, Handbook of Applied Hydrology, McGraw-Hill Book Co.

§116-23. Calculation methodology.

- A. Stormwater runoff from all regulated activity sites with a drainage area of greater than five acres shall be calculated using a generally accepted calculation technique(s) that is based on the NRCS Soil Cover Complex Method. Table 116-23 summarizes acceptable

computation methods. The method selected for use shall be based on the individual limitations and suitability of each method for a particular site. The use of the Rational Method to estimate peak discharges for drainage areas greater than five acres shall be permitted only upon approval by the Municipal Engineer.

Table 116-23

Acceptable Computation Methodologies for SWM Site Plan

Method	Developed By	Applicability
TR-20 (or commercial computer package based on TR-20)	USDA NRCS	Applicable where use of full hydrology computer model is desirable or necessary
TR-55 (or commercial computer package based on TR-55)	USDA NRCS	Applicable for land development plans where limitations described in TR-55 are met
HEC-1/HEC-HMS	U.S. Army Corps of Engineers	Applicable where use of a full hydrologic computer model is desirable or necessary
Rational Method (or commercial computer package based on Rational Method)	Emil Kuichling (1889)	For sites up to five acres or as approved by the municipality
Other methods	Varies	Other computation methodologies approved by the municipality

- B. All calculations using the Soil Cover Complex Method shall use the appropriate design rainfall depths for the various return period storms consistent with this chapter. Rainfall depths used shall be obtained from NOAA Atlas 14 values consistent with a partial duration series. When stormwater calculations are performed for routing procedures or infiltration, water quality and runoff volume functions, the duration of rainfall shall be 24 hours.
- C. All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times of concentration (duration) and storm events with rainfall intensities obtained from NOAA Atlas 14 partial duration series estimates or the latest version of the PennDOT Drainage Manual (PDM Publication 584). Times of concentration shall be

calculated based on the methodology recommended in the respective model used. Times of concentration for channel and pipe flow shall be computed using Manning's Equation.

- D. Outside of the Chester Creek watershed, the applicant shall utilize the following ground cover assumptions for all predevelopment water quality and runoff volume, infiltration volume and peak flow rate calculations:
- (1) For regulated activities involving new development, the following ground cover assumptions shall be used:
 - (a) For areas that are woods (as defined in Article II of this chapter), predevelopment calculations shall assume ground cover of "woods in good condition."
 - (b) For all other areas (including all impervious surfaces), predevelopment calculations shall assume ground cover of "meadow."
 - (2) For regulated activities involving redevelopment, the following ground cover assumptions shall be used:
 - (a) For areas that are woods (as defined in Article II of this chapter), predevelopment calculations shall assume ground cover of "woods in good condition."
 - (b) For areas that are not woods or not impervious surfaces, predevelopment calculations shall assume ground cover of "meadow."
 - (c) For areas that are impervious surfaces, predevelopment calculations shall assume at least 20% of the existing impervious surface area to be disturbed as "meadow" ground cover.
 - (3) The applicant shall determine which stormwater standards apply to the proposed regulated activity as follows:
 - (a) Stormwater standards for new development shall apply to all proposed regulated activities that involve only new development activities as defined in this chapter.
 - (b) Stormwater standards for redevelopment shall apply to all proposed regulated activities that involve only redevelopment activities as defined in this chapter.
 - (c) At the discretion of the Municipal Engineer, regulated activities that involve a combination of both new development and redevelopment activities, as defined in this chapter, may either:

1. Apply the stormwater standards (redevelopment or new development) that are associated with the activity that involves the greatest amount of land area; or
 2. Apply the redevelopment and new development stormwater standards to the corresponding redevelopment and new development portions of the proposed regulated activity.
- E. For projects in the Chester Creek watershed, all undeveloped land shall be considered to be "meadow" good condition, Type B soils (CN = 58, C = 0.12), unless the natural ground cover generates a lower CN or C value (i.e., forest). If a proposed development meets the definition of "redevelopment" as defined in Article II of this chapter, the applicant may adjust the predevelopment CN or C value based on the curves provided in Appendix C. Runoff characteristics for off-site areas draining through the project site shall be based on actual existing conditions and shall be assumed to not have any controls implemented on future development (i.e., no release rate restrictions).
- F. Runoff curve numbers (CN) for both predevelopment and proposed (postconstruction) conditions to be used in the Soil Cover Complex Method shall be obtained from Table C-1 in Appendix C of this chapter.
- G. Runoff coefficients (C) for both predevelopment and proposed (postconstruction) conditions for use in the Rational Method shall be obtained from Table C-2 in Appendix C of this chapter.
- H. Weighted averaging of runoff coefficients shall not be used for manual computations or input data for water quality and runoff volume calculations.
- I. Hydraulic computations to determine the capacity of pipes, culverts, and storm sewers shall be consistent with methods and computations contained in the Federal Highway Administration Hydraulic Design Series No. 5 (Publication No. FHWA-NHI-01-020 HDS No. 5, as amended). Hydraulic computations to determine the capacity of open channels shall be consistent with methods and computations contained in the Federal Highway Administration Hydraulic Engineering Circular No. 15 (Publication No. FHWA-NHI-05-114 HEC 15, as amended). Values for Manning's roughness coefficient (n) shall be consistent with Table C-3 in Appendix C of the chapter.
- J. Runoff calculations shall include the following assumptions:
- (1) Average antecedent moisture conditions (for the Soil Cover Complex Method only, for example, TR-55, TR-20).

- (2) A Type II distribution storm (for the Soil Cover Complex Method only, for example, TR-55, TR-20).

§116-24. Other requirements.

- A. Any BMP intended to hold standing water for four days or longer shall be designed to incorporate biologic controls consistent with the West Nile Guidance found in Appendix D, PADEP document 363-0300-001, "Design Criteria — Wetlands Replacement/Monitoring," as amended (or contact the Pennsylvania State Cooperative Wetland Center or the Penn State Cooperative Extension Office for design information).
- B. Any stormwater basin required or regulated by this chapter designed to store runoff and requiring a berm or earthen embankment shall be designed to provide an emergency spillway to safely convey flow up to and including the one-hundred-year proposed conditions. The height of embankment shall provide a minimum one foot of freeboard above the maximum pool elevation computed when the facility functions for the one-hundred-year proposed conditions inflow. Should any BMP require a dam safety permit under PA Chapter 105 regulations, the facility shall be designed in accordance with and meet the regulations of PA Chapter 105 concerning dam safety. PA Chapter 105 may require the safe conveyance of storms larger than one-hundred-year event.
- C. Any drainage conveyance facility and/or channel not governed by PA Chapter 105 regulations shall be designed to convey, without damage to the drainage facility or roadway, runoff from the twenty-five-year storm event. Larger storm events (fifty-year and one-hundred-year storms) shall also be safely conveyed in the direction of natural flow without creating additional damage to any drainage facilities, nearby structures, or roadways.
- D. Conveyance facilities to or exiting from stormwater management facilities (i.e., detention basins) shall be designed to convey the design flow to or from the facility.
- E. Roadway crossings or structures located within designated floodplain areas shall be able to convey runoff from a one-hundred-year design storm consistent with Federal Emergency Management Agency National Flood Insurance Program Floodplain Management Requirements.
- F. Any facility located within a PennDOT right-of-way shall comply with PennDOT minimum design standards and permit submission and approval requirements.

- G. Adequate erosion protection and energy dissipation shall be provided along all open channels and at all points of discharge. Design methods shall be consistent with the Federal Highway Administration Hydraulic Engineering Circular No. 11 (Publication No. FHWA-IP-89-016, as amended) and the PADEP Erosion and Sediment Pollution Control Program Manual (Publication No. 363-2134-008, as amended), or other design guidance acceptable to the Municipal Engineer.

§116-25. Other conveyance and system design standards.

Conveyance and system design standards shall be in accordance the Chapter 115 of the Code of Thornbury Township titled "Subdivision and Land Development."

Article IV. STORMWATER MANAGEMENT (SWM) SITE PLAN REQUIREMENTS

§116-26. General requirements.

For any regulated activity, unless exempt per the provisions of §116-6:

- A. Preparation and implementation of an approved SWM site plan is required.
- B. No regulated activity shall commence until the municipality issues written approval of a SWM site plan, which demonstrates compliance with the requirements of this chapter, and, if required, a letter of adequacy has been issued by the Conservation District for an erosion and sediment control plan.
- C. The preliminary or final approval of subdivision and/or land development plans and the issuance of any building or occupancy permit shall not proceed until the applicant has received written approval of a SWM site plan from the municipality.
- D. The SWM site plan approved by the municipality shall be on site throughout the duration of the regulated activity.

§116-27. SWM site plan contents.

The SWM site plan shall consist of a general description of the project including items described in §116-18, calculations, maps, and plans. A note on the maps shall refer to the associated computations and erosion and sediment control plan by title and date. The cover sheet of the computations and erosion and sediment control plan shall refer to the associated maps by title and date. All SWM site plan materials shall be submitted to the municipality in a format that is clear, concise, legible, neat, and well organized; otherwise, the SWM site plan shall not be accepted for review and shall be returned to the applicant. The SWM site plan requirements for regulated activities with less than 10,000 square feet of proposed earth disturbance and less than 2,000 square feet of proposed impervious surfaces shall include, at a minimum, all items

required for the Simplified Approach stormwater management plan (Appendix A). For all other SWM site plans, the following items shall be included:

A. General.

- (1) A general description of the proposed project.
- (2) A listing of all regulatory approvals required for the proposed project and the status of the review and approval process for each. Final approval or adequacy letters must be submitted to the municipality prior to (or as a condition of) the municipality's issuing final approval of the SWM site plan. Proof of application or documentation of required permit(s) or approvals for the programs listed below shall be part of the SWM site plan, if applicable:

- (a) NPDES permit for stormwater discharges from construction activities;
- (b) PADEP permits as needed:

1. PADEP joint permit application.
2. Chapter 105 (Dam Safety and Waterway Management).
3. Chapter 106 (Floodplain Management).

- (c) PennDOT highway occupancy permit;
- (d) Erosion and sediment control plan letter of adequacy; and
- (e) Any other permit under applicable state or federal regulations.

- (3) A statement, signed by the applicant, acknowledging that any revision to the approved SWM site plan shall be submitted to and approved by the municipality and that a revised erosion and sediment control plan shall be submitted to, and approved by, the Conservation District or municipality (as applicable) for a determination of adequacy prior to construction of the revised features.

- (4) The following signature block signed and sealed by the qualified licensed professional responsible for the preparation of the SWM site plan:

"I (name), on this date (date of signature), hereby certify to the best of my knowledge that the SWM site plan meets all design standards and criteria of the Thornbury Township Stormwater Management Ordinance (Ordinance No.) ____." [Note: Include signature, name, discipline of professional license, and license stamp or seal here.]

- B. Maps or plan sheets. Map(s) or plan sheets of the site shall be submitted on minimum twenty-four-inch-by-thirty-six-inch sheets and shall be prepared in a form that meets the requirements for recording at the Chester County Office of the Recorder of Deeds and the

requirements of the operation and maintenance (O&M) plan and O&M agreement (Article VII). If the SALDO has additional or more stringent criteria than this chapter, then the SALDO criteria shall also apply. Unless otherwise approved by the Municipal Engineer, the contents of the maps or plan sheets shall include, but not be limited to:

- (1) A location map, with a scale of one inch equals 2,000 feet or greater, showing the site location relative to highways, municipal boundaries, or other identifiable landmarks.
- (2) The name of the project, tax parcel number(s), and the names, addresses and phone numbers of the owner of the property, the applicant, and the firm preparing the plan.
- (3) Signature and seal of the qualified licensed professional(s) responsible for preparation of the maps and plan sheets.
- (4) The date of SWM site plan submission and revision dates, as applicable.
- (5) A graphic and written scale of one inch equals no more than 50 feet.
- (6) A North arrow.
- (7) Legal property boundaries, including:
 - (a) The total project property boundary and size with distances marked to the nearest foot and bearings to the nearest degree.
 - (b) Boundaries, size and description of purpose of all existing easements and deed-restricted areas of the project property, with distances marked to the nearest foot and bearings to the nearest degree.
- (8) Existing natural resources and natural or man-made hydrologic features that are located within the site or receiving discharge from, or that may otherwise be impacted by, the proposed regulated activity, including but not limited to:
 - (a) All existing natural resources, hydrologic features and drainage patterns, including natural waterways, water bodies, wetlands, streams (intermittent and perennial), ponds, lakes, vernal pools, etc., natural infiltration areas and patterns, areas of significant natural evapotranspiration, and other water features and aquatic resources.
 - (b) Any existing man-made drainage features, BMPs, conveyances, facilities, open channels, swales, drainage patterns, or other flood, stormwater or drainage control features.
 - (c) For the site, discharge points and locations of concentrated flows and their drainage areas.
 - (d) For named waters, show names and their watershed boundaries within the site.

- (e) Special management areas (as per §116-15P).
- (f) For the water bodies, streams and wetlands identified in Subsection B(8)(a), label or otherwise show the following attributes, if applicable:
 1. The designated use as determined by PADEP (25 Pa. Code Chapter 93);
 2. Impairments listed on the PADEP "Integrated List" (as updated) and the listed source and cause of impairment;
 3. Name, date, and target pollutant(s) for any approved total maximum daily load (TMDL); and
 4. Drainages to water supply reservoirs.
- (g) Areas that are part of the Pennsylvania Natural Diversity Inventory (PNDI), and a list of potential impacts and clearances received (for regulated activities involving one acre or more proposed earth disturbance).
- (h) Woods, vegetated riparian buffers and other areas of natural vegetation.
- (i) Topography using contours (with elevations based on established bench marks) at intervals of two feet. In areas of slopes greater than 15%, five-foot contour intervals may be used. The datum used and the location, elevation and datum of any bench marks used shall be shown.
- (j) Areas classified by the municipality as steep slopes.
- (k) Soil names and boundaries, general type of soils with hydrologic soil group noted, and in particular note areas most conducive to infiltration BMPs, such as groups A and B, etc., estimated permeabilities in inches per hour, and location and other results of all soil tests and borings.
- (l) If present, areas with underlying carbonate geologic units, existing sinkholes, subsidence or other karst features, and any associated groundwater recharge areas with increased vulnerability to contamination.
- (m) Any contaminated surface or subsurface areas of the site.
- (n) Water supply wells.
 1. Location of existing well(s) on the project property and delineation of the(ir) recharge area(s) (if known), or a fifty-foot diameter assumed recharge area.
 2. Location of existing well(s) within 50 feet beyond the boundary of the project property boundary (if public water supply is proposed for the regulated activity).

- (o) Current FEMA one-hundred-year floodplain boundaries, elevations, and floodway boundaries for any special flood hazard areas on or within 100 feet of the property.
 - (p) Boundaries of riparian buffer(s) as required by §116-15T.
 - (q) Boundaries of a fifty-foot construction non-disturbance buffer to protect streams (intermittent and perennial), wetlands and other water bodies during construction of the proposed regulated activity.
- (9) Location of the proposed regulated activity, limits of earth disturbance (disturbed area), and BMPs and conveyances relative to the location of existing natural resources and hydrologic features and special management areas resulting from the site design process of §116-18.
 - (10) Description of existing and proposed ground cover and land use, including the type and total area.
 - (11) Existing and proposed man-made features, including roads, paved areas, buildings, and other impervious and pervious surfaces on the project property (or an appropriate portion of the property as determined in consultation with the Municipal Engineer) and within the proposed disturbed area and including the type and total area of the following:
 - (a) Existing impervious surfaces;
 - (b) Existing impervious surfaces proposed to be replaced;
 - (c) Existing impervious surfaces to be permanently removed and replaced with pervious ground cover;
 - (d) New or additional impervious surfaces; and
 - (e) Percentage of the site covered by impervious surfaces for both the existing and proposed post-construction conditions.
 - (12) The total extent of the upstream area draining through the site.
 - (13) All BMPs, conveyances and other stormwater management facilities shall be located on the plan sheets, including design drawings, profile drawings, construction details, materials to be used, description of function, etc.
 - (14) Complete delineation of the flow paths used for calculating the time of concentration for the predevelopment and post-construction conditions shall be included.
 - (15) The locations of all existing and proposed utilities, sanitary sewers, on-lot wastewater facilities (including subsurface tanks and leach fields), and water supply lines within the site and within 50 feet beyond the proposed limits of earth disturbance.

- (16) A grading plan, including all areas of proposed earth disturbance and the proposed regulated activity and delineating the boundary or limits of earth disturbance of the site. The total disturbed area of the site shall be noted in square feet and acres.
- (17) Proposed final grade elevations and contours at intervals of two feet. In areas of steep slopes greater than 15%, five-foot contour intervals may be used.
- (18) For each proposed BMP and conveyance included in the SWM site plan (including any to be located on any property other than the property being developed by the applicant), the following shall be included on the SWM site plan map or plan sheets:
 - (a) Identification of the person responsible for ongoing inspections, operation, repair, and maintenance of the BMP or conveyance after completion of construction.
 - (b) Delineation of the land area, structures, impervious surfaces, and conveyances draining to and from the BMP or conveyance.
 - (c) Easements, as per the requirements of Article VII, that shall include:
 - 1. Boundaries labeled with distances shown in feet and bearings to the nearest degree;
 - 2. Notes or other documentation, as needed, to grant the municipality the right of access to all BMPs and conveyances for the purposes of inspection and enforcement of the requirements of this chapter, and any applicable O&M plans and O&M agreements;
 - 3. Notes or other documentation, as needed, to grant the municipality the right of access to all roadways necessary to access all BMPs and conveyances, where roadways are not to be dedicated to the municipality;
 - 4. Notes or other documentation as needed to grant the owner of any BMP or conveyance the right of access for the purpose of inspection, operation, maintenance, and repair of the BMP or conveyance that is to be owned, operated and maintained by a person other than the municipality and other than the owner of the property on which the BMP or conveyance is located;
 - 5. A minimum twenty-foot perimeter (or other width as determined in consultation with the Municipal Engineer) around all BMPs and conveyances;
 - 6. Sufficient vehicular ingress to and egress from a public right-of-way or roadway, as determined in consultation with the Municipal Engineer; and

7. Accompanying notes or other documentation as needed, and in accordance with Article VII, describing the type, purpose and total area of easements, whom the easement is granted to, and the rights, duties and obligations of the parties with respect to every BMP or conveyance.
 - (d) Boundaries of land areas (if any) for which deed restrictions are required for the purpose of protecting and prohibiting disturbance to a BMP or conveyance, indicating the area to which the restriction applies with distances shown in feet and bearings to the nearest degree, and a written description of the type, purpose and nature of the restriction.
 - (e) Other items that may be needed to comply with all other requirements of Article VII.
- C. A written description of the following information shall be included in the SWM site plan:
- (1) Existing features, conditions, natural resources, hydrologic features, and special management areas [as listed in Subsection B(8)];
 - (2) How the site design achieves the requirements of §116-18, and if applicable, where they could not be achieved and why;
 - (3) The overall stormwater management design concept for the project and how the site design achieves the requirements of §§116-15 through 116-25 of Article III;
 - (4) Proposed features and conditions, proposed erosion and sediment control features, proposed BMPs, conveyances, and any other stormwater facilities;
 - (5) A description of the effect of the project (in terms of flow alteration and runoff volumes, water quality and peak flows, etc.) on existing natural resources, hydrologic features and special management areas, adjacent and downgradient properties, and any existing municipal or other stormwater conveyance system(s), that may be affected by or receive runoff from the regulated activity (whether located within or outside of the area of the regulated activity), and specifics of how erosion, water quality and flow impacts will be avoided or otherwise mitigated;
 - (6) Proposed nonpoint source pollution controls and justification and confirmation that the proposed project will not result in any increased pollutant loadings to any existing stream or stream impairment identified by PADEP, or to any receiving water body;
 - (7) Expected project time schedule; and
 - (8) Description of construction stages or project phases, if so proposed.

- D. A detailed site evaluation conducted by a qualified licensed professional for projects proposed in areas of carbonate geology or karst topography, and other environmentally sensitive areas, such as contaminated sites and brownfields, as described in §116-15O and R of this chapter.
- E. Stormwater runoff design computations and documentation, such as hydrologic, hydraulic, and structural computations, assumptions, BMP loading ratios, etc., consistent with the guidelines and criteria presented in the PA BMP Manual (as amended) or other guidance acceptable to the Municipal Engineer, and used in the design of the BMPs, conveyances and other features proposed to be utilized for stormwater management, or as otherwise necessary to demonstrate that the requirements of this chapter have been met, specifically including the requirements in §§116-15 and 116-18 through 116-23.
- F. Inspections; operation and maintenance requirements. The following documents shall be prepared and submitted to the municipality for review and approval as part of the SWM site plan, in accordance with the requirements of Article VII, for each BMP and conveyance included in the SWM site plan (including any to be located on any property other than the property being developed by the applicant):
- (1) An O&M plan;
 - (2) An O&M agreement;
 - (3) Any easement agreements that are needed to ensure access, inspection, maintenance, operation, repair and permanent protection of any permanent BMP(s) and conveyances associated with the regulated activity;
 - (4) Any written deed, deed amendment or equivalent document (if needed) to be recorded against a subject property, as shown on the SWM site plan maps or plan sheets, or recorded plan sheets for the purpose of protecting and prohibiting disturbance to a BMP or conveyance; and
 - (5) Written approval, easement agreements, or other documentation for discharges to adjacent or downgradient properties when required to comply with §116-15G and Article VII of this chapter.
- G. An erosion and sediment control plan, where applicable, as prepared for and submitted to the Conservation District and/or municipality. A letter of adequacy from the Conservation District, if applicable, must be submitted to the municipality prior to (or as a condition of) the municipality's final approval of the SWM site plan.
- H. A highway occupancy permit from the Pennsylvania Department of Transportation (PennDOT) District Office must be submitted to the municipality prior to (or as a

condition of) the municipality's final approval of the SWM site plan when utilization of a PennDOT storm drainage system is proposed.

§116-28. SWM site plan submission.

A complete SWM site plan that complies with all applicable provisions of §116-27 shall be submitted to the municipality for review and approval, as follows:

- A. The SWM site plan shall be coordinated with the applicable state and federal permit process and the Municipal SALDO review process. All permit approvals or letters of adequacy not yet received by the applicant at the time of submittal of the SWM site plan to the municipality must be submitted to the municipality prior to (or as a condition of) the municipality's final approval of the SWM site plan.
- B. For projects that require SALDO approval, the SWM site plan shall be submitted by the applicant as part of the preliminary plan submission where applicable for the regulated activity.
- C. For regulated activities that do not require SALDO approval, the SWM site plan shall be submitted by the applicant for review in accordance with instructions from the municipality.
- D. The number of copies of the SWM site plan to be submitted by the applicant for review shall be in accordance with instructions from the municipality.
- E. The corresponding review fee shall be submitted to the municipality simultaneously with the SWM site plan, per the municipality's fee schedule.
- F. Any submissions to the municipality that are found to be incomplete shall not be accepted for review and shall be returned to the applicant within 30 days with a notification in writing of the specific manner in which the submission is incomplete.
- G. Financial security, per the requirements of §116-10, shall be submitted to the municipality prior to approval of the SWM site plan or as part of the financial security which is posted pursuant to the SALDO.

§116-29. SWM Site Plan Review.

- A. The SWM site plan shall be submitted to the municipality for review by the Municipal Engineer for consistency with this chapter and the respective PA Act 167 stormwater management plan(s). The Municipal Engineer will review the SWM site plan for any

subdivision or land development for compliance with this chapter and the Municipal SALDO provisions not otherwise superseded by this chapter.

- B. If applicable, the applicant shall have received a "letter of adequacy" from the Conservation District or other PADEP approval for the proposed regulated activity prior to (or as a condition of) final approval by the municipality.
- C. The Municipal Engineer will notify the applicant and the municipality in writing, within 30 calendar days, whether the SWM site plan is consistent with the requirements of this chapter. If the SWM site plan involves a subdivision and land development plan, the notification shall occur within the time period allowed by the MPC (as amended). If a longer notification period is provided by other statute, regulation, or ordinance, the applicant will be so notified by the municipality.
 - (1) If the Municipal Engineer determines that the SWM site plan is consistent with this chapter, the Municipal Engineer shall forward a letter of consistency to the municipality, which shall then forward a copy to the applicant.
 - (2) The municipality may approve the SWM site plan with conditions reasonably defined to make the SWM site plan compliant with the terms of this chapter and, if so, shall provide the conditions for approval in writing.
 - (3) If the Municipal Engineer determines that the SWM site plan is inconsistent or noncompliant with this chapter, the Municipal Engineer will forward a letter to the municipality, with a copy to the applicant citing the reason(s) and specific chapter sections for the inconsistency or noncompliance. Inconsistency or noncompliance may be due to inadequate information to make a reasonable judgment as to compliance with this chapter. Any SWM site plans that are inconsistent or noncompliant may be revised by the applicant and resubmitted in accordance with §116-31 when consistent with this chapter. Resubmission will commence a new municipal review and notification time period.
- D. The municipality will not grant final approval to any proposed subdivision, land development, or regulated activity specified in this chapter if the SWM site plan has been found to be inconsistent with this chapter.
- E. All required permits from PADEP shall be obtained and submitted to the municipality prior to (or as a condition of) final approval of any proposed subdivision, land development, or other regulated activity by the municipality.
- F. No building permits for any regulated activity will be approved by the municipality if the SWM site plan has been found to be inconsistent with this chapter, as determined by the

Municipal Engineer. All required permits from PADEP shall be obtained prior to issuance of a building permit.

- G. The municipality's approval of a SWM site plan shall be valid for a period not to exceed five years commencing on the date that the municipality approved the SWM site plan. If stormwater management facilities included in the approved SWM site plan have not been constructed or, if constructed, as-built plans of these facilities have not been approved within this five-year time period, then the applicant may seek reinstatement of approval of the expired SWM site plan. If the municipality determines that the expired SWM site plan is consistent and compliant with current regulations and requirements, then the expired SWM site plan will be reinstated; otherwise, it will be rejected. The applicant will be prohibited from conducting any regulated activity until a reinstated or newly approved SWM site plan is obtained in accordance with §116-31 of this chapter.
- H. All or portions of the final approved SWM site plan shall be recorded (as "record plans") per the instructions of the municipality.
- I. Upon completion of construction, the applicant shall be responsible for completing final as-built plans of all BMPs, conveyances, or other stormwater management facilities included in the approved SWM site plan as per the requirements of §116-33 of this chapter.

§116-30. Revision of SWM site plans.

- A. A submitted SWM site plan under review by the municipality shall be revised and resubmitted for any of the following reasons; the revised SWM site plan shall be resubmitted in accordance with §116-28 and subject to review as specified in §116-29 of this chapter:
 - (1) A change in stormwater management BMPs, conveyances, facilities or techniques;
 - (2) Relocation or redesign of stormwater management BMPs, conveyances, or facilities; or
 - (3) Soil or other site conditions are not as stated on the SWM site plan as determined by the Municipal Engineer, and the new conditions necessitate design changes.
- B. A revision to an approved SWM site plan shall be submitted to the municipality, accompanied by the applicable municipal review fee.

§116-31. Resubmission of inconsistent or noncompliant SWM site plans.

Any SWM site plan deemed inconsistent or noncompliant may be revised and resubmitted with the revisions addressing the Municipal Engineer's concerns documented in writing. The submission shall be addressed to the municipality in accordance with §116-28 of this chapter, distributed accordingly, and be subject to review as specified in §116-29 of this chapter. The applicable municipal review fee shall accompany a resubmission of a SWM site plan previously determined to be inconsistent or noncompliant.

**Article V. PERFORMANCE AND INSPECTION OF REGULATED ACTIVITIES;
FINAL AS-BUILT PLANS**

§116-32. Performance and inspection of regulated activities.

- A. All regulated activities shall be conducted, operated and maintained in accordance with the requirements set forth in Articles III, VII, and VIII of this chapter. When a SWM site plan is required by this chapter, all regulated activities shall be performed in accordance with the requirements of the final approved SWM site plan.
- B. The Municipal Engineer or other municipal designee shall be provided access to the site to inspect all phases of the erosion and sediment control measures and installation of the permanent BMPs and conveyances at such times as deemed appropriate by the Municipal Engineer or other municipal designee.
- C. Periodic inspections may be made by the Municipal Engineer or other designee during construction. A set of design plans approved by the municipality shall be on file and available for viewing at the site throughout the duration of the construction activity.
- D. Inspections, including but not limited to a final inspection, of all constructed BMPs, conveyances, or other stormwater facilities, and related improvements may be conducted by the Municipal Engineer or other designee to confirm compliance with this chapter and with the final approved SWM site plan prior to the issuance of any occupancy permit, use permit, or other form of final approval of the project by the municipality.
- E. Upon completion of construction, every permanent stormwater BMP, conveyance or other stormwater facility constructed or used as part of the regulated activity shall be operated, maintained and inspected by the landowner, or other designated person, in accordance with the O&M plan and O&M agreement approved by the municipality.
- F. The municipality or its designee may periodically inspect any permanent stormwater BMP, conveyance or facility for compliance with this chapter, an approved O&M plan,

or an approved O&M agreement, per the provisions of Article IX. The municipality may inspect at any time it has reason to believe a violation exists. The municipality may pursue enforcement for violations consistent with the provisions of Article IX.

§116-33. Final as-built plans.

- A. For regulated activities involving one acre or more of earth disturbance, the applicant shall provide to the municipality final as-built plans (signed and sealed by a qualified licensed professional) of all BMPs, conveyances, other stormwater facilities and related improvements shown in the final approved SWM site plan.
- B. The final as-built plans shall include the following for all BMPs, conveyances, other stormwater facilities and related improvements:
 - (1) The location, elevations, dimensions, and as-built conditions of all BMPs, conveyances, other stormwater facilities and related improvements including topographic contours and all typical details for storm drainage and conveyance systems, stormwater management facilities and impervious surfaces (existing, proposed, or constructed) included in the approved SWM site plan; and
 - (2) Explanation of any discrepancies or variations from the final approved SWM site plan, other related approved construction plans, calculations and specifications (and approved revisions thereto).
- C. The final as-built plans shall include a certification of completion signed and sealed by a qualified licensed professional verifying that all permanent BMPs and conveyances have been constructed according to the final approved SWM site plan and related approved construction plans, calculations and specifications.
- D. All areas of the regulated activity draining to BMPs must be stabilized prior to submittal of the as-built plans.
- E. After receipt of the as-built plans by the municipality, the municipality or its designee may review the as-built plans for consistency with this chapter, the final approved SWM site plan, other related approved construction plans, and subsequent approved revisions thereto, as well as actual conditions at the site, and the municipality may conduct a final inspection, as per §116-32D.
- F. The as-built plans must be received, reviewed and determined to be acceptable by the municipality prior to release of the financial security or other performance guarantee.

- G. Final occupancy permit(s) or use permit or other final approval to use or operate the constructed improvement may not be issued by the municipality until the final as-built plans have been accepted.
- H. Upon final acceptance of the final as-built plans by the municipality, the applicant shall review and, if required by the municipality, revise and rerecord the O&M plan and the O&M agreement to reflect the final as-built conditions and information for each permanent BMP or conveyance, in accordance with the requirements of Article VII.
- I. All or portions of the final as-built plans shall be recorded if required by the municipality.

Article VI. FEES AND EXPENSES

§116-34. Site plan review and inspection fees established.

The Board of Supervisors, by resolution, shall establish a schedule of fees for all applications submitted and inspections performed under this chapter. The applicant shall also be responsible for reimbursing the municipality for all of the municipality's costs incurred in reviewing the application and accompanying plans and documents, including the Township Engineer and Solicitor fees. The cost of inspections will be billed to the applicant as inspections are completed at a rate as set forth from time to time by resolution of the Board of Supervisors.

§116-35. Expenses covered by fees.

- A. The fees required of the applicant by this chapter shall, at a minimum, cover:
 - (1) Administrative costs;
 - (2) The review of the SWM site plan by the municipality, the Municipal Engineer and other municipal consultants;
 - (3) Coordination and meetings with the applicant;
 - (4) The inspection of erosion and sediment control measures, BMPs, conveyances and other related improvements during construction;
 - (5) Review of project communications, reports, and additional supporting information;
 - (6) Other site inspections;
 - (7) The final inspection upon completion of the BMPs, conveyances, and other stormwater management facilities and related improvements presented in the SWM site plan; and
 - (8) Review of final as-built plan submission and revised calculations, and inspections as needed.

- B. The applicant shall also reimburse all expenses incurred by the municipality for any additional work or municipal consultant fees required to enforce any permit provisions regulated by this chapter, correct violations, and ensure proper completion of remedial actions.

Article VII. OPERATION AND MAINTENANCE (O&M) RESPONSIBILITIES AND EASEMENTS

§116-36. General requirements for protection, operation and maintenance of stormwater BMPs and conveyances.

The following shall apply to all regulated activities in accordance with the requirements of the subsequent sections of this Article VII:

- A. Continuing operations and maintenance responsibilities of all permanent BMPs, conveyances, or other stormwater management facilities shall be reviewed and approved by the municipality along with the SWM site plan. The municipality may require an offer of 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 accept or reject the operations and maintenance responsibility for any portion of or all of the BMPs, conveyances or other stormwater controls and facilities.
- B. An operation and maintenance (O&M) plan shall be submitted to the municipality for review and approval for all existing and proposed permanent BMPs and man-made conveyances or other stormwater facilities identified in the SWM site plan. Multiple BMPs or conveyances may be addressed by a combined O&M plan where all such facilities are similar in O&M requirements and ownership.
- C. The O&M plan(s) and O&M agreement(s) shall name the person identified in the SWM site plan who shall be the owner of and be responsible for ongoing inspections, operation, repair, and maintenance of each BMP or conveyance following completion of construction.
- D. For any BMP or man-made conveyance (including any to be located on any property other than the property being developed by the applicant) to be owned by a person other than the municipality:
 - (1) An O&M agreement shall be submitted to the municipality for review and approval; and

- (2) The O&M plan shall be attached to, incorporated within, and recorded as a public record along with a fully executed O&M agreement, all of which shall be recorded as a restrictive covenant that runs with the land and shall be binding upon the landowner and any heirs, administrators, successors in interest or assigns of the landowner.
- E. The following shall be provided for all BMPs and conveyances (including any to be located on any property other than the property being developed by the applicant) by an O&M or other agreement or by otherwise establishing covenants, easements, or deed restrictions or by dedication to the municipality:
- (1) Permanent protection of the BMP or conveyance from disturbance or alteration;
 - (2) Right of entry and access for the municipality for inspection and enforcement of this chapter (including §116-47G) and any applicable O&M plan or O&M agreement; and
 - (3) Right of entry and access for the person owning the BMP or conveyance and responsible for fulfilling the O&M requirements when that person is not the municipality and is different from the owner of the property on which the BMP or conveyance is located (such as may be applicable for §116-15G of this chapter).
- F. All O&M and other agreements, covenants, easements and deed restrictions shall:
- (1) Be submitted to the municipality for review and approval;
 - (2) Be recorded as a public record, upon approval, against each parcel(s) which is part of the SWM site plan or otherwise contains any BMP or conveyance comprising part of the regulated activity which is the subject of an O&M agreement; and
 - (3) Run with the land and be binding upon the landowner, its heirs, administrators, successors in interest, and assigns.
- G. The materials, documents and content required by this Article VII may be prepared in conjunction with and incorporated with similar materials, documents and content required for other permit or approval applications, such as those required by PADEP for the post-construction stormwater management plan.

§116-37. Operation and maintenance plans.

The following items shall be included in the O&M plan, unless otherwise approved by the Municipal Engineer:

- A. A plan sheet(s) or map(s) showing each BMP and man-made conveyance and which shall include, but not be limited to:
- (1) Property(ies) identification (owner name and address; and property address and/or lot and/or tax parcel number, etc.), property boundaries and tax parcel number of the land parcel on which the BMP or conveyance is located.
 - (2) Name, address, phone number, date prepared, signature and seal of the licensed professional responsible for preparation of the plan sheet or map.
 - (3) Clear identification of the location, dimensions, and function of each BMP or conveyance covered by the O&M plan.
 - (4) The location of each BMP and conveyance relative to roadways, property boundaries, or other identifiable landmarks and existing natural drainage features such as streams, lakes, ponds, or other bodies of water within the immediate vicinity of, or receiving discharge from, the BMP or conveyance.
 - (5) Delineation of the land area, structures, impervious surfaces and conveyances draining to and from the BMP.
 - (6) Representative elevations and/or topographic contours at intervals of two feet, or other as acceptable to the Municipal Engineer.
 - (7) Other features, including FEMA floodplain and floodway boundaries, sinkholes, etc., located within the immediate proximity of each BMP and conveyance.
 - (8) Locations of areas of vegetation to be managed or preserved that function as a BMP or conveyance.
 - (9) The locations of all surface and subsurface utilities, on-lot wastewater facilities, sanitary sewers, and waterlines within 20 feet of each BMP or conveyance.
 - (10) The following as it pertains to any easements, covenants and deed restrictions established for each applicable BMP or conveyance:
 - (a) Boundaries delineated with bearings and distances shown that encompass the BMP or conveyance and that includes a twenty-foot perimeter area surrounding these features and sufficient vehicular ingress to and egress from a public right-of-way and roadway;
 - (b) Labels specifying the type and purpose of the easement, covenant, or deed restriction and whom it benefits; and
 - (c) Labels with reference to any corresponding easement agreement, covenant, deed restriction or other document to be recorded.
 - (11) The plan sheet or map shall be prepared at sufficient scale for municipal review, and ultimately for the use by the person responsible for operation and maintenance, and shall also be prepared at a legible scale that meets the

requirements for recordation along with (and as an attachment to) the O&M agreement and O&M plan at the Chester County Office of the Recorder of Deeds.

B. The following information shall be included in the O&M plan and written in a manner consistent with the knowledge and understanding of the person who will be responsible for the maintenance activities:

- (1) The name and address of the following:
 - (a) Property(ies) on which each BMP or conveyance is located;
 - (b) Owner of the property;
 - (c) Owner of each stormwater BMP or conveyance who is responsible for implementation of the O&M plan;
 - (d) Person responsible for maintaining adequate liability insurance and payment of taxes; and
 - (e) Person preparing the O&M plan.
- (2) A description of each BMP and conveyance and how the BMPs and conveyances are intended to function.
- (3) A description of actions necessary to operate, inspect, and maintain each BMP or conveyance, including but not limited to:
 - (a) Lawn care, vegetation maintenance, landscaping and planting;
 - (b) Cleanout of accumulated debris and sediment (including from grates, trash racks, inlets, etc.); and
 - (c) Other anticipated periodic maintenance and repair.
- (4) The following statement shall be included:

"The landowner acknowledges that, per the provisions of the Thornbury Township Stormwater Management Ordinance, it is unlawful to modify, remove, fill, landscape, alter or impair the effectiveness of, or place any structure, other vegetation, yard waste, brush cuttings, or other waste or debris into any permanent stormwater management BMP or conveyance described in this O&M plan or to allow the BMP or conveyance to exist in a condition which does not conform to this O&M plan, without written approval from the Township."
- (5) Inspection and maintenance schedules.

- (6) Explanation of the purpose and limitations of any easements, covenants, or deed restrictions associated with any BMP or conveyance that are to be recorded against the property.
- C. A statement that no BMP or man-made conveyance may be used by the owner or others for any purpose other than its intended stormwater control function, or if approved by the Municipal Engineer, a statement of specific allowable uses of the BMP (i.e., recreational benefits that maybe associated with certain BMPs owned by a homeowners' association, or allowable uses by an individual residential landowner).
- D. A statement that establishes a reasonable time frame for remedy of deficiencies found by the owner during its inspections.
- E. Language needed to fulfill the requirements of §116-40B, C and D of this chapter.

§116-38. Operation and maintenance agreements.

- A. An O&M agreement shall be required for any BMP or man-made conveyance to be owned by a person other than the municipality, and the agreement shall:
 - (1) Be between the owner of the BMP or conveyance and the municipality and shall be substantially the same as the O&M agreement in Appendix E.
 - (2) Incorporate the approved O&M plan(s) for all BMPs or conveyances to be covered by the O&M agreement;
 - (3) Set forth the rights, duties and obligations of the owner of the BMP or conveyance and the municipality and be consistent with the approved O&M plan(s);
 - (4) Be recorded as a deed restriction or restrictive covenant that runs with the land and shall be binding upon the landowner, its heirs, administrators, successors in interest, and assigns;
 - (5) Be submitted to the municipality for review prior to approval of the SWM site plan;
 - (6) Upon approval by the municipality, be signed by the designated owner of the BMP or conveyance and submitted for signature by the municipality; and
 - (7) When fully executed, be recorded by the landowner at the Chester County Office of the Recorder of Deeds following municipal approval of the O&M plan and prior to the start of construction.

- B. Other items or conditions may be required by the municipality to be included in the O&M agreement where determined necessary by the municipality to guarantee the satisfactory operation and maintenance of all permanent BMPs and conveyances.
- C. After approval of the final as-built plans per the requirements of Article V, the applicant shall review and, if necessary and if required by the municipality, revise and rerecord the O&M plan and O&M agreement to reflect the final as-built conditions of each BMP and conveyance if different from the information included in the original recorded documents.

§116-39. Easements and deed restrictions.

- A. Easements shall be established in connection with any regulated activity for all permanent BMPs and conveyances that will not be dedicated to or otherwise owned by the municipality (including any to be located on any property other than the property being developed by the applicant) and shall:
 - (1) Include all land area occupied by each BMP or conveyance;
 - (2) Include a twenty-foot-wide perimeter (or other width as determined in consultation with the Municipal Engineer) surrounding the feature(s);
 - (3) Provide sufficient vehicular ingress and egress from a public right-of-way and roadway;
 - (4) Permanently protect every BMP and conveyance from disturbance or alteration where not otherwise protected by a recorded O&M agreement, covenant, deed restriction or other means;
 - (5) Grant the municipality the right, but not the duty, to access every BMP and conveyance from a public right-of-way or public roadway to conduct periodic inspections and to undertake other actions that may be necessary to enforce the requirements of this chapter or of any applicable O&M plan or O&M agreement; where roadways will not be dedicated to the municipality, the municipality shall be granted access to the private roadways as necessary to access every BMP and conveyance;
 - (6) Grant the owner of each BMP and conveyance the right to access, inspect, operate, maintain, and repair the BMP or conveyance when the feature is to be owned, operated and maintained by a person other than the municipality and other than the owner of the parcel on which it is located;
 - (7) Be shown, with bearings and distances noted, on the SWM site plan map/plan sheets, O&M plan map/plan sheets, final as-built plans, and be signed and sealed by a qualified licensed professional;

- (8) Include language legally sufficient to ensure that the easement shall run with the land and bind the landowner granting the easement, its heirs, administrators, successors in interest and assigns, into perpetuity; and
 - (9) Be recorded at the Chester County Office of the Recorder of Deeds following municipal approval and prior to the start of construction.
- B. For any BMP or conveyance which is designed to receive runoff from another parcel or parcels and which is owned by the landowner of the parcel upon which the BMP or conveyance is located, in addition to any easement or easement agreement required pursuant to Subsection A, an easement agreement shall be prepared and executed between the landowner of the parcel or parcels draining to the BMP or conveyance and the owner of the BMP or conveyance. This easement agreement shall:
- (1) Describe the ownership interests of all parties to the easement agreement, including the ownership of all affected parcels and of the BMP or conveyance;
 - (2) Provide for the grant of a drainage easement from the owner of the BMP or conveyance to the landowner of the parcel(s) draining to the BMP, which shall extend from the shared parcel boundary(ies) to the receiving BMP and shall include the connecting flow path(s) or conveyance;
 - (3) Include a written legal (metes and bounds) description of the easement area, with reference to a recorded plan sheet showing the legal boundaries of the easement area (or an accompanying plan sheet/map), signed and sealed by a licensed professional.
 - (4) Incorporate by reference or be recorded with the corresponding O&M plan and O&M agreement;
 - (5) State that the purpose of the easement agreement is to ensure the continuous right of the discharging parcel to discharge onto the parcel containing the BMP and into the BMP or conveyance;
 - (6) Restrict the BMP or conveyance owner's use of the easement area of the parcel upon which the BMP or conveyance is located, consistent with the purpose of the easement granted;
 - (7) Establish the duty and responsibility of the landowner of the parcel or parcels draining to the BMP or conveyance to maintain the existing drainages on the discharging parcel or parcels as designed and constructed to discharge to the receiving BMP;
 - (8) Include language legally sufficient to ensure that the easement will run with the land and will bind all parties to the easement agreement, their heirs, administrators, successors in interest and assigns, into perpetuity;
 - (9) Be submitted to the municipality for review and approval prior to approval of the SWM site plan;

- (10) Contain all additional provisions or information as the municipality may require upon review; and
- (11) Be executed by the parties to the easement agreement and recorded at the Chester County Recorder of Deeds Office against the draining parcel(s) and the parcel upon which the BMP or conveyance is located within five days of the municipality's approval of the corresponding O&M plan.

§116-40. Other post-construction responsibilities.

- A. The provisions of §116-44 of this chapter shall apply to any permanent BMP or conveyance that is constructed as part of an approved SWM site plan or covered by an approved O&M plan.
- B. The person responsible for the operation and maintenance of a BMP or conveyance shall make records of the installation and of all maintenance and repairs and shall retain the records for at least two years. A copy of such records shall be submitted to the municipality, if requested.

Article VIII. PROHIBITIONS

§116-41. Prohibited discharges applicable to all Township properties.

- 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 the municipality's separate storm sewer system or the waters of the commonwealth is prohibited.
- B. No person shall allow, or cause to allow, discharges into the municipality's separate storm sewer system or the waters of the commonwealth that are not composed entirely of stormwater, except:
 - (1) As provided in Subsection C below; and
 - (2) Discharges allowed under a state or federal permit.
- C. The following discharges are authorized unless they are determined by the municipality to be significant contributors to pollution to the municipality's separate storm sewer system or to the waters of the commonwealth:
 - (1) Discharges from firefighting activities;
 - (2) Potable water sources, including waterline and fire hydrant flushings;

- (3) Irrigation drainage;
- (4) Air-conditioning condensate;
- (5) Springs;
- (6) Water from crawl space pumps;
- (7) Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used;
- (8) Diverted stream flows;
- (9) Flows from riparian habitats and wetlands;
- (10) Uncontaminated water from foundations or from footing drains;
- (11) Lawn watering;
- (12) Dechlorinated swimming pool discharges;
- (13) Uncontaminated groundwater;
- (14) Water from individual residential car washing; and
- (15) Routine external building washdown (which does not use detergents or other compounds).

D. In the event that the municipality determines that any of the discharges identified in Subsection C significantly contribute pollutants to the municipality's separate storm sewer system or to the waters of the commonwealth, or is notified of such significant contribution of pollution by PADEP, the municipality will notify the responsible person to cease the discharge.

E. Upon notice provided by the municipality under Subsection D, the discharger shall, within a reasonable time period, as determined by the municipality consistent with the degree of pollution caused by the discharge, cease the discharge.

F. Nothing in this section shall affect a discharger's responsibilities under state law.

§116-42. Prohibited connections applicable to all Township properties.

The following connections are prohibited, except as provided in §116-41C above:

- A. Any drain or conveyance, whether on the surface or subsurface, that allows any nonstormwater discharge, including sewage, process wastewater, and wash water, to enter a separate storm sewer system, and any connections to the separate storm sewer system from indoor drains and sinks.
- B. Any drain or conveyance connected from a commercial or industrial land use to a separate storm sewer system, which has not been documented in plans, maps, or equivalent records and approved by the municipality.

§116-43. Roof drain and sump pump provisions applicable to all Township properties.

- A. Roof drains and sump pump discharges shall not be connected to sanitary sewers.
- B. Roof drain, sump pump, foundation and footing drain discharges:
 - (1) To the maximum extent practicable, shall discharge to infiltration or vegetative BMPs or to vegetated or other areas with adequate capacity;
 - (2) May be connected to streets, storm sewers, or roadside ditches only if determined necessary or acceptable by the Municipal Engineer or other municipal designee; and
 - (3) Shall be considered in stormwater management calculations to demonstrate that conveyance and receiving facilities have adequate capacity.

§116-44. Alteration of BMPs.

- A. No person shall modify, remove, fill, landscape, alter, or impair the effectiveness of any stormwater BMPs, conveyances, facilities, areas or structures, unless the activity is part of an approved maintenance program, without the written approval of the municipality.
- B. No person shall place any structure, fill, landscaping, additional vegetation, yard waste, brush cuttings, or other waste or debris into a BMP or conveyance, or within a stormwater easement, that would limit or alter the functioning of the stormwater BMP or conveyance, without the written approval of the municipality.

Article IX. ENFORCEMENT; VIOLATIONS AND PENALTIES

§116-45. Public nuisance.

- A. Any regulated activity conducted in the violation of any provision of this chapter is hereby deemed a public nuisance.
- B. Each day that a violation continues shall constitute a separate violation.
- C. A separate violation will be found to exist for each section of this chapter found to have been violated.
- D. To the extent that the municipality does not enforce any provision of this chapter, such action or inaction shall not constitute a waiver by the municipality of its rights of future enforcement hereunder.

§116-46. Right of entry.

- A. Upon presentation of proper credentials, duly authorized officers or agents of the municipality may enter at reasonable times upon any property within the municipality to inspect the implementation, condition, or operation and maintenance of all erosion and sediment controls and permanent stormwater BMPs, conveyances, or other stormwater facilities both during and after completion of a regulated activity or for compliance with any requirement of this chapter.
- B. Persons working on behalf of the municipality shall have the right to temporarily locate on or in any BMP, conveyance or other stormwater facility in the municipality such devices as are necessary to conduct monitoring and/or sampling of the discharges from such BMP or conveyance or other stormwater facilities.
- C. Failure of the landowner or representative to grant access to the municipality within 24 hours of notification, verbal or written, is a violation of this chapter.

§116-47. Enforcement.

- A. The Township Manager or other designee is hereby authorized and directed to enforce all of the provisions of this chapter. The Township Manager may delegate enforcement duties, including the initial determination of ordinance violation and service of notice, if notice is given, to such other officers or agents as the Township Manager shall deem qualified for that purpose.
- B. It shall be the responsibility of the landowner of the real property on which any regulated activity is proposed to occur, is occurring, or has occurred to comply with the applicable terms and conditions of this chapter.
- C. All municipal inspections for compliance with the approved SWM site plan shall be the responsibility of the municipality or its designee.
- D. During any stage of the work of any regulated activity, if the Municipal Engineer or other designee determines that the erosion and sediment control measures, permanent BMPs, conveyances or other stormwater facilities are not being installed or maintained in accordance with the approved SWM site plan, the municipality may suspend or revoke any existing permits or other approvals until the deficiencies are corrected or until a revised SWM site plan is submitted and approved, if and as determined to be necessary by the Municipal Engineer or other designee.

- E. In the event that the Township Manager or other designee finds that a person has violated a provision of this chapter, or fails to conform to the requirements of any permit or approval issued by the municipality, or any O&M plan or O&M agreement approved by the municipality, the municipality may order compliance by written notice of the violation to the landowner.
- F. Such notice may, without limitation, require the following remedies:
- (1) Performance of monitoring, analyses, and reporting;
 - (2) Elimination of prohibited connections or discharges;
 - (3) Cessation of any violating discharges, practices, or operations;
 - (4) Abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property;
 - (5) Payment of a fine to cover administrative and remediation costs and/or forfeiture of financial security;
 - (6) Implementation of stormwater controls, BMPs, and conveyances; and
 - (7) Operation, maintenance or repair of BMPs, conveyances or other stormwater facilities.
- G. Such notice shall set forth the nature of the violation(s), citing to specific sections of this chapter which have not been met, and establish a time limit for commencement of correction and completion of correction of the violation(s). The notice shall provide for a right of the landowner's appeal to the Stormwater Management Appeals Board in accordance with §116-50 of this chapter. Said notice shall further advise that, if applicable, should the violator fail to take the required action within the established deadline, possible sanctions, clearly described, may be imposed, or the work may be done by the municipality or designee, and the expense thereof shall be charged to the violator.
- H. Failure to comply within the time specified in such notice shall also subject such person to the penalty provisions of this chapter. All such penalties shall be deemed cumulative and shall not prevent the municipality from pursuing any and all other remedies available in law or equity.

§116-48. Suspension and revocation of permits and approvals.

- A. Any building, land development, or other permit or approval issued by the municipality may be suspended or revoked by the municipality for:
- (1) Noncompliance with or failure to implement any provision of the permit or approved SWM site plan or O&M agreement;

- (2) A violation of any provision of this chapter or any other law or regulation applicable to the regulated activity;
 - (3) The creation of any condition or the commission of any act during the regulated activity that constitutes or creates a hazard or nuisance or endangers the life, health, safety, or property of others; or
 - (4) Failure to correct a violation within the allowed time period allowed per notice given by the municipality.
- B. Prior to revocation or suspension of a permit, unless there is immediate danger or threat of such danger to life, public health or property, at the request of the applicant, the Stormwater Management Appeals Board shall schedule a hearing on the violation and proposed revocation or suspension, pursuant to public notice. The expense of a hearing shall be the applicant's responsibility.
- C. A suspended permit or approval may be reinstated by the municipality when:
- (1) The Municipal Engineer or other designee has inspected and approved the corrections to the BMPs, conveyances or other stormwater facilities or the elimination of the hazard or nuisance; and
 - (2) The municipality is satisfied that the violation has been corrected.
- D. A permit or approval that has been revoked by the municipality cannot be reinstated. The applicant may apply for a new permit or approval in accordance with this chapter.

§116-49. Violations and penalties.

- A. Any person who violates or permits the violation of any provision of this chapter shall, upon conviction thereof in a summary proceeding brought before a District Justice under the Pennsylvania Rules of Criminal Procedure, be guilty of a summary offense, punishable by a fine of not less than \$100 and not more than \$1,000, plus costs and attorney's fees, and, upon default of the payment of the fine and costs, imprisonment not to exceed 30 days. Each day or portion thereof that a violation continues shall be deemed a separate offense.
- 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 chapter. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other legal or equitable forms of remedy or relief. Such relief may include costs, fees, and charges, including the

municipality's attorney's fees (charged at the hourly rate approved by the governing body of the municipality) and costs, as may be permitted by law.

- C. Notwithstanding any other provision of this chapter, the municipality shall have the right at any or all times deemed necessary by the Municipal Engineer or designee to enter upon any property within the municipality to inspect and, upon determination of a violation of this chapter, to correct the violation, with all expenses associated with correcting the violation to be charged to the property owner responsible for the violation.

§116-50. Appeals.

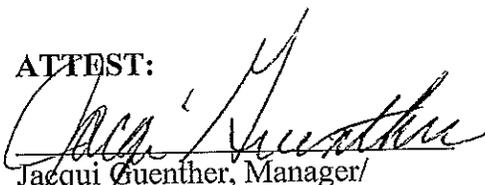
- A. Any person aggrieved by any action of the Municipal Engineer or other designee relative to the provisions of this chapter may appeal to the Municipality's Governing Body within 30 days of that action.
- B. Any person aggrieved by any decision of the Municipality's Governing Body relative to the provisions of this chapter may appeal to the Chester County Court of Common Pleas within 30 days of the municipality's decision.

§116-51. Effective Date

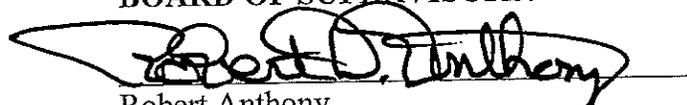
This Ordinance shall become effective thirty (30) days after it is enacted by the Township Board of Supervisors.

ENACTED and **ORDAINED** by the Board of Supervisors of Thornbury Township, Chester County, Pennsylvania this 19th day of August, 2014.

ATTEST:

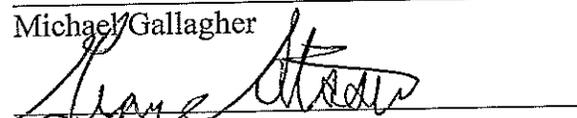

Jacquie Guenther, Manager/
Municipal Secretary

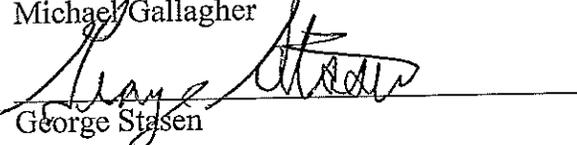
**THORNBURY TOWNSHIP
BOARD OF SUPERVISORS:**


Robert Anthony


James Benoit


William Reilly


Michael Gallagher


George Stasen

Appendix A.1

ORDINANCE APPENDIX A

**SIMPLIFIED APPROACH TO
STORMWATER MANAGEMENT
FOR SMALL PROJECTS**

Appendix A.1	Applicability, Submittal and Approval Requirements
Appendix A.2	Operation, Maintenance and Inspection Plan and Agreement
Figure A.3	Infiltration Trench Detail
Figure A.4	Shed Stone Base Detail
Figure A.5	Deck Stone Base Detail
Figure A.6	Rain Barrel Detail
Figure A.7	Rain Garden/Bioretenion Detail

Appendix A.1

A. Simplified Approach Applicability:

- Only projects with Regulated Activities that involve 500 or more square feet, but less than 2,000 square feet of Proposed Impervious Surfaces and/or less than 10,000 square feet of proposed Earth Disturbance may utilize the methodology presented in the "Simplified Approach to Stormwater Management for Small projects" (Simplified Approach).
- The Applicant shall first review the planned project with the Township prior to initiating the Simplified Approach to confirm the following:
 - That the proposed project is not otherwise exempt from the stormwater management control and the engineered Stormwater Management Site Plan requirements of the Township's Stormwater Management Ordinance;
 - That the proposed project is eligible to use this Simplified Approach;
 - To determine which components of the proposed project must be included in the calculation of "impervious surfaces (areas)"; and,
 - Whether any local conditions are known to the Township that would preclude the use of any of the techniques included in this Simplified Approach.

B. Simplified Approach Submittal and Approval Requirements:

Use of the Simplified Approach requires:

- The applicant to submit the following to the Township for review and approval prior to beginning construction:
 - A Simplified Stormwater Management Site Plan (i.e. sketch plan) that contains the information listed in Section C of this Appendix; and
 - A completed, signed and notarized "Simplified Operation, Maintenance and Inspection Plan and Agreement".
- The first 1-inch of rainfall runoff from Proposed Impervious Surfaces (as defined by the Thornbury Township Stormwater Management Ordinance) must be captured on the applicant's property by an Infiltration Trench (Fig. A.3), Infiltration Be (Fig. A.4 or Fig. A.5), Rain Barrel (Fig A.6), or Rain Garden/Bioretenion Area (Fig A.7) collectively an "Infiltration BMP".

Appendix A.1

- The "Simplified Approach – Stormwater Best Management Practices Operation, Maintenance and Inspection Plan and Agreement" will be recorded at the Chester County Office of the Recorder of Deeds after approval by the Municipality.
- A final inspection conducted by the Township after completion of construction.

C. Simplified Approach Stormwater Management Site Plan

The Simplified Stormwater Management Site Plan shall be prepared at sufficient scale for municipal review, and ultimately for the use by the person responsible for operation and maintenance, and shall also be prepared at a legible scale that meets the requirements for recordation as an attachment to the Simplified Approach – Stormwater Best Management Practices Operation, Maintenance and Inspection Plan and Agreement at the Chester County Office of the Recorder of Deeds.

The following items shall be included in the Simplified Stormwater Management Site Plan.

- Owner name and address; and property address and tax parcel number of the parcel on which the Infiltration Facility located.
- Name, address and phone number of person responsible for preparation of the site plan.
- Location and dimensions of the Infiltration BMP relative to roadways, property boundaries, or other identifiable landmarks and existing natural drainage features such as streams, lakes, ponds, or other bodies of water.
- Delineation of the land area, structures, Impervious Surfaces and Conveyances draining to and from the Infiltration BMP
- Representative elevations and/or topographic contours at intervals of two (2) feet, or other as acceptable to the Township Engineer.
- Other features including FEMA floodplain and floodway boundaries, sinkholes, etc. located within the immediate proximity of the Infiltration BMP.
- Locations of areas of vegetation to be managed or preserved that function as part of the Infiltration BMP.
- The property boundaries and locations of all surface and subsurface utilities, on-lot waste water facilities, sanitary sewers, and water lines.
- The following as it pertains to any easements, covenants and deed restrictions established for the Infiltration BMP:

Appendix A.1

- a) Boundaries delineated with bearings and distances shown that encompass the Infiltration BMP or conveyance and that includes a twenty (20) foot perimeter area surrounding these features and sufficient vehicular ingress to and egress from a public right-of-way and roadway or blanket easement that encompasses the entire property;
- b) Labels specifying the type and purpose of the easement, covenant, or deed restriction and who it benefits; and
- c) Labels with reference to any corresponding easement agreement, covenant, deed restriction or other document to be recorded.

D. Description of BMPs

The following is a description of several types of BMPs that could be implemented. The requirements of each BMP as described below follow the PA BMP Manual. Refer to the PA BMP Manual which can be found on the PA Department of Environmental Protection's website.

- **Simplified Approach Stormwater Management Infiltration Trench:**

An infiltration trench is a long, narrow, rock-filled trench, with a perforated pipe placed within the rock to distribute water evenly along the trench that receives stormwater runoff. Runoff is stored in the void space between the stones and in the pipe, and infiltrates through the bottom of the trench into the underlying soil matrix. Figure A.3 shows the typical infiltration trench configuration. Infiltration trenches shall incorporate or make provisions for the following elements:

- These facilities shall be located a minimum of ten (10) feet from the building foundation to avoid foundation seepage problems, and at least five (5) feet from any property line and are not recommended if their installation would create a risk of flooding other structures constructed at or below grade.
- Perforated pipe placed within the rock is to be set level.
- The typical trench is 2 feet wide and 3 feet deep (2 feet of stone with 1 foot of cover).
- Trench shall be wrapped in nonwoven geotextile (top, sides, and bottom).
- There shall be a positive overflow that allows stormwater that cannot be stored or infiltrate to be discharged into a nearby vegetated area.

Appendix A.1

- Roof downspouts may be connected to infiltration trenches, but shall contain a cleanout to collect sediment and debris before entering the infiltration area.
 - Infiltration testing may be required by the Township to ensure soil is capable of infiltrating stormwater.
 - It is recommended that there be a 2 foot clearance above the regularly occurring seasonal high water table, and have a minimum depth to bedrock of 2 feet.
 - The infiltration trench shall be at least 5 feet from any property line, 50 feet from individual water supply wells, and 50 feet from any septic system component. It should not be located near stormwater hotspots.
 - The infiltration trench shall be located a minimum of 10 feet from any sub-surface structures such as building foundations and basements.
 - Infiltration areas shall be protected from compaction by heavy equipment during and after construction
 - Infiltration trenches shall be placed in service after all earth disturbance associated with a given project is stabilized to avoid clogging.
 - The ratio of the drainage area which stormwater runoff is collected from to the area of the footprint (bottom area) of the infiltration portion of the facility shall be as small as possible with a ratio of less than 5:1 preferred.
- **Simplified Approach Stormwater Management Infiltration Bed**

An infiltration bed is a rock-filled area that receives stormwater runoff. Runoff is stored in the void space between the stones and in the pipe, and infiltrates through the bottom of the trench into the underlying soil matrix. They are typically used under sheds and decks. Figure A.4 and Figure A.5 shows the typical infiltration configuration. Infiltration Beds shall incorporate or make provisions for the following elements:

- These facilities shall be located at least five (5) feet from any property line and are not recommended if their installation would create a risk of flooding other structures constructed at or below grade.
- The typical infiltration bed shall extend at least one (1) foot past the roof line of the shed or shall extend to the outer edge of the deck in order to capture the stormwater.

Appendix A.1

- The stone shall be placed on nonwoven geotextile (top and sides only)
 - There shall be a positive overflow that allows stormwater that cannot be stored or infiltrated to be discharged into a nearby vegetated area.
 - Roof downspouts shall not be connected to infiltration bed.
 - Infiltration testing may be required by the township to ensure soil is capable of infiltration stormwater.
 - It is recommended that there be a 2 foot clearance above the regularly occurring seasonal high water table, and have a minimum depth to bedrock of 2 feet.
 - The infiltration bed shall be at least 5 feet from any property line. It should not be located near stormwater Hotspots.
 - Infiltration bed areas shall be protected from compaction by heavy equipment during and after construction
 - Infiltration beds shall be placed in service after all earth disturbance associated with a given project is stabilized to avoid clogging.
 - The ratio of the drainage area which stormwater runoff is collected from to the area of the footprint (bottom area) of the infiltration bed should be at least 1:1 preferred.
- Simplified Approach Stormwater Management Rain Barrels/Cisterns

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. The stored water can also be used as a non-potable water supply. Cisterns are larger than rain barrels having volumes of 200 gallons or more, and can be placed on the surface or underground. Rain barrels and cisterns are manufactured in a variety of shapes and sizes. All of these facilities must make provisions for the following items:

- There must be a means to release the water stored between storm events in order for the necessary storage volume to be available for the next storm.

Appendix A.1

- Stormwater must be kept from entering other potable systems, and pipes and storage units must be clearly marked "Do Not Drink."
 - An overflow outlet should be placed a few inches below the top with an overflow pipe to divert flow away from structures.
 - Use screens to filter debris, and covers (lids) to prevent mosquitoes.
 - Make sure cisterns are watertight and do not leak.
 - Rain barrels are typically assumed to be 25% full to calculate volume since they are not always emptied before each storm.
- Rain Garden/Bioretenion Area

A Rain Garden (Bioretenion Area) is an excavated depression area on the surface of the land in which native vegetation is planted to filter and use stormwater runoff. Runoff ponds on top of the surface of the rain garden and then infiltrates into an enhanced soil/planting mix below the surface where plants can use the water to grow. Bioretenion improves water quality, with the vegetation planted in the facility filtering the water, and the root systems encouraging or promoting infiltration. Key elements of a rain garden include:

- Recommended ponding depths not exceeding 1 foot.
- Native vegetation that can tolerate dry and wet weather. Typically, native floodplain plant species are best suited to the variable environmental condition encountered. See <http://extension.psu.edu/plants/gardening/maescapes/rain-gardens> for suggested plants.
- An overflow area where, if the bioretenion area were to overflow, the overflow would flow over pervious surfaces (i.e. grass, meadow), and would not cause harm to property, or;
- An overflow, such as a domed riser, to allow excess flow from large storms to travel to other infiltration areas, pervious areas, or connected storm systems designed to receive the excess runoff.
- For most areas, slopes should be limited to 3:1, maximum.
- The soil/planting mix depth should not be less than 1.5 feet deep and typically consist of a mixture of topsoil, sand and compost (i.e. mulch). The topsoil, sand and compost should be uniformly mixed by volume in a 50%, 30%, 20% mixture, respectively.

Appendix A.2
Operation, Maintenance, and Inspection Plan, and Agreement

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

WITNESSETH

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

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

WHEREAS, the stormwater management BMP Operations and Maintenance Plan approved by the Township (hereinafter referred to as the "Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the Township, provides for management of stormwater within the confines of the Property through the use of Best Management Practices (BMPs); and

WHEREAS, the Township, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the Township and the protection and maintenance of water quality require that on-site stormwater Best Management Practices be constructed and maintained on the Property; and

WHEREAS, for the purposes of this agreement, the following definitions shall apply:

BMP — "Best Management Practice;" activities, facilities, designs, measures or procedures used to manage stormwater impacts from land development, to protect and maintain water quality and groundwater recharge and to otherwise meet the purposes of the Municipal Stormwater Management Ordinance, including but not limited to infiltration trenches, seepage pits, filter strips, bioretention, wet ponds, permeable paving, rain gardens, grassed swales, forested buffers, sand filters and detention basins.

CONVEYANCE SYSTEM — A man-made, existing or proposed facility, structure or channel used for the transportation or transmission of stormwater from one place to another, including pipes, drainage ditches, channels, and swales (vegetated or other), gutters, stream channels, and like facilities or features. Conveyance systems are generally considered to be permanent appurtenances to the property.

INFILTRATION TRENCH — A BMP surface structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer.

SEEPAGE PIT — An underground BMP structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer.

RAIN GARDEN — A BMP overlain with appropriate mulch and suitable vegetation designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or underground aquifer.

WHEREAS, the Township requires, through the implementation of the Plan, that stormwater management BMPs as required by said Plan and the Municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, his successors and assigns, and

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

1. The BMPs shall be constructed by the Landowner in accordance with the plans and specifications identified in the Plan.
2. The Landowner shall operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Township and in accordance with the specific maintenance requirements noted on the Plan.
3. The Landowner hereby grants permission to the Township, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper identification, to inspect the BMP(s) whenever it deems necessary. Whenever possible, the Township shall notify the Landowner prior to entering the property.
4. In the event the Landowner fails to operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Township, the Township or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). This provision shall not be construed to allow the Township to erect any permanent structure on the land of the Landowner. It is expressly understood and agreed that the Township 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 Township.
5. In the event the Township, 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 Township for all expenses (direct and indirect) incurred within 10 days of the date of invoice from the Township. Upon the failure of the Landowner to pay within 10 days of the date of the invoice, the charges shall become delinquent and may be collected by the Township by municipal lien or any other action at law or in equity.

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the on-site BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests shall indemnify, hold harmless and release the Township's employees and designated representatives from all damages, accidents, casualties, occurrences or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Township. In the event that a claim is asserted against the Township, its designated representatives or employees, the Township shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgment or claims against the Township's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.

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 Township:

(SEAL)

For the Landowner:

ATTEST:

_____ (Township)

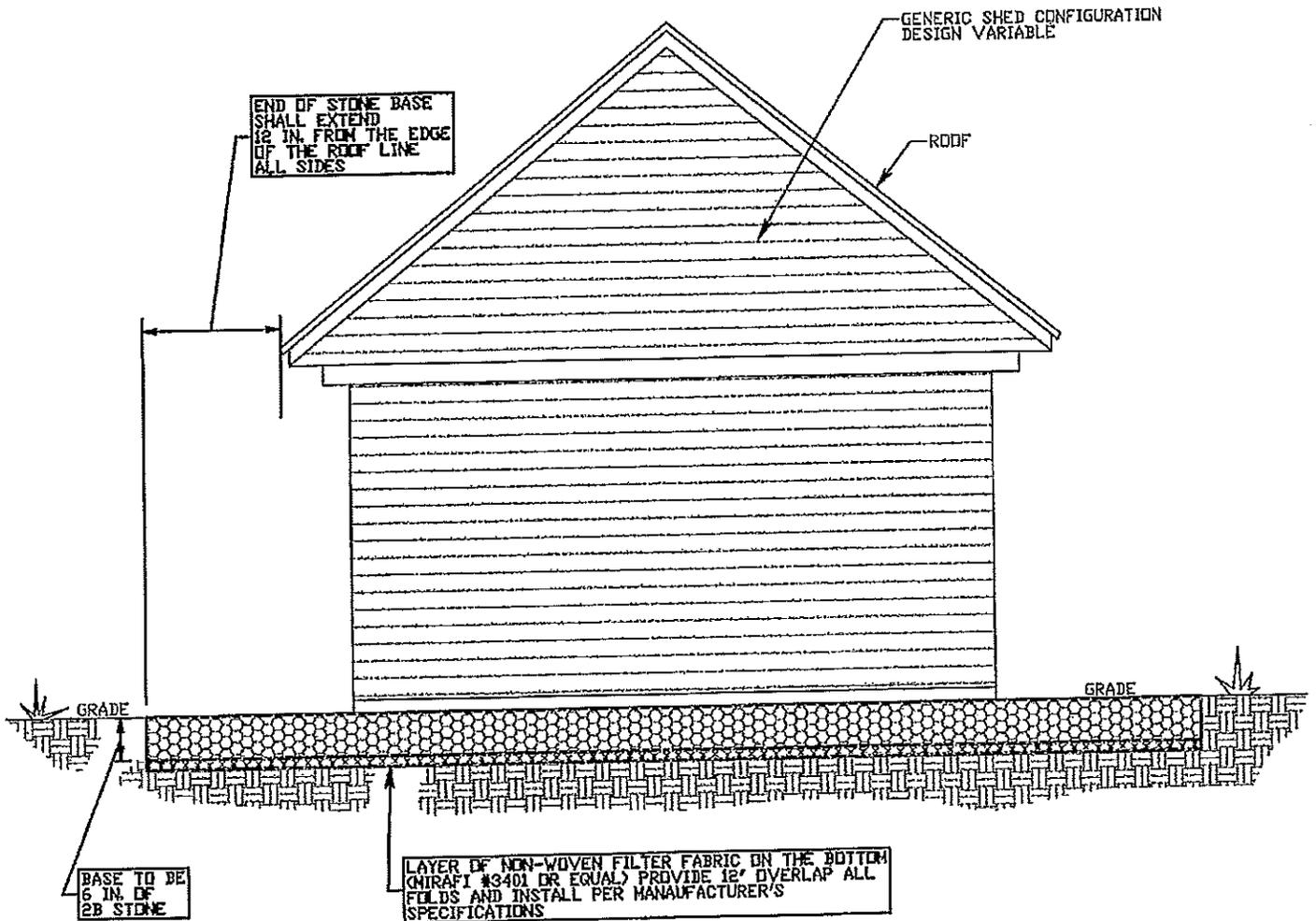
County of _____, Pennsylvania

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

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

NOTARY PUBLIC

(SEAL)



CROSS SECTION

GENERAL NOTES

1. THIS DETAIL IS FOR THE INSATLLATION OF A STONE BASE BELOW THE AREA OF THE SHED AS SHOWN.
2. THE SHED DEPICTED IS A GENERIC REPRESENTATION, AND IS NOT INTENDED TO BE AN APPROVED DESIGN BY THORNBURY TOWNSHIP OR THIS OFFICE. THE SHED SHOULD BE DESIGNED BY A PROFESSIONAL IN ACCORDACNE WITH ALL LOCAL, STATE AND/OR FEDERAL BUILDING CODE REQUIREMENTS.
3. ALL SHEDS SHALL BE APPROVED BY THE THORNBURY TOWNSHIP BUILDING INSPECTOR.

FIGURE A.4: SHED STONE BASE DETAIL

PREPARED FOR

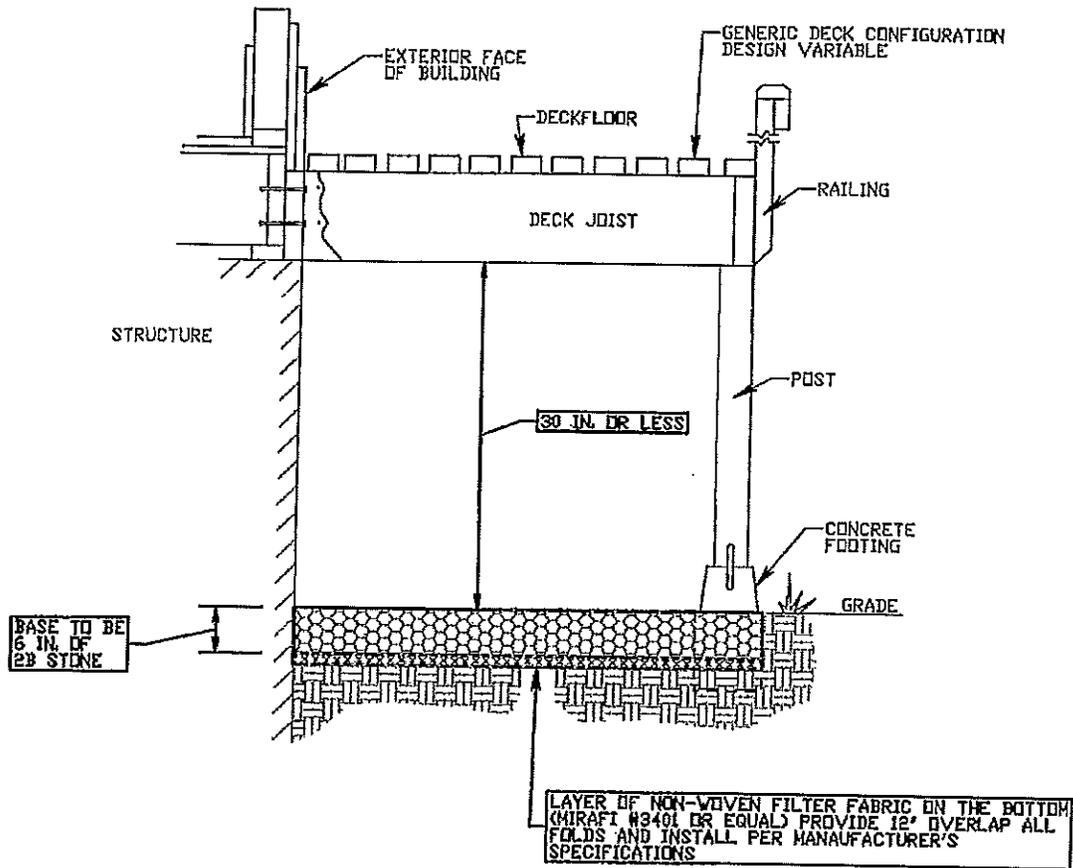
Thornbury Township

Thornbury Township * Chester County * Pennsylvania

Yerkes

YERKES ASSOCIATES, INC.

PROJECT -	W-13-0314-12
DATE -	MARCH 26, 2014
SCALE -	NOT TO SCALE
DRAWN -	CEJ3
CHECKED -	MRC
CAD FILE	ThornburyTwp details.pro
TAX PARCEL -	N/A
NOTEBOOK -	N/A
PLAN NO. -	N/A
SHEET NO. -	1



CROSS SECTION

GENERAL NOTES

1. THIS DETAIL IS FOR THE INSTALLATION OF A STONE BASE BELOW THE AREA OF THE DECK AS SHOWN.
2. THE DECK DEPICTED IS A GENERIC REPRESENTATION AND IS NOT INTENDED TO BE AN APPROVED DESIGN BY THORNBURY TOWNSHIP OR THIS OFFICE. THE DECK SHOULD BE DESIGNED BY A PROFESSIONAL IN ACCORDANCE WITH ALL LOCAL, STATE AND/OR FEDERAL BUILDING CODE REQUIREMENTS.
3. ALL DECKS SHALL BE APPROVED BY THE THORNBURY TOWNSHIP BUILDING INSPECTOR.

FIGURE A.5: DECK STONE BASE DETAIL

PREPARED FOR

Thornbury Township Township

Thornbury Township * Chester County * Pennsylvania

Yerkes

YERKES ASSOCIATES, INC.

CONSULTING ENGINEERS

SITE PLANNERS

SURVEYORS

PROJECT -	W-13-0314-12
DATE -	MARCH 26, 2014
SCALE -	NOT TO SCALE
DRAWN -	CEJ3
CHECKED -	MRC
CAD FILE	ThornburyTwp details.pro
TAX PARCEL -	N/A
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PLAN NO. -	N/A
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ORDINANCE APPENDIX B

SITE DESIGN PROCESS

NATURAL HYDROLOGY SITE DESIGN PROCESS

INTRODUCTION

Section 116-18 identifies a natural hydrology site design process that strives to minimize disturbances to land, site hydrology, and natural resources, and maintain the natural hydrologic regime, drainage patterns and flow conditions of a site to the maximum extent practicable. This appendix is intended to build on that process by providing additional information for achieving site designs that best maintain pre-construction stormwater runoff conditions, protect site amenities, and preserve natural resources. This appendix describes the following components of the natural hydrology site design process:

- Design Principles and Techniques;
- Design Process;
- Design Practices; and
- References.

Some common drainage design approaches for land development radically alter natural hydrologic conditions by constructing collection and conveyance systems that are designed to remove runoff from a site as quickly as possible and capture it in a detention basin. This approach has often led to the degradation of water quality, reduced groundwater recharge, and increased volumes of runoff, as well as the expenditure of additional resources for detaining and managing increased volumes of concentrated runoff at some downstream location.

The natural hydrology site design process encourages land development site designs that minimize post-development runoff rates and volumes, and that minimize needs for artificial conveyance and storage facilities. This process strives to incorporate the desired land development into the natural hydrologic landscape in a manner that maintains and utilizes existing site hydrology features and functions to minimize generation of new stormwater. This avoids cumulative environmental impacts often associated with land development, and reducing the need for and size of constructed stormwater facilities. This approach minimizes the disturbance of land area, natural features and site hydrology; preserves significant concentrations of open space, woodlands, and corridors of environmentally sensitive features; and incorporates landscape-based BMPs and low impact development techniques to minimize the utilization of more intrusive structural stormwater facilities.

With this design process, the primary goals of a land development project can be achieved while minimizing the negative environmental impacts and avoiding management costs associated with unnecessary stormwater runoff. The fundamental principle of this design process is that site hydrology features are considered "up front" in the land development design process and are prioritized as integral aspects to be maintained and utilized within the site design, rather than being first sacrificed for space needed for traditional site layout or for construction of more intrusive stormwater facilities.

Natural hydrology site design is not a new approach but rather a holistic process that combines certain principles of Low Impact Development, Conservation Design, and Sustainable Design, and focuses on reducing unnecessary alterations to the natural patterns and functions of existing on-site hydrologic features. These natural hydrologic features tend to perform their “hydrologic function” (i.e., infiltration, evapotranspiration, flow attenuation, pollutant removal, etc.) very efficiently and sometimes have the hydrologic capacity to perform that function on increased runoff loadings from the built environment. However, care must be taken to adequately characterize the capacity of their hydrologic function and avoid overwhelming the feature with excessive runoff loadings, thus causing unintended impairments that are completely counter-productive to the purpose of natural hydrology site design.

Preserving natural hydrologic conditions requires careful site design considerations. Natural hydrology site design should serve as the foundation of the overall site design approach, and when applied in conjunction with the design professional’s overall land development goals and desired outcomes, can help shape the overall vision and conceptual layout of the land development project.

Site design practices include preserving natural drainage features, minimizing impervious surface area, reducing the hydraulic connectivity of impervious surfaces, and protecting natural depression storage. Applying this site design process helps maintain site hydrology and manage stormwater by: minimizing the generation of stormwater runoff (achieved by designing to the land, considering site drainage patterns and infiltration characteristics, reducing grading and compaction, and considering scale and placement of buildings); managing stormwater as close to the point of generation as possible (by disconnecting impervious surfaces and distributing storm flows to landscaped-based BMPs); providing open and vegetated channel conveyance (as needed to treat water quality, reduce velocity and infiltrate); and managing remaining conveyed stormwater in common open space (as needed to disperse low velocity storm flows, treat water quality, infiltrate, and release). A well-designed site will contain a mix of all those features.

DESIGN PRINCIPLES AND TECHNIQUES

Natural hydrology site design involves identifying and prioritizing natural resources and natural and man-made hydrologic features, and incorporating such features into the overall site design to take advantage of their efficiencies of hydrologic performance, their cost efficiencies of reducing the need for or size of constructed stormwater facilities, and their aesthetic amenities. The five Design Principles to be achieved by this approach are as follows:

- Minimize land disturbance – both surface and subsurface.
- Minimize the cumulative area to be covered by impervious and compacted surfaces.
- Designing to the land, so that the layout of constructed and landscape features utilizes the natural topography and minimizes grading.
- Design the constructed stormwater management system to take advantage of the natural hydrologic landscape to achieve the required stormwater runoff control standards.
- Refine the site design and layout to optimize the cumulative benefits of the natural

hydrologic features, the constructed stormwater management system, and the land development components to achieve the minimum post-construction runoff volume, peak discharge rates and pollutant loads from the proposed land development site.

Techniques to be applied to achieve the design principles are presented in Table B.1.

DESIGN PROCESS

The first step in applying natural hydrology site design is to identify, delineate and assess the functions of all existing natural resources and natural and man-made hydrologic features that; are located within the project site; will receive discharge from the project site; or, may be impacted by runoff or disturbance from the proposed land development project. This includes:

- Streams, waterways, springs, wetlands, vernal pools, and water bodies;
- Drainage patterns, conveyances and discharge points;
- Natural infiltration areas and patterns;
- Areas of natural vegetation that provide significant evapotranspiration, pollutant removal, bank stabilization, flow attenuation, or riparian buffer functions;
- Floodplains; and
- Other features that contribute to the overall hydrologic function and value of the site and its receiving streams.

Once this inventory and assessment are completed, these identified resources and features are then prioritized for their ability to provide hydrologic function and performance for managing runoff from the proposed site improvements. Specifically, they should be prioritized as follows:

- Those to be incorporated into the site design in a manner that provides for their protection from any disturbance or impact from the proposed land development;
- Those to be protected from further disturbance or impact and for which the proposed land development will provide improvement to existing conditions;
- Those that can be incorporated into and utilized as components of the overall site design in a manner that protects or improves their existing conditions while utilizing their hydrologic function (e.g., for infiltration, evapotranspiration, or reducing pollutant loads, runoff volume or peak discharge rates, etc.) to reduce the need for or size of constructed BMPs; and
- Those that may be considered for alteration, disturbance or removal.

These prioritizations are then applied as the basis on which to begin the site design lay-out, grading, construction, and permanent ground cover designs to achieve the five (5) Design Principles outlined above. The following section describes just a few of the many design practices, methods and techniques that are available to achieve the landowner's desired land development goals and the desired environmental efficiencies intended by natural hydrology site design.

Table B.1 – Site Design Process Principles and Techniques

Design Principles	Design Techniques
<p>Minimize land disturbance – both surface and subsurface.</p>	<ul style="list-style-type: none"> • Maintain the natural soil structure and vegetative cover that are often critical components of maintaining the hydrologic functions of natural infiltration, bioretention, flow attenuation, evapotranspiration, and pollutant removal. • Protect, or improve, natural resources to reduce the needs for environmental mitigation, future environmental restoration, and cumulative flow and water quality impacts of unnecessary disturbances within the watershed system. • Minimize the disturbance of natural surface and groundwater drainage features and patterns, discharge points and flow characteristics, natural infiltration and evapotranspiration patterns and characteristics, natural stream channel stability, and floodplain conveyance, etc.
<p>Minimize the cumulative area to be covered by impervious and compacted surfaces.</p>	<ul style="list-style-type: none"> • Minimize the size of individual impervious surfaces. • Separate large impervious surfaces into smaller components. • Disconnect runoff from one impervious surface to another. • Avoid unnecessary impervious surfaces. • Utilize porous materials where suited in lieu of impervious materials.
<p>Designing to the land, so that the layout of constructed and landscape features utilizes the natural topography and minimizes grading.</p>	<ul style="list-style-type: none"> • Prioritize on-site hydrologic features (i.e., for protection, improvement, utilization, or alteration) and natural site drainage patterns and infiltration characteristics and consider them for the cornerstones of the conceptual site design. • Reduce grading and compaction by applying selective grading design methods to provide final grading patterns that preserve existing topography where it most benefits natural hydrologic functions and where needed; this results in graded areas that evenly distribute runoff and minimize concentrated runoff flows. • Consider the scale and placement of buildings and other infrastructure to minimize impact to natural hydrologic features. • Incorporate unique natural, scenic, and historic site features into the configuration of the development, and ensure flexibility in development design to meet community needs for complimentary and aesthetically pleasing development, such as can be achieved through Conservation Design and Sustainable Design approaches.

Design Principles	Design Techniques
<p>Design the constructed stormwater management system to take advantage of the natural hydrologic landscape to achieve the required stormwater runoff control standards.</p>	<ul style="list-style-type: none"> • Incorporate natural hydrologic features that have been selected for their available capacity and function into the overall system of site runoff controls. • Incorporate Low Impact Development (or similar) BMPs and distribute storm flows to: <ul style="list-style-type: none"> ○ Reduce runoff; ○ Manage stormwater at or as close to the point of generation as possible; ○ Disconnect discharges from streets and municipal storm sewer systems; and ○ Select and design BMPs to give first priority to nonstructural and vegetation (landscape-based) BMPs, second priority to surface structural BMPs, third priority to subsurface structural BMPs, and design subsurface BMPs as shallow as possible. • Provide open channel conveyance, as needed, to: <ul style="list-style-type: none"> ○ Treat water quality; ○ Reduce runoff velocity; and ○ Promote infiltration and evapotranspiration of runoff. • Manage remaining conveyed stormwater from small storms in common open space areas to achieve multiple objectives: <ul style="list-style-type: none"> ○ Disperse storm flows and reduce velocity; ○ Treat water quality; and ○ Promote infiltrate and evapotranspiration of runoff. • Provide for appropriate conveyance to retention or detention storage facilities as needed for flows from large storm events. • Maintain open space functions consistent with common area uses (passive recreation, on-site sewage management, scenic vistas, etc).
<p>Refine the site design and layout to optimize the cumulative benefits of the natural hydrologic features, the constructed stormwater management system, and the land development components to achieve the minimum post-construction runoff volume, peak discharge rates and pollutant loads from the proposed land development site.</p>	<p>Apply site design techniques and practices as appropriate based on:</p> <ul style="list-style-type: none"> • Conservation Design principles and practices. • Sustainable Design principles and practices. • Low Impact Development Design principles and practices.

DESIGN PRACTICES

Numerous practices and strategies can be considered where their aim is to sustain and utilize the benefits of existing site hydrology and minimize the generation of new stormwater runoff. Following are brief descriptions of various practices that can be used to achieve the principles of the natural hydrology site design process.

Site Layout Practices

The following site layout practices are but a few of the methods by which the natural hydrology site design process described above can be implemented. Such practices are less functions of regimented codes and procedures than about understanding and recognizing the benefits and values that existing resources can contribute to the desired outcomes of the land development project. In some circumstances, communication among design engineers, land planning and environmental professionals, knowledgeable developers, community representatives, and regulatory authorities is also beneficial to combine their collective understanding and perspectives to create effective planning efforts.

Preserving Natural Drainage Features. Protecting natural drainage features, particularly vegetated drainage swales and channels, is desirable because of their ability to infiltrate and attenuate flows and to filter pollutants. Unfortunately, some common land development practices encourage just the opposite pattern -- streets and adjacent storm sewers typically are located in the natural headwater valleys and swales, thereby replacing natural drainage functions with an impervious system. As a result, runoff and pollutants generated from impervious surfaces flow directly into storm sewers with no opportunity for attenuation, infiltration, or filtration. Designing developments to fit site topography retains much of the natural drainage function. In addition, designing with the land minimizes the amount of site grading, reduces the amount of compaction that can alter site infiltration characteristics, and can result in cost savings to the developer.

Protecting Natural Depression Storage Areas. Depressional storage areas have no surface outlet, or drain very slowly following a storm event. They can be commonly seen as ponded areas in fields during the wet season or after large runoff events. Some development practices eliminate these depressions by filling or draining, thereby eliminating their ability to reduce surface runoff volumes and trap pollutants. The volume and release-rate characteristics of depressions should be protected in the design of the development site to assist in reducing runoff volumes and reducing runoff rates. Designing around the depression, or incorporating its storage as additional capacity in required detention facilities, treats this area as a site amenity rather than a detriment.

Avoiding Introduction of Impervious Areas. Careful site planning should consider reducing impervious coverage to the maximum extent possible. Building footprints, sidewalks, driveways, and other features producing impervious surfaces should be evaluated to minimize impacts on runoff. In many instances, municipalities have the ability to reduce impervious cover by providing incentives or opportunities in their zoning and subdivision/ land development ordinances to reduce road width, reduce or modify cul-de-sac dimensions, reduce or modify curbing requirements, and reduce or modify sidewalk requirements.

Disconnecting Impervious Surfaces. Impervious surfaces are significantly less of a problem if they are not directly connected to an impervious conveyance system (such as storm sewer). Two basic ways to reduce hydraulic connectivity are routing roof runoff over lawns and reducing the use of storm sewers. Site grading should promote increasing travel time of stormwater runoff from these sources, and should help reduce concentration of runoff to a single point within the project site.

Routing Roof Runoff Over Lawns. Roof runoff can be easily routed over lawns in most site designs. The practice discourages direct connections of downspouts to "driveway-to-street-to-storm sewers" or parking lots. The practice also discourages sloping driveways and parking lots to the street. Crowning the driveway, to run off to the lawn, uses the lawn as a filter strip.

Reducing Street Widths. Street widths can be reduced by either eliminating on-street parking and/or by reducing roadway widths. Designers should select the narrowest practical street width for the design conditions (speed, curvature, etc.). Narrower neighborhood streets should be considered and encouraged under select conditions. Reduced street widths also can lower maintenance needs and costs.

Limiting Sidewalks to One Side of the Street. A sidewalk on one side of the street may suffice in low-traffic neighborhoods. The lost sidewalk could be replaced with bicycle/recreational trails that follow back-of-lot lines as an alternative to reduced sidewalks, where appropriate.

Reducing Building Setbacks. Reducing building setbacks (from streets) reduces the size of impervious areas of driveways and entry walks and is most readily accomplished along low-traffic streets where traffic noise is not a problem.

Constructing Compact Developments or Conservation Design: Low impact cluster or compact development can reduce the amount of impervious area for a given number of lots. Savings result from reduced street length, which also contributes to a reduction in development and long-term maintenance costs. Reduced site disturbance and preservation of open space help buffer sensitive natural areas and retain more of a site's natural hydrology. Development can be designed so that areas of high infiltration soils are reserved as stormwater infiltration areas. Construction activity can be focused onto less-sensitive areas without affecting the gross density of development.

Stormwater Best Management Practices

Stormwater best management practices (BMPs) are intended to supplement natural hydrology site design techniques where needed. Structural in nature, such practices include bioretention facilities, rain gardens, swales and other engineered stormwater BMPs. Listed here are techniques intended to help manage stormwater predominantly at or near the source, rather than traditional techniques that largely release runoff over an extended period of time to adjacent properties and streams. This list, in no way exhaustive, gives examples of a few of the most common practices.

Bioretention. This type of BMP combines open space with stormwater treatment. Soil and plants, rather than sand filters, treat and store runoff. Infiltration and evapotranspiration are achieved, often coupled with an underdrain to collect water not infiltrated or used in the root zone.

Rain Gardens. Typically rain gardens are shallow depression areas containing a mix of water tolerant native plant species. The intent is to capture runoff for storage and use in the root zone of plants. Intended largely as a way of managing stormwater through evapotranspiration (ET), rain gardens often function as infiltration facilities as well.

Reducing the Need for Storm Sewers. Increasing the use of natural or vegetated drainage swales can reduce the need for extending storm sewers for draining streets, parking lots, and back yards, the potential for accelerating runoff from the development can be greatly reduced. The practice requires greater use of swales and may not be practical for some development sites, especially if there are concerns for areas that do not drain in a "reasonable" time. The practice requires educating local citizens, who may expect runoff to disappear shortly after a rainfall event.

Using Permeable Paving Materials. These materials include permeable interlocking concrete paving blocks or porous bituminous concrete, among others. Such materials should be considered as alternatives to conventional pavement surfaces, especially for low use surfaces such as driveways, overflow parking lots, and emergency access roads. Surfaces for which seal coats may be applied should refrain from using permeable paving materials.

SOURCES

Conservation Design for Stormwater Management, Delaware Department of Natural Resources and Environmental Control and the Brandywine Conservancy, September 1997.

Conservation Design: Techniques for Preserving Natural Hydrologic Functions, White Paper prepared for New Castle County, Delaware Drainage Code, John M. Gaadt, AICP, September 2007.

Growing Greener, Conservation by Design, a program of the Natural Lands Trust, www.natlands.org/.

Guidance on MS4 Ordinance Provisions, Document Number 392-0300-003, by the Pennsylvania Department of Environmental Protection.

Low Impact Development Center, <http://www.lowimpactdevelopment.org/>.

PA Department of Environmental Protection, Best Management Practices Manual, 2006.

ORDINANCE APPENDIX C

RUNOFF COEFFICIENTS AND CURVE NUMBERS

TABLE C-1. RUNOFF CURVE NUMBERS

Source: Table 2-2a, Table 2-2b, and Table 2-2c from U. S. Department of Agriculture, Natural Resources Conservation Service, June 1986, Urban Hydrology for Small Watersheds, Technical Release No. 55 (TR-55), Second Edition.

TABLE C-2. RATIONAL RUNOFF COEFFICIENTS

Source: Table F.2 from Delaware County Planning Department, December 2011, Crum Creek Watershed Act 167 Stormwater Management Plan.

TABLE C-3. MANNING'S 'n' VALUES

Source: Table 3-1 from United States Army Corps of Engineers, January 2010, HEC-RAS River Analysis System, Hydraulic Reference Manual, Version 4.1.

TABLE C-3. MANNING'S 'n' VALUES

Chapter 3-- Basic Data Requirements

Table 3-1 Manning's 'n' Values

Type of Channel and Description	Minimum	Normal	Maximum
A. Natural Streams			
1. Main Channels			
a. Clean, straight, full, no rifts or deep pools	0.025	0.030	0.033
b. Same as above, but more stones and weeds	0.030	0.035	0.040
c. Clean, winding, some pools and shoals	0.033	0.040	0.045
d. Same as above, but some weeds and stones	0.035	0.045	0.050
e. Same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
f. Same as "d" but more stones	0.045	0.050	0.060
g. Sluggish reaches, weedy, deep pools	0.050	0.070	0.080
h. Very weedy reaches, deep pools, or floodways with heavy stands of timber and brush	0.070	0.100	0.150
2. Flood Plains			
a. Pasture no brush	0.025	0.030	0.035
1. Short grass	0.030	0.035	0.050
2. High grass			
b. Cultivated areas	0.020	0.030	0.040
1. No crop	0.025	0.035	0.045
2. Mature row crops	0.030	0.040	0.050
3. Mature field crops			
c. Brush	0.035	0.050	0.070
1. Scattered brush, heavy weeds	0.035	0.050	0.060
2. Light brush and trees, in winter	0.040	0.060	0.080
3. Light brush and trees, in summer	0.045	0.070	0.110
4. Medium to dense brush, in winter	0.070	0.100	0.160
5. Medium to dense brush, in summer			
d. Trees	0.030	0.040	0.050
1. Cleared land with tree stumps, no sprouts	0.050	0.060	0.080
2. Same as above, but heavy sprouts	0.080	0.100	0.120
3. Heavy stand of timber, few down trees, little undergrowth, flow below branches	0.100	0.120	0.160
4. Same as above, but with flow into branches			
5. Dense willows, summer, straight	0.110	0.150	0.200
3. Mountain Streams, no vegetation in channel, banks usually steep, with trees and brush on banks submerged			
a. Bottom: gravels, cobbles, and few boulders	0.030	0.040	0.050
b. Bottom: cobbles with large boulders	0.040	0.050	0.070

TABLE C-3. MANNING'S 'n' VALUES

Chapter 3—Basic Data Requirements

Table 3-1 (Continued) Manning's 'n' Values

Type of Channel and Description	Minimum	Normal	Maximum
B. Lined or Built-Up Channels			
1. Concrete			
a. Trowel finish	0.011	0.013	0.015
b. Float Finish	0.013	0.015	0.016
c. Finished, with gravel bottom	0.015	0.017	0.020
d. Unfinished	0.014	0.017	0.020
e. Gunite, good section	0.016	0.019	0.023
f. Gunite, wavy section	0.018	0.022	0.025
g. On good excavated rock	0.017	0.020	
h. On irregular excavated rock	0.022	0.027	
2. Concrete bottom float finished with sides of:			
a. Dressed stone in mortar	0.015	0.017	0.020
b. Random stone in mortar	0.017	0.020	0.024
c. Cement rubble masonry, plastered	0.016	0.020	0.024
d. Cement rubble masonry	0.020	0.025	0.030
e. Dry rubble on riprap	0.020	0.030	0.035
3. Gravel bottom with sides of:			
a. Formed concrete	0.017	0.020	0.025
b. Random stone in mortar	0.020	0.023	0.026
c. Dry rubble or riprap	0.023	0.033	0.036
4. Brick			
a. Glazed	0.011	0.013	0.015
b. In cement mortar	0.012	0.015	0.018
5. Metal			
a. Smooth steel surfaces	0.011	0.012	0.014
b. Corrugated metal	0.021	0.025	0.030
6. Asphalt			
a. Smooth	0.013	0.013	
b. Rough	0.016	0.016	
7. Vegetal lining			
	0.030		0.500

TABLE C-3. MANNING'S 'n' VALUES

Chapter 3-- Basic Data Requirements

Table 3-1 (Continued) Manning's 'n' Values

Type of Channel and Description	Minimum	Normal	Maximum
<i>C. Excavated or Dredged Channels</i>			
1. Earth, straight and uniform			
a. Clean, recently completed	0.016	0.018	0.020
b. Clean, after weathering	0.018	0.022	0.025
c. Gravel, uniform section, clean	0.022	0.025	0.030
d. With short grass, few weeds	0.022	0.027	0.033
2. Earth, winding and sluggish			
a. No vegetation	0.023	0.025	0.030
b. Grass, some weeds	0.025	0.030	0.033
c. Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
d. Earth bottom and rubble side	0.028	0.030	0.035
e. Stony bottom and weedy banks	0.025	0.035	0.040
f. Cobble bottom and clean sides	0.030	0.040	0.050
3. Dragline-excavated or dredged			
a. No vegetation	0.025	0.028	0.033
b. Light brush on banks	0.035	0.050	0.060
4. Rock cuts			
a. Smooth and uniform	0.025	0.035	0.040
b. Jagged and irregular	0.035	0.040	0.050
5. Channels not maintained, weeds and brush			
a. Clean bottom, brush on sides	0.040	0.050	0.080
b. Same as above, highest stage of flow	0.045	0.070	0.110
c. Dense weeds, high as flow depth	0.050	0.080	0.120
d. Dense brush, high stage	0.080	0.100	0.140

Other sources that include pictures of selected streams as a guide to n value determination are available (Fasken, 1963; Barnes, 1967; and Hicks and Mason, 1991). In general, these references provide color photos with tables of calibrated n values for a range of flows.

Although there are many factors that affect the selection of the n value for the channel, some of the most important factors are the type and size of materials that compose the bed and banks of a channel, and the shape of the channel. Cowan (1956) developed a procedure for estimating the effects of these factors to determine the value of Manning's n of a channel. In Cowan's procedure, the value of n is computed by the following equation:

ORDINANCE APPENDIX D
WEST NILE VIRUS DESIGN GUIDANCE

WEST NILE VIRUS GUIDANCE

(This source is from the Monroe County, PA Conservation District that researched the potential of West Nile Virus problems from BMPs due to a number of calls they were receiving)

Monroe County Conservation District Guidance: Stormwater Management and West Nile Virus

Source: Brodhead McMichaels Creeks Watershed Act 167 Stormwater Management Ordinance Final Draft 2/23/04

The Monroe County Conservation District recognizes the need to address the problem of nonpoint source pollution impacts caused by runoff from impervious surfaces. The new stormwater policy being integrated into Act 167 stormwater management regulations by the PA Department of Environmental Protection (PADEP) will make nonpoint pollution controls an important component of all future plans and updates to existing plans. In addition, to meet post-construction anti-degradation standards under the state National Pollutant Discharge Elimination System (NPDES) permitting program, applicants will be required to employ Best Management Practices (BMPs) to address nonpoint pollution concerns.

Studies conducted throughout the United States have shown that wet basins and in particular constructed wetlands are effective in traditional stormwater management areas such as channel stability and flood control and are one of the most effective ways to remove stormwater pollutants (United States Environmental Protection Agency 1991, Center for Watershed Protection 2000). From Maryland to Oregon, studies have shown that as urbanization and impervious surfaces increase in a watershed, the streams in those watersheds become degraded (CWP 2000). Although there is debate over the threshold of impervious cover when degradation becomes apparent (some studies show as little as 6% while others show closer to 20%), there is agreement that impervious surfaces cause nonpoint pollution in urban and urbanizing watersheds and that degradation is ensured if stormwater BMPs are not implemented.

Although constructed wetlands and ponds are desirable from a water quality perspective, there may be concerns about the possibility of these stormwater management structures becoming breeding grounds for mosquitoes. The Conservation District feels that although it may be a valid concern, municipalities should not adopt ordinance provisions prohibiting wet basins for stormwater management.

Mosquitoes

The questions surrounding mosquito production in wetlands and ponds have intensified in recent years by the outbreak of the mosquito-borne West Nile Virus. As is the case with all vector-borne maladies, the life cycle of West Nile Virus is complicated, traveling from mosquito to bird, back to mosquito, and then to other animals including humans. *Culex pipiens* was identified as the vector species in the first documented cases from New York in 1999. This species is still considered the primary transmitter of the disease across its range. Today there are some 60 species of mosquitoes that inhabit Pennsylvania. Along with *C. pipiens*, three other

species have been identified as vectors of West Nile Virus while four more have been identified as potential vectors.

The four known vectors in NE Pennsylvania are *Culex pipiens*, *C. restuans*, *C. salinarius*, and *Ochlerotatus japonicus*. All four of these species prefer, and almost exclusively use, artificial containers (old tires, rain gutters, birdbaths, etc.) as larval habitats. In the case of *C. pipiens*, the most notorious of the vector mosquitoes, the dirtier the water, the better they like it. The important factor is that these species do not thrive in functioning wetlands where competition for resources and predation by larger aquatic and terrestrial organisms is high.

The remaining four species, *Aedes vexans*, *Ochlerotatus Canadensis*, *O. triseriatus*, and *O. trivittatus*, are currently considered potential vectors due to laboratory tests (except the *O. trivittatus*, which did have one confirmed vector pool for West Nile Virus in PA during 2002). All four of these species prefer vernal habitats and ponded woodland areas following heavy summer rains. These species may be the greatest threat of disease transmission around stormwater basins that pond water for more than four days. This can be mitigated, however, by establishing ecologically functioning wetlands.

Stormwater Facilities

If a stormwater wetland or pond is constructed properly and a diverse ecological community develops, mosquitoes should not become a problem. Wet basins and wetlands constructed as stormwater management facilities should be designed to attract a diverse wildlife community. If a wetland is planned, proper hydrologic soil conditions and the establishment of hydrophytic vegetation will promote the population of the wetland by amphibians and other mosquito predators. In natural wetlands, predatory insects and amphibians are effective at keeping mosquito populations in check during the larval stage of development while birds and bats prey on adult mosquitoes.

The design of a stormwater wetland must include the selection of hydrophytic plant species for their pollutant uptake capabilities and for not contributing to the potential for vector mosquito breeding. In particular, species of emergent vegetation with little submerged growth are preferable. By limiting the vegetation growing below the water surface, larvae lose protective cover, and there is less chance of anaerobic conditions occurring in the water.

Stormwater ponds can be designed for multiple purposes. When incorporated into an open space design, a pond can serve as a stormwater management facility and a community amenity. Aeration fountains and stocked fish should be added to keep larval mosquito populations in check.

Publications from the PA Department of Health and the Penn State Cooperative Extension concerning West Nile Virus identify aggressive public education about the risks posed by standing water in artificial containers (tires, trash cans, rain gutters, bird baths) as the most effective method to control vector mosquitoes.

Conclusion

The Conservation District understands the pressure faced by municipalities when dealing with multifaceted issues such as stormwater management and encourages the incorporation of water quality management techniques into stormwater designs. As Monroe County continues to grow, conservation design, infiltration, and constructed wetlands and ponds should be among the preferred design options to reduce the impacts of increases in impervious surfaces. When designed and constructed appropriately, the runoff mitigation benefits to the community from these design options will far outweigh their potential to become breeding grounds for mosquitoes.

ORDINANCE APPENDIX E

**STORMWATER
BEST MANAGEMENT PRACTICES
AND CONVEYANCES
OPERATION AND MAINTENANCE AGREEMENT**

UPI No. - _____

**STORMWATER BEST MANAGEMENT PRACTICES (BMPs) AND CONVEYANCES
OPERATION AND MAINTENANCE AGREEMENT**

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

WITNESSETH:

WHEREAS, the Landowner is the owner of certain real property by virtue of a deed of conveyance recorded at the Office of the Recorder of Deeds of Chester County, Pennsylvania, at Deed Book _____ and Page____, having a UPI No. of _____
(hereinafter "Property"); and

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

WHEREAS, the stormwater Best Management Practices (herein after BMP(s)) And Conveyances Operations and Maintenance Plan approved by the Township (hereinafter referred to as the "O&M Plan") for the Property, which is attached hereto as Exhibit A and made part hereof, provides for management of stormwater within the confines of the Property through the use of BMP(s) and conveyances; and

WHEREAS, the Township and the Landowner, for itself and its administrators, executors, successors, heirs, and assigns, agree that the health, safety, and welfare of the residents of the Township and the protection and maintenance of water quality require that stormwater BMP(s) and conveyances be constructed and maintained on the Property; and

WHEREAS, for the purposes of this Agreement, the following definitions shall apply:

BMP -- "Best Management Practice" --Those activities, facilities, designs, measures, or procedures as specifically identified in the O&M Plan, used to manage stormwater impacts from land development, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of the Township's Stormwater Management Ordinance. BMPs may 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, manufactured devices, and operational

and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff. The BMPs identified in the O&M Plan are permanent appurtenances to the Property; and

Conveyance – As specifically identified in the O&M Plan, a man-made, existing or proposed facility, structure or channel used for the transportation or transmission of stormwater from one place to another, including pipes, drainage ditches, channels and swales (vegetated and other), gutters, stream channels, and like facilities or features. The conveyances identified in the O&M Plan are permanent appurtenances to the Property; and

WHEREAS, the Township requires, through the implementation of the O&M Plan, that stormwater management BMPs and conveyances, as required by said O&M Plan and the Township's Stormwater Management Ordinance, be constructed and adequately inspected, operated and maintained by the Landowner, its administrators, executors, successors in interest, heirs, and assigns.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto, intending to be legally bound hereby, agree as follows:

1. The foregoing recitals to this Agreement are incorporated as terms of this Agreement as if fully set forth in the body of this Agreement.

2. The Landowner shall construct the BMP(s) and conveyance(s) in accordance with the final design plans and specifications as approved by the Township which are identified as follows:

Titled _____,

Dated _____ Last revised _____.

3. The Landowner shall inspect, operate and maintain the BMP(s) and Conveyance(s) as shown on the O&M Plan in good working order acceptable to the Township and in accordance with the specific inspection and maintenance requirements in the approved O&M Plan. The notes from the O & M Plan which establish the specific instruction and maintenance requirements are attached hereto as Exhibit B and made a part hereof.

4. The Landowner hereby grants permission to the Township, its authorized agents and employees, to enter upon the Property from a public right-of-way or roadway, at reasonable times and upon presentation of proper identification, to inspect the BMP(s) and Conveyance(s) whenever it deems necessary for compliance with this Agreement, the O&M Plan and the Township's Stormwater Management Ordinance. Whenever possible, the Township shall notify the Landowner prior to entering the Property.

5. The Township intends to inspect the BMP(s) and Conveyance(s) a minimum of once every two (2) years to determine if they continue to function as required and designed. The Landowner shall reimburse the Township for the cost of the inspection which cost shall be established by resolution of the Board of Supervisors.

6. The Landowner acknowledges that, per the Township's Stormwater Ordinance, it is unlawful, without written approval of the Township, to:

- a. Modify, remove, fill, landscape, alter or impair the effectiveness of any BMP or Conveyance that is constructed as part of the approved O&M Plan;
- b. Place any structure, fill, landscaping, additional vegetation, yard waste, brush cuttings, or other waste or debris into a BMP or conveyance that would limit or alter the functioning of the BMP or Conveyance;
- c. Allow the BMP or Conveyance to exist in a condition which does not conform to the approved O&M Plan or this Agreement; and
- d. Dispose of, discharge, place or otherwise allow pollutants including, but not limited to, deicers, swimming pool additives, household chemicals, and automotive fluids to directly or indirectly enter any BMP or Conveyance.

7. In the event that the Landowner fails to operate and maintain the BMP(s) and conveyance(s) as shown on the O&M Plan in good working order acceptable to the Township, the Landowner shall be in violation of this Agreement and the Stormwater Ordinance, and the Landowner agrees that the Township or its representatives may, in addition to and not in derogation or diminution of any remedies available to it under the Stormwater Ordinance or other statutes, codes, rules or regulations, or this Agreement, enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s) and Conveyance(s). It is expressly understood and agreed that the Township 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 Township.

8. In the event that the Township, 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 Township for all expenses (direct and indirect) incurred within thirty (30) days of delivery of an invoice from the Township. Failure of the Landowner to make prompt payment to the Township may result in enforcement proceedings, which may include the filing of a lien against the Property, which filing is expressly authorized by the Landowner.

9. The intent and purpose of this Agreement is to ensure the proper maintenance of the on-site BMP(s) and Conveyance(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or affect any additional liability on any party for damage alleged to result from or be caused by stormwater runoff.

10. The Landowner, for itself and its executors, administrators, assigns, heirs, and other successors in interest, hereby releases and shall release the Township's employees, its agents and designated representatives from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees, agents or representatives arising out of the construction, presence, existence, or maintenance of the BMP(s) and Conveyance(s) either by the Landowner or Township. In the event that a claim is asserted or threatened against the Township, its employees, agents or designated representatives, the Township shall notify the Landowner, and the Landowner shall defend, at his own expense, any claim, suit, action or proceeding, or any threatened claim, suit, action or proceeding against the Township, or, at the request of the Township, pay the cost, including attorneys' fees, of defense of the same undertaken on behalf of the Township. If any judgment or claims against the Township's employees, agents or designated representatives shall be allowed, the Landowner shall pay all damages, judgments or claims and any costs and expenses incurred by the Township, including attorneys, regarding said damages, judgments or claims.

11. The Township may enforce this Agreement in accordance with its Stormwater Ordinance, at law or in equity, against the Landowner for breach of this Agreement. Remedies may include fines, penalties, damages or such equitable relief as the parties may agree upon or as may be determined by a court of competent jurisdiction. Recovery by the Township shall include its reasonable attorney's fees and costs incurred in seeking relief under this Agreement.

12. Failure or delay in enforcing any provision of this Agreement shall not constitute a waiver by the Township of its rights of enforcement hereunder.

13. The Landowner shall inform future buyers of the Property about the function of, operation, inspection and maintenance requirements of the BMP(s) prior to the purchase of the Property by said future buyer, and upon purchase of the Property the future buyer assumes all responsibilities as Landowner and must comply with all components of this Agreement.

14. This Agreement shall inure to the benefit of and be binding upon, the Township and the Landowner, as well as their heirs, administrators, executors, assigns and successors in interest.

15. This Agreement shall be recorded at the Office of the Recorder of Deeds of Chester County, Pennsylvania, and shall constitute a covenant running with the Property, in perpetuity.

IN WITNESS WHEREOF, the parties hereunto have executed this Agreement as of the day and year first above written.

LANDOWNER

Witness

BY: _____
Name:

Attest:

TOWNSHIP

THORNBURY TOWNSHIP

Teresa Destefano, Secretary

BY: _____
Township Manager

COMMONWEALTH OF PENNSYLVANIA:

COUNTY OF CHESTER

SS
:

On this, the _____ day of _____, 20____, before me, the undersigned officer, personally appeared _____, known to me (or satisfactorily proven) to be the person whose name is subscribed to the within instrument, and acknowledged that he/she executed the same for the purposes therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Notary Public

My Commission Expires:

ORDINANCE APPENDIX F

APPENDIX F - RIPARIAN BUFFER TECHNICAL REFERENCE GUIDE

The following references will provide helpful guidance in establishing and restoring riparian buffers. These references have been selected based on their applicability to watersheds in the southeastern Pennsylvania area, including specific information related to appropriate riparian vegetation within the Piedmont Province, which is the primary physiographic province for the Chester Creek watershed. These references also include guides for establishing a riparian buffer program and include additional sources of information related to riparian corridor restoration. There are numerous publications related to riparian corridor and riparian buffer measures available through local, county, state, and federal agencies such as DEP, EPA, and USDA. In addition, the County Conservation Districts are a valuable source of local data and should also be consulted for further information.

Alliance for the Chesapeake Bay, Pennsylvania Department of Environmental Protection, September 2000. *Forest Buffer Toolkit*, Stream ReLeaf Program.

Penn State College of Agricultural Sciences, 1996. *Establishing Vegetative Buffer Strips Along Streams to Improve Water Quality*. Publication # AGRS-87.

Fike, Jean, June 1989. *Terrestrial & Palustrine Plant Communities of Pennsylvania*, Pennsylvania Natural Diversity Inventory, The Nature Conservancy, Western Pennsylvania Conservancy, and Pennsylvania Department of Conservation and Natural Resources.

Pennsylvania Association of Conservation Districts, Inc., Keystone Chapter, Soil and Water Conservation Society, Pennsylvania Department of Environmental Protection, Natural Resources Conservation Service, 1998. *Pennsylvania Handbook of Best Management Practices for Developing Areas*. Prepared by CH2MHill.

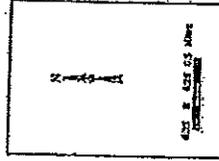
Palone, R. S. and A. H. Todd (eds), 1997. *Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers*. Chesapeake Bay Program and Northeastern Area State and Private Forestry. Natural Resources Conservation Service Cooperative State Research Education and Extension Services.

The Federal Interagency Stream Restoration Working Group (FISRWG, 10/1998). *Stream Corridor Restoration Principles, Processes, and Practices*. GPO Item No. 0120-A; SuDocs No. A57.0/2:ENS/PT.653. ISBN-0-934213-58-3. Published October 1998, Revised August 2000.

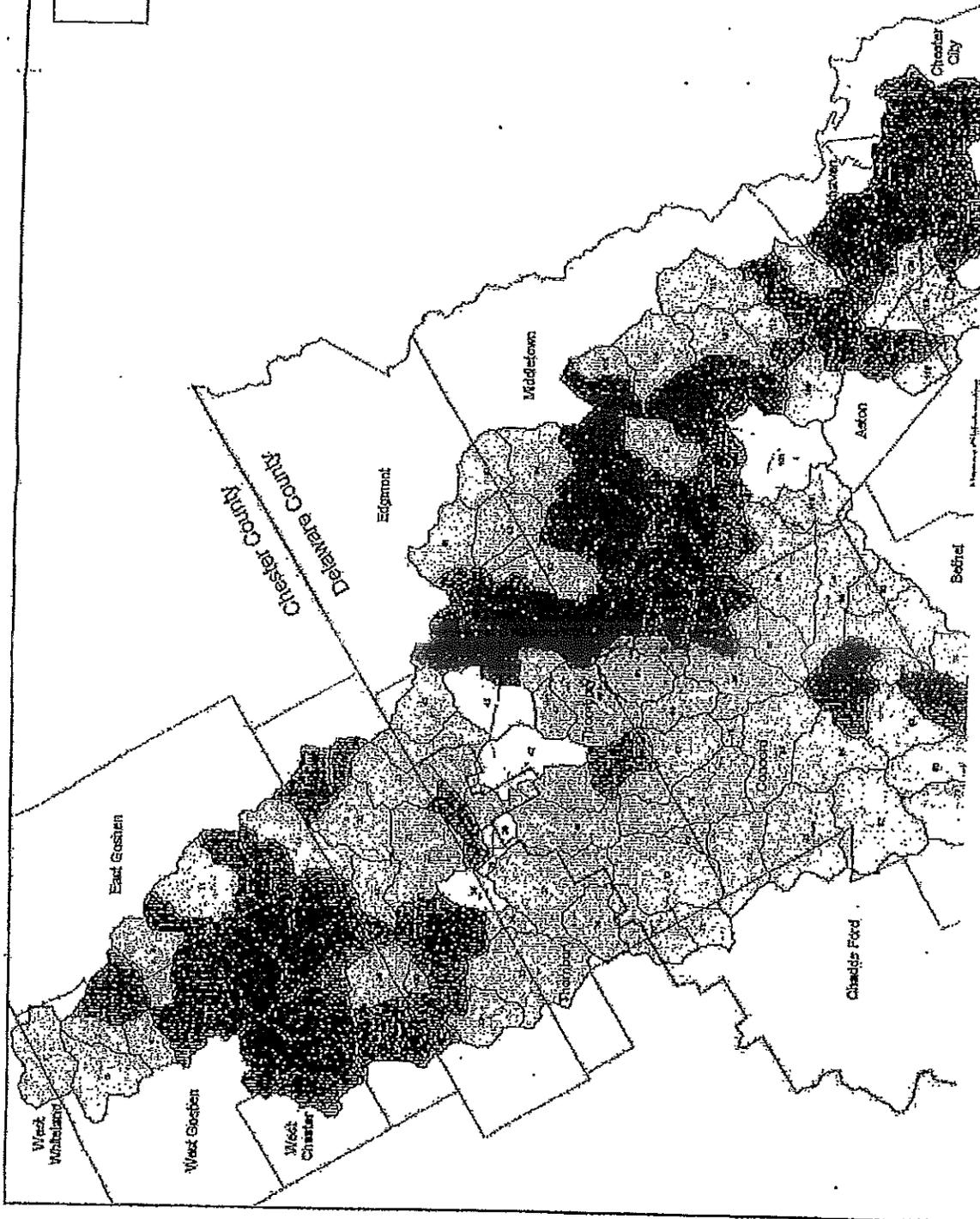
ORDINANCE APPENDIX G

CHESTER CREEK WATERSHED
ACT 167 STUDY
PLATE 3: RELEASE RATE MAP
June, 2002

LEGEND	
	County Boundary
	Street
	Municipal Boundary
Release Rates	
	0.5
	1.0
	1.5
	2.0
	Subarea Boundaries



Note: Maps for reference use only. The exact location of the subwatershed management district boundaries as they apply to a given development shall not be determined by mapping the boundaries using the two-foot topographic contours (or the most accurate data) available, provided as part of the drainage plan.

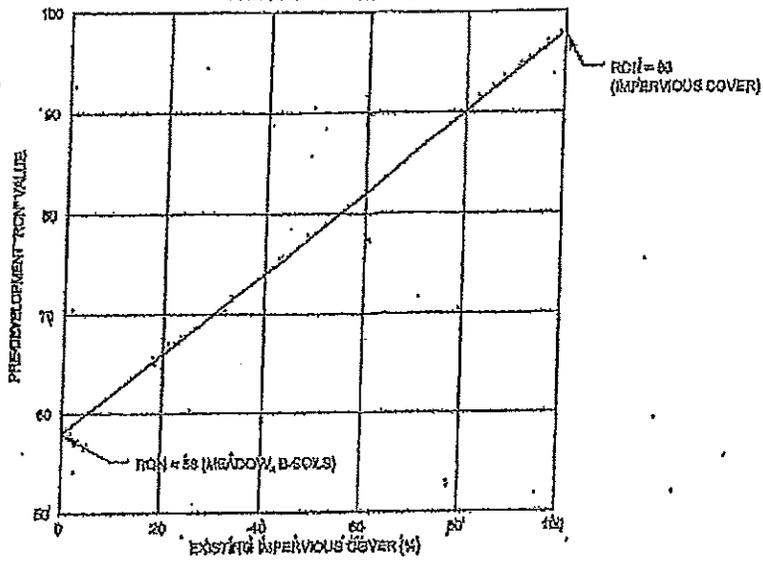


ORDINANCE APPENDIX H

FIGURE B-3

REDEVELOPMENT PROJECTS
RUNOFF CRITERIA ADJUSTMENT FOR PRE-DEVELOPMENT CONDITIONS

NRCS METHODOLOGY
RCN ADJUSTMENT



RATIONAL FORMULA
C ADJUSTMENT

