ELK TOWNSHIP
STORMWATER MANAGEMENT ORDINANCE

ELK TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA

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ARTICLE I – GENERAL PROVISIONS

Section 101. Short Title

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

Section 102. Statement of Findings

The Board of Supervisors of Elk Township 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 stream beds and stream banks, thereby elevating sedimentation), destroying aquatic habitat, and elevating aquatic pollutant concentrations and loadings such as sediments, nutrients, heavy metals, and pathogens. Groundwater resources are also impacted through loss of recharge.

C. A comprehensive program of stormwater management, including minimization of impacts of 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 Elk Township and all of the people of the Commonwealth of Pennsylvania, their resources, and the environment.

D. Stormwater is an important water resource that provides infiltration and groundwater recharge for water supplies and baseflow 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 baseflow, 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. Non-stormwater discharges to municipal or other storm sewer systems can contribute to pollution of the Waters of the Commonwealth.

Section 103. Purpose

The purpose of this Ordinance 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 Elk Township:

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 baseflows, 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 Elk Township.

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. Provide review procedures and performance standards for stormwater planning and management.

T. Fulfill the purpose and requirements of PA Act 167 (PA Act 167, Section 3):

"(1) Encourage planning and management of storm water runoff in each watershed which is consistent with sound water and land use practices.

(2) Authorize a comprehensive program of stormwater management designated to preserve and restore the flood carrying capacity of Commonwealth streams; to preserve to the maximum extent practicable natural storm water runoff regimes and natural course, current and cross-section of water of the Commonwealth; and to protect and conserve ground waters and ground-water recharge areas.

(3) Encourage local administration and management of storm water consistent with the Commonwealth's duty as trustee of natural resources and the people's constitutional right to the preservation of natural, economic, scenic, aesthetic, recreational and historic values of the environment."

Section 104. Statutory Authority

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

A. Act of October 4, 1978, P.L. 864 (Act 167) 32 P.S., Section 680.1 et seq., as amended, the "Storm Water Management Act" (hereinafter referred to as "the Act");

B. Second Class Township Code, 53 P.S. Sections 65101 et seq.;

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

Section 105. Applicability

A. The following activities are regulated by this Ordinance:

1. All Regulated Activities as defined in this Ordinance including, but not limited to, New Development, Redevelopment, and Earth Disturbance Activities that are located within Elk Township shall be subject to regulation by this Ordinance.

2. When a building and/or grading permit is required for any Regulated Activity on an existing parcel, or an 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 Ordinance.

3. The provisions of Article VIII, Prohibitions, apply to all activities, persons, and properties within Elk Township.

4. This Ordinance contains the stormwater management performance standards and design criteria that are necessary from a watershed-based perspective.

B. Duty of Persons Engaged in a Regulated Activity

Notwithstanding any provision(s) of this Ordinance, 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 Ordinance if the cumulative Proposed Impervious Surface or Earth Disturbance exceeds the corresponding threshold for exemption (as presented in Table 106.1 "Thresholds for Regulated Activities that are Exempt from the Provisions of this Ordinance as Listed Below").

2. The date of adoption of this Ordinance 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.

   For example:

   > If, after adoption of this Ordinance, an Applicant proposes construction of a six hundred (600) square foot garage, that project would be exempted from the requirements of this Ordinance as noted in Table 106.1. If, at a later date, an Applicant proposes to construct a nine hundred (900) 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 Ordinance for the cumulative total of one thousand five hundred (1,500) square feet of additional Impervious Surface added to the property since adoption of this Ordinance.

Section 106. Exemptions and Modified Requirements

A. Requirements for Exempt Activities

1. An exemption from any requirement of this Ordinance shall not relieve the Applicant from implementing all other applicable requirements of this Ordinance 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 Ordinance 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 one thousand (1,000) square feet of Proposed Impervious Surfaces AND less than five thousand (5,000) square feet of Earth Disturbance; or

2. Are listed in Subsection 106.C,

are exempt from those (and only those) requirements of this Ordinance that are included in the sections and articles listed in Table 106.1. Exemptions are for the items noted in Table 106.1 only, and shall not relieve the Landowner from other applicable requirements of this Ordinance. Exemption shall not relieve the Applicant from implementing such measures as are necessary to protect health, safety, and welfare, property, and water quality.

TABLE 106.1
Thresholds for Regulated Activities that are Exempt from the Provisions of this Ordinance as Listed Below (see Notes below)

Ordinance Article/Section	Activities Listed in Subsection 106.C.	< 1,000 sq. ft. of Proposed Impervious Surfaces AND < 5,000 sq. ft. of Proposed Earth Disturbance	≥ 1,000 sq. ft. of Proposed Impervious Surfaces OR ≥ 5,000 sq. ft. of Proposed Earth Disturbance
Article I	Not Exempt	Not Exempt	Not Exempt
Article II	Not Exempt	Not Exempt	Not Exempt
Sections 302 and 303	Not Exempt	Not Exempt	Not Exempt
Sections 301, 304, 305, 306, 307, 308, 309, 310, 311, and 312	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 and Pollution Control Requirements	Must comply with PA Code, Title 25 (Environmental Protection), Chapter 102 (Erosion and Sediment Control) and other applicable State and municipal codes, including the Clean Streams Law.		

Table 106.1 Notes:

- Specific activities listed in Subsection 106.C are exempt from the indicated requirements, regardless of size.
- 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 Ordinance.
- "Exempt" – Regulated Activities are exempt from the requirements of listed section(s) only; all other provisions of this Ordinance apply.

C. Exemptions for Specific Activities

The following specific Regulated Activities are exempt from the requirements of Sections 301, 304, 305, 306, 307, 308, 309, 310, 311, and 312, and Article IV, Article V, Article VI and Article VII of this Ordinance (as shown in Table 106.1), unless otherwise noted below. All other conveyance and system design standards established by Elk Township in other codes or ordinances shall be required, and all other provisions of this Ordinance 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 Elk Township within two (2) calendar days of the commencement of the activity. A detailed plan shall be submitted no later than thirty (30) days following commencement of the activity. If Elk Township finds that the work is not an emergency, then the work shall cease immediately and the requirements of this Ordinance 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 Elk Township.

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), when performed in accordance with the requirements of 25 PA Code Chapter 102. Under 25 PA Code 102 regulations, Agricultural Activities with 5,000 square feet or more of tilling or animal heavy use area are required to have an Agricultural Erosion and Sediment Control Plan (or equivalent Conservation Plan); however those regulations do not require the plan to be reviewed or approved.

    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 Elk Township 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 Section 303 of this Ordinance.

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 Section 303 of this Ordinance, and is exempt from all other requirements of this Ordinance listed in Subsection 106.C above. Resurfacing of existing paved surfaces is exempt from the requirements of this Ordinance listed above. Construction of new or additional Impervious Surfaces shall comply with all requirements of this Ordinance as indicated in Table 106.1.

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 Ordinance.

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. Modified Requirements for Small Projects

1. Regulated Activities that involve 1,000 to 2,000 square feet of Proposed Impervious Surfaces and less than 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 address the requirements of Sections 301, 304, 305, 306, 307, 308, 309, 310, 311 and 312, and Article IV, Article V, Article VI and Article VII of this Ordinance (as shown in Table 106.2).

2. The Applicant shall first contact the Municipal Engineer for Elk Township: to confirm that the proposed project is eligible for use of the Simplified Approach and is not otherwise exempt from these Ordinance 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. 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 applicable provisions of this Ordinance as shown in Table 106.2 shall apply.

TABLE 106.2
Thresholds for Regulated Activities that are Eligible for "Modified" Requirements for the Provisions of this Ordinance that are Listed Below

Ordinance Article/Section	Activities Listed in Subsection 106.D and106.E
Article I	All Provisions Apply
Article II	All Provisions Apply
Sections 302 and 303	All Provisions Apply
Sections 301, 304, 305, 306, 307, 308, 309, 310, 311 and 312	Exempt if Modified Requirements of Subsections 106.D and/or E are Applied
Article IV	Exempt if Modified Requirements of Subsections 106.D and/or E are Applied
Article V	Exempt if Modified Requirements of Subsections 106.D and/or E are Applied
Article VI	Exempt if Modified Requirements of Subsections 106.D and/or E are Applied
Article VII	Exempt if Modified Requirements of Subsections 106.D and/or E are Applied
Article VIII	All Provisions Apply
Article IX	All Provisions Apply
Other Erosion, Sediment and Pollution Control Requirements	Must comply with 25 PA Code Chapter 102 (Erosion and Sediment Control) and other applicable State and municipal codes, including the Clean Streams Law.

Table 106.2 Note:

"Modified Requirements" – Regulated Activities listed within the Subsections of this Ordinance noted in Table 106.2 are eligible for exemption only from the indicated sections and subsections of this Ordinance and only if the modified requirements of Subsections 106.D and/or E are met to the satisfaction of Elk Township; all other provisions of this Ordinance apply.

E. Modified Requirements for Agricultural Structures

It is the declared policy of the Commonwealth to conserve and protect and to encourage the development and improvement of its agricultural lands for the production of food and other agricultural products. Municipalities must encourage the continuity, development and viability of agricultural operations within its jurisdiction. Except as necessary to protect the public health, safety and welfare, Regulated Activities involving proposed new or expanded Impervious Surfaces associated with Agricultural Activities are exempt from the requirements of Sections 301, 304, 305, 306, 307, 308, 309, 310, 311 and 312, and Article IV, Article V, Article VI and Article VII of this Ordinance (and listed in Table 106.2) only when it has been demonstrated to the satisfaction of Elk Township that the proposed project will comply with all of the requirements listed below. All other provisions of this Ordinance shall apply. To be eligible for exemption from the Ordinance provisions stated above, the proposed Regulated Activity shall:

1. Be directly associated with an Agricultural Activity (as defined in Article II);

2. Include less than ten thousand (10,000) square feet of proposed new or expanded Impervious Surface (excluding adjoining vehicle parking and movement areas) and not more than an additional five thousand (5,000) square feet of adjoining vehicle parking and movement area;

3. Be installed on a farm or mushroom operation that has a current Mushroom Farm Environmental Management Plan (MFEMP) reviewed and deemed adequate by the Conservation District, or an Agricultural Erosion and Sediment Control Plan or Conservation Plan (as defined in Article II) that complies with the requirements of 25 PA Code Chapter 102 (Erosion and Sediment Control);

4. Divert runoff from the proposed new or expanded Impervious Surfaces (including vehicle parking and movement area) entirely away from animal management, waste management and crop farming areas and any other source of pollutants;

5. Include BMP(s) that will permanently retain at least one (1) inch of rainfall runoff from the total area of proposed new or expanded Impervious Surfaces and vehicle parking and movement areas;

6. Be designed so that any point of discharge of runoff from the proposed new or expanded Impervious Surface (excluding vehicle movement area):

    a. Is not directly connected to, and is not directly connected to any constructed Conveyance that is connected to, a municipal Separate Storm Sewer System or public roadway;

b. Is located at least one hundred fifty (150) feet from any municipal Separate Storm Sewer System or public roadway, or any constructed Conveyance connected to any municipal Separate Storm Sewer System or public roadway.

7. Either:

   a. Have all proposed new or expanded Impervious Surfaces and proposed vehicle parking and movement areas and BMP(s) included within the current MFEMP or current Agricultural Erosion and Sediment Control Plan or a Conservation Plan for the farm or mushroom operation;

      OR

   b. Be constructed per design plans prepared and sealed by a Licensed Professional in conformance with the PADEP "Best Practices for Environmental Protection in the Mushroom Farm Community" (2003 or as amended), or per design plans prepared and sealed by a Licensed Professional (or Conservation District staff person designated by NRCS) that comply with USDA NRCS standards and specifications, and for which completion of construction will be certified by the Licensed (or NRCS-designated design) Professional responsible for the design; and

8. Not be eligible for exemption if an NPDES permit is required.

Section 107. Repealer

Any ordinance or ordinance provision of Elk Township inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

Section 108. Severability

If any sentence, clause, section or part of this Ordinance 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 Ordinance. It is hereby declared the intent of the Board of Supervisors of Elk Township that this Ordinance would have been adopted had such unconstitutional, illegal or invalid provision, sentence, clause, section or part thereof not been included herein.

Section 109. Compatibility with Other Ordinances or Legal Requirements

A. Approvals issued and actions taken pursuant to this Ordinance 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 Ordinance 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 Ordinance shall take precedence.

C. Nothing in this Ordinance shall be construed to affect any of Elk Township's requirements regarding stormwater matters that do not conflict with the provisions of this Ordinance. The requirements of this Ordinance shall supersede any conflicting requirements in other municipal ordinances or regulations.

Section 110. 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 to Elk Township for the timely installation and proper construction of all stormwater management facilities as required by the approved SWM Site Plan and this Ordinance, 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 509-511 of the MPC and the provisions of Elk Township's Subdivision and Land Development Ordinance (SALDO).

Section 111. Waivers

A. General

   The requirements of this Ordinance 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 Ordinance on the Site, Elk Township may approve measures other than those in this Ordinance, subject to Subsections 111.B and 111.C.

B. The Board of Supervisors shall have the authority to waive or modify the requirements of one or more provisions of this Ordinance 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 Ordinance 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 Ordinance. A request for waiver or 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 Ordinance involved, and the minimum modification necessary.

C. PADEP Approval Required

For any proposed Regulated Activity involving Earth Disturbance equal to or greater than one (1) acre, Elk Township may approve measures for minimum volume and infiltration control other than those required in this Ordinance 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 PA Clean Streams Law, 35 P.S. Section 691.1, et seq.

Section 112. 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

Section 201. Interpretation

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

A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.

B. The word "includes" or "including" shall not limit the term to the specific example, but is intended to extend its meaning to all other instances of like kind and character.

C. The word "person" includes an individual, partnership, public or private association or corporation, firm, trust, estate, Elk Township, 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 Elk Township.

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 Ordinance are for the purposes of enforcing the provisions of this Ordinance and have no bearing on other municipal regulations or ordinances.

Section 202. Definitions

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 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 Elk Township for approval to engage in any Regulated Activity as defined in this Ordinance.

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 Elk Township at the completion of the project, as per the requirements of Section 502 of this Ordinance as "final As-Built Plans".

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

Baseflow – 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 Ordinance. Stormwater BMPs are commonly grouped into one (1) of two (2) broad categories or measures: "structural" or "nonstructural." In this Ordinance, 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.

Board of Supervisors - The Board of Supervisors of Elk Township.

Buffer – See Riparian Buffer.

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 drainageways, swales, streams, ditches, canals, and pipes flowing partly full.

CN – Curve number.

Commonwealth – 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 manmade, 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 Ordinance, 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 (5)-year storm) and duration (e.g., twenty-four (24) hours), used in the design and evaluation of stormwater management systems. Also see Return Period.

Detention (or **To Detain)** – Capture and temporary storage of runoff in a stormwater management facility for release at a controlled rate.

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 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 Elk Township.

Diameter at Breast Height (DBH) – The outside bark diameter of a tree at breast height which is defined as four and one half (4.5) feet (one and thirty-seven one-hundredths meter (1.37 m)) 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 ridge line.

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 Elk Township to minimize accelerated erosion and sedimentation, and that must be prepared and approved per the applicable requirements.

FEMA – 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 (100)-year flood. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the one hundred (100)-year floodway, it is assumed, absent evidence to the contrary, that the floodway extends from the centerline of the stream and to fifty (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 forest lands. 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.

Grade/Grading – 1. (noun) A slope, usually of a road, channel, or natural ground, specified in percent and shown on plans as specified herein. 2. (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 under-ground soils and rock units.

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

HEC-1 – The U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC) hydrologic runoff model.

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

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 baseflow, storage, and groundwater supplies under natural conditions.

Hydrologic Soil Group (HSG) – A classification of soils by the Natural Resources Conservation Service (NRCS), into four (4) 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, tennis or other paved courts; or athletic playfields comprised of synthetic turf materials. For the purposes of determining compliance with this Ordinance, 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.

Land Development – Any of the following activities:

1. The improvement of one (1) or more contiguous lots, tracts, or parcels of land for any purpose involving a group of two (2) or more buildings, or the division or allocation of land between or among two (2) or more existing or prospective occupants by means of, or for the purpose of, streets, common areas, leaseholds, building groups, or other features, or
2. A division of land into lots for the purpose of conveying such lots singularly or in groups to any person, partnership, or corporation for the purpose of the erection of buildings by the person, partnership, or corporation.

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 they are 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 Ordinance 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 - Act of July 31, 1968, P.L. 805, No. 247, 53 P.S. Section 10101, et seq., as amended, the Pennsylvania Municipalities Planning Code, Act 247.

MFEMP – Mushroom Farm Environmental Management Plan.

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 Elk Township.

Elk Township – Elk Township, Chester County, Pennsylvania.

NOAA - 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 Ordinance.

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.

Non-structural Best Management Practice (BMPs) – See Best Management Practice (BMP).

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

PADEP – 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 Ordinance.

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

PennDOT – Pennsylvania Department of Transportation.

Pennsylvania Stormwater Best Management Practices Manual (PADEP BMP Manual) - Document Number 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 Elk 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 Pennsylvania 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 Elk Township 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 Ordinance.

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 Ordinance.

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 Pennsylvania Code Chapter 92, Chapter 102, or the Clean Streams Law.

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 (3) days.

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 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 (1) time. For example, the twenty-five (25)-year return period rainfall would be expected to occur on average once every twenty-five (25) years; or stated in another way, the probability of a twenty-five (25)-year storm occurring in any one (1) year is four-one hundredths (0.04) (i.e., a four (4)% 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 – 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 Elk Township where any proposed Regulated Activity, as defined in this Ordinance, 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 Ordinance, indicating how stormwater runoff will be managed at a particular Site in accordance with this Ordinance, 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 Ordinance 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 Practices).

Subdivision - The division or re-division of a lot, tract, or parcel of land by any means, into two (2) or more lots, tracts, parcels or other divisions of land, including changes in existing lot lines for the purpose, whether immediate or in the future, of lease, subdivision resulting from a mortgage encumbrance, partition by the court for distribution to heirs or devisees, transfer of ownership, or building or lot development; Provided, however, that the division by lease of land for agricultural purposes into parcels of more than ten (10) acres, not involving any new street, easement of access, or residential dwellings shall not be included.

Subdivision and Land Development Ordinance – Subdivision and Land Development Ordinance of Elk Township**,** Chester County, PA, 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 Site Plan.

Timber Operations – See Forest Management.

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.

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.

Water Table – The upper most 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.

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.

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

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

Woods - Any land area of at least one-quarter (0.25) acre with a natural or naturalized ground cover (excluding manicured turf grass) and that has an average density of two (2) or more viable trees per one thousand five hundred (1,500) square feet with a DBH of six (6) inches or greater and where such trees existed at any time within three (3) years of the time of land development application submission of the proposed project. The land area to be considered Woods shall be measured from the outer drip lines of the outer trees.

ARTICLE III – STORMWATER MANAGEMENT STANDARDS

Section 301. General Requirements

A. Applicants proposing Regulated Activities in Elk Township which are not exempt under Section 106 shall submit a Stormwater Management Site Plan (SWM Site Plan) to Elk Township for review and approval in accordance with Articles III and IV. SWM Site Plans approved by Elk Township shall be on Site throughout the duration of the Regulated Activity.

B. 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 Ordinance, the most restrictive applies.

C. The stormwater management and runoff control criteria and standards in this Ordinance 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.

D. No Regulated Activity within Elk Township shall commence until:

   1. Elk Township issues approval of a SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance; and

   2. The Applicant has received a letter of adequacy or approval for the Erosion and Sediment Control Plan review by Elk Township 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.

E. Neither submission of an SWM Site Plan under the provisions herein nor compliance with the provisions of this Ordinance shall relieve any person from responsibility for damage to any person or property otherwise imposed by law.

F. 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 Section 304 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 Ordinance.

G. To the maximum extent practicable, Post-construction 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.

H. For Regulated Activities with one (1) acre or more of proposed Earth Disturbance, existing drainage peak rate and volume discharges, up to and including the one hundred (100)-year storm, onto or through adjacent property(ies) or downgradient property(ies), including diffuse drainage discharge, and the concentration of discharges, shall not be altered in any manner without written permission from, and where applicable as determined by Elk Township, an easement and agreement with the affected Landowner(s) for conveyance of discharges onto or through their property(ies). Such discharges shall be subject to any applicable discharge criteria specified in this Ordinance.

I. 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 Sections 305, 306, 307, and 308). Drainage facilities located on the Site shall be designed to safely convey flows from outside of the Site through the Site.

J. 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 5-year and 10-year storm event peak runoff rate reduction standards for New Development required by this Ordinance, the Applicant shall propose alternate methods to mitigate the bypass of BMPs, subject to the approval of the Municipal Engineer. In no case shall resulting peak rate be greater than the Pre-development peak rate for the equivalent design storm.

K. 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 Ordinance, to meet the erosion and sediment control requirements of Elk Township, if applicable, and to meet all requirements under Title 25 of the PA Code and the Clean Streams Law.

L. For all Regulated Activities, permanent BMPs and Conveyances shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Storm Water Management Act.

M. 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 Elk Township. Elk Township 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).

N. 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.

O. Hotspots 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 Elk Township.

P. 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.

Q. Additional Water Quality Requirements -

Elk Township 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.).

R. Applicants shall adhere to all Riparian Buffer standards as defined in 25 PA Code Chapter 102, the Elk Township Zoning Ordinance and the Subdivision and Land Development Ordinance.

Section 302. 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 Elk Township 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 (Erosion and Sediment Control), and/or erosion and sediment control requirements of Elk Township.

B. Work within natural drainage ways subject to permit by PADEP under 25 PA Code Chapter 105 (Dam Safety and Waterway Management).

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 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 Chapter 105.

Section 303. Erosion and Sediment Control

A. No Regulated Activity within Elk Township shall commence until:

1. Elk Township receives documentation that the Applicant has received:

a. A "letter of adequacy" from the Conservation District, or other approval from PADEP in compliance with 25 PA Code Chapter 102 (Erosion and Sediment Control), of an Erosion and Sediment Control Plan for construction activities, if applicable;

b. A PADEP NPDES Construction Activities Permit as required under Title 25 Pennsylvania 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 Elk Township, 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 Subsection 306.M.

Section 304. Site Design Process

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. For Regulated Activities with ten thousand (10,000) or more square feet of proposed Earth Disturbance OR two thousand (2,000) or more square feet of Proposed Impervious Surfaces, the Applicant shall demonstrate in its SWM Site Plan (as required in Subsection 402.C) 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 Ordinance. The Site design shall:

A. First, identify and delineate all existing natural resources and natural and man-made hydrologic features listed in Subsection 402.B.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 the 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 Section 304.B 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 Subsection 304.B into the Site design to protect and utilize those features and their hydrologic functions to reduce the need for or the 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 Subsections 304.B and 304.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, and for location and design of features and BMPs to be used to comply with the requirements of Sections 305, 306, 307, 308, 310 and 311.

Section 305. 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 (2)-year, twenty-four (24)-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 Subsection 309.D of this Ordinance.

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 Section 306. The infiltration volume required under Section 306 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 (2) 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 pre-treatment prior to the runoff entering the stormwater management practice.

G. Elk Township may require additional water quality and runoff control measures for stormwater discharging to special management areas such as those listed in Subsection 301.P.

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 Subsection 304.C that apply to water quality and volume control.

Section 306. 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 Section 305.

B. For Regulated Activities involving New Development, the volume of a minimum of one (1)-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 (1)-inch of runoff from all Proposed Impervious Surfaces;
   OR
2. The total water quality and runoff volume required in Section 305 of this Ordinance.

D. If the requirements of Subsections 306.B or 306.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 first one-half (0.5) inch of runoff volume shall be infiltrated.

E. Only if a minimum of at least one-half (0.5) inch infiltration requirement cannot be physically accomplished on the Site, shall a waiver from Section 306 be considered by Elk Township.

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 Soil Science Society of America Certified Professional Soil Scientist or a PADEP Certified Sewage Enforcement Officer. A detailed soils evaluation may be conducted by a similarly qualified professional upon prior approval by Elk Township. At a minimum, the soils evaluation 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 sub-grade 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 required unless it can be reasonable demonstrated to the Municipal Engineer that this is not possible based on the site characteristics and conditions.

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 twenty-four (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 (see Subsection 306.N).

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 (3) days (seventy-two (72) hours) from the end of the design storm.

K. All infiltration practices shall:

1. Be selected and designed to meet the criteria of Subsection 304.C that are applicable to infiltration;

2. Be set back at least fifteen (15) feet from all buildings and features with sub-grade elements (e.g., basements, foundation walls, etc.), twenty (20) feet from all on-lot wastewater facilities (including subsurface tanks and absorption areas), ten (10) feet from all property lines, easements and rights of way, and fifty (50) feet from all water supply wells, 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 thirty (30) feet of a building or feature with sub-grade elements (e.g., basements, foundation walls, etc.), the bottom elevation shall be set below the elevation of the sub-grade 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, pre-treatment or additional design considerations are needed to protect groundwater quality.

2. When located within a “well head 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.

N. Post-construction infiltration testing may be required at the discretion of the Municipal Engineer if infiltration practices have not been adequately protected from compaction and sedimentation. Such tests shall be performed at the same locations and using the same methods as performed during the design phase. Failure to achieve the pre-construction soil infiltration levels will be cause for the Applicant to undertake corrective action as approved by the Municipal Engineer. No infiltration facilities will be approved by Elk Township where such constructed features fail to provide infiltration characteristics adequate for the approved design.

O. All areas designated for infiltration shall not receive runoff until the contributory drainage area has achieved final stabilization.

P. 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.

Q. 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.

R. All infiltration practices shall have appropriate positive overflow controls.

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

T. 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 non-woven 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 and cleanout of debris shall be provided in all facilities.

Section 307. Stream Channel Protection Requirements

For Regulated Activities involving New Development with one (1) 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 (2)-year, twenty-four (24)-hour design storm shall be reduced to the Predevelopment peak flow rate of the one (1)-year, twenty-four (24)-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 (1)-year, twenty-four (24)-hour storm flow shall be detained for a minimum of twenty-four (24) hours and a maximum not to exceed seventy-two (72) hours from a point in time when the maximum volume of water from the one (1)-year, twenty-four (24)-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 Predevelopment ground cover conditions shall be determined using the corresponding ground cover assumptions presented in Subsection 309.D of this Ordinance.

D. The minimum orifice size in the outlet structure to the BMP shall be three (3) 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 (24) hour attenuation with the three (3)-inch orifice, the calculations shall be submitted showing this condition.

E. When the calculated orifice size is less than three (3) inches and this orifice size is approved by the Municipal Engineer, gravel filters (or other methods) are recommended to discharge low-flow rates. 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.

Section 308. 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.

A. Post-construction peak flow rates from any Regulated Activity shall not exceed the Predevelopment peak flow rates as shown for each of the design storms specified in Table 308.1.

TABLE 308.1
Peak Rate Control Standards

(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)

POST-CONSTRUCTION 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
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 Subsection 309.D of this Ordinance.

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 twenty percent (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 308.1, using the Redevelopment Ground Cover Assumptions presented in Subsection 309.D.

D. Only the area of the proposed Regulated Activity shall be subject to the peak flow rate control standards of this Ordinance. 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 non-structural 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.

Section 309. Calculation Methodology

A. Stormwater runoff from all Regulated Activity Sites with a drainage area of greater than five (5) acres shall be calculated using a generally accepted calculation technique(s) that is based on the NRCS Soil Cover Complex Method. Table 309.1 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 (5) acres shall be permitted only upon approval by the Municipal Engineer.

TABLE 309.1

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	US 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 (5) acres, or as approved by the Elk Township.
Other Methods	Varies	Other computation methodologies approved by the Elk Township.

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 Ordinance. 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 twenty-four (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 Publication 584 (Drainage Manual). 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. 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 Ordinance), 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 Ordinance), 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 twenty percent (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 Ordinance.

b. Stormwater standards for Redevelopment shall apply to all proposed Regulated Activities that involve only Redevelopment activities as defined in this Ordinance.

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 Ordinance, may either:

i. Apply the stormwater standards (Redevelopment or New Development) that are associated with the activity that involves the greatest amount of land area; or

ii. Apply the Redevelopment and New Development stormwater standards to the corresponding Redevelopment and New Development portions of the proposed Regulated Activity.

E. Runoff curve numbers (CN) for both Predevelopment and proposed (Post-construction) conditions to be used in the Soil Cover Complex Method shall be obtained from Table C-1 in Appendix C of this Ordinance.

F. Runoff coefficients (C) for both Predevelopment and proposed (Post-construction) conditions for use in the Rational Method shall be obtained from Table C-2 in Appendix C of this Ordinance.

G. Weighted averaging of runoff coefficients shall not be used for manual computations or input data for water quality and runoff volume calculations.

H. Hydraulic computations to determine the capacity of pipes, culverts, and storm sewers shall be consistent with methods and computations contained in PennDOT Publication 13M (Design Manual Part 2 - Highway Design) and Publication 584 (Drainage Manual). Values for Manning's roughness coefficient (n) shall be consistent with Table C-3 in Appendix C of the Ordinance.

I. 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).

Section 310. Retention and Detention Basin Design Standards

A. Retention basins shall be designed to create a healthy ecological community with sufficient circulation of water to prevent the growth of unwanted vegetation and mosquitoes.

B. Retention basins shall be of sufficient size to allow the appropriate aquatic community needed to maintain healthy pond ecology and avoid mosquitoes capable of carrying West Nile Virus and other diseases. Sediment storage volume equal to at least twenty percent (20%) of the volume of the permanent pool shall be provided.

C. The design of a retention basin shall include the determination of the proposed site's ability to support a viable permanent pool. The design shall take into account such factors as the available and required rate and quality of dry weather inflow, the stormwater inflow, seasonal and longer-term variations in ground water table, and impacts of potential pollutant loadings.

D. Detention basins are generally discouraged as a stormwater management practice and should only be used as a last resort where no other management facility is practical. Detention basins typically collect and quickly release runoff from a site in a manner that is contrary to the principles, goals and standards presented within this ordinance.

E. The maximum inside side slopes of detention basins shall not exceed four (4) horizontal to one (1) vertical (4:1).

F. For detention basins that are not to contain temporary standing water, the minimum required slope of the basin bottom is two percent (2%).

G. Basin inflow pipes and swales shall be separated from outlet structures to the greatest extent possible in order to maximize the flow path and flow time through the basin.

H. The discharge ends of basin inflow pipes shall be a minimum of twelve (12) inches above the basin floor (detention basins) or normal water surface elevation (retention basins).

I. Proper stabilization structures, such as stilling basins, energy dissipaters, level spreaders, and channel lining shall be constructed at the outlets of all basins and emergency spillways convert concentrated flow to uniform shallow sheet flow to reduce velocities of discharged water, prevent erosion, and direct water so that it does not adversely impact downstream activities.

J. Energy dissipaters and/or shall be installed that, to prevent erosion and minimize concentrated flow at points where pipes or drainage ways discharge to or from basins. Such facilities shall be both functional and harmonious with the surrounding environment; for example, native rock shall be used in constructing dissipaters, where practical.

K. Low flow channels constructed of concrete or asphalt are not permitted.

L. Outlet structures:

1. To minimize clogging and to facilitate cleaning and inspecting, outlet pipes for all basins with a drainage area of one (1) acre or more shall have an internal diameter of at least eighteen (18) inches and a minimum profile grade of one percent (1%).

2. Anti-seep collars shall be provided on all outlet pipes within a constructed berm.

3. All principal outlet structures shall be constructed using reinforced concrete with watertight construction joints, and shall have a minimum internal dimensions of four (4) feet.

4. The use of architecturally treated concrete, stucco, painted surface or stone facade treatment shall be considered for enhancing the outlet structure's appearance. Such facilities shall be both functional and harmonious in design with the surrounding environment.

5. Outlet structures shall include childproof non-clogging trash racks at all openings exceeding six (6) inches except those openings designed to carry perennial stream flows. Periodic cleaning of debris from trash racks shall be included in the Operation and Maintenance plan.

6. Outlet pipes shall be constructed of reinforced concrete with watertight gaskets.

7. Anti-vortex devices, consisting of a thin vertical plate normal to the basin berm, shall be provided at the top of all circular risers or stand pipes.

8. Outlet structures for all basins shall be designed to permit the basin to be completed drained to facilitate maintenance.

M. Any basin requiring a berm or earthen embankment shall have an emergency spillway to safely convey flow up to and including the 100-year storm. The height of embankment shall provide a minimum one (1.0) foot of Freeboard above the maximum pool elevation. Should any basin require a dam safety permit under Chapter 105 regulations, the facility shall be designed in accordance with Chapter 105 concerning dam safety. Chapter 105 may require the safe conveyance of storms larger than the 100-year event.

N. For all drainage areas of one (1) acre or more:

1. The discharge (or outfall pipe) as well as the emergency spillway, dam breast area, and water storage area shall be located at least twenty-five (25) feet from the tract boundary.

2. The minimum distance between a proposed discharge point (including the energy dissipater, etc.) and a downstream property boundary shall be greater than ten (10) feet.

3. Where there is discharge onto or through adjacent properties, the design shall address the protection of downstream properties from adverse impacts. The Municipal Engineer may require that the setback distances be increased based on factors such as topography, soil conditions, the size or location of structures, and discharge rates and volumes. A drainage easement through adjacent properties may also be required.

Section 311. Conveyance System Design Standards

A. Stormwater conveyance and collection systems of drainage inlets and manholes, pipes, channels, and swales shall be designed in accordance with PennDOT Publication 13M (Design Manual Part 2 - Highway Design), Publication 72M (Standards for Roadway Construction), Publication 584 (Drainage Manual), and Publication 408 (Highway Construction Specifications), latest editions.

B. Stormwater collection and conveyance systems shall be designed to convey a 25-year storm event without surcharging inlets or manholes, with a minimum freeboard of one (1) foot provided in all inlets and manholes.

C. The design of all stormwater conveyance and collection systems shall provide for the conveyance of flows from the 100-year storm event to BMPs.

D. Roadway culverts shall be designed in accordance with PennDOT Publication 13M (Design Manual part 2 - Highway Design), Publication 72M (Standards for Roadway Construction), Publication 584 (Drainage Manual), and Publication 408 (Highway Construction Specifications), latest editions.

E. Roadway culverts and bridges shall be designed to convey the 100-year storm event.

F. Single family residential driveway culverts shall be designed to convey the 10-year storm event.

G. Any stormwater facility located within or discharging to a PennDOT right-of-way shall be approved by PennDOT, in accordance with PennDOT standards for design, construction and maintenance, and PennDOT Highway Occupancy Permit requirements.

H. Inlets, Manholes, and Pipes

1. Swale inlets shall be placed at the swale center and shall be located a minimum of four (4) feet from the edge of the cartway.

2. Inlets shall be located at tangents on the uphill side of all street intersections.

3. Inlets and manholes shall be spaced at maximum intervals of 300 feet.

4. Inlets or manholes shall be provided at pipe junctions, where pipe sizes change, and wherever there is a change in pipe alignment or grade.

5. The location of all inlets shall be approved by the Municipal Engineer.

6. All storm sewer pipe materials in public roadways, private roadways and open space areas outside of roadways shall be constructed of reinforced concrete.

7. The minimum slope of all storm sewer pipe shall be 0.50%.

8. Open end pipes shall be finished with endwalls or end sections.

9. The minimum diameter of collection and conveyance pipes shall be eighteen (18) inches.

10. Where storm sewer pipes of unequal sizes meet at an inlet or manhole junction, the inside crown of the smaller pipe shall be at or above the inside crown of the larger pipe.

11. The outside crown of storm sewer pipes shall be a minimum depth of one (1) foot below the subgrade elevation of road pavements and curbs, and four (4) inches below the top of an inlet or manhole box (excluding the top unit, top slab, manhole rim, and inlet frame).

12. Storm sewer pipes shall be designed to produce a minimum velocity of 3.0 feet per second when flowing full, and a maximum velocity of 10.0 feet per second.

13. The ends of all storm sewer pipes shall be saw-cut, as needed, and not hammered or broken, and the ends shall be flush with the inside of inlet boxes, manholes and other structures.

14. Inlet and manhole adjustment risers shall be constructed of concrete, with pre-formed gasket seals to prevent water infiltration.

15. Inlets located at low points (such as sag vertical curves) shall be designed to accommodate the design storm overland flow to the inlet as well as all bypass flows from upstream inlets.

16. Modified inlet boxes shall be used when required in accordance with the PennDOT Roadway Construction Standards, latest edition. Pipes shall not be allowed to enter the corner of boxes

I. Channels and Swales

1. Open Vegetated Channels are conveyance systems that are engineered to also perform as water quality and infiltration practices. Such systems can be used for the conveyance, retention, infiltration and filtration of stormwater runoff.

2. Stormwater conveyance channels shall be designed to convey runoff from a 25-year, 24-hour storm event from all upstream contributory areas with one (1) foot of freeboard above the design water surface elevation. The design shall demonstrate that runoff from a 100-year, 24-hour storm will not encroach on any internal or external properties.

3. All vegetated swales and channels shall have maximum side-slopes of 4:1 (H:V), and shall include erosion control matting to prevent soil erosion and facilitate the rapid establishment of vegetation.

4. 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 Number 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.

5. Channels shall be designed to temporarily store the water quality volume within the system for a maximum period of 48 hours and a minimum period of one (1) hour.

6. Accumulated sediment within the channel bottom shall be removed when twenty-five (25%) of the original hydraulic volume has been reduced.

7. Check dams along the channel length may be warranted.

Section 312. Other Requirements

A. Roadway crossings or structures located within the Floodplain Conservation District as defined in the Elk Township Zoning Ordinance shall comply with all related requirements of said Ordinance.

B. Conveyance systems shall be designed to encourage infiltration and improve water quality, wherever practicable.

C. Use of grassed swales or open vegetated swales in lieu of curbing to convey, infiltrate and/or treat stormwater runoff from roadways is encouraged.

D. Street curbing for the purpose of stormwater collection and conveyance is discouraged. On streets that contain curbing, storm sewers shall be placed in front of the curbing.

E. Conveyance facilities draining to or discharging from stormwater management facilities (i.e. retention or detention basins) shall be designed to convey the design flow to and from the facilities.

F. Any BMP intended to hold standing water for four (4) days or longer shall be designed in accordance with Appendix D – West Virus Design Guidance.

G. All permanent structural stormwater BMP's providing stormwater control for other than a single residential lot shall be located within a defined drainage easement that allows access by Elk Township maintenance personnel and vehicles, in accordance with Operation and Maintenance Agreements. Access to all easements shall be provided from a public right-of-way.

H. Any drainage Conveyance facility and/or channel not regulated by PA Code, Title 25 (Environmental Protection), Chapter 105 (Dam Safety and Waterway Management), shall be designed to convey runoff from the 25-year storm event without damage to the drainage facility or roadway. Storms in excess of the 25-year storm event shall be safely conveyed in the direction of natural flow without adversely impacting any drainage facility, roadway, structure, or property.

I. Any facilities that constitute water obstructions (i.e. culverts, bridges, outfalls, or stream enclosures) and any work involving wetlands governed by Chapter 105 regulations shall be designed in accordance with Chapter 105 and associated PADEP permit requirements.

J. No property owner shall obstruct or alter the flow, location or carrying capacity of a stream, channel or drainage swale to the detriment of any other property owner, whether upstream or downstream, including the removal of plantings. All subdivision and/or land development plans containing streams, channels, drainage swales, storm sewers or other conveyance systems that cross property boundaries, existing or proposed, or whose discharge crosses such boundaries, shall contain a note so stating.

K. Any stormwater management facility located within or discharging to a PennDOT right-of-way shall be approved by PennDOT, in accordance with PennDOT standards for design, construction and maintenance, and PennDOT Highway Occupancy Permit requirements.

ARTICLE IV – STORMWATER MANAGEMENT (SWM) SITE PLAN REQUIREMENTS

Section 401. General Requirements

For any Regulated Activity, unless exempt per the provisions of Section 106:

A. Preparation and implementation of an approved SWM Site Plan is required.

B. No Regulated Activity shall commence until Elk Township issues written approval of a SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance 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 Elk Township.

D. The SWM Site Plan approved by Elk Township shall be on Site throughout the duration of the Regulated Activity.

Section 402. SWM Site Plan Contents

The SWM Site Plan shall consist of a general description of the project including items described in Section 304, 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 Elk Township 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 following items shall be included in the SWM Site Plan:

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 Elk Township prior to (or as a condition of) Elk Township'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:

i. PADEP Joint Permit Application,

ii. Chapter 105 (Dam Safety and Waterway Management),

iii. 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 Elk Township, and that a revised Erosion and Sediment Control Plan shall be submitted to, and approved by, the Conservation District or Elk Township (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 Elk Township Stormwater Management Ordinance".
>
> *[Note: include signature, printed name, date, discipline of professional license, and license stamp or embossed seal*]

B. Maps or Plan Sheets

Map(s) or plan sheets of the Site shall be submitted on minimum twenty-four (24)-inch by thirty-six (36)-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 Ordinance, 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 (1) inch equals two thousand (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 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 (1) inch equals no more than fifty (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 Subsection 301.P).

f. For the water bodies, streams and wetlands identified in Subsection 402.B.8.a, label or otherwise show the following attributes, if applicable:

   i. The Designated Use as determined by PADEP (25 PA Code Chapter 93);

   ii. Impairments listed on the PADEP "Integrated List" (as updated) and the listed source and cause of impairment;

   iii. Name, date, and target pollutant(s) for any approved Total Maximum Daily Load (TMDL); and

   iv. 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 (1) 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 (2) feet. In areas of slopes greater than fifteen (15) percent, five (5)-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 Elk Township Zoning Ordinance 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 –

   i. Location of existing well(s) on the project property and delineation of the(ir) recharge area(s) (if known), or a minimum fifty (50) foot diameter assumed recharge area;

ii. Location of existing well(s) within fifty (50) feet beyond the boundary of the project property boundary; and

o. Current FEMA one hundred (100)-year floodplain boundaries, elevations, and Floodway boundaries for any Special Flood Hazard Areas on or within one hundred (100) feet of the property.

p. Boundaries of Riparian Buffers as required by the Zoning Ordinance and the Subdivision and Land Development Ordinance.

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 Section 304.

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. Percent 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 absorption areas), and water supply lines within the Site and within fifty (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 (2) feet. In areas of steep slopes greater than fifteen (15) percent, five (5)-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:

        i. Boundaries labeled with distances shown in feet and bearings to the nearest degree;

        ii. Notes or other documentation, as needed, to grant Elk Township the right of access to all BMPs and Conveyances for the purposes of inspection and enforcement of the requirements of this Ordinance, and any applicable O&M Plans and O&M Agreements;

        iii. Notes or other documentation, as needed, to grant Elk Township the right of access to all roadways necessary to access all BMPs and Conveyances, where roadways are not to be dedicated to Elk Township;

        iv. 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 Elk Township, and other than the owner of the property on which the BMP or Conveyance is located;

v. A minimum ten (10)-foot wide perimeter (or other width as determined in consultation with the Municipal Engineer) around all BMPs and Conveyances;

vi. Sufficient vehicular ingress to and egress from a public right-of-way or roadway, as determined in consultation with the Municipal Engineer; and

vii. Accompanying notes or other documentation as needed, and in accordance with Article VII describing the type, purpose and total area of easements, who 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 402.B.8);

2. How the Site design achieves the requirements of Section 304, 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 Sections 301 through 312 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 Subsections 301.O and 301.R of this Ordinance.

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 Ordinance have been met, specifically including the requirements in Sections 301 and 304 through 309.

F. Inspections, Operation and Maintenance Requirements.

The following documents shall be prepared and submitted to Elk Township 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 Subsection 301.G and Article VII of this Ordinance.

G. An Erosion and Sediment Control Plan, where applicable, as prepared for and submitted to the Conservation District and/or Elk Township. A letter of adequacy from the Conservation District, if applicable, must be submitted to Elk Township prior to (or as a condition of) Elk Township's final approval of the SWM Site Plan.

H. A Highway Occupancy Permit from the PennDOT District 6-0 Office must be submitted to Elk Township prior to (or as a condition of) Elk Township's final approval of the SWM Site Plan when utilization of a PennDOT storm drainage system is proposed, or when any stormwater facility, BMP or Conveyance is to be located within or discharging to a PennDOT right-of-way.

Section 403. SWM Site Plan Submission

A complete SWM Site Plan that complies with all applicable provisions of Section 402 shall be submitted to Elk Township for review and approval, as follows:

A. The SWM Site Plan shall be coordinated with the applicable State and Federal permit process and (where applicable) the Elk Township 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 Elk Township must be submitted to Elk Township prior to (or as a condition of) Elk Township'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 the requirements of Elk Township.

D. The number of copies of the SWM Site Plan to be submitted by the Applicant for review shall be in accordance with the requirements of Elk Township.

E. The corresponding review fee shall be submitted to Elk Township simultaneously with the SWM Site Plan, per Elk Township's fee schedule.

F. Any submissions to Elk Township that are found to be incomplete shall not be accepted for review and shall be returned to the Applicant within seven (7) calendar days with a notification in writing of the specific manner in which the submission is incomplete.

G. Financial security, per the requirements of Section 110, shall be submitted to Elk Township prior to approval of the SWM Site Plan.

Section 404. SWM Site Plan Review

A. The SWM Site Plan shall be submitted to Elk Township for review by the Municipal Engineer for consistency with this Ordinance 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 Ordinance and the Elk Township SALDO provisions not otherwise superseded by this Ordinance.

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 Elk Township.

C. The Municipal Engineer will notify the Applicant and Elk Township in writing, within thirty (30) calendar days, whether the SWM Site Plan is consistent with the requirements of this Ordinance. 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 Elk Township.

    1. If the Municipal Engineer determines that the SWM Site Plan is consistent with this Ordinance, the Municipal Engineer shall forward a letter of consistency to Elk Township, who shall then forward a copy to the Applicant.

    2. Elk Township may approve the SWM Site Plan with conditions reasonably defined to make the SWM Site Plan compliant with the terms of this Ordinance, 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 Ordinance, the Municipal Engineer will forward a letter to Elk Township, with a copy to the Applicant citing the reason(s) and specific Ordinance 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 Ordinance. Any SWM Site Plans that are inconsistent or noncompliant may be revised by the Applicant and resubmitted in accordance with Section 406 when consistent with this Ordinance. Resubmission will commence a new municipal review and notification time period.

D. Elk Township will not grant final approval to any proposed subdivision, land development, or Regulated Activity specified in this Ordinance if the SWM Site Plan has been found to be inconsistent with this Ordinance.

E. All required permits from PADEP shall be obtained and submitted to Elk Township prior to (or as a condition of) final approval of any proposed subdivision, land development, or other Regulated Activity by Elk Township.

F. No building permits for any Regulated Activity will be approved by Elk Township if the SWM Site Plan has been found to be inconsistent with this Ordinance, as determined by the Municipal Engineer. All required permits from PADEP shall be obtained prior to issuance of a building permit.

G. Elk Township's approval of a SWM Site Plan shall be valid for a period not to exceed five (5) years commencing on the date that Elk Township 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 (5) year time period, then the Applicant may seek reinstatement of approval of the expired SWM Site Plan. If Elk Township 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 Section 406 of this Ordinance.

H. All or portions of the final approved SWM Site Plan shall be recorded (as "record plans") per the instructions of Elk Township.

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 Section 502 of this Ordinance.

Section 405. Revision of SWM Site Plans

A. A submitted SWM Site Plan under review by Elk Township shall be revised and resubmitted for any of the following reasons:

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.

The revised SWM Site Plan shall be resubmitted in accordance with Section 403 and subject to review as specified in Section 404 of this Ordinance.

B. A revision to an approved SWM Site Plan shall be submitted to Elk Township, accompanied by the applicable municipal review fee.

Section 406. 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 Elk Township in accordance with Section 403 of this Ordinance, distributed accordingly, and be subject to review as specified in Section 404 of this Ordinance. 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, AND FINAL AS-BUILT PLANS

Section 501. Performance and Inspection of Regulated Activities

A. All Regulated Activities and all activities controlled by this Ordinance shall be conducted, operated and maintained in accordance with the requirements set forth in Articles III, VII, and VIII of this Ordinance. When a SWM Site Plan is required by this Ordinance, 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 Elk Township 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 Ordinance 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 Elk Township.

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 Elk Township.

F. Elk Township or its designee may periodically inspect any permanent stormwater BMP, Conveyance or facility for compliance with this Ordinance, an approved O&M Plan, or an approved O&M Agreement, per the provisions of Article IX. Elk Township may inspect at any time if it has reason to believe a violation exists. Elk Township may pursue enforcement for violations consistent with the provisions of Article IX.

Section 502. Final As-Built Plans

A. For Regulated Activities involving one (1) acre or more of Earth Disturbance, the Applicant shall provide to Elk Township 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 Elk Township, Elk Township or its designee may review the As-Built Plans for consistency with this Ordinance, 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 Elk Township may conduct a final inspection, as per Subsection 501.D.

F. The As-Built Plans must be received, reviewed and determined to be acceptable by Elk Township prior to:

1. Close out of any associated Elk Township permit or other close out of the project by Elk Township;

2. Release of the financial security or other performance guarantee; and

3. Dedication of the stormwater facilities to Elk Township, or conveyance to a homeowners association, or other person responsible for operation, maintenance and repair, if applicable.

G. Final occupancy permit(s) or Use Permit or other final approval to use or operate the constructed improvement may not be issued by Elk Township until the final As-Built Plans have been accepted.

H. Upon final acceptance of the final As-Built Plans by Elk Township, the Applicant shall review and, if required by Elk Township, revise and re-record 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 by the Applicant if required by Elk Township.

ARTICLE VI – FEES AND EXPENSES

Section 601. Elk Township SWM Site Plan Review and Inspection Fees

Fees have been established by Elk Township, as may be modified by resolution of the Board of Supervisors or as otherwise allowed by law, to defray plan review and construction inspection costs incurred by Elk Township. All fees shall be paid by the Applicant at the time of SWM Site Plan submission.

Section 602. Expenses Covered by Fees

A. The fees required of the Applicant by this Ordinance shall at a minimum cover:

1. Administrative costs;

2. The review of the SWM Site Plan by Elk Township, the Municipal Engineer and other municipal consultants;

3. Coordination and meetings with the Applicant;

4. Visits to the Site in association with the review of the SWM Site Plan.

5. The construction inspections of erosion and sediment control measures, BMPs, Conveyances and other related improvements during construction;

6. Review of project communications, reports, and additional supporting information;

7. Other Site inspections;

8. The final inspection upon completion of the BMPs, Conveyances, and other stormwater management facilities and related improvements presented in the SWM Site Plan; and

9. Review of final As-Built Plan submission and revised calculations, and inspections as needed.

B. The Applicant shall also reimburse all expenses incurred by Elk Township for any additional work or municipal consultant fees required to enforce any permit provisions regulated by this Ordinance, correct violations, and ensure proper completion of remedial actions.

ARTICLE VII – OPERATION AND MAINTENANCE (O&M) RESPONSIBILITIES AND EASEMENTS

Section 701. General Requirements for Protection, Operation and Maintenance of Stormwater BMPs and Conveyances

The following shall apply to all Regulated Activities and other activities controlled by this Ordinance 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 Elk Township along with the SWM Site Plan. Elk Township may require an offer of dedication of such facilities as part of the requirements for approval of the SWM Site Plan. Such a requirement is not an indication that Elk Township will accept dedication of the facilities. Elk Township 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 Elk Township 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 Elk Township:

    1. An O&M Agreement shall be submitted to Elk Township 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, deed restrictions, or by dedication to Elk Township:

1. Permanent protection of the BMP or Conveyance from disturbance or alteration;

2. Right of entry and access for Elk Township for inspection and enforcement of this Ordinance (including Subsection 903.G) 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 Elk Township and is different from the owner of the property on which the BMP or Conveyance is located (such as may be applicable for Subsection 301.G of this Ordinance).

F. All O&M and other agreements, covenants, easements and deed restrictions shall:

1. Be submitted to Elk Township 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.

Section 702. 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 (2) 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 waste water facilities, sanitary sewers, and water lines within twenty (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 minimum ten (10)-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 who 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. Clean out 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 Elk Township's 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 Elk Township. The Landowner acknowledges that obligations may exist according to an approved Plan requiring satisfaction of the terms of that Plan*"

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. Every deed affected by any BMP shall include the language contained in Section 702.B.4

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 their inspections.

E. Language needed to fulfill the requirements of Subsections 705.B, 705.C, and 705.D of this Ordinance, including but not limited to a statement that expressly identifies that the then owner(s) of the land shall be responsible for the obligations and improvements shown in the Plan should the owner of the BMP identified in the Plan fail to satisfy all obligations and conditions contained in the Plan at any time. This obligation shall be a covenant running with the land.

F. The Elk Township Board of Supervisors may revise, amend and change the format/content for such plans from time to time by Resolution.

Section 703. 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 Elk Township, and the Agreement shall:

1. Be between the owner of the BMP or Conveyance and Elk Township, and shall be substantially the same as the sample O&M Agreement in Appendix E (Applicant to confirm O&M agreement content with Elk Township prior to submission);

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 Elk Township, 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 Elk Township for review prior to approval of the SWM Site Plan;

6. Upon approval by Elk Township, be signed by the designated owner of the BMP or Conveyance and submitted for signature by Elk Township; 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 Elk Township to be included in the O&M Agreement where determined necessary by Elk Township 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 Elk Township, revise and re-record 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.

D. All Agreements shall contain a statement that expressly identifies that the then owner(s) of the land shall be responsible for the obligations contained in the Agreement should the owner of the BMP identified in the O&M Plan fail to satisfy all obligations and conditions contained in said Plan at any time. This obligation shall be a covenant running with the land.

E. The Elk Township Board of Supervisors may revise, amend and change the format/content for all Agreements required by this Ordinance from time to time by Resolution.

Section 704. Easements and Deed Restrictions

A. Easements shall be established in connection with any Regulated Activity or any activity controlled by this Ordinance for all permanent BMPs and Conveyances that will not be dedicated to or otherwise owned by Elk Township, (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 ten (10)-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 Elk Township 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 Ordinance, or of any applicable O&M Plan or O&M Agreement; where roadways will not be dedicated to Elk Township, Elk Township 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 Elk Township 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 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, in 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 to be owned by a person other than Elk Township or the Landowner owning the parcel upon which a BMP or Conveyance is located, an easement agreement shall be prepared and executed between the Landowner and the owner of the BMP or Conveyance which shall:

1. Describe the ownership interests of all parties to the easement agreement, including the ownership of the BMP or Conveyance;

2. 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 qualified Licensed Professional;

3. Grant an easement from the Landowner to the owner of each BMP and Conveyance, establishing the right and obligation to occupy, access, inspect, operate, maintain, and repair the BMP or Conveyance;

4. Include a description of the purpose of the easement and the responsibilities of the parties involved;

5. Incorporate by reference or be recorded with, the corresponding O&M Plan and O&M Agreement;

6. Restrict the Landowner's use of the easement area of the parcel on which the BMP or Conveyance is located, consistent with the rights granted to the owner of the BMP or Conveyance;

7. Be submitted to Elk Township for review and approval prior to approval of the SWM Site Plan;

8. Upon approval by Elk Township, be signed by the owner of the BMP(s) or Conveyance(s) and the Landowner and submitted for signature by Elk Township;

9. Include language legally sufficient to ensure that the easement will run with the land affected by the easement and that the easement agreement is binding upon the parties to the easement agreement, their heirs, administrators, successors in interest and assigns, in perpetuity;

10. Contain additional provisions or information as required by Elk Township; and

11. When fully executed, be recorded by the Landowner at the Chester County Office of the Recorder of Deeds against all parcels affected by the terms of the easement agreement, within thirty (30) calendar days of Elk Township's approval of the corresponding O&M Plan.

C. For any area(s) shown on the SWM Site Plan sheets or As-Built Plan sheets as requiring, or area(s) that is otherwise determined to require, deed restriction(s) for the purpose of protecting and prohibiting disturbance to a BMP or Conveyance, such deed restrictions will be incorporated into a written deed, restrictive covenant, or equivalent document. The deed or other document shall:

1. Include a clear and understandable description of the purpose, terms and conditions of the restricted use;

2. Include the written legal description (metes and bounds description) of the area to which the restrictions apply that is consistent with the boundary shown on the O&M plan sheets and SWM Site Plan maps/plan sheets;

3. Make reference to any corresponding O&M Plan(s) and O&M Agreement(s);

4. Include language legally sufficient to ensure that the terms of the restriction run with the land and shall be binding upon the Landowner, its heirs, administrators, successors in interest, and assigns;

5. Be submitted to Elk Township for review and approval prior to approval of the SWM Site Plan;

6. Upon approval by Elk Township, be signed by the Landowner and owner of the BMP or Conveyance and submitted to Elk Township; and

7. Be fully executed and recorded at the Chester County Office of the Recorder of Deeds within thirty (30) calendar days of Elk Township's approval of the O&M Plan.

Section 705. Other Post-construction Responsibilities

A. The provisions of Section 804 of this Ordinance 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 ten (10) years. These records shall be submitted to Elk Township, if requested.

C. Upon final inspection, Elk Township shall inform the person responsible for the operation and maintenance whether the submission of periodic (annual or other frequency) inspection and maintenance reports will be required.

D. The owner of each BMP and Conveyance shall keep on file with Elk Township the name, address, and telephone number of the person responsible for maintenance activities and implementation of the O&M Plan. In the event of a change, new information shall be submitted by the BMP or Conveyance owner to Elk Township within thirty (30) calendar days of the change**.**

ARTICLE VIII – PROHIBITIONS

Section 801. Prohibited Discharges

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 Elk Township's separate storm sewer system or the Waters of the Commonwealth is prohibited.

B. No person shall allow, or cause to allow, discharges into Elk Township's separate storm sewer system or the Waters of the Commonwealth that are not composed entirely of stormwater, except:

1. As provided in Subsection 801.C below; and

2. Discharges allowed under a State or Federal permit.

C. The following discharges are authorized unless they are determined by Elk Township to be significant contributors to pollution to Elk Township's separate storm sewer system or to the Waters of the Commonwealth:

1. Discharges from fire-fighting activities;

2. Potable water sources including water line 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 Elk Township determines that any of the discharges identified in Section 801.C significantly contribute pollutants to Elk Township's separate storm sewer system or to the Waters of the Commonwealth, or is notified of such significant contribution of pollution by PADEP, Elk Township will notify the responsible person to cease the discharge.

E. Upon notice provided by Elk Township under Section 801.D, the discharger shall, within a reasonable time period, as determined by Elk Township 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.

Section 802. Prohibited Connections

The following connections are prohibited, except as provided in Section 801.C above:

A. Any drain or Conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge, including sewage, process wastewater, and wash water to enter a 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 Elk Township.

Section 803. Roof Drains and Sump Pumps

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. Shall not connect to streets, storm sewers, or roadside ditches; and

3. Shall be considered in stormwater management calculations to demonstrate that Conveyance and receiving facilities have adequate capacity.

Section 804. 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 which had been constructed pursuant to an approval by Elk Township without the written approval of Elk Township, unless the activity is part of an approved maintenance program.

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 Elk Township.

ARTICLE IX – ENFORCEMENT AND PENALTIES

Section 901. Public Nuisance

A. Any Regulated Activity and/or prohibited activity conducted in the violation of any provision of this Ordinance are 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 Ordinance found to have been violated.

D. To the extent that Elk Township does not enforce any provision of this Ordinance, such action or inaction shall not constitute a waiver by Elk Township of its rights of future enforcement hereunder.

Section 902. Right of Entry

A. Upon presentation of proper credentials, duly authorized officers or agents of Elk Township may enter at reasonable times upon any property within Elk Township 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 Ordinance.

B. Persons working on behalf of Elk Township shall have the right to temporarily locate on or in any BMP, Conveyance or other stormwater facility in Elk Township 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 Elk Township within seventy-two (72) hours of notification, verbal or written, is a violation of this Ordinance.

Section 903. Enforcement

A. The Municipal Engineer, Elk Township code enforcement official or other designee is hereby authorized and directed to enforce all of the provisions of this Ordinance. The Elk Township Board of Supervisors 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 Elk Township shall deem qualified for that purpose.

B. It shall be the responsibility of the Landowner of the real property on which any Regulated Activity or any other prohibited activity, jointly and/or severally with any other person, tenant, assignee, or entity in possession of any portion of the real property is proposed to occur, is occurring, or has occurred to comply with the applicable terms and conditions of this Ordinance.

C. All municipal inspections for compliance with the approved SWM Site Plan shall be the responsibility of Elk Township or its designee. The times and locations shall be at the Township's discretion.

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, Elk Township 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. The Landowner shall have the right of appeal to the Elk Township Board of Supervisors in accordance with Section 906 of this Ordinance upon notice of suspension or revocation of a permit or other approval.

E. In the event that the Municipal Engineer or other designee finds that a person has violated a provision of this Ordinance, or fails to conform to the requirements of any permit or approval issued by Elk Township, or any O&M Plan or O&M Agreement approved by Elk Township, Elk Township 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 the then estimated amount of money Elk Township determines necessary to cover administrative expenses, inspection and professional consultant expenses and remediation costs and/or forfeiture of financial security. Should the amount of financial security not satisfy the amount then necessary to satisfy these obligations, the individuals and entities described in Section 903.B. shall be responsible for the satisfaction of the then total amount necessary to comply with the notice and enforcement. This estimated amount shall be applied to the eventual total amount Elk Township incurs as a result of the failure to

comply with the terms of the notice to complete the corrective measures required, and the individuals and entities described in Section 903.B. shall ultimately be responsible for the satisfaction of this total amount;

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 Ordinance which have not been met, and establish a time limit for commencement of correction and completion of correction of the violations(s). The notice shall provide for a right of the Landowner's appeal to the Elk Township Board of Supervisors in accordance with Section 906 of this Ordinance. 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 Elk Township 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 Ordinance. All such penalties shall be deemed cumulative and shall not prevent Elk Township from pursuing any and all other remedies available in law or equity.

Section 904. Suspension and Revocation of Permits and Approvals

A. Any building, land development, or other permit or approval issued by Elk Township may be suspended or revoked by Elk Township 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 Ordinance 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 Elk Township.

B. Upon suspension or revocation of a permit or approval, the owner, person or entity in possession may not continue and/or commence any construction, alteration of structure(s), and/or activity which is subject to said permit or approval, and Elk

Township shall terminate any related permits, regardless of the status of completion of the project(s) included in such permit, including but not limited to building and/or use and occupancy permit, until such time as the as the terms and procedures of this Ordinance are satisfied.

C. A suspended permit or approval may be reinstated by Elk Township 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. Elk Township is satisfied that the violation has been corrected, and the Applicant has paid all costs and expenses incurred by Elk Township as a result of the suspended permit or approval, including but not limited to professional consultant fees.

D. A permit or approval that has been revoked by Elk Township cannot be reinstated. The Applicant may apply for a new permit or approval in accordance with this Ordinance.

Section 905. Penalties

A. Any person violating or permitting the violation of the provisions of this Ordinance shall be subject to a fine of not more than one thousand dollars ($1,000.00) for each violation, recoverable with costs. The establishment of a violation for purposes of setting fines or penalties for such violation shall be in accordance with a citation to a magisterial district judge with jurisdiction and venue over the location of the violation and such an action will be subject to the procedures provided for the enforcement of summary offenses under the Pennsylvania Rules of Criminal Procedure. A separate offense shall arise for each day or portion thereof a violation is found to exist and may be determined for each section of this Ordinance which is found to have been violated.

B. In addition, Elk Township may, through its solicitor, institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other legal or equitable forms of remedy or relief. Such relief may include costs, fees, and charges, including Elk Township's attorney's fees (charged at the hourly rate approved by the Board of Supervisors of Elk Township) and costs, as may be permitted by law.

C. Notwithstanding any other provision of this Ordinance, Elk Township shall have the right at any or all times deemed necessary by the Municipal Engineer or designee to enter upon any property within Elk Township to inspect and, upon determination of a violation of this Ordinance, to correct the violation, with all expenses associated with

correcting the violation to be charged to the property owner responsible for the violation.

Section 906. Appeals

A. Any person aggrieved by any action of the Municipal Engineer or other designee relative to the provisions of this Ordinance may appeal by submission of a written request to Elk Township's Board of Supervisors within thirty (30) days of that action. Upon receipt of such written request, the Elk Township Board of Supervisors shall schedule a hearing pursuant to public notice as is defined the MPC. All expenses of a hearing shall be the responsibility of the appellant in cases where the appellant is the recipient of a notice of violation or notice of suspension or revocation of a permit or other approval pursuant to Section 903. Such appellant shall submit payment for the estimated costs for such hearing along with the written request described herein, shall also pay all additional costs should the actual costs exceed the estimated payment and shall have the burden of going forward to demonstrate compliance with the Ordinance requirements and approved Plan. Submission of a written request described herein shall not absolve the appellant of the responsibility to take immediate corrective action whenever immediate danger or threat of such danger to life, public health or property has been identified by Elk Township or its designee, where applicable.

B. Any person aggrieved by any decision of Elk Township's Board of Supervisors relative to the provisions of this Ordinance may appeal to the County Court of Common Pleas in the County where the activity has taken place within thirty (30) days of the Elk Township decision.

Section 907. Effective Date

This Ordinance shall take effect five (5) days from the date of enactment.

APPENDIX A

SIMPLIFIED APPROACH TO STORMWATER MANAGEMENT FOR SMALL PROJECTS

Appendix A

Simplified Approach to Stormwater Management for Small Projects

Appendix A.1 –
Applicability, Submittal and Approval Requirements

Appendix A.2 –
"Simplified Approach to Stormwater Management for Small Projects – Handbook"

Appendix A.3 –
***"Simplified Approach – Stormwater Best Management Practices Operation, Maintenance and Inspection Plan and Agreement"* –**
Sample Agreement

Appendix A.1

Applicability, Submittal and Approval Requirements

Applicability:

- Small projects that involve 1,000 to 2,000 square feet of Proposed Impervious Surfaces and less than 10,000 square feet of proposed Earth Disturbance may apply the "Simplified Approach to Stormwater Management for Small Projects" (Simplified Approach).
- Only projects that meet the above size thresholds as specified in the Elk Township Stormwater Management Ordinance may use this Simplified Approach and are then not required to submit a formal Stormwater Management Site plan to Elk Township. However, these projects are still required to address water quality and infiltration requirements as outlined in this Simplified Approach "Handbook".
- Any project with more than 2,000 square feet of Proposed Impervious Surface or more than 10,000 square feet of proposed Earth Disturbance can NOT apply this Simplified Approach.
- The Applicant should first review the planned project with the Municipal Engineer 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 Elk Township Stormwater Management Ordinance (see Section 106.C of this 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 Municipal Engineer that would preclude the use of any of the techniques included in this Simplified Approach.

Submittal and Approval Requirements:

Use of the Simplified Approach requires:

- The applicant to submit the following to Elk Township for review and approval prior to beginning construction:

    - A Simplified Stormwater Management Site Plan (i.e. sketch plan) and accompanying Worksheet; and
    - A completed, signed and notarized "Simplified Operation, Maintenance and Inspection Plan and Agreement". The Applicant should contact Elk Township to verify acceptability of specific agreement content prior to submission.
- The first 1-inch of rainfall runoff from Proposed Impervious Surfaces (as defined by the Elk Township Stormwater Management Ordinance) must be captured and removed on the applicant's property.
- The Applicant to record a "Simplified Approach – Stormwater Best Management Practices Operation, Maintenance and Inspection Plan and Agreement" at the Chester County Office of the Recorder of Deeds after signature by the Municipality.
- A final inspection conducted by Elk Township after completion of construction.

Appendix A.2

Simplified Approach to Stormwater Management for Small Projects - Handbook

Simplified Approach to Stormwater Management for Small Projects

Handbook

prepared by:
Borton-Lawson Engineering, Inc.
3897 Adler Place
Bethlehem, PA 18017

Revised June 10, 2012

Further revised by:
URS Corporation
4051 Ogletown Road, Suite 300
Newark, DE 19713

for:
Elk Township
as part of the
County-wide Act 167 Stormwater Management Plan for Chester County, PA

Revised Date: **October 2013**

All revisions made by URS Corporation were completed without consultation with Borton-Lawson and were completed at the sole discretion of Elk Township

STORMWATER MANAGEMENT PROCEDURES FOR MEETING THE SIMPLIFIED APPROACH REQUIREMENTS

Introduction

This Handbook has been developed to allow homeowners or applicants for small projects to comply with stormwater management requirements of the Elk Township Stormwater Management Ordinance, including sizing, designing, locating and installing on-lot measures, referred to herein as "Best Management Practices" (BMPs). **Only projects that meet the total size thresholds specified in the Elk Township Stormwater Management Ordinance may use this Simplified Approach** and are then not required to submit a formal Stormwater Management Site plan to the Municipality. However, these projects are still required to address certain requirements, such as stormwater quality, infiltration, rate and volume management goals as outlined in this Simplified Approach Handbook.

Pennsylvania Act 167 (PA Stormwater Management Act) was authorized on October 4, 1978 (32 P.S., P.L. 864) and gave Pennsylvania Municipalities the power to regulate activities that affect flooding, streambank erosion, stormwater runoff and surface and groundwater quantity and quality. The Elk Township Stormwater Management Ordinance was prepared to comply with the PA Act 167 requirements and includes provisions allowing this Simplified Approach to be used for small projects as specified in the Ordinance.

If the guidelines presented in this Handbook are followed, the applicant may not require professional engineering services to comply with these stormwater management goals; however, any applicant is free to retain such services as needed. This Handbook is organized into five sections:

- **Section 1** presents descriptions of BMPs that can be considered for on-lot stormwater management.
- **Section 2** presents definitions of key terms.
- **Section 3** describes requirements and steps for using the simplified approach for designing a suitable BMP, and a description of what needs to be included on the simplified stormwater management (SWM) site plan (i.e. sketch plan).
- **Section 4** illustrates an example of how to obtain the size and dimensions of a BMP(s) for a sample project, complete a site plan, and prepare a worksheet.
- **Section 5** describes the requirements to be met for a "Simplified Approach Operation, Maintenance and Inspection Plan and Agreement".

The Simplified Approach requires:

- The applicant to submit the following to Elk Township for review and approval prior to beginning construction:
  - A Simplified Stormwater Management (SWM) Site Plan (i.e. sketch plan), and accompanying Worksheet, and
  - A completed and signed "Simplified Approach Operation, Maintenance and Inspection Plan and Agreement".
- The first 1-inch of rainfall runoff from proposed impervious surfaces (as defined by the Elk Township Stormwater Management Ordinance) must be captured and removed from the stormwater runoff leaving the applicant's property.
- The applicant to record the "Simplified Approach Operation, Maintenance and Inspection Plan and Agreement" at the Chester County Recorder of Deeds after signature by Elk Township and before starting construction.

The purpose of requiring effective stormwater management from small projects is to help reduce stormwater runoff in the community, to maintain groundwater recharge, to prevent degradation of surface and groundwater quality, and to otherwise protect water resources and public safety.

What needs to be submitted to Elk Township?

- ☐ Simplified Approach Worksheet (Table 4)
- ☐ Simplified SWM site plan (i.e. sketch plan), containing the features described in Section 3, Step 1.
- ☐ "Simplified Approach Operation, Maintenance and Inspection Plan and Agreement" must be signed, notarized and (after approval and signature by the Township) recorded at the Chester County Recorder of Deeds.

If the applicant is using a contractor to construct the project, the worksheet and sketch plan must be shared with the contractor to ensure the BMP(s) are properly installed.

1. 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 are taken directly from the PA Stormwater BMP Manual (December, 2006). Refer to the PA BMP Manual (latest version) which can be found on the PA Department of Environmental Protection's website.

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 to 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 either on the surface or underground. Figures 1 and 2 show examples of rain barrels and cisterns, respectively, which could be used to manage stormwater from a project. 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 in the container between storm events in order for the necessary storage volume to be available for the next storm.
- 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 of the storage container with an overflow pipe to divert flow away from structures once the storage containers are filled.
- Use screens to filter debris, and covers (lids) placed over the containers to prevent insects and debris from entering the storage chamber.
- 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 fully emptied before each storm. The tables contained in this Handbook were developed to account for the 25% increase in the required storage of a rain barrel or a cistern.

Source (picture on left): http://www.rfcity.org/Eng/Stormwater/YourProperty/YourProperty.htm
Source (picture on right): :http://www.floridata.com/tracks/transplantedgardener/Rainbarrels.cfm

Figure 1: Rain Barrels

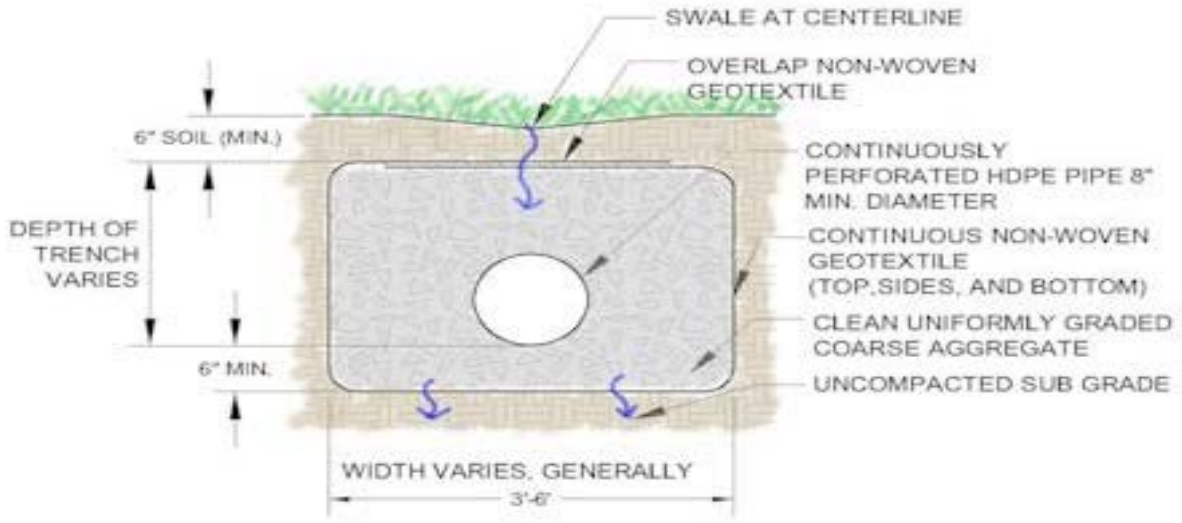
Source (for both pictures): Pennsylvania Stormwater BMP Manual (PADEP, 2006)

Figure 2: Cisterns

Infiltration Trench

An infiltration trench is a long, narrow, rock-filled trench, with or without a perforated pipe placed within the rock to distribute water evenly along the trench, that receives stormwater runoff, and has no outlet. 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 3 shows a typical cross-section of an infiltration trench configuration. Infiltration trenches shall incorporate or make provisions for the following elements:

- Unless otherwise approved by the Municipal Engineer, these facilities should be located a minimum of:
  - Fifteen (15) feet from the building foundation to avoid foundation seepage problems, and are not recommended if their installation would create a risk of flooding other structures constructed at or below grade.
  - Ten (10) feet from any property lines, easements, or rights-of-way.
  - Fifty (50) feet from water supply wells
  - Twenty (20) feet from any sewage system component.
- Installation of an infiltration trench cannot cause earth disturbance within fifty (50) feet from a perennial or intermittent stream, wetland or waterbody. Protecting this area from disturbance along the aforementioned features helps protect the applicant's land from erosion, the flood carrying capacity of streams, and the water quality of the waterbody. Where the applicant cannot meet the 50-foot non-disturbance width, the applicant should work with the Municipal Engineer to determine if a reduced width is acceptable, however a minimum of at least a 10 foot non-disturbance area width should be maintained in all cases.
- These facilities should not be located near stormwater Hotspots (refer to B.2 Definitions).
- Perforated pipe placed within the rock is to be set level.
- The width is limited to between **3 to 8 feet**, and the depth ranges from **2 to 5 feet**.
- Trench should be wrapped in nonwoven geotextile (top, sides, and bottom).
- There should be a positive overflow that allows stormwater that cannot be stored or infiltrated to be discharged into a nearby vegetated area.
- Roof downspouts may be connected to infiltration trenches, but should contain a cleanout to collect sediment and debris before entering the infiltration area.
- Infiltration testing is recommended 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 should be at least The infiltration trench should be located so that it presents no threat to sub-surface structures such as building foundations and basements.
- Protect infiltration areas from compaction by heavy equipment during and after construction.
- Infiltration trenches should be constructed after all earth disturbance associated with a given project or site 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 should be as small as possible with a ratio of less than 5:1 preferred.



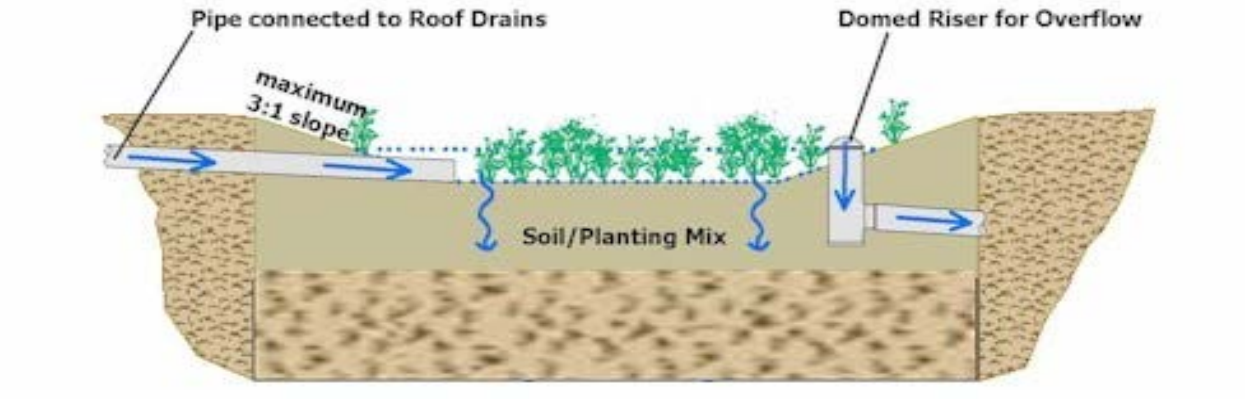
Source: Pennsylvania Stormwater BMP Manual (PADEP, 2006)

Figure 3: Cross-Section of Typical Infiltration Trench

Rain Garden/Bioretention Area

A Rain Garden (Bioretention 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. Bioretention improves water quality, with the vegetation planted in the facility filtering the water, and the root systems encouraging or promoting infiltration. Figure 4 shows a cross-section of a typical rain garden. Key elements of a rain garden include:

- Unless otherwise approved by the Municipal Engineer, these facilities should be located a minimum of:
  - Fifteen (15) feet from the building foundation to avoid foundation seepage problems, and are not recommended if their installation would create a risk of flooding other structures constructed at or below grade.
  - Ten (10) feet from any property lines, easements, or rights-of-way.
  - Fifty (50) feet from water supply wells
  - Twenty (20) feet from any sewage system component.
- Installation of a rain garden cannot cause earth disturbance within fifty (50) feet from a perennial or intermittent stream, wetland or waterbody. Protecting this area from disturbance along the aforementioned features helps protect the applicant's land from erosion, the flood carrying capacity of streams, and the water quality of the waterbody. Where the applicant cannot meet the 50-foot non-disturbance width, the applicant should work with the Municipal Engineer to determine if a reduced width is acceptable, however a minimum of at least a 10 foot non-disturbance area width should be maintained in all cases.
- These facilities should not be located near stormwater Hotspots (refer to B.2 Definitions).
- Recommended ponding depths not exceeding **1 foot**.
- Native vegetation that can tolerate dry and wet weather.
- An overflow area where, if the bioretention 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; however, where space is limited, 2:1 side slopes may be acceptable with approval from the municipal engineer.
- 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.



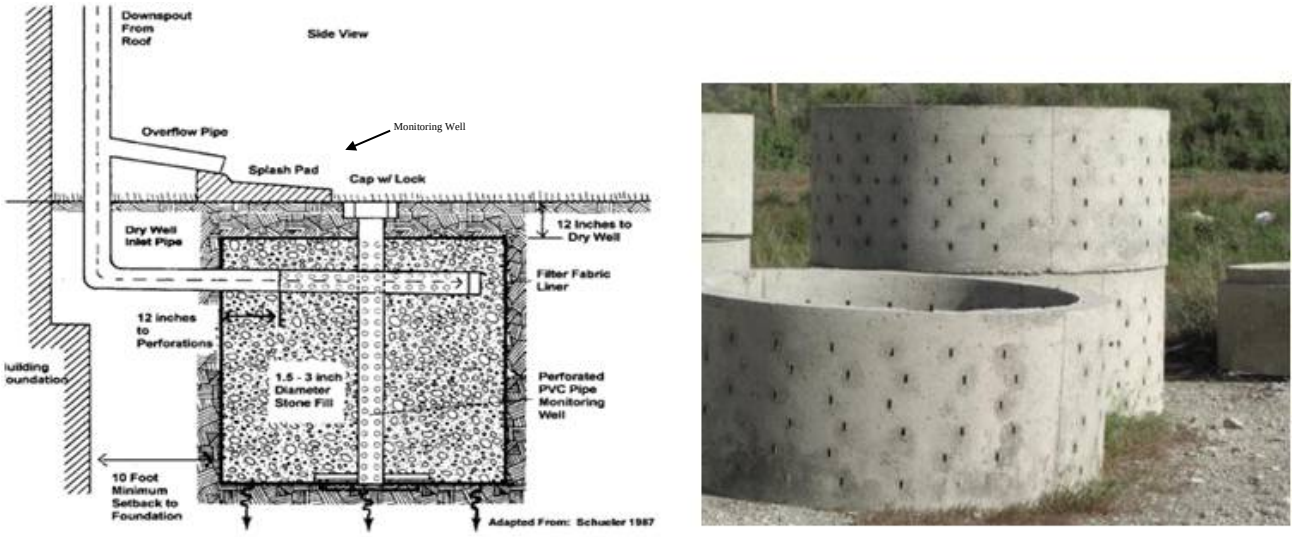
Source: Pennsylvania Stormwater BMP Manual (PADEP, 2006)

Figure 4: Cross-Section of Typical Rain Garden/Bioretention Area

Dry Wells

A dry well, also referred to as a seepage pit, is a subsurface storage facility that temporarily stores and infiltrates runoff from the roofs of buildings or other impervious surfaces. A dry well can be either a structural prefabricated chamber (Dry Well #1) or an excavated pit filled with stone fill (Dry Well #2). Dry Wells discharge the stored runoff via infiltration into the surrounding or underlying soils. Figure 5 shows a typical prefabricated dry well and a typical dry well configuration with stone fill. The following elements shall be incorporated into all dry well designs:

- Unless otherwise approved by the Municipal Engineer, these facilities should be located a minimum of:
  - Fifteen (15) feet from the building foundation to avoid foundation seepage problems, and are not recommended if their installation would create a risk of flooding other structures constructed at or below grade.
  - Ten (10) feet from any property lines, easements, or rights-of-way.
  - Fifty (50) feet from water supply wells
  - Twenty (20) feet from any sewage system component.
- Installation of a dry well cannot cause earth disturbance within fifty (50) feet from a perennial or intermittent stream, wetland or waterbody. Protecting this area from disturbance along the aforementioned features helps protect the applicant's land from erosion, the flood carrying capacity of streams, and the water quality of the waterbody. Where the applicant cannot meet the 50-foot non-disturbance width, the applicant should work with the Municipal Engineer to determine if a reduced width is acceptable, however a minimum of at least a 10 foot non-disturbance area width should be maintained in all cases.
- These facilities should not be located near stormwater Hotspots (refer to B.2 Definitions).
- Dry well should be constructed after all earth disturbance associated with a given project or site is stabilized to avoid clogging.
- During construction, compaction of the subgrade soil in the bottom of the dry well should be avoided, and construction should be performed only with light machinery.
- For Dry Well #2 designs, the depth of dry well should be between **1.5 feet to 4 feet**. Gravel fill should consist of uniformly graded stone with an average diameter of between one and one half and two (1.5 –2.0) inches with the gravel fill wrapped in a nonwoven geotextile to separate the stone fill from the surrounding soil.
- At least 1 foot of soil must be placed over the top of the dry well.
- Dry wells should be inspected at least four (4) times annually as well as after large storm events.
- Dry wells should have overflow pipes to allow high volumes of runoff to overflow the facility and flow into a connected infiltration area, pervious area, or other connected storm sewer designed to receive the excess runoff.
- Every dry well must have at least one monitoring well to assist in the inspection of the dry well to determine how much water is retained within the well during dry weather periods.
- Infiltration testing is recommended to ensure the underlying soil is capable of infiltrating the needed volume of stormwater.



Source (for picture on left): http://www.seagrant.sunysb.edu/pages/BMPsForMarinas.htm
Source (for picture on right): http://www.copelandconcreteinc.net/1800652.html

Figure 5: Typical Dry Well Configuration filled with Stone Fill (DRY WELL #2) (Left) and Structural Prefabricated Chamber (DRY WELL #1) (Right)

2. Definitions

These definitions apply only to this Simplified Approach to Stormwater Management for Small Projects Handbook. The definitions included in the Elk Township Stormwater Management Ordinance also apply.

Best Management Practice (BMP) – As defined in the Elk Township Stormwater Management Ordinance, but generally including activities, facilities, designs, measures or procedures used to manage stormwater impacts from land development and earth disturbance activities to meet stormwater quality, runoff control and groundwater recharge protection requirements. BMPs include, but are not limited to, a wide variety of practices and devices such as: infiltration facilities (dry wells and infiltration trenches), filter strips, low impact design, bioretention (rain gardens), permeable paving, grassed swales, and manufactured devices (cisterns and rain barrels). Structural stormwater BMPs are permanent appurtenances to the project site.

Geotextile - A fabric manufactured from synthetic fibers which provides a separation between different types of media (i.e., soil and stone), and is used to achieve specific objectives, including infiltration or filtration.

Hotspot - Areas where land use or activities generate highly contaminated runoff, with concentrations of pollutants that are higher than those that are typically found in stormwater (e.g. vehicle salvage yards, recycling facilities, vehicle fueling stations, fleet storage areas, vehicle equipment and cleaning facilities, and vehicle service and maintenance facilities).

Impervious Surface - As defined in the Township's Stormwater Management Ordinance, but generally including any surface that prevents the infiltration of water into the ground. Impervious surfaces generally include, but are not limited to, streets, sidewalks, pavements, driveway areas, or roofs. The applicant should review the Stormwater Management Ordinance and if needed consult with the Municipal Engineer to confirm what components of the proposed project are considered "impervious surfaces". Compacted soils or stone surfaces (such as for vehicle movement or parking), among other features, are included in the definition of "impervious surfaces".

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

Low Impact Development - A land development and construction approach that uses various land planning, design practices, and technologies to simultaneously conserve and protect natural resource systems, and reduce infrastructure costs.

Percent Void Volume – The volume of void space, expressed as a percentage, of the total volume of the storage facility (void volume + volume of solid materials providing structural support for the storage facility).

Pervious Surface - Any area not defined as impervious surface.

Potable – A water supply that is either absent of contaminants or contains contaminant levels that are below a given threshold level that makes the water as suitable for drinking.

Runoff - Any part of precipitation that flows over the land surface.

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

3. Steps for Using the Simplified Approach

All proposed impervious areas (as defined by the Elk Township Stormwater Management Ordinance) must be included in the determination of the amount of new impervious areas and the size of proposed BMPs needed to manage stormwater. Proposed impervious areas on an individual residential lot generally include, but are not limited to: roof area, pavement, sidewalks, driveways, patios, porches, permanent pools, or parking areas, etc. See the definitions provided in Section 2 and check with the Municipal Engineer to confirm what features of the proposed project must be included in the calculation of new impervious areas. Sidewalks or patios that are constructed with gravel or pervious pavers and will not be disturbed or altered in the future may not need to be included in this calculation (check with the Municipal Engineer). In these cases, the amount of proposed impervious area may be reduced for proposed patios, and sidewalks through the use of gravel, pervious pavement, and turf pavers. All proposed impervious areas must be constructed so that runoff is conveyed to a BMP(s); no runoff may be directed to storm sewers, inlets or other impervious areas (i.e. street) without effective stormwater management from a site.

In addition, the use of low impact development is recommended to further minimize the effect of the new construction on water, land, and air. Low impact development is a method of development that incorporates design techniques that include: minimizing the amount of land disturbance, reducing the amount of impervious cover, disconnecting gutters and directing stormwater runoff to vegetated areas to infiltrate, and redirecting the flow of stormwater runoff from impervious surfaces to vegetated areas instead of the street or gutter.

All individuals planning on using the Simplified Approach are encouraged to review the planned project with the Municipal Engineer prior to initiating the Simplified Approach to confirm the following:

- That the proposed project is not otherwise exempt from the stormwater management control and engineered Stormwater Management Site Plan requirements of the Elk Township Stormwater Management Ordinance;
- That the proposed project size is within the range eligible to use this Simplified Approach;
- To determine which components of the proposed project must be included in the calculation of “impervious areas”; and
- Whether any local conditions are known to the Municipal Engineer that would preclude the use of any of the techniques included in this Simplified Approach.

The steps that must be undertaken to meet the Ordinance requirements follow. Tables 1 through 3 are provided after these steps to assist with required calculations. The size and description of the proposed construction as well as important aspects related to the design of the BMP(s) must be documented in the Simplified Approach Worksheet found in Table 4 at the end of this section.

Step 1 - Prepare the Simplified SWM Site Plan (i.e. sketch plan) that includes:

- Name and address of the owner of the property, and name and address of individual preparing the plan (if different than the property owner), along with the date of submission.
- Location of all existing structures including buildings, driveways, and roads within fifty (50) feet of the project site.
- Location of proposed structures, driveways, or other paved areas with approximate size in square feet.
- Location of property lines, easements, and rights-of-way.
- Location, and distance, of any existing surface water features, such as streams, lakes, ponds, wetlands or other natural waterbodies, within fifty (50) feet of the project site and/or BMPs.
- Location, orientation, and dimensions of all proposed BMPs. For all rain gardens/bioretention, infiltration trenches, and dry wells the length, width, and depth must be included on the plan. For rain barrels or cisterns the volume must be included.
- Location of any existing or proposed on-lot septic system and potable water wells showing proximity to the proposed BMP(s). See Section 1, Description of BMPs, for the appropriate setbacks for on-lot septic systems and potable water wells.

Step 2 –Determine the Impervious Area to be Managed

- Determine the total area of all proposed impervious surfaces that will need to drain to one or more BMP(s).
- Also determine the total area for proposed earth disturbance to complete the project and install the BMP(s). The total earth disturbance to complete a project is often greater than the project area to allow for access from construction vehicles, stock piling of materials and excavation. The total area of earth disturbance must account for all of the construction activities necessary to construct the project.
- Determine locations where BMP(s) need to be placed so that the appropriate amount of stormwater runoff from the proposed impervious surfaces can be captured and managed.

Step 3 – Select the BMP(s) to be Used and Determine Appropriate Sizing Criteria

- Select the BMP(s) to be used and determine the requirements of each from Section 1, Description of BMPs.
  - For instance, the back half of a garage may drain to a rain barrel and the front half of the garage and a driveway may drain to a bioretention area. Each BMP will be sized differently, manage stormwater runoff and will need to be designed to be consistent with Section 1.
- Then obtain the required storage volume and surface area needed for each of the proposed BMP(s) from the appropriate heading below.
- Complete Table 4 Simplified Approach Worksheet.

For Rain Barrels/Cisterns:

Step 3A –Select the proposed impervious area value in Column 1 of Table 1 that is closest to, but not less than the determined value.

Step 3B – Determine the volume that needs to be provided in cubic feet and gallons to satisfy the volume requirements using Columns 2 and 3 in Table 1.

For Rain Gardens/Bioretention or Dry Well #1:

Step 3A – Select the proposed impervious area value in Column 1 of Table 2 that is closest to, but not less than the determined value.

Step 3B - Determine the volume that needs to be provided in cubic feet to satisfy the volume requirements using Column 2 in Table 2.

Step 3C – Using the value from Column 2 determined above, and the depth (D) of the proposed BMP, simply determine the surface area needed from Column 3 of Table 2.

Note: The arrows under Column 3 in Table 2 indicate which range of depths is appropriate for each BMP. To determine the depth based on the area, select an area that corresponds to the required volume, and is closest to, but not more than the area to be used. To determine the area based on the depth, select a depth that is closest to, but not less than the depth that is to be used.

For Infiltration Trench or Dry Well #2:
Step 3A – Select the proposed impervious area value in Column 1 of Table 3 that is closest to, but not less than the determined value.

Step 3B - Determine the volume that needs to be provided in cubic feet to satisfy the volume requirements using Column 2 in Table 3.

Step 3C – Using the value from Column 2 determined above, and the depth (D) of the proposed BMP, simply determine the surface area needed from Column 3 of Table 3.

Note: The arrows under Column 3 in Table 3 indicate which range of depths is appropriate for each BMP. To determine the depth based on the area, select an area that corresponds to the required volume, and is closest to, but not less than the area to be used. To determine the area based on the depth, select a depth that is closest to, but not less than the depth that is to be used.

Step 4 – Submit the final SWM Site Plan, Simplified Approach Worksheet, and "Simplified Approach Operation, Maintenance and Inspection Plan and Agreement" to Elk Township for review and approval. Once approved by the Township, the "Simplified Approach Operation,

Maintenance and Inspection Plan and Agreement" must be signed and notarized. After the Township has signed the "Simplified Approach Operation, Maintenance and Inspection Plan and Agreement", record the Agreement at the Chester County Office of Recorder of Deeds. Construction can begin only after the Township has issued its approval of the proposed project to the applicant, including agreement signatures and recordation.

Table 1: Simplified Approach - Calculating Rain Barrel/Cistern Storage Volume for 1" Rainfall[1]

Column 1	Column 2	Column 3	
Proposed Impervious Area[2] (square feet)	**Volume of Rain Barrel/Cistern[3] (cubic feet)**	**Volume of Rain Barrel/Cistern (gallons)**	
I	V_{RBcf}	V_{RBgal}	
Sum of all Proposed Impervious Areas	$(1*(1/12)*I)/0.75=V_{RBcf}$	$V_{RBcf} * 7.48=V_{RBgal}$	
50	6	42	
100	11	83	
150	17	125	**Rain Barrel**
200	22	166	
250	28	208	
300	33	249	
350	39	291	
400	44	332	
450	50	374	
500	56	416	
550	61	457	**Cistern**
600	67	499	
650	72	540	
700	78	582	
750	83	623	
800	89	665	
850	94	706	
900	100	748	
950	106	790	
1,000	111	831	

1. The typical volume of a rain barrel is between 50-200 gallons, so more than one rain barrel may be needed. Larger volumes may require a cistern.
2. Rain barrel/cistern use may be considered for larger impervious areas than those shown but the required volume in such cases may render these as an impractical BMP.
3. It is assumed that the rain barrel/cistern is 25% full prior to receiving runoff.

Table 2: Simplified Approach - Calculating Rain Garden/Bioretention and Dry Well #1 Storage Volume and Surface Area for 1 Inch Rainfall

Column 1	Column 2	Column 3							
Total Proposed Impervious Area (square feet)	**Volume of Rain Garden/ Bioretention or Dry Well #1[1] (cubic feet)**	**Surface Area of Rain Garden/Bioretention or Dry Well #1** Acceptable Depths for Each BMP are indicated by the arrows below **(square feet)**							
		Area Required for a Depth(D) of 0.5'	*Area Required for a Depth(D) of 1.0'*	*Area Required for a Depth(D) of 1.5'*	*Area Required for a Depth(D) of 2.0'*	*Area Required for a Depth(D) of 2.5'*	*Area Required for a Depth(D) of 3.0'*	*Area Required for a Depth(D) of 3.5'*	*Area Required for a Depth(D) of 4.0'*
		Rain Garden /Bioretention (0.5'-1.0')		**Dry Well #1 (1.5'-4.0')**					
I	V	*A(sf)*							
Proposed Impervious Areas	1*(1/12)**I*= V	V/D=A							
100	8	17	8	6	4	3	3	2	2
150	13	25	13	8	6	5	4	4	3
200	17	33	17	11	8	7	6	5	4
250	21	42	21	14	10	8	7	6	5
300	25	50	25	17	13	10	8	7	6
350	29	58	29	19	15	12	10	8	7
400	33	67	33	22	17	13	11	10	8
450	38	75	38	25	19	15	13	11	9
500	42	83	42	28	21	17	14	12	10
550	46	92	46	31	23	18	15	13	11
600	50	100	50	33	25	20	17	14	13
650	54	108	54	36	27	22	18	15	14
700	58	117	58	39	29	23	19	17	15
750	63	125	63	42	31	25	21	18	16
800	67	133	67	44	33	27	22	19	17
850	71	142	71	47	35	28	24	20	18
900	75	150	75	50	38	30	25	21	19
950	79	158	79	53	40	32	26	23	20
1000	83	167	83	56	42	33	28	24	21
1050	88	175	88	58	44	35	29	25	22
1100	92	183	92	61	46	37	31	26	23
1150	96	192	96	64	48	38	32	27	24
1200	100	200	100	67	50	40	33	29	25
1250	104	208	104	69	52	42	35	30	26
1300	108	217	108	72	54	43	36	31	27
1350	113	225	113	75	56	45	38	32	28
1400	117	233	117	78	58	47	39	33	29
1450	121	242	121	81	60	48	40	35	30
1500	125	250	125	83	63	50	42	36	31
1550	129	258	129	86	65	52	43	37	32
1600	133	267	133	89	67	53	44	38	33
1650	138	275	138	92	69	55	46	39	34
1700	142	283	142	94	71	57	47	40	35
1750	146	292	146	97	73	58	49	42	36
1800	150	300	150	100	75	60	50	43	38
1850	154	308	154	103	77	62	51	44	39
1900	158	317	158	106	79	63	53	45	40
1950	163	325	163	108	81	65	54	46	41
2000	167	333	167	111	83	67	56	48	42

1. It is assumed that the rain garden/bioretention or the dry well #1 are empty prior to receiving runoff (i.e. 0% full)

Table 3: Simplified Approach - Calculating Infiltration Trench and Dry Well #2 Storage Volume and Surface Area for 1 Inch of Rainfall

Column 1	Column 2	Column 3							
Total Proposed Impervious Area (square feet)	**Volume of Infiltration Trench or Dry Well #2[1] (cubic feet)**	**Surface Area of Infiltration Trench or Dry Well #2** Acceptable Depths for Each BMP are indicated by the arrows below **(square feet)**							
		Area Required for a Depth(D) of 1.5'	*Area Required for a Depth(D) of 2.0'*	*Area Required for a Depth(D) of 2.5'*	*Area Required for a Depth(D) of 3.0'*	*Area Required for a Depth(D) of 3.5'*	*Area Required for a Depth(D) of 4.0'*	*Area Required for a Depth(D) of 4.5'*	*Area Required for a Depth(D) of 5.0'*
		Dry Well #2 (1.5'-4.0')					**Infiltration Trench (2.0'-5.0')**		
I	V	*A(sf)*							
Proposed Impervious Area	(1*(1/12)**I*)/ (0.4)[1] =V	V/D=A							
100	21	14	10	8	7	6	5	5	4
150	31	21	16	13	10	9	8	7	6
200	42	28	21	17	14	12	10	9	8
250	52	35	26	21	17	15	13	12	10
300	63	42	31	25	21	18	16	14	13
350	73	49	36	29	24	21	18	16	15
400	83	56	42	33	28	24	21	19	17
450	94	63	47	38	31	27	23	21	19
500	104	69	52	42	35	30	26	23	21
550	115	76	57	46	38	33	29	25	23
600	125	83	63	50	42	36	31	28	25
650	135	90	68	54	45	39	34	30	27
700	146	97	73	58	49	42	36	32	29
750	156	104	78	63	52	45	39	35	31
800	167	111	83	67	56	48	42	37	33
850	177	118	89	71	59	51	44	39	35
900	188	125	94	75	63	54	47	42	38
950	198	132	99	79	66	57	49	44	40
1000	208	139	104	83	69	60	52	46	42
1050	219	146	109	88	73	63	55	49	44
1100	229	153	115	92	76	65	57	51	46
1150	240	160	120	96	80	68	60	53	48
1200	250	167	125	100	83	71	63	56	50
1250	260	174	130	104	87	74	65	58	52
1300	271	181	135	108	90	77	68	60	54
1350	281	188	141	113	94	80	70	63	56
1400	292	194	146	117	97	83	73	65	58
1450	302	201	151	121	101	86	76	67	60
1500	313	208	156	125	104	89	78	69	63
1550	323	215	161	129	108	92	81	72	65
1600	333	222	167	133	111	95	83	74	67
1650	344	229	172	138	115	98	86	76	69
1700	354	236	177	142	118	101	89	79	71
1750	365	243	182	146	122	104	91	81	73
1800	375	250	188	150	125	107	94	83	75
1850	385	257	193	154	128	110	96	86	77
1900	396	264	198	158	132	113	99	88	79
1950	406	271	203	163	135	116	102	90	81
2000	417	278	208	167	139	119	104	93	83

1. Assumes a percent void volume of 40%

Table-4: Simplified Approach Worksheet

Name of Property Owner(s):					Date:
Name of Applicant(s) [if different than Owner(s)]:					
Contact Phone #: Email Address:					
Address of Project:					
Description of Project:					
☐ Met with Municipal Engineer to discuss proposed project. [insert date of meeting]					
Distance from earth disturbance to nearest surface water feature (stream, pond, wetland, etc.) (Circle one): 50 feet or less More than 50 feet					
☐ **Step 1**: Attach Simplified SWM Site Plan (i.e. sketch plan), per Section 3, Step 1					
Step 2: Determine the Impervious Area to be Managed					
	Total Proposed Impervious Area (square feet):				
	Total Earth Disturbance (square feet):				
Step 3: Select the BMP(s) to be Used and Appropriate Sizing Criteria					
	Rain Barrel or Cistern				
	Proposed Impervious Surface from Column 1 in Table 1	Volume from Column 3 in Table 1			
	Rain Garden/Bioretention or Dry Well #1				
	Proposed Impervious Surface from Column 1 in Table 2	Volume of BMP from Column 2 in Table 2	Area Dimensions of BMP - Column 3 in Table 2	Depth of BMP from Column 3 in Table 2	Types of Materials to be Used
	Infiltration Trench or Dry Well #2				
	Proposed Impervious Surface from Column 1 in Table 3	Volume of BMP from Column 2 in Table 3	Area Dimensions of BMP - Column 3 in Table 3	Depth of BMP from Column 3 in Table 3	Types of Materials to be Used
☐ **Step 4**: Complete, Sign & have Operation, Maintenance and Inspection Plan and Agreement Notarized and Recorded at the County Recorder of Deeds (when signed by Municipality)					

Note: For additional BMPs, use additional sheet(s).

4. Example

Simplified Approach to Stormwater Management for a Residential Garage and Driveway addition

Joe Homeowner wants to build a 400 square foot garage, and a 720 square foot (40′ long x 18′ wide) impervious driveway that is graded so that the stormwater runoff drains to the grassy area along one edge of the driveway. (An annotated excerpt from Table 1 is provided below as Figure 1 and an annotated excerpt from Table 3 is provided below as Figure 2 to outline the steps of this example. A completed Table 4 is provided as Figure 4).

STEP 1 – Make a sketch of the site plan as shown in Figure 3.

STEP 2 - Determine the total area of all proposed impervious surfaces to drain to each BMP:

Garage Roof (Front)	10 ft. x 20 ft.	=	200 sq. ft
Garage Roof (Rear)	10 ft. x 20 ft.	=	200 sq. ft.
Driveway	40 ft. x 18 ft.	=	720 sq. ft.

Total Proposed Impervious Surface			**1,120 sq. ft.**
Total Proposed Earth Disturbance Area			**2,500 sq. ft. (estimated)**

Note: If the driveway used pervious pavement (i.e. paving blocks), then the total impervious area would only be 400 square feet, and no stormwater management practices would need to control runoff from the project.

STEP 3 – Select the BMP(s) to be Used and Appropriate Sizing Criteria

Select a BMP or combination of BMPs from Section 1 to be used to satisfy the volume requirement. Determine the length, width, depth and other requirements for the BMPs in Section 1. A BMP needs to be placed to catch runoff from the back of the garage, and a BMP needs to be placed to capture runoff from the front of the garage and the driveway. Figure 3 shows the direction the runoff flows and the locations where the BMPs are to be placed.

Joe Homeowner would like to use a rain barrel (BMP #1) to capture the runoff from the rear of the garage and an infiltration trench (BMP #2) to capture runoff from the front of the garage and the driveway.

BMP #1 (Rain Barrel/Cistern) – Steps 3A and 3B - See Figure 1 on page 23

STEP 3A - Select the proposed impervious area value for BMP #1, the rain barrel or cistern, in Column 1 of Table 1 that is closest to, but not less than 200:

The value in Column 1 that is closest to but is not less than 200 is 200.

STEP 3B - Determine the volume that BMP #1 must be to satisfy the volume requirements using Columns 2 and 3 in Table 1:

The volume in gallons of the rain barrel/cistern to be used as BMP #1, assuming the rain barrel/cistern is 25% full, is determined by finding the value in Column 3 for the same row that corresponds to the impervious area value determined in Step 1. Therefore, the volume of BMP #1, the rain barrel/cistern must be ≥ 166 gallons. Depending on the size of the rain barrel(s), a combination of rain barrels could be used in succession, or a cistern could be used.

BMP #2 (Infiltration Trench) - Steps 3A through 3C – See Figure 2 on Page 24

STEP 3A - Select the proposed impervious area value for BMP #2, the infiltration trench, using Column 1 in Table 3:

Find the row in Column 1 that is closest to but not less than 920 (200 from the front of the garage + 720 from the driveway). Therefore, the value selected is 950.

STEP 3B - Determine the volume that BMP #2, the infiltration trench must be to satisfy the volume requirements using Column 2 in Table 3:

The volume of the infiltration trench to be used as BMP #2, assuming a percent void volume of 40%, is determined by finding the value in Column 2 that is in the same row as 950 square feet from Column 1. Therefore, the volume of BMP #2 must be 198 cubic feet.

STEP 3C - Utilizing the value from Column 2 determined above, and the surface area that the proposed BMP will occupy, determine the depth needed using Column 3 in Table 3:

Joe Homeowner would like to place the infiltration trench along the edge of the driveway so it would have a length of 20 feet. The smallest width that can be used, as stated in the infiltration trench requirements in Section 1, is 3 feet. Therefore, the area of the infiltration trench is:

20 feet * 3 feet = 60 square feet

To find the minimum depth of the trench move toward the right side of the table from 198 cubic feet in Column 2 to Column 3, and find the column with a value of as close to but not more than 60 square feet, which is 57 square feet. Then obtain the minimum depth of the facility by reading the depth from the column heading at the top of the table. Therefore, the depth of the trench would need to be 3.5 feet.

Selected BMPs:
BMP #1: Rain barrel(s) that provides for at least 166 gallons, and
BMP #2: A 20′ long x 3′ wide x 3.5′ deep infiltration trench

Figure 1: Example – Calculating Storage Volume for Rain Barrel/Cistern using Table 1

Column 1	Column 2	Column 3	
Proposed Impervious Area (square feet)	**Volume of Rain Barrel/Cistern[1] (cubic feet)**	**Volume of Rain Barrel/Cistern (gallons)**	
I	V_{RBcf}	V_{RBgal}	
Sum of all Proposed Impervious Areas	$(1*(1/12)*I)/0.75=V_{RBcf}$	$V_{RBcf} * 7.48=V_{RBgal}$	
50	6	42	↑ Rain Barrel
100	11	83	
150	17	125	
Step 3A 200	22	**Step 3B** 166	↓
250	28	208	↑ Cistern
300	33	249	
350	39	291	
400	44	332	
450	50	374	
500	56	416	
550	61	457	
600	67	499	
650	72	540	
700	78	582	
750	83	623	
800	89	665	
850	94	706	
900	100	748	
950	106	790	
999	111	830	↓

[1]Assume that the rain barrel/cistern is 25% full

Figure 2: Example – Calculating Storage Volume Surface Area and Depth for Infiltration Trench Using Table 3

Column 1	Column 2	Column 3							
Total Proposed Impervious Area (square feet)	**Volume of Infiltration Trench or Dry Well #2[1] (cubic feet)**	**Surface Area of Infiltration Trench or Dry Well #2** Acceptable Depths for Each BMP are indicated by the arrows below **(square feet)**							
		Area Required for a BMP with a Depth(D) of 1.5'	*Area Required for a BMP with a Depth(D) of 2.0'*	*Area Required for a BMP with a Depth(D) of 2.5'*	*Area Required for a BMP with a Depth(D) of 3.0'*	*Area Required for a BMP with a Depth(D) of 3.5'*	*Area Required for a BMP with a Depth(D) of 4.0'*	*Area Required for a BMP with a Depth(D) of 4.5'*	*Area Required for a BMP with a Depth(D) of 5.0'*
						Infiltration Trench (2.0'-5.0')			
		Dry Well #2 (1.5'-4.0')							
I	V	*A(sf)*							
Sum of all Proposed Impervious Areas	$(1*(1/12)*I)/(0.4)^1 = V$	V/D=A							
50	10	7	5	4	3	3	3	2	2
100	21	14	10	8	7	6	5	5	4
150	31	21	16	13	10	9	8	7	6
200	42	28	21	17	14	12	10	9	8
250	52	35	26	21	17	15	13	12	10
300	63	42	31	25	21	18	16	14	13
350	73	49	36	29	24	21	18	16	15
400	83	56	42	33	28	24	21	19	17
450	94	63	47	38	31	27	23	21	19
500	104	69	52	42	35	30	26	23	21
550	115	76	57	46	38	33	29	25	23
600	125	83	63	50	42	36	31	28	25
650	135	90	68	54	45	39	34	30	27
700	146	97	73	58	49	42	36	32	29
750	156	104	78	63	52	45	39	35	31
800	167	111	83	67	56	48	42	37	33
850	177	118	89	71	59	51	44	39	35
900	188	125	94	75	63	54	47	42	38
Step 3A 950	**Step 3B** 198	132	99	79		**Step 3C** 57	49	44	40
999	208	139	104	83		59	52	46	42

[1] Assumes a percent void volume of 40%

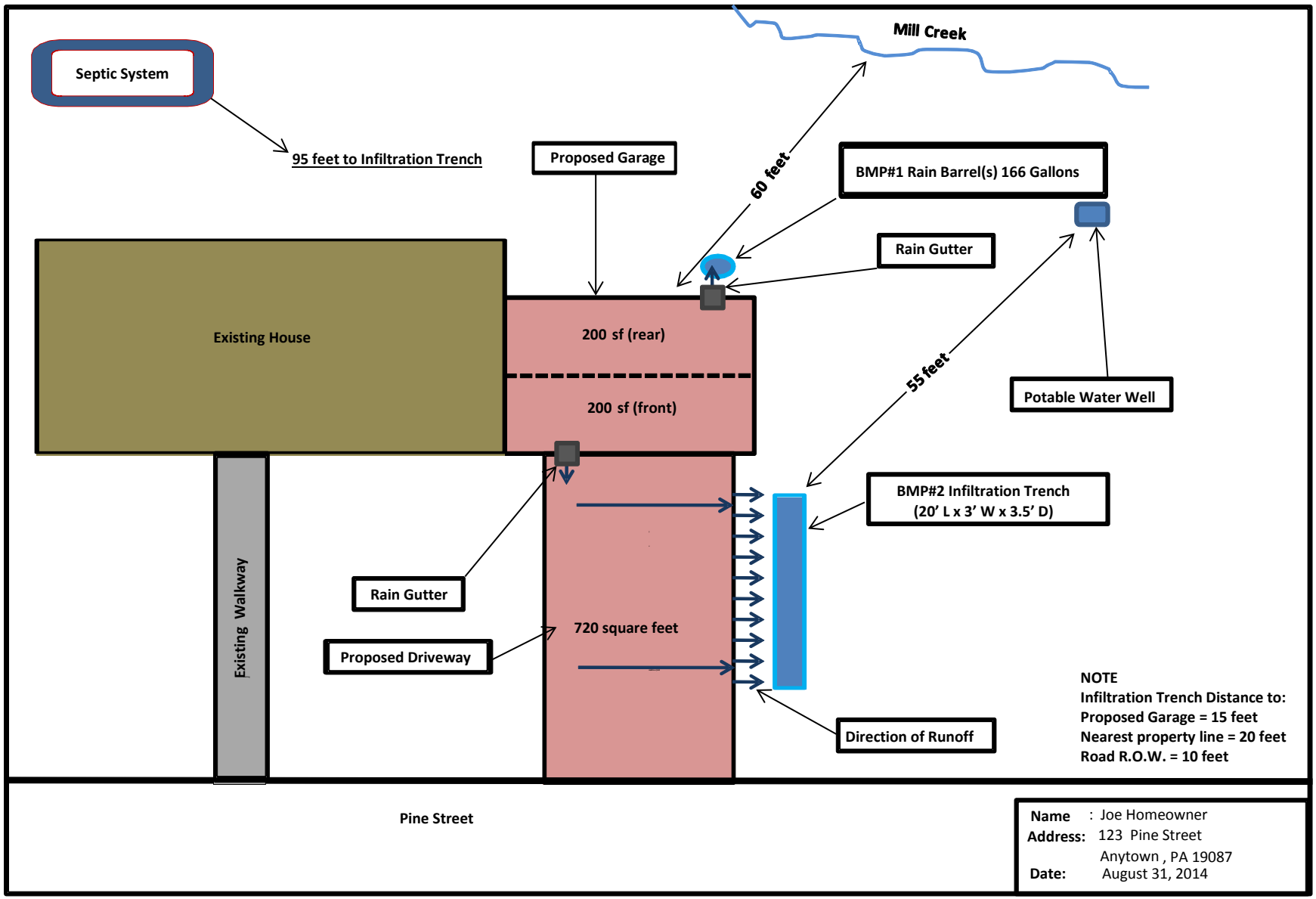


Figure 3. Example of Simplified Stormwater Management Site Plan for Joe Homeowner

Figure 4: Simplified Approach Worksheet – Example for *Joe Homeowner*

Name of Property Owner(s): **Joe Homeowner**					Date: **8/26/12**
Name of Applicant(s) [if different than Owner(s)]: **N/A**					
Contact Phone #: **610-555-1234** Email Address: **joe@homeowner.com**					
Address of Project: **123 Pine St., Anytown, PA 19355**					
Description of Project: **Add a 2-car garage and driveway**					
☐ Met with Municipal Engineer to discuss proposed project. [date of meeting 6/1/14]					
Distance from earth disturbance to nearest surface water feature (stream, pond, wetland, etc.) (Circle one): 50 feet or less More than 50 feet					
[x] **Step 1**: Attach Simplified SWM Site Plan (i.e. sketch plan), per Section 3, Step 1					
Step 2: Determine the Impervious Area to be Managed					
	Total Proposed Impervious Area (square feet): **1,120 sq. feet**				
	Total Earth Disturbance (square feet): **~ 2,500 sq. feet**				
Step 3: Select the BMP(s) to be Used and Appropriate Sizing Criteria					
	Rain Barrel or Cistern				
	Proposed Impervious Surface from Column 1 in Table 1	Volume from Column 3 in Table 1			
	200 sq. feet	**166 gallons**			
	Rain Garden/Bioretention or Dry Well #1				
	Proposed Impervious Surface from Column 1 in Table 2	Volume of BMP from Column 2 in Table 2	Area Dimensions of BMP - Column 3 in Table 2	Depth of BMP from Column 3 in Table 2	Types of Materials to be Used
	N/A				
	Infiltration Trench or Dry Well #2				
	Proposed Impervious Surface from Column 1 in Table 3	Volume of BMP from Column 2 in Table 3	Area Dimensions of BMP - Column 3 in Table 3	Depth of BMP from Column 3 in Table 3	Types of Materials to be Used
	920 sq. feet	**198 cubic feet**	**20 ft by 3 ft**	**3.5 ft**	**Infiltration trench, uniformly graded aggregate, 8" HDPE pipe, geotextile, grass planted on top.**
[x] **Step 4**: Complete, Sign & have Operation, Maintenance and Inspection Agreement Notarized and Recorded at the County Recorder of Deeds (when signed by the Municipality)					

Note: For additional BMPs, use additional sheet(s).

5. Simplified Approach Operation, Maintenance and Inspection Plan and Agreement

It is the property owner's responsibility to properly maintain BMPs. It is also the property owner's responsibility to inform any future buyers of the function, operation, and maintenance needed for any BMPs on the property prior to the purchase of the property. The sample "Simplified Approach Operation, Maintenance and Inspection Plan and Agreement" outlines the maintenance required for each type of BMP, the responsibilities of the property owner, and the rights of Elk Township in regards to inspection and enforcement of the maintenance requirements.

The "Simplified Approach Operation, Maintenance and Inspection Plan and Agreement" must be completed by the property owner and submitted to Elk Township for review along with the Site Plan and Simplified Approach Worksheet. Once the Township has approved this submission, the Agreement must be signed, notarized and submitted to the Township for signature. Following the signature by the Township, the property owner must have the Agreement recorded at the County Recorder of Deeds, so that the Agreement will be applicable to future property owners, and a copy of the final recorded Agreement must be returned to the Township. No construction can commence until the Township has received a copy of the final recorded Agreement.

Appendix A.3

Simplified Approach – Stormwater Best Management Practices Operation, Maintenance, and Inspection Plan and Agreement

SAMPLE AGREEMENT

SAMPLE AGREEMENT

It is the Landowner's responsibility to properly maintain BMPs. It is also the Landowner's responsibility to inform any future buyers of the function, operation, and maintenance needed for any BMPs on the property prior to the purchase of the property. The following maintenance agreement outlines the inspection and maintenance required for each type of BMP, the responsibilities of the Landowner, and the rights of Elk Township in regards to inspection and enforcement of the maintenance requirements. This agreement is a sample intended to demonstrate typical requirements, rights and responsibilities; the Applicant/Landowner should contact Elk Township to confirm acceptability of specific agreement language prior to submission to the Township. The Elk Township Board of Supervisors may revise, amend and change the format/content for all Agreements required by this Ordinance from time to time by Resolution.

The Operation, Maintenance and Inspection Plan and Agreement must be signed, notarized and submitted to Elk Township. Following approval and signature by the Township, the Landowner must have the Agreement recorded at the Chester County Office of the Recorder of Deeds so that the Agreement will be applicable to future landowners.

SIMPLIFIED APPROACH
STORMWATER BEST MANAGEMENT PRACTICES
OPERATION, MAINTENANCE, AND INSPECTION PLAN AND AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of _____, 20___, by and between _____, (hereinafter the "Landowner"), and Elk Township, Chester County, Pennsylvania, (hereinafter "Municipality").

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property by virtue of a deed of conveyance recorded in the land records of Chester County, Pennsylvania, at Deed Book _____ and Page _____, (hereinafter "Property"); and

WHEREAS, the Landowner recognizes that the stormwater management best management practices or BMPs (hereinafter referred to as "BMP" or "BMP(s)") located on the Property at

_____

(address of Property where BMP is located) must be inspected and maintained; and

WHEREAS, the Municipality and the Landowner, for itself and for its administrators, executors, successors, heirs, and assigns, agree that the health, safety, and welfare of the residents of the Municipality and the protection and maintenance of water quality require that on-site BMP(s) 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 ground water recharge and to otherwise meet the purposes of the Municipality's Stormwater Management Ordinance, including, but not limited to infiltration trenches, dry wells, bioretention, rain gardens, permeable paving, rain barrels and cisterns, etc. The BMP(s) are permanent appurtenances to the Property; and

Conveyance – As specifically identified in the Simplified Stormwater Management Site Plan (herein after "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, and like facilities or features. The conveyances identified in the Plan are permanent appurtenances to the Property; and

WHEREAS, the Municipality requires that the BMP(s) and conveyances as shown on the Plan and in accordance with the sizing calculations found on the Simplified Method Worksheet (hereinafter "Worksheet") be constructed by the Landowner; the BMP(s) shall further be maintained by the Landowner, its administrators, executors, successors, heirs, and assigns in accordance with the associated operation and maintenance requirements included herein. The Plan and Worksheet are attached hereto and incorporated herein together as Exhibit "A" hereto; and

WHEREAS, the Municipality requires that stormwater management BMP(s) be constructed and adequately inspected, operated and maintained by the Landowner, its administrators, executors, successors, heirs, and assigns, in accordance with the following maintenance requirements:

NOTE TO APPLICANT/LANDOWNER:
Retain the type of BMP(s) from the following list that applies to this Property and delete any of the following BMP(s) listed below that do not apply. Additional BMP's and associated maintenance requirements shall be added if applicable.

1. Infiltration Trenches

a. At least twice a year and after significant rainfall events the Landowner is to inspect the infiltration trench and remove any accumulated debris, sediment and invasive vegetation.
b. Vegetation along the surface of an infiltration trench is to be maintained in good condition, and any bare spots are to be revegetated as soon as possible.
c. Vehicles are not to be parked or driven on an infiltration trench, and care is to be taken to avoid excessive compaction by mowers.
d. Any debris, such as leaves blocking flow from reaching an infiltration trench, is to be routinely removed.

2. Bioretention/Rain Garden

a. Any debris, such as leaves blocking flow from reaching a bioretention/rain garden, is to be routinely removed.

b. Pruning and weeding are required as needed including removal of invasive species, especially while vegetation is being established for a bioretention/rain garden.

c. Mulch cover is to be maintained in a bioretention/rain garden, re-spread and replaced as needed to prevent erosion, reduce weed growth and assist with plant survival, without restricting the infiltration of stormwater.

d. At least twice a year the Landowner is to inspect the bioretention/rain garden for sediment buildup, ground cover and vegetative conditions and make any repairs as needed.

e. Watering is required as needed, including during periods of extended dry weather and drought.

f. Trees and shrubs in a bioretention/rain garden are to be inspected at least twice per year by the Landowner to evaluate their health. If they are in poor health they are to be replaced.

3. Dry Wells

a. Dry wells are to be inspected by the landowner at least four (4) times a year and after significant rainfalls, and debris, trash, sediment, and any other waste material need to be removed and disposed of at suitable disposal or recycling sites and in compliance with local, state, and federal waste regulations.

b. For dry wells, gutters are to be regularly cleaned out and ensure that proper connections are maintained to facilitate the effectiveness of the dry well.

c. The filter screen for downspouts or roof gutters which intercepts roof runoff and conveys it to the dry well must be cleaned and replaced as necessary.

d. Dry wells that are damaged are to be fixed or replaced within two (2) weeks of being damaged.

e. If an intermediate sump box exists in conjunction with a dry well, it must be cleaned out at least once per year.

4. Rain Barrels and Cisterns

a. Rain Barrels and Cisterns are to be cleared of debris routinely at least every three (3) months and after all significant storms to allow stormwater from gutters to enter them.

b. Gutters that directly convey rain water to dry wells, rain barrels, and cisterns are to be routinely cleared of trash and debris at least every three (3) months and after significant rainfall events.
c. Rain Barrels and cisterns are to be be routinely emptied to allow for storage of additional rain water.
d. Overflow outlets from rain barrels and cisterns must be kept free and clear of debris.
e. Rain Barrels and cisterns that are damaged are to be fixed or replaced within two (2) weeks of being damaged.

N**OW, 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 and obligations of the Landowner as if fully set forth in the body of this Agreement.

2. The Landowner shall construct the BMP(s) in accordance with the specifications identified in the Plan and Worksheet.

3. The Landowner shall inspect, operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality and in accordance with the specific inspection and maintenance requirements outlined in this Agreement.

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

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

a. Modify, remove, fill, landscape, alter or impair the effectiveness of any BMP or conveyance that is constructed as part of the 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 Plan or this Agreement; and

d. Dispose of, discharge, place or otherwise allow pollutants including, but not limited to, deicers, pool additives, household chemicals and automotive fluids to directly or indirectly enter any BMP or conveyance.

6. 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 Municipality the Landowner shall be in violation of this Agreement and the Landowner agrees that the Municipality 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). It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.

7. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all expenses (direct and indirect), including professional consultant fees, incurred within 30 days of delivery of an invoice from the Municipality. Failure of the Landowner to make prompt payment to the Municipality may result in enforcement proceedings, which may include the filing of a lien against the Property, which filing is expressly authorized by the Landowner.

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

9. The Landowner, its executors, administrators, assigns, heirs, and other successors in interests, hereby release and shall release the Municipality, its employees, agents and designated representatives from all damages, accidents, casualties, occurrences or claims which might arise or be asserted against the Municipality and/or its said employees, agents or representatives, arising out of the construction, presence, existence, or maintenance of the BMP(s) either by the Landowner or Municipality. In the event that a

claim is asserted or threatened against the Municipality, its employees, agents or designated representatives, the Municipality shall notify the Landowner and the Landowner shall defend, at his own expense, any claim, suit, action or proceeding, or threatened claim, suit, action or proceeding against the Municipality or, at the request of the Municipality, pay the cost, including attorneys' fees, of defense of the same undertaken on behalf of the Municipality. If any judgment or claims against the Municipality, its 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 Municipality, including attorney's fees, regarding said damages, judgment or claims.

10. The Municipality 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 Municipality shall include its reasonable attorney's fees and costs incurred in seeking relief under this Agreement.

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

12. 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.

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

14. 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 and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs, and any other successors in interest, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

_____

For the Landowner:

_____

ATTEST:

_____

Elk Township, Chester County, 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)**

APPENDIX B

SITE DESIGN PROCESS

NATURAL HYDROLOGY SITE DESIGN PROCESS

INTRODUCTION

Section 304 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
Minimize land disturbance – both surface and subsurface.	• 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.
Minimize the cumulative area to be covered by impervious and compacted surfaces.	• 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.
Designing to the land, so that the layout of constructed and landscape features utilizes the natural topography and minimizes grading.	• 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 tthat 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
Design the constructed stormwater management system to take advantage of the natural hydrologic landscape to achieve the required stormwater runoff control standards.	• 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: o Reduce runoff; o Manage stormwater at or as close to the point of generation as possible; o Disconnect discharges from streets and municipal storm sewer systems; and o 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: o Treat water quality; o Reduce runoff velocity; and o Promote infiltratation and evapotranspiration of runoff. • Manage remaining conveyed stormwater from small storms in common open space areas to achieve multiple objectives: o Disperse storm flows and reduce velocity; o Treat water quality; and o 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).
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.	Apply site design techniques and practices as appropriate based on: • 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 les -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.

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-1. RUNOFF CURVE NUMBERS
(3 pages)

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 2-2a Runoff curve numbers for urban areas [1/]

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2/]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5/]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

1 Average runoff condition, and $I_a = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands [1/]

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment [2/]	Hydrologic condition [3/]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+ CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1] Average runoff condition, and I_a=0.2S

[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-2c Runoff curve numbers for other agricultural lands [1/]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. [2/]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. [3/]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 [4/]	48	65	73
Woods—grass combination (orchard or tree farm). [5/]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. [6/]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 [4/]	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

1 Average runoff condition, and $I_a = 0.2S$.

2 *Poor:* <50%) ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: > 75% ground cover and lightly or only occasionally grazed.

3 *Poor*: <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.

4 Actual curve number is less than 30; use CN = 30 for runoff computations.

5 CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

6 *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

TABLE C-2. RATIONAL RUNOFF COEFFICIENTS
(1 page)

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

TABLE F-2

RATIONAL RUNOFF COEFFICIENTS

		HYDROLOGIC SOIL GROUP			
LAND USE DESCRIPTION		A	B	C	D
Cultivated land : without conservation treatment		.49	.67	.81	.88
: with conservation treatment		.27	.43	.61	.67
Pasture or range land: poor condition		.38	.63	.78	.84
: good condition		---*	.25	.51	.65
Meadow: good condition		---*	---*	.44	.61
Woods: thin stand, poor cover, no mulch		---*	.34	.59	.70
: good cover		---*	---*	.45	.59
Open spaces, lawns, parks, golf courses, cemeteries					
Good condition: grass cover on 75% or more of the area		---*	.25	.51	.65
Fair condition: grass cover on 50% to 75% of the area		---*	.45	.63	.74
Commercial and business areas (85% impervious)		.84	.90	.93	.96
Industrial districts (72% impervious)		.67	.81	.88	.92
Residential:					
Average lot size	Average % impervious				
1/8 acre or less	65	.59	.76	.86	.90
1/4 acre	38	.25	.49	.67	.78
1/3 acre	30	---*	.49	.67	.78
1/2 acre	25	---*	.45	.65	.76
1 acre	20	---*	.41	.63	.74
Paved parking lots, roofs, driveways, etc.		.99	.99	.99	.99
Streets and roads:					
Paved with curbs and storm sewers		.99	.99	.99	.99
Gravel		.57	.76	.84	.88
Dirt		.49	.69	.80	.84

Notes: Values are based on SCS definitions and are average values**.**
Values indicated by ---* should be determined by the design engineer based on site characteristics.

Source : New Jersey Department of Environmental Protection, Technical Manual for Stream Encroachment, August 1984

TABLE C-3. MANNING'S 'n' VALUES
(3 pages)

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 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			
1. Short grass	0.025	0.030	0.035
2. High grass	0.030	0.035	0.050
b. Cultivated areas			
1. No crop	0.020	0.030	0.040
2. Mature row crops	0.025	0.035	0.045
3. Mature field crops	0.030	0.040	0.050
c. Brush			
1. Scattered brush, heavy weeds	0.035	0.050	0.070
2. Light brush and trees, in winter	0.035	0.050	0.060
3. Light brush and trees, in summer	0.040	0.060	0.080
4. Medium to dense brush, in winter	0.045	0.070	0.110
5. Medium to dense brush, in summer	0.070	0.100	0.160
d. Trees			
1. Cleared land with tree stumps, no sprouts	0.030	0.040	0.050
2. Same as above, but heavy sprouts	0.050	0.060	0.080
3. Heavy stand of timber, few down trees, little undergrowth, flow below branches	0.080	0.100	0.120
4. Same as above, but with flow into branches	0.100	0.120	0.160
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 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 3-1 (Continued) Manning's 'n' Values

Type of Channel and Description	Minimum	Normal	Maximum
C. *Excavated or Dredged Channels*			
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:

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.

APPENDIX E

STORMWATER BEST MANAGEMENT PRACTICES AND CONVEYANCES OPERATION AND MAINTENANCE AGREEMENT

SAMPLE AGREEMENT

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 Elk Township, Chester County, Pennsylvania, (hereinafter "Township");

WHEREAS, the Landowner is the owner of certain real property as recorded by deeds in the land records of Chester County, Pennsylvania, Deed, and Deed Book Page (hereinafter "Property"), copies of which are attached hereto as ***Exhibit A***.

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

WHEREAS, the Landowner has proposed a subdivision and/or land development and/ or other Regulated Activity (as defined by the Elk Township Stormwater Management Ordinance) more particularly described and depicted on certain plans entitled _____ which are attached hereto as ***Exhibit B*** and made part hereof, and the Stormwater Controls and BMP Inspection and Maintenance Plan, as required by the Elk Township Stormwater Management Ordinance, executed by the Landowner and approved by the Township (hereinafter referred to as the "BMP Plan") for the property identified herein, which is attached hereto as ***Exhibit C*** and made part hereof, 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 BMPs be constructed and maintained on the Property; and

WHEREAS, Landowner, their heirs and assigns are responsible for the construction, improvement and permanent maintenance of those improvements, changes and/or modifications described in ***Exhibit B*** and ***Exhibit C***. The obligation commences upon construction and continues permanently thereafter; 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 BMP 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 Municipality'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 indentified in the Plan are permanent appurtenances to the Property; and

Conveyance – As specifically identified in the BMP 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 BMP Plan are permanent appurtenances to the Property; and

WHEREAS, the Township requires, through the implementation of the Plan, that stormwater management BMPs as required by said Plan and the Elk Township 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. All of the preceding paragraphs are included herein as if set forth originally.

2. **Maintenance of all Surface Stormwater Drainage Facilities and BMPs by Landowner, its Successors and Assigns:** The Landowner, on behalf of itself and its successors and assigns, is responsible for the installation and maintenance of the modifications, changes and/or improvements described in ***Exhibit B*** and ***Exhibit C***. This obligation may include, but is not limited to, all mowing, maintenance, repair and replacement of all detention basins, drainage swales, BMPs described in Exhibit C and related surface stormwater facilities depicted on the Plans described above (herein attached as ***Exhibit B***), all costs shall be borne by the owner or owners of the Property where such stormwater facilities are located so that all such basins, swales, surface drainage easements and related facilities shall be kept in good working order at all times.

3. **Construction of BMP Facility by Landowner:** The Landowner shall construct BMPS in accordance with the plans and specifications identified on the Plan.

4. **Duty of Operation & Maintenance of Facility:** The Landowner shall operate and maintain the BMPs as shown on the Plan in good working order acceptable to the Township and in accordance with the specific routine inspection and maintenance requirements noted on the Plan and in the BMP Plan. The Landowner acknowledges that, per the Elk Township 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, pool additives, household chemicals, and automotive fluids to directly or indirectly enter any BMP or conveyance.

5. **Right of Entry on Premises:** The Landowner hereby grants permission to the Township, its authorized agents, and employees to enter upon the property, at reasonable times, after providing reasonable notice, and upon presentation of proper identification, to inspect the BMPs whenever it reasonably deems necessary. Whenever possible, the Township shall notify the Landowner prior to entering the property. Landowner shall reimburse Township for all costs and expenses incurred in these inspections should no funds remain in any escrow

account as described hereafter. Should Township enter the Property for inspections, Township shall have the obligation to restore, replace and/or replant any trees, shrubs, improvements, and/or vegetation removed and/or disturbed to complete any inspection, repair and/or correction. Township shall have no such obligation should it enter the Property for the purpose of performing corrections as provided in this Agreement. Landowner grants Township, its successors and assigns a permanent easement and access to all areas described in ***Exhibit B*** and ***Exhibit C*** for the purpose of access, inspection and/or corrections required assuring compliance with the terms of ***Exhibit B*** and ***Exhibit C***.

6. **Failure to Maintain:** In the event that the Landowner fails to operate and maintain the BMPs as shown on the Plan and as described in the BMP Plan, in good working order, as reasonably determined by the Township, the Township, its authorized agents, and/or employees may enter upon the Property and:

   a. Take whatever action is deemed necessary to maintain said BMPs. 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.

   b. Require such monitoring, analysis and reporting as the Township determines necessary to assure compliance.

   c. Order the elimination of all prohibited discharges.

   d. Cease all violating discharges, practices, or operations.

   e. Impose all remedies, fines and/or costs as may then exist under then current controlling Ordinances.

   f. Require the implementation of these stormwater BMPs and/or the proper operation and maintenance of all stormwater BMPs.

   g. Suspend or revoke any building, land development or other permit or approval issued by the Township for Non-compliance with or failure to implement any provision of the permit and/or the Plans described in ***Exhibit B*** and ***Exhibit C***; and/or any violation of the controlling Ordinance(s).

   h. Township shall provide ten days' written notice to correct any of the defective and/or failure as described herein, unless Township reasonably determines a risk or hazard to public health, safety and welfare exists. Should the Township reasonably determine that such risk exists Township may correct the defects immediately, and Landowner shall reimburse Township for all costs, expenses and fees incurred in such correction.

   i. In the event Township reasonably expends any funds for work of any nature, labor, use of equipment, engagement of contractors, use of equipment, supplies, consultants, legal fees, filing fees and/or any other cost to assure compliance with ***Exhibit B*** and ***Exhibit C***, Landowner shall reimburse Township for all sums reasonably expended by Township to assure compliance, including but not limited to all corrective measures, legal fees and an administrative fee in the amount of ten percent (10%) of any invoice.

j. The Township may, in addition to the remedies described in this Agreement, file an action at law and/or in equity, and all services/materials described herein are recognizable services and/or materials under the terms of the Pennsylvania Municipal Liens Law.

7. **Reimbursement by Landowner and Right to File Liens.** In the event that the Township reasonably performs work of any nature for corrections, or reasonably 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 ten (10) days of receipt of an invoice from the Township. Failure of the Property owner to immediately reimburse the Township as required by this paragraph shall entitle the Township to place a lien (in any manner provided for by law) upon the Property or properties whose obligations under this Agreement were satisfied by the Township. **LANDOWNER DOES HEREBY AUTHORIZE AND EMPOWER ANY ATTORNEY OF ANY COURT OF RECORD OF PENNSYLVANIA OR OF ANY OTHER STATE TO APPEAR FOR HIM OR HER AND CONFESS JUDGMENT IN FAVOR OF ELK TOWNSHIP IN THE AMOUNT AS DETERMINED BY A AFFIDAVIT SIGNED BY THE TOWNSHIP SECRETARY AND INCURRED BY THE TOWNSHIP PURSUANT TO LANDOWNERS' FAILURE TO SATISFY THIS AGREEMENT TOGETHER WITH ALL COSTS OF SUIT AND EXPENSES.**

8. **No Waiver:** In the event the Township shall enter upon any of the areas provided for by this Agreement to perform the Property owner's obligations under this Agreement, such performances by the Township shall not act as a waiver of the Property owner's continuing and future obligations under this Agreement.

9. **Purpose of Agreement:** The intent and purpose of this Agreement is to ensure the proper maintenance and inspection of the on-site BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability on any party for damage alleged to result from or be caused by stormwater runoff.

   Landowner shall include the following notice to the deed of ownership for the Property described in Exhibit A, and in all deeds subsequently conveying all or any portion of the real property, a covenant binding Landowners and all successors in interest designating the responsibility for operation and maintenance of the facilities described in ***Exhibit B*** and ***Exhibit C*** as follows:

   "UNDER AND SUBJECT, nevertheless, to the following conditions and restrictions: Prior to the construction of a dwelling or any other earthmoving activities, Grantee shall construct the permanent stormwater management facilities as shown on the stormwater management plans described ***[INSERT PLAN DATES AND REFERENCES]****, dated and last revised and approved by Elk Township; thereafter, the Grantee, his heirs, executors, administrators, successors and assigns ("owner"), at his or their sole cost and expense, shall operate, maintain and repair said stormwater management facilities on the lot in accordance with said plan, so that the facilities shall at all times continue to operate and function in the same manner and capacity as they were designed. In the event of the failure of the owner to comply with these conditions and restrictions, and the STORMWATER BEST MANAGEMENT PRACTICES, OPERATIONS AND MAINTENANCE AGREEMENT ("AGREEMENT") Elk Township shall have said stormwater management facilities repaired or restored as required, and the costs thereof shall be assessed to the owner; said assessment shall be a charge and a continuing lien upon the property herein, as more fully described in the AGREEMENT, and the plans described therein. Elk Township, before it may exercise this right, shall notify the*

owner by certified mail of its intention to take the aforenoted action, unless an emergency exists according to the terms of the AGREEMENT. The notice shall set forth in what manner the owner has neglected the operation and maintenance of or repair to the stormwater management facilities and/or comply with the terms of the AGREEMENT, and if the owner fails to correct or repair the items listed in the notice from Elk Township, then Elk Township shall exercise their rights contained in this AGREEMENT, as well as any other Statutory authority. Owner shall reimburse Township for all reasonable fees, costs and professional consultant fees incurred to satisfy all annual reports (including but not limited to DEP MS4 Reports) required by any State, Federal or Local Agency. This covenant shall run with the land."

10. **Release of Township:** The Landowner, its executors, administrators, assigns, and other successors in interest shall 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 BMPs by the Landowner or Township except for any damages or claims resulting from the negligent or intentional acts of the Township's employees or consultants. 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.

11. **Recording of Agreement/Covenant Running with the Land:** 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 and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs, and any other successors in interest, in perpetuity.

12. **Required Parties.** All owners of the real property described in ***Exhibit A***, and all applicants who are not owners of the land must sign this Agreement. All responsibility and obligations contained herein shall be joint and/or several. The Agreement is not complete and no permit will be issued until the Landowner provides proof of recording with the Office of Recorder of Deeds, West Chester, Chester County, PA, and delivers a certified recorded copy to the Township.

[SIGNATURES APPEAR ON THE FOLLOWING PAGE]

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed the day and date first above written:

ATTEST:

_____

ELK TOWNSHIP:

By: _____
Name:
Title:

By: _____
Name:
Title:

LANDOWNER:

_____

By: _____
Name:
Title:

_____

By: _____
Name:
Title:

STATE OF _____ :
: ss.
COUNTY OF _____ :

On this _____ day of _____, 20___, before me a Notary Public in and for the Commonwealth of Pennsylvania, the undersigned officer(s), personally appeared _____, who acknowledged him/herself/themselves to be the _____ of ELK TOWNSHIP, a Township of _____ class, and that he/she/they as such officer(s), being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the Township by him/herself/themselves as such officer(s).

In Witness Whereof, I hereunto set my hand and official seal.

_____[SEAL]
Notary Public

My Commission Expires:

_____

STATE OF _____ :
: ss.
COUNTY OF _____ :

On this _____ day of _____, 20___, before me a Notary Public in and for the Commonwealth of Pennsylvania, the undersigned officer, personally appeared _____ who acknowledged him/herself/themselves to be the _____ of , a Pennsylvania corporation, and that he/she/they as such officer(s), being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the corporation by him/herself/themselves as such officer(s).

In Witness Whereof, I hereunto set my hand and official seal.

_____[SEAL]
Notary Public

My Commission Expires:

_____

Exhibit A
Deeds

Exhibit B
BMP Plan

Exhibit C
Legal Description