

SCHUYLKILL RIVER

STORMWATER MANAGEMENT

ORDINANCE

ORDINANCE NO. 676

Township of Exeter, Berks County

PENNSYLVANIA

Adopted at a Public Meeting Held on

March 9, 2009

TABLE OF CONTENTS

	<u>PAGE</u>
ARTICLE I- GENERAL PROVISIONS.....	5
Section 101. Short Title	5
Section 102. Statement of Findings	5
Section 103. Purpose.....	6
Section 104. Statutory Authority	8
Section 105. Applicability/Regulated Activities.....	8
Section 106. Repealer	9
Section 107. Severability	9
Section 108. Compatibility With Other Ordinance Requirements	9
Section 201. Interpretation.....	11
Section 202. Definitions.....	11
ARTICLE III-STORMWATER MANAGEMENT	23
Section 301. General Requirements.....	23
Section 302. Permit Requirements by Other Government Entities	24
Section 303. Erosion and Sediment Control During Regulated Earth Disturbance Activities	24
Section 304. Nonstructural Project Design (Sequencing to Minimize Stormwater Impacts).....	26
Section 305. Ground Water Recharge (Infiltration/Recharge/Bioretenion)	27
Section 306. Water Quality Requirements.....	33
Section 307. Streambank Erosion Requirements.....	34
Section 308. Stormwater Management Districts	34
Section 309. Calculation Methodology.....	37
Section 310. Design Criteria for Stormwater Management and Conveyance BMPs ..	40
ARTICLE IV-DRAINAGE PLAN REQUIREMENTS	51
Section 401. General Requirements.....	51
Section 402. Exemptions	51
Section 403. Drainage Plan Contents.....	53
Section 404. Plan Submission.....	58
Section 405. Drainage Plan Review.....	59
Section 406. Modification of Plans.....	60
Section 407. Resubmission of Disapproved Drainage Plans	61
ARTICLE V-INSPECTIONS	63
Section 501. Schedule of Inspections	63
ARTICLE VI-FEES AND EXPENSES	65
Section 601. Municipality Drainage Plan Review and Inspection Fee.....	65
Section 602. Expenses Covered by Fees.....	65
ARTICLE VII-MAINTENANCE RESPONSIBILITIES	67
Section 701. Performance Guarantee.....	67
Section 702. Adherence to Approved Stormwater Control and BMP Operations and Maintenance Plan.....	67
Section 703. Operations and Maintenance Agreement for Privately Owned Stormwater Controls and BMPs	67
Section 704. Stormwater Management Easements	68

Section 705. Recording of Approved Stormwater Control and BMP Operations and Maintenance Plan and Related Agreements	68
Section 706. Municipal Stormwater Control and BMP Operation and Maintenance Fund	68
ARTICLE VIII- PROHIBITIONS.....	71
Section 801. Prohibited Discharges and Connections	71
Section 802. Roof Drains	71
Section 803. Alteration of SWM BMPs	71
ARTICLE IX- ENFORCEMENT AND PENALTIES.....	73
Section 901. Right-of-Entry	73
Section 902. Public Nuisance	73
Section 903. Enforcement Generally	73
Section 904. Suspension and Revocation of Permits and Approvals	74
Section 905. Penalties	74
Section 906. Notification	75
Section 907. Enforcement.....	75
Section 908. Appeals	76
SAMPLE SITE SKETCH PLAN	112

APPENDICES

- ORDINANCE APPENDIX A - STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES OPERATION AND MAINTENANCE AGREEMENT
- ORDINANCE APPENDIX B - STORMWATER MANAGEMENT DESIGN CRITERIA
- ORDINANCE APPENDIX C - DRAINAGE PLAN APPLICATION
- ORDINANCE APPENDIX D - STORMWATER MANAGEMENT DISTRICT WATERSHED MAP*
- ORDINANCE APPENDIX E - LOW IMPACT DEVELOPMENT PRACTICES
- ORDINANCE APPENDIX F - WEST NILE VIRUS GUIDANCE
- ORDINANCE APPENDIX G - REFERENCES
- ORDINANCE APPENDIX H - RESERVED FOR FUTURE USE
- ORDINANCE APPENDIX I - STORMWATER MANAGEMENT PRACTICES FOR PROJECTS WHICH ARE EXEMPT UNDER SECTION 402 OF THIS ORDINANCE

ARTICLE I- GENERAL PROVISIONS

Section 101. Short Title

This Ordinance shall be known and may be cited as the “Schuylkill River Watershed Stormwater Management Ordinance”).

Section 102. Statement of Findings

The governing body of Exeter Township finds that:

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

- G. Public education on the control of pollution from stormwater is an essential component in successfully addressing stormwater.
- H. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES).
- I. Non-stormwater discharges to municipal separate storm sewer systems can contribute to pollution of waters of the Commonwealth by the Municipality.

Section 103. Purpose

The purpose of this Ordinance is to promote the public health, safety, and welfare within the Schuylkill River Watershed by maintaining the natural hydrologic regime by minimizing the impacts described in Section 102 of this Ordinance through provisions designed to:

- A. Promote alternative project designs and layout that minimizes impacts to surface and ground water.
- B. Promote nonstructural Best Management Practices (BMPs).
- C. Minimize increases in stormwater volume.
- D. Minimize impervious surfaces.
- E. Manage accelerated runoff and erosion and sedimentation problems at their source by regulating activities that cause these problems.
- F. Provide review procedures and performance standards for stormwater planning and management.
- G. Utilize and preserve the existing natural drainage systems.
- H. Manage stormwater impacts close to the runoff source, which requires a minimum of structures and relies on natural processes.
- I. Focus on infiltration of stormwater, to maintain groundwater recharge, to prevent degradation of surface and groundwater quality and to otherwise protect water resources.
- J. Maintain existing base flows and quality of streams and watercourses, where possible.
- K. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code Chapter 93.4a to protect and maintain “existing uses” and maintain the level of water quality to support those uses in all streams, and to protect and maintain water quality in “special protection” streams.
- L. Address the quality and quantity of stormwater discharges from the development site.

- M. Provide a mechanism to identify controls necessary to meet the NPDES permit requirements.
- N. Implement an illegal discharge detection and elimination program to address non-stormwater discharges into the Township of Exeter's separate storm sewer system.
- O. Preserve and restore the flood-carrying capacity of streams.
- P. Prevent scour and erosion of streambanks and streambeds.
- Q. Provide performance standards and design criteria for watershed-wide stormwater management and planning.
- R. Provide proper operation and maintenance of all permanent stormwater management facilities and BMPs that are implemented in the Township of Exeter.
- S. NPDS Requirements

Federal regulations approved October 1999 require operators of small municipal separate storm sewer systems (MS4s) to obtain NPDES Phase II permits from DEP by March 2003. (NPDES II is an acronym for the National Pollutant Discharge Elimination System Phase II Stormwater Permitting Regulations.) This program affects all municipalities in "urbanized areas" of the state. This definition applies to all Schuylkill River watershed municipalities identified in Table III-1 of the Schuylkill River Stormwater Management Plan Volume II as NPDES Phase II municipalities. Therefore, these identified municipalities will be subject to the NPDES Phase II requirements mandated by the Federal Clean Water Act as administered by DEP. For more information on NPDES II requirements, contact the DEP Regional Office.

- T. Ensure adequate drainage of all streets;
- U. Intercept storm water runoff along streets at intervals related to the extent and grade of the area drained;
- V. Provide positive drainage away from on-site sewage disposal facilities and buildings;
- W. Accommodate runoff so that the storm water discharge from the site at any point during construction does not exceed the pre-development discharge for the design rainfall frequency specified in Appendix B. Post-construction storm water discharge shall not exceed the rates specified in Section 308.
- X. Ensure adequate drainage at intersections of driveways with streets.
- Y. Provide shallow swales along all side and rear lot lines to direct surface drainage to the street or other drainage facilities.

Section 104. Statutory Authority

Primary Authority:

The Township of Exeter is empowered to regulate these activities by the authority of the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, the “Storm Water Management Act” and the Second Class Township Code, 53PS Section 66501 et seq. and Section 66601 et seq.

Secondary Authority

The Township of Exeter also is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended.

Section 105. Applicability/Regulated Activities

- A. The following are defined as “Regulated Activities” that may affect stormwater runoff and are subject to regulation by this Ordinance:
1. Land development.
 2. Subdivision.
 3. Alteration of the natural hydrologic regime.
 4. Construction or reconstruction of or additional impervious or semi-pervious surfaces such as but not limited to driveways, parking lots, patios, and roads.
 5. Construction of new buildings or additions to existing buildings. See Section 402 for exemptions.
 6. Site redevelopment. See Sections 308.G – 308.I.
 7. Diversion piping or encroachment in any natural or man-made channel.
 8. Nonstructural and structural stormwater management Best Management Practices (BMP’s) or appurtenances thereto.
 9. Regulated Earth Disturbance.
 10. Any of the above Regulated Activities which were approved more than five (5) years prior to the effective date of this Ordinance and resubmitted for approval by the Township of Exeter.

Earth Disturbance activities and associated stormwater management controls are also regulated under existing state law and implementing regulations. This Ordinance shall operate in coordination with those parallel requirements; the requirements of this Ordinance shall continue to be no less restrictive in meeting the purposes of this Ordinance than state law.

Section 106. Repealer

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

Section 107. Severability

Should any section or provision of this Ordinance be declared invalid by a court of competent jurisdiction, such decision shall not affect the validity of any of the remaining provisions of this Ordinance.

Section 108. Compatibility With Other Ordinance Requirements

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

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, firm, association, organization, partnership, trust, company, corporation, unit of government, or any other similar entity.
- D. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.
- E. The words "used or occupied" include the words "intended, designed, maintained, or arranged to be used, occupied or maintained."

Section 202. Definitions

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

Agricultural Activities - The work of producing crops and raising livestock including tillage, plowing, disking, harrowing, pasturing and installation of conservation measures. For purposes of regulation by this Ordinance construction of new buildings or impervious area is not considered an agricultural activity.

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

As-built drawings - Those maintained by the Contractor as he constructs the project and upon which he documents the actual locations of the building components and changes to the original contract documents. These, or a copy of same, are turned over to the Engineer at the completion of the project

Applicant - A person who has filed an application for approval to engage in any Regulated Activities as defined in Section 105 of this Ordinance.

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

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

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

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

Buffer – The area of land immediately adjacent to any stream, measured perpendicular to and horizontally from the top-of-bank on both sides of a stream. (See Top of Bank)

Channel - A drainage element in which stormwater flows with an open surface. Open channels include, but shall not be limited to, natural and man-made drainage ways, swales, streams, ditches, canals, and pipes flowing partly full.

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

Cistern - An underground reservoir or tank for storing rainwater.

Conservation District - The Berks County Conservation District.

Culvert - A structure with appurtenant works, which carries water under or through an embankment or fill.

Dam - An artificial barrier, together with its appurtenant works, constructed for the purpose of impounding or storing water or another fluid or semifluid, or a refuse bank, fill or structure for highway, railroad or other purposes which does or may impound water or another fluid or semifluid.

Department – The Pennsylvania Department of Environmental Protection.

Designee - The agent of the Berks County Planning Commission Berks County Conservation District and/or agent of the governing body involved with the administration, review or enforcement of any provisions of this ordinance by contract or memorandum of understanding.

Design Professional (Qualified) – Any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by the Ordinance

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

Designated Watershed (ACT 167) – A Watershed which is listed under the Pennsylvania Department of Environmental Protection’s “Index of Designated Watersheds (Stormwater Management)” pursuant to the Stormwater Management Act P.L. 864, No. 167, October 4, 1978, and published in the Pennsylvania Bulletin on May 31, 1980 and August 9, 1980, as amended on November 19, 1991, April 21, 1992, June 21, 1994, April 16, 1996, April 15, 1997 and December 16, 1997).

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 and are dry until the next rainfall event.

Developer – A person that seeks to undertake any Regulated Activities at a project site in the Township of Exeter.

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

Development Site - The specific tract of land where any Regulated Activities in the Township of Exeter are planned, conducted or maintained.

Diffused Drainage Discharge – Drainage discharge not confined to a single point location or channel, such as sheet flow or shallow concentrated flow.

Discharge – 1. (verb) To release water from a project, site, aquifer, drainage basin or other point of interest 2. (noun) The rate and volume of flow of water such as in a stream, generally expressed in cubic feet per second (volume per unit of time). See also Peak Discharge.

Discharge Point – The point of discharge for a stormwater facility.

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

Ditch – An artificial waterway for irrigation or stormwater conveyance.

Downslope Property Line - That portion of the property line of the lot, tract, or parcels of land being developed located such that overland or pipe flow from the site would be directed towards it.

Drainage Conveyance Facility - A Stormwater Management Facility designed to transmit stormwater runoff and shall include channels, swales, pipes, conduits, culverts, storm sewers, etc.

Drainage Easement - A right granted by a landowner to a grantee, allowing the use of private land for stormwater management purposes.

Drainage Permit - A permit issued by the Municipal governing body after the drainage plan has been approved.

Drainage Plan - The documentation of the stormwater management system, if any, to be used for a given development site, the contents of which are established in Section 403.

Earth Disturbance Activity – A construction or other human activity which disturbs the surface of land, including, but not limited to, clearing and grubbing, grading, excavations, embankments, land development, agricultural plowing or tilling, timber harvesting activities, road maintenance activities, mineral extraction, and the moving, depositing, stockpiling, or storing of soil, rock or earth materials.

Emergency Spillway – A conveyance area that is used to pass peak discharge greater than the maximum design storm controlled by the stormwater facility.

Encroachment – A structure or activity that changes, expands or diminishes the course, current or cross section of a watercourse, floodway or body of water.

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

Erosion and Sediment Control Plan - A plan for a project site which identifies BMPs to minimize accelerated erosion and sedimentation.

Exceptional Value Waters – Surface waters of high quality which satisfy Pennsylvania Code Title 25 Environmental Protection, Chapter 93, Water Quality Standards, § 93.4b(b) (relating to anti-degradation).

Existing Conditions (“Natural Condition”) - The initial condition of a project site prior to the proposed alteration. If the initial condition of the site is undeveloped land, the land use shall be considered as "meadow" unless the natural land cover is proven to generate lower curve numbers or Rational "C" value, such as forested lands.

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

Floodplain - Any land area susceptible to inundation by water from any natural source or delineated by applicable Department of Housing and Urban Development, Federal Insurance Administration Flood Hazard Boundary - Mapped as being a special flood hazard area.

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

Fluvial Geomorphology - The study of landforms associated with river channels and the processes that form them.

Forest Management/Timber Operations - Planning and activities necessary for the management of forest land with no change of land use proposed. These include timber inventory and preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting and reforestation.

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

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

Grassed Waterway - A natural or constructed waterway, usually broad and shallow, covered with erosion-resistant grasses, used to convey surface water.

Groundwater - Water beneath the earth's surface, often between saturated soil and rock that supplies wells and springs.

Groundwater Recharge - Replenishment of existing natural underground water supplies without degrading groundwater quality.

HEC-HMS - The U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC) - Hydrologic Modeling System (HMS). This model was used to model the Schuylkill River watershed during the ACT 167 Plan development and was the basis for the Standards and Criteria of this Ordinance.

High Quality Waters – Surface waters having quality which exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water by satisfying Pennsylvania Code Title 25 Environmental Protection, Chapter 93 Water Quality Standards, § 93.4b(a).

Hotspots - Areas where land use or activities generate highly contaminated runoff, with concentrations of pollutants in excess of those typically found in stormwater.

Hydrograph – A graph of discharge versus time for a selected point in the drainage system.

Hydrologic Regime (natural) – The hydrologic cycle or balance that sustains quality and quantity of stormwater, baseflow, storage, and groundwater supplies under natural conditions.

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

Impervious Surface - A surface that prevents the infiltration of water into the ground. Impervious surface includes, but is not limited to, any roof, parking or driveway areas, and any new streets and sidewalks. Any surface areas designed to be gravel or crushed stone shall be assumed to be impervious surfaces.

Impoundment - A retention or detention basin designed to retain stormwater runoff and release it at a controlled rate.

Infill – Development that occurs on smaller parcels that remain undeveloped but are within or very close proximity to urban areas. The development relies on existing infrastructure and does not require an extension of water, sewer or other public utilities.

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

Infiltration Structures - A structure designed to direct runoff into the underground water (e.g., french drains, seepage pits, seepage trench).

Inlet - The upstream end of any structure through which water may flow.

Intermittent Stream - A stream that flows only part of the time. Flow generally occurs for several weeks or months in response to seasonal precipitation, due to groundwater discharge.

Land Development – Any of the following activities:

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

Limiting zone—A soil horizon or condition in the soil profile or underlying strata which includes one of the following:

- (i) A seasonal high water table, whether perched or regional, determined by direct observation of the water table or indicated by soil mottling.
- (ii) 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.
- (iii) A rock formation, other stratum or soil condition which is so slowly permeable that it effectively limits downward passage of water.

Lot – A designated parcel, tract or area of land established by a plat or otherwise as permitted by law and to be used, developed or built upon as a unit.

Main Stem (Main Channel) - Any stream segment or other runoff conveyance facility used as a reach in the Schuylkill River hydrologic model.

Manning Equation (Manning formula) - A method for calculation of velocity of flow (e.g., feet per second) and flow rate (e.g., cubic feet per second) in open channels based upon channel shape, roughness, depth of flow and slope. "Open channels" may include closed conduits so long as the flow is not under pressure.

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

Municipality – Township of Exeter, Berks County, Pennsylvania.

Natural Condition – See Existing Conditions.

Natural Hydrologic Regime (see hydrologic regime)

Natural Recharge Area – Undisturbed surface area or depression where stormwater collects, and a portion of which infiltrates and replenishes the underground and groundwater.

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

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

Nonstructural Best Management Practice (BMPs) – Methods of controlling stormwater runoff quantity and quality, such as innovative site planning, impervious area and grading reduction, protection of natural depression areas, temporary ponding on site and other techniques.

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

NRCS - Natural Resource Conservation Service (previously SCS).

Outfall - "Point source" as described in 40 CFR § 122.2 at the point where the Township of Exeter's storm sewer system discharges to surface waters of the Commonwealth.

Outlet - Points of water disposal to a stream, river, lake, tidewater or artificial drain.

Parent Tract – The parcel of land from which a land development or subdivision originates, determined from the date of municipal adoption of this ordinance.

Parking Lot Storage - Involves the use of parking areas as temporary impoundments with controlled release rates during rainstorms.

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

Penn State Runoff Model - The computer-based hydrologic model developed at the Pennsylvania State University.

Pipe - A culvert, closed conduit, or similar structure (including appurtenances) that conveys stormwater.

Planning Commission - The Planning Commission of Exeter Township.

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

Post Construction – Period after construction where disturbed areas are stabilized, stormwater controls are in place and functioning and all proposed improvements in the approved land development plan are completed.

Pretreatment – Techniques employed in stormwater BMPs to provide storage or filtering to trap coarse materials and other pollutants before they enter the system, but not necessarily meet the water quality volume requirements of Section 306.

Project Site - The specific area of land where any Regulated Earth Disturbance Activities in the Township of Exeter are planned, conducted or maintained.

Rational Formula - A rainfall-runoff relation used to estimate peak flow.

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

Reconstruction – Demolition of, and subsequent rebuilding of impervious surface.

Record Drawings - Original documents revised to suit the as-built conditions and subsequently provided by the Engineer to the Client. The Engineer takes the Contractor's as-builts, reviews them in detail with his/her own records for completeness, then either turns these over to the Client or transfers the information to a set of reproducibles, in both cases for the Client's permanent records."

Redevelopment – The demolition, construction, reconstruction, alteration, or improvement exceeding seventy-five (75) percent of the currently developed portion of the site on properties or tracts where existing land use is commercial, industrial, institutional, or multifamily residential. Maintenance activities such as top-layer grinding and re-paving are not considered to be redevelopment. Interior remodeling projects and tenant improvements are also not considered to be redevelopment. Utility trenches in streets are not considered redevelopment.

Regulated Activities - Any actions or proposed actions that involve the alteration or development of land in a manner that may affect stormwater runoff as specified in Section 105 of this Ordinance.

Regulated Earth Disturbance Activity - Activity involving Earth Disturbance subject to regulation under 25 PA Code Chapters 92, Chapter 102, or the Clean Streams Law.

Release Rate - The percentage of existing conditions peak rate of runoff from a site or subarea to which the proposed conditions peak rate of runoff must be reduced to protect downstream areas.

Repaving – Replacement of the impervious surface that does not involve reconstruction of an existing paved (impervious) surface.

Replacement Paving – Reconstruction of and full replacement of an existing paved (impervious) surface.

Retention Basin - A structure in which stormwater is stored and not released during the storm event. Retention basins do not typically have an outlet to other down stream conveyance features such as channels, storm sewer, or other surface waters. Generally, these features empty via recharge and must infiltrate stored water in no more than 4 days. These features may have an emergency spillway or other overflow device for large events.

Return Period - The average interval, in years, within which a storm event of a given magnitude can be expected to recur. For example, the 25-year return period rainfall would be expected to recur on the average of once every twenty-five years.

Riser - A vertical pipe extending from the bottom of a pond that is used to control the discharge rate from the pond for a specified design storm.

Road Maintenance - Earth disturbance activities within the existing road cross-section, such as grading and repairing existing unpaved road surfaces, cutting road banks, cleaning or clearing drainage ditches and other similar activities.

Roof Drains - A drainage conduit or pipe that collects water runoff from a roof and leads it away from the structure.

Rooftop Detention - Temporary ponding and gradual release of stormwater falling directly onto flat roof surfaces by incorporating controlled-flow roof drains into building designs.

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

SALDO – The Exeter Township Subdivision and Land Development Ordinance.

Sediment Basin - A barrier, dam, retention or detention basin located and designed to retain rock, sand, gravel, silt, or other material transported by water during construction.

Sediment Pollution - The placement, discharge or any other introduction of sediment into the waters of the Commonwealth.

Sedimentation - The process by which mineral or organic matter is accumulated or deposited by the movement of water or air.

Seepage Pit/Seepage Trench - An area of excavated earth filled with loose stone or similar coarse material, into which surface water is directed for infiltration into the underground water.

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

Shallow Concentrated Flow - Stormwater runoff flowing in shallow, defined ruts prior to entering a defined channel or waterway.

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

Soil-Cover Complex Method - A method of runoff computation developed by the NRCS that is based on relating soil type and land use/cover to a runoff parameter called Curve Number (CN).

Source Water Protection Areas (SWPA) – The zone through which contaminants, if present, are likely to migrate and reach a drinking water well or surface water intake.

Special Geologic Features - Carbonate bedrock features, including but not limited to closed depressions, existing sinkholes, fracture traces, lineaments, joints, faults, caves and pinnacles, which may exist and must be identified on a site when stormwater management BMPs are being considered.

Special Protection Subwatersheds - Watersheds for which the receiving waters are exceptional value (EV) or high quality (HQ) waters.

Spillway – A conveyance that is used to pass the peak discharge of the maximum design storm controlled by the stormwater facility.

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

Storage Indication Method - A reservoir routing procedure based on solution of the continuity equation (inflow minus outflow equals the change in storage) with outflow defined as a function of storage volume and depth.

Storm Frequency - The number of times that a given storm "event" occurs or is exceeded on the average in a stated period of years. See "Return Period."

Storm Sewer - A system of pipes and/or open channels that convey intercepted runoff and stormwater from other sources, but excludes domestic sewage and industrial wastes.

Stormwater - The surface runoff generated by precipitation reaching the ground surface.

Stormwater Management District - Those subareas in which some type of detention is required to meet the plan requirements and the goals of Act 167.

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

Stormwater Management Plan - The plan for managing those land use activities that will influence stormwater runoff quality and quantity and that would impact the Tributaries to the Schuylkill River Watershed adopted by Berks County as required by the Act of October 4, 1978, P.L. 864, (Act 167), and known as the "The Tributaries to The Schuylkill River in Berks County Act 167 Stormwater Management Plan".

Stormwater Management Site Plan - The plan prepared by the Applicant or his representative indicating how stormwater runoff will be managed at the particular site of interest according to this Ordinance.

Stream – A natural watercourse.

Stream Buffer – The land area adjacent to each side of a stream, essential to maintaining water quality. (See Buffer)

Stream Enclosure - A bridge, culvert or other structure in excess of 100 feet in length upstream to downstream which encloses a regulated water of this Commonwealth.

Subarea (Subwatershed)- The smallest drainage unit of a watershed for which stormwater management criteria have been established in the Stormwater Management Plan.

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

Surface Waters of the Commonwealth - Any and all rivers, streams, creeks, rivulets, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

Swale - A low lying stretch of land which gathers or carries surface water runoff.

Timber Operations - See Forest Management.

Time-of-Concentration (Tc) - The time for surface runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. This time is the combined total of overland flow time and flow time in pipes or channels, if any.

Top-of-Bank – Highest point of elevation in a stream channel cross section at which a rising water level just begins to flow out of the channel and over the floodplain.

Vernal Pond – Seasonal depressional wetlands that are covered by shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall.

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

Waters of the Commonwealth - Any and all rivers, streams, creeks, rivulets, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

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

Wellhead – 1. a structure built over a well; and 2. the source of water for a well.

Wellhead Protection Area - The surface and subsurface area surrounding a water supply well, well field, spring or infiltration gallery supplying a public water system, through which contaminants are reasonably likely to move toward and reach the water source.

Wet Basin - Pond for urban runoff management that is designed to detain urban runoff and always contains water.

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

ARTICLE III-STORMWATER MANAGEMENT

Section 301. General Requirements

- A. Applicants proposing regulated activities in Schuylkill River Watershed which do not fall under the exemption criteria shown in Section 402 shall submit a drainage plan consistent with the Schuylkill River Watershed Stormwater Management Plan to the Township of Exeter for review. These criteria shall apply to the total proposed development even if development is to take place in stages
- B. The Applicant is required to evaluate practicable alternatives to the surface discharge of stormwater, the creation of impervious surfaces and the degradation of waters of the Commonwealth, and must maintain as much as possible the natural hydrologic regime. Appendix E Low Impact Development Practices provides several alternatives.
- C. The Drainage Plan must be designed consistent with the sequencing provisions of Section 304 to ensure maintenance of the natural hydrologic regime and to promote groundwater recharge and protect groundwater and surface water quality and quantity. The Drainage Plan designer must proceed sequentially in accordance with Article III of this ordinance.
- D. Existing points of concentrated drainage that discharge onto adjacent property shall not be altered in any manner which could cause property damage without permission of the affected property owner(s) and shall be subject to any applicable discharge criteria specified in this Ordinance.
- E. Areas of existing diffused drainage discharge shall be subject to any applicable discharge criteria in the general direction of existing discharge, whether proposed to be concentrated or maintained as diffused drainage areas, except as otherwise provided by this ordinance. If diffused drainage discharge is proposed to be concentrated and discharged onto adjacent property, the Applicant must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge, or otherwise prove that no erosion, sedimentation, flooding or other impacts will result from the concentrated discharge.
- F. Where a development site is traversed by existing watercourses, drainage easements shall be provided conforming to the line of such watercourses. The terms of the easement shall conform to the stream buffer requirements contained in Section 306.D of this Ordinance.
- G. Any stormwater management facilities regulated by this Ordinance that would be located in or adjacent to waters of the Commonwealth or wetlands shall be subject to approval by PaDEP through the Joint Permit Application process, or, where deemed appropriate by PaDEP, the General Permit process. When there is a question whether wetlands may be involved, it is the responsibility of the Applicant or his agent to show that the land in question cannot be classified as wetlands, otherwise approval to work in the area must be obtained from PaDEP.

- H. Any alteration that affects stormwater flow directly or indirectly toward a PennDOT facility shall be subject to PennDOT regulations.
- I. Minimization of impervious surfaces and infiltration of runoff through seepage beds, infiltration trenches, etc. are encouraged, where soil conditions permit, to reduce the size or eliminate the need for detention facilities or other structural BMPs.
- J. Roof drains shall not be connected to impervious surfaces in order to promote overland flow and infiltration/ percolation of stormwater where advantageous to do so. When site conditions preclude infiltration/percolation, then it shall be permitted on a case-by-case basis by the Township of Exeter.
- K. Stormwater runoff shall be treated for water quality in accordance with Section 306 of this Ordinance.
- L. Transference of runoff to or from an Exceptional Value/High Quality (EV/HQ) watershed is prohibited unless otherwise authorized by PaDEP, Delaware River Basin Commission (DRBC) or Susquehanna River Basin Commission (SRBC).

Section 302. Permit Requirements by Other Government Entities

Permits must comply with any and all applicable local, county, state and federal regulations.

Section 303. Erosion and Sediment Control During Regulated Earth Disturbance Activities

- A. Whenever the vegetation and topography are to be disturbed, such activity must be in conformance with Chapter 102, Title 25, Rules and Regulations, Part I, Commonwealth of Pennsylvania, Department of Environmental Protection, Subpart C, protection of Natural Resources, Article II, Water Resources, Chapter 102, “Erosion Control.”
- B. No Regulated Earth Disturbance Activities within the Township of Exeter shall commence until the Township of Exeter receives an approval from the Conservation District of an Erosion and Sediment Control Plan for construction activities.
- C. PaDEP has regulations that require an Erosion and Sediment Control Plan for any earth disturbance activity of 5,000 square feet or more, under 25 Pa. Code § 102.4(b).
- D. In addition, under 25 Pa. Code Chapter 92, a PaDEP “NPDES Construction Activities” permit is required for Regulated Earth Disturbance activities.
- E. Evidence of any necessary permit(s) for Regulated Earth Disturbance activities from the appropriate DEP regional office or County Conservation District must be provided to the Township of Exeter. The issuance of an NPDES Construction Permit or permit coverage under the statewide General Permit (PAG-2) satisfies the requirements subsection 303.A.
- F. A copy of the Erosion and Sediment Control plan and any required permit, as required by DEP regulations, shall be available at the project site at all times.

- G. Additional erosion and sediment control design standards and criteria shall be applied where infiltration BMPs are proposed and shall include the following:
1. Areas proposed for infiltration BMPs shall be protected from sedimentation and compaction during the construction phase to maintain maximum infiltration capacity.
 2. Infiltration BMPs shall not be constructed nor receive runoff until the entire contributory drainage area to the infiltration BMP has achieved final stabilization.
- H. Sediment and erosion pollution control facilities shall be designed according to applicable governmental standards, specifically the following:
1. PaDEP sediment and erosion control plan requirements in Chapter 102, Title 25 Pa. Code.
 2. Berks County Conservation District standards, which has been delegated by the Pennsylvania Department of Environmental Protection to enforce the erosion and sediment pollution control plan.
 3. It shall be the responsibility of the applicant to submit the application and other necessary material to the Berks County Conservation District. Comments shall be received and compliance therewith accomplished prior to final plan approval.
- I. Erosion and sediment pollution control devices shall be installed concurrently with earthmoving activities and whenever a situation is created which would contribute to increased erosion.
- J. No earthmoving or stripping of vegetation will be conducted in areas of greater than thirty-three (33) percent slope unless specific approval is obtained from the Township.
- K. Earthmoving and the addition of fill shall be maintained where possible and practicable to preserve desirable natural features and the topography of the site. Changes in grade and topography and other earthmoving shall be in accordance with the approved Erosion and Sediment Pollution Control Plan.
- L. Stripping of vegetation, regarding or other development shall be done in such a way that will minimize erosion.
- M. All clearing and grading operations shall comply with the requirements for Tree Preservation included in the Exeter Township Zoning Ordinance.
1. Land disturbance shall be limited to the actual construction site and an access strip. The amount of disturbed area and the duration of exposure shall be kept to a practical minimum.
 2. To the maximum extent practicable, mature, healthy trees of at least six (6) inches trunk width measured three (3) feet above the average surrounding ground level shall be retained and protected. Such trees shall not be removed except as

provided on the approved subdivision or land development plan in accordance with the applicable provisions of the Exeter Township Zoning Ordinance. The filling of soil over the roots of trees to be preserved is prohibited. (The roots are presumed to extend out from the tree as far as the tree's branches extend outward.)

- N. Procedures for protecting soils or geologic structures with water supply potential from contamination by surface water or other disruption by construction activity shall be established in consultation with the Township and such areas shall include, at minimum, those underlain by carbonate limestone formations. The Township may require pollution control facilities to be provided on existing and proposed stormwater management systems within or adjacent to the project site.
- O. Provisions for protecting existing wells or other water supplies shall be established.
- P. Unless otherwise permitted, graded slopes shall not be steeper than three (3) horizontal unites to one (1) vertical unit.
- Q. A minimum of four (4) inches of topsoil shall be provided on all disturbed areas prior to final seeding and mulching.
- R. Adequate erosion protection shall be provided along all open channels, and at all points of discharge (PaDEP Erosion, Sediment and Pollution Control Manual).

Section 304. Nonstructural Project Design (Sequencing to Minimize Stormwater Impacts)

- A. For projects disturbing one (1) acre or more, the design of all Regulated Activities shall include evaluation of practicable alternatives to the surface discharge of stormwater, the creation of impervious surfaces, and the degradation of waters of the Commonwealth, and must maintain as much as possible the natural hydrologic regime of the site. See Appendix E Low Impact Development Practices for several alternatives.
 - 1. An alternative is practicable if it is available and capable of being done after taking into consideration existing technology and logistics in light of overall project purposes, and other municipal requirements.
 - 2. All practicable alternatives to the discharge of stormwater are presumed to have less adverse impact on quantity and quality of waters of the Commonwealth unless otherwise demonstrated.
- B. For projects disturbing one (1) acre or more, the Applicant shall:
 - 1. Prepare an Existing Resource and Site Analysis Map (ERSAM) showing environmentally sensitive areas including, but not limited to, steep slopes, ponds, lakes, streams, wetlands, hydric soils, vernal pools, flood plains, stream buffer zones, hydrologic soil groups A and B (areas conducive to infiltration), special geologic features, any existing recharge areas and any other requirements outlined in the municipal Subdivision and Land Development Ordinance.

2. Establish appropriate buffers for each of the delineated environmentally sensitive areas per all applicable Township Ordinance (See Section 306.D. for stream buffers and Section 305.K for special geologic feature buffers).
3. Prepare a draft project layout avoiding sensitive areas identified in Section 304.B.1.
4. Identify site specific existing conditions drainage areas, discharge points, recharge areas and hydrologic soil groups A and B.
5. Evaluate Nonstructural Stormwater Management Alternatives that:
 - a. Minimize earth disturbance
 - b. Minimize impervious surfaces
 - c. Break up large impervious surfaces.
6. Satisfy infiltration objective (Section 305) and provide for stormwater pretreatment prior to infiltration. Pretreatment may not be necessary for rooftop runoff which enters the infiltration facility directly from a roof leader.
7. Satisfy water quality (Section 306) and streambank erosion protection objective (Section 307).
8. Determine what Management District the site falls into (Appendix D) and conduct an existing conditions runoff analysis.
9. Prepare a final project design to maintain existing conditions drainage areas and discharge points, to minimize earth disturbance and impervious surfaces, and to the maximum extent possible, to ensure the remaining site development has no surface or point discharge.
10. Conduct a proposed conditions runoff analysis based on the final design and to meet the release rate and in turn the overbank flow and extreme event requirements (Section 308).
11. Manage any remaining runoff through treatment prior to discharge, as part of detention, bioretention, direct discharge or other structural control.

Section 305 Ground Water Recharge (Infiltration/Recharge/Bioretenion)

Maximizing the ground water recharge capacity of the area being developed is required. Design of the infiltration stormwater management facilities shall give consideration to providing ground water recharge to compensate for the reduction in the percolation that occurs when the ground surface is disturbed or impervious surface is created. These measures are required to be consistent with Section 103, and take advantage of utilizing any existing recharge areas.

Infiltration may not be feasible on every site due to site-specific limitations such as soil type. If it cannot be physically accomplished due to seasonal high water table, soil permeability rate, soil depth or setback distances from special geologic features, then the design professional shall be responsible to show that this cannot be physically accomplished. If the applicant seeks relief due

to site-specific limitations, the Township has the right to hire an independent professional, at the applicant's expense, to assess the applicant's claim. If it can be physically accomplished, then the volume of runoff to be infiltrated shall be determined from Sections 305.A.3 depending on demonstrated site conditions and shall be the greater of the two volumes.

A. Infiltration BMPs shall meet the following minimum requirements:

1. Infiltration Requirements:

a. Regulated activities will be required to infiltrate, where site conditions permit, a portion of the runoff created by the development as part of an overall stormwater management plan designed for the site. The volume of runoff to be infiltrated shall be determined from Sections 305.A.3.a. or 305.A.3.b, depending upon demonstrated site conditions.

2. Infiltration BMPs intended to receive runoff from developed areas shall be selected based on suitability of soils and site conditions and shall be constructed on soils that have the following characteristics:

a. A minimum depth of 24 inches between the bottom of the BMP and the limiting zone.

b. An infiltration and/or percolation rate sufficient to accept the additional stormwater load and drain completely as determined by field tests conducted by the Applicant's design professional.

c. The infiltration facility shall be capable of completely infiltrating the required retention (infiltration) volume within 4 days (96 hours).

d. Pretreatment shall be provided prior to infiltration.

3. The size of the infiltration facility shall be based upon the following volume criteria:

a. NRCS Curve Number equation.

The NRCS runoff equation shall be utilized to calculate infiltration requirements (I) in inches.

$$I \text{ (Infiltration requirement, in inches)} = (200 / CN) - 2$$

Eqn: 305.1

Where:

CN = SCS (NRCS) curve number of existing conditions contributing to the infiltration facility.

This equation is displayed graphically in, and the infiltration requirement can be determined from Figure 305.1.

It has been determined that infiltrating 0.46 inches of runoff from the impervious areas will aid in maintaining the hydrologic regime of the watershed. However, the rounded number 0.5 inches will be used.

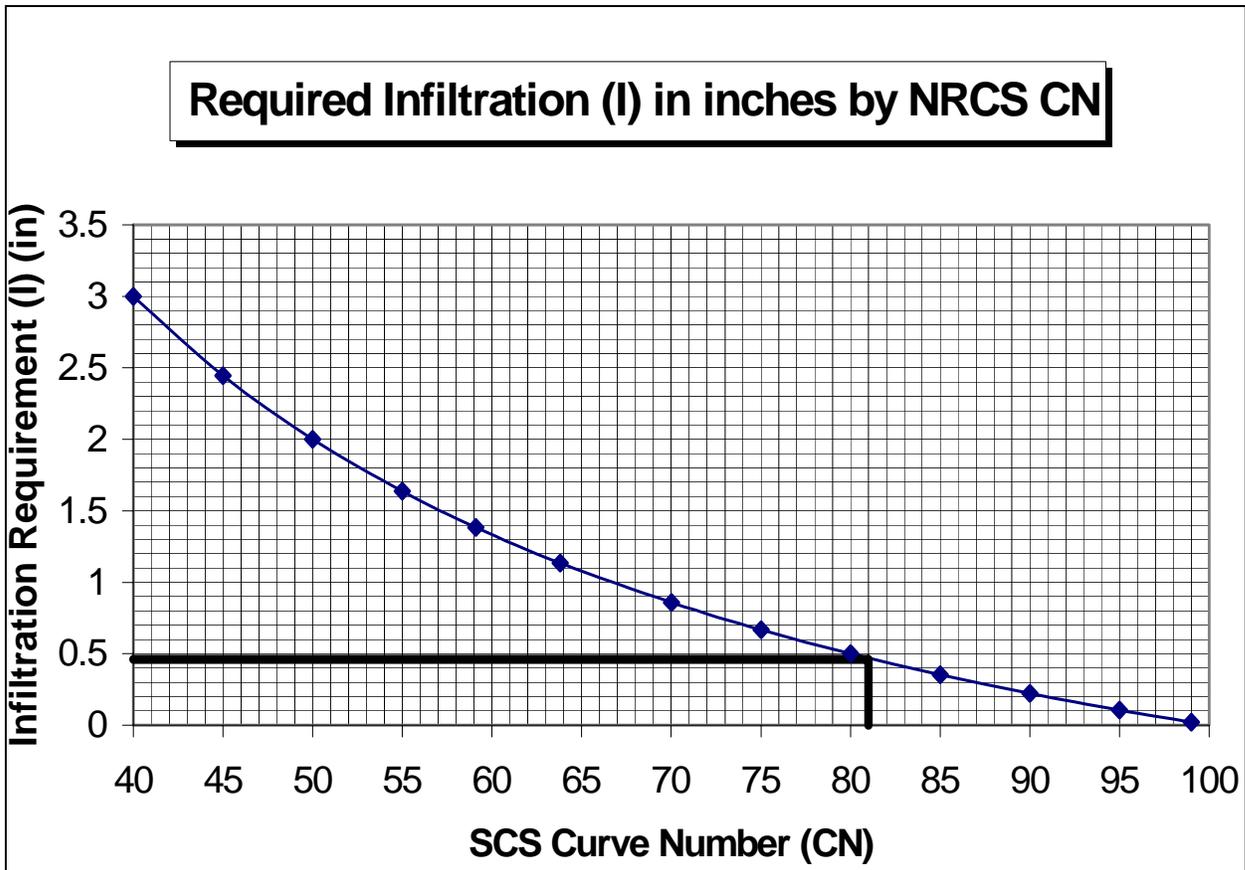


Figure 305.1. Infiltration requirement based upon NRCS Curve Number.

The retention (infiltration) volume (Re_v) required to meet the infiltration requirement would therefore be computed as:

$$Re_v = (0.5 \text{ or } I, \text{ whichever is greater}) * \text{impervious area (square feet)} / (12 \text{ in/ft}) = \text{Cubic Feet} \quad \text{Eqn: 305.2}$$

Where:

I = infiltration requirements (in inches.)

- b. Annual Recharge – Water Budget Approach.

If the goals of Sections 305.A.3.a cannot be achieved, then 0.5 inches of rainfall shall be infiltrated from all impervious areas, up to an existing site conditions curve number of 81. Above a curve number of 81, Equation 305.1 or the curve in Figure 305.1 should be used to determine the infiltration requirement.

The retention (infiltration) volume (Re_v) required again would therefore be computed as:

$$Re_v = (0.5 \text{ or } I, \text{ whichever is greater}) * \text{impervious area (sq.ft.)} / (12\text{in/ft}) = \text{Cubic Feet.}$$

- B. Soils - A detailed soils evaluation of the project site shall be required where practicable to determine the suitability of infiltration facilities. The evaluation shall be performed by a qualified design professional, and at a minimum, address soil permeability, depth to bedrock and subgrade stability. The Township Engineer shall be notified a minimum of two (2) working days prior to the site evaluation so that the evaluation may be witnessed by the Township Engineer or its designee. The general process for designing the infiltration BMP shall be:
1. Analyze hydrologic soil groups as well as natural and man-made features within the site to determine general areas of suitability for infiltration practices. In areas where development on fill material is under consideration, conduct geotechnical investigations of sub-grade stability; infiltration is not permitted to be ruled out without conducting these tests.
 2. Provide field tests such as double ring infiltrometer or hydraulic conductivity tests (at the level of the proposed infiltration surface) to determine the appropriate hydraulic conductivity rate. Percolation tests are not recommended for design purposes.
 3. Design the infiltration structure for the required retention (Re_v) volume based on field determined capacity at the level of the proposed infiltration surface.
 4. If on-lot infiltration structures are proposed by the Applicant's design professional, it must be demonstrated to the Township of Exeter that the soils are conducive to infiltrate on the lots identified.
- C. Carbonate Areas – The Applicant is required to investigate the ability of all areas on the site which are not underlain by carbonate rock to meet the infiltration requirements of Section 305.A. If this investigation proves infeasible, infiltration can occur on areas underlain by carbonate rock by following the recommended procedure below in conjunction with Figure B-1 in Ordinance Appendix B. However, the Applicant is not required to use infiltration in carbonate areas even if the site falls into the “Recommended” range on Figure B-1 in Ordinance Appendix B. If infiltration is not proposed, the calculated infiltration volume (Section 305.A) shall be treated by a facility which prevents the required volume of runoff from being discharged off-site. Acceptable methods for treating this volume are storage and reuse, bio-retention, wet ponds, and soil composting. Other methods may be acceptable and all methods should generally follow the design guidelines outlined in the Pennsylvania Stormwater Best Management Practice Manual, latest edition.

Infiltration BMP loading rate percentages in Figure B-1 in Ordinance Appendix B shall be calculated as follows:

$$\left(\frac{\text{Area tributary to the infiltration BMP}}{\text{Base Area of the infiltration BMP}} \right) * 100\%$$

The area tributary to the infiltration BMP shall be weighted as follows:

Area Description	Weighting
All disturbed area to be made impervious	100%
All disturbed areas to be made pervious	50%
All undisturbed impervious areas	100%
All undisturbed pervious areas	0%

Soil thickness is to be measured from the bottom of any proposed infiltration BMP. The effective soil thickness in Figure B-1 in Ordinance Appendix B is the measured soil thickness multiplied by the thickness factor based on soil permeability, as follows:

Permeability Range	Thickness Factor
6.0 to 12.0 inches/hr	0.8
2.0 to 6.0 inches / hr	1.0
1.0 to 2.0 inches/hr	1.4
0.75 to 1.0 inches/hr	1.2
0.5 to 0.75 inches/hr	1.0

The design of all facilities over Karst shall include an evaluation of measures to minimize adverse effects.

- D. Stormwater Hotspots – Following is a list of examples of designated stormwater hotspots. If a site is designated as a stormwater hotspot, it has important implications for how stormwater is managed. First and foremost, untreated stormwater runoff from hotspots shall not be allowed to recharge into groundwater where it may contaminate water supplies. Therefore, the Re_v requirement shall NOT be applied to development sites that fit into the hotspot category (i.e., the entire WQ_v must still be treated). Second, a greater level of stormwater treatment shall be considered at hotspot sites to prevent pollutant washoff after construction. It shall be noted that EPA’s NPDES stormwater program requires some industrial sites to prepare and implement a stormwater pollution prevention plan.

Examples of Stormwater Hotspots:

- Vehicle salvage yards and recycling facilities
- Vehicle fueling stations
- Vehicle service and maintenance facilities
- Vehicle and equipment cleaning facilities
- Fleet storage areas (bus, truck, etc.)
- Industrial sites (based on Standard Industrial Codes)
- Marinas (service and maintenance)
- Outdoor liquid container storage
- Outdoor loading/unloading facilities

- Public works storage areas
- Facilities that generate or store hazardous materials
- Commercial container nursery
- Other land uses and activities as designated by an appropriate review authority

The following land uses and activities are not normally considered Stormwater Hotspots:

- Residential streets and rural highways
- Residential development
- Institutional development
- Office developments
- Non-industrial rooftops
- Pervious areas, except golf courses and nurseries (which may need an Integrated Pest Management (IPM) Plan).

While large highways (i.e., those roads with average daily traffic volume (ADT) greater than 30,000) are not designated as a stormwater hotspot; it is important to ensure that highway stormwater management plans adequately protect groundwater.

- E. Caution shall be exercised where infiltration is proposed in Source Water Protection Areas as defined by the Township of Exeter or Water Authority.
- F. Infiltration facilities shall be used in conjunction with other innovative or traditional stormwater control facilities that are found within the PaDEP State BMP Manual.
- G. Caution shall be exercised where salt or chloride (e.g., municipal salt storage) would be a pollutant since soils do little to filter this pollutant and it may contaminate the groundwater. The qualified design professional shall evaluate the possibility of groundwater contamination from the proposed infiltration facility and perform a hydrogeologic justification study if necessary.
- H. The infiltration requirement in High Quality or Exceptional Value waters shall be subject to the Department's Chapter 93 Antidegradation Regulations.
- I. Dependent upon certain land use or stormwater hotspots, an impermeable liner will be required in detention basins where the possibility of groundwater contamination exists. Applicant may be required to submit a detailed hydrogeologic investigation for review and approval by the Township of Exeter.
- J. The Township of Exeter shall require the Applicant to provide safeguards against groundwater contamination for land uses that may cause groundwater contamination should there be a mishap or spill.
- K. For projects that disturb one (1) acre or more, unless a stricter setback is otherwise specified in the Zoning Ordinance, the following minimum setback requirements for infiltration facilities shall apply:
 - 100 feet from water supply wells
 - 10 feet downslope or 100 feet upslope from building foundations

- 50 feet from septic system drainfields
- 50 feet from a geologic contact with carbonate bedrock, unless a preliminary site investigation is done in the carbonate bedrock to show the absence of special geologic features within 50 feet of the proposed infiltration area;
- 100 feet from the property line unless documentation is provided to show all setbacks from wells, foundations and drainfields on the neighboring property will be met.

Section 306. Water Quality Requirements

The applicant shall comply with the following water quality requirements of this Article.

- A. Developed areas shall provide adequate storage and treatment facilities necessary to capture and treat stormwater runoff. The infiltration volume computed under Section 305 may be a component of the water quality volume if the Applicant chooses to manage both components in a single facility. If the infiltration volume is less than the water quality volume, the remaining water quality volume may be captured and treated by methods other than infiltration BMPs. The required water quality volume (WQ_v) is the storage capacity needed to capture and treat a portion of stormwater runoff from the developed areas of the site.

To achieve this goal, the following criterion is established:

The following calculation formula is to be used to determine the water quality storage volume, (WQ_v), in acre-feet of storage for the Schuylkill River watershed:

$WQ_v = [(P)(R_v)(A)]/12$	Eqn: 306.1
---------------------------	------------

Where:

WQ_v = Water Quality Volume (acre-feet)

P = 1 inch

A = Total contributing drainage area to the water quality BMP (acres)

R_v = 0.05 + 0.009(I) where I is the percent of the area that is impervious surface ((impervious area/A)*100)

This volume requirement can be accomplished by the permanent volume of a wet basin or the detained volume from other BMPs.

Release of water can begin at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility). The design of the facility shall provide for protection from clogging and unwanted sedimentation.

- B. For areas within defined Special Protection subwatersheds which include Exceptional Value (EV) and High Quality (HQ) waters, and Cold Water Fishery (CWF), the temperature and quality of water and streams shall be maintained.
- C. To accomplish the above, the Applicant shall use innovative or traditional stormwater control facilities that are found within the PADEP BMP Manual.

- D. If a perennial or intermittent stream passes through the site, the applicant shall create a stream buffer extending a minimum of fifty (50) feet to either side of the top-of-bank of the channel. The buffer area shall be maintained with appropriate native vegetation (Reference to Appendix H of Pennsylvania Handbook of Best Management Practices for Developing Area for plant lists). If the applicable rear or side yard setback is less than fifty (50) feet, the buffer width may be reduced to twenty-five (25) percent of the required setback, to a minimum of ten (10) feet, at the discretion of the Township after consideration of the water quality rating of the stream in question and the need to protect it. If an existing buffer is legally prescribed (i.e. deed, covenant, easement, etc.) and it exceeds the requirements of this Ordinance, the existing buffer shall be maintained. The Township of Exeter may permit a smaller or larger buffer width if desired, but the buffer width may not be less than ten (10') feet. This does not include lakes, wetlands, or permitted stream crossing.
- E. Evidence of any necessary permit(s) for regulated earth disturbance activities from the appropriate PaDEP regional office must be provided to the Township of Exeter. The issuance of an NPDES Construction Permit (or permit coverage under the statewide General Permit (PAG-2) satisfies the requirements of Section 306.A.

Section 307. Streambank Erosion Requirements

In addition to control of the water quality volume, in order to minimize the impact of stormwater runoff on downstream streambank erosion, the primary requirement is to design a BMP to detain the proposed conditions 2-year, 24-hour design storm to the existing conditions 1-year peak flow using the SCS Type II distribution. Additionally, provisions shall be made (such as adding a small orifice at the bottom of the outlet structure) so that the proposed condition 1-year storm takes a minimum of 24 hours to drain from the facility, measured from a point where the maximum volume of water from the 1-year storm is captured (i.e., the maximum water surface elevation is achieved in the facility). Release of water can begin at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility).

The minimum orifice size in the outlet structure to the BMP shall be a three (3) inch diameter orifice and a trash rack shall be installed to prevent clogging. On sites with contributing drainage areas to this BMP that do not provide enough runoff volume to allow a 24-hour attenuation with the 3 inch orifice, the calculations shall be submitted showing this condition. Orifice sizes less than 3 inches can be utilized, provided that the design will prevent clogging of the intake.

Section 308. Stormwater Management Districts

- A. The Schuylkill River Watershed has been divided into stormwater management districts as shown on the Management District Map in Appendix D.

In addition to the requirements specified in Table 308.1 below, the groundwater recharge (Section 305), water quality (Section 306), and streambank erosion control (Section 307), requirements shall be implemented.

Standards for managing runoff rates from each subarea in the Schuylkill River Watershed for the 2-year through 100-year design storms are shown in Table 308.1. Development

sites located in each of the Districts must control proposed conditions runoff rates to existing conditions runoff rates for the design storms in accord with Table 308.1, unless a more stringent standard is imposed by Table Footnote 2 below.

TABLE 308.1 – Water Quantity Requirements

Management District	Proposed Condition Design Storm		Existing Condition Design Storm	Equivalent Release Rate
A	2-year	Reduce To	1-year	-
	5-year		5-year	100%
	10-year		10-year	100%
	25-year		25-year	100%
	50-year		50-year	100%
	100-year		100-year	100%
B	2-year	Reduce To	1-year	-
	5-year		2-year	30%
	10-year		5-year	75%
	25-year		10-year	75%
	50-year		25-year	75%
	100-year		50-year	75%
C *	2-year	Reduce To	1-year	100%
	5-year		5-year	100%
	10-year		10-year	100%
	25-year		25-year	100%
	50-year		50-year	100%
	100-year		100-year	100%

Table Footnote (1) The Owatin Creek Watershed #515 (designated as C) shall be added to the “B” District.

Table Footnote (2) For any site which proposes to discharge into an established stormwater drainage conveyance system (i.e., a system of swales, ditches, channels, pipes, conduits, culverts and storm sewers) the site may only discharge at a rate that does not exceed the site’s proportional share of the flow capacity of the most restrictive element (e.g., a culvert) of the downstream conveyance system. The site’s proportional share of the flow capacity is equivalent to the ratio of the proposed development site acreage to the total watershed acreage served by the conveyance system upstream of the most restrictive element. Therefore, if the proposed development site is 10% of the total watershed area, the discharge from the proposed development shall not exceed 10% of the available downstream capacity at peak flow with travel time considered. The 50 year storm event shall be the design storm for this provision unless a greater capacity is warranted due to consideration of public safety.

Table Footnote (3) All areas, regardless of the release rate, must still meet the requirements of the groundwater recharge criteria (Section 305), water quality criteria (Section 306), and streambank erosion criteria (Section 307).

- B. General - Proposed condition rates of runoff from any regulated activity shall not exceed the peak release rates of runoff prior to development for the design storms specified on the Stormwater Management District Watershed Map (Ordinance Appendix D) and Section 308 of this Ordinance.
- C. District Boundaries - The boundaries of the Stormwater Management Districts are shown on the Schuylkill River Watershed Act 167 Stormwater Management Plan that is available for inspection at the municipal office. A copy of the Schuylkill River Watershed Act 167 Stormwater Management Plan at a reduced scale is included in the Ordinance Appendix D. The exact location of the Stormwater Management District boundaries as they apply to a given development site shall be determined by mapping the boundaries using the two-foot topographic contours (or most accurate data required) provided as part of the Drainage Plan.
- D. Sites Located in More Than One District - For a proposed development site located within two or more stormwater management district category subareas, the peak discharge rate from any subarea shall meet the Management District Criteria for which the discharge is located, as indicated in Section 308. The calculated peak discharges shall apply regardless of whether the grading plan changes the drainage area by subarea. An exception to the above may be granted if discharges from multiple subareas recombine in proximity to the discharge site. In this case, peak discharge in any direction shall follow Management District A criteria provided that the overall site discharge meets the Management District Criteria for which the discharge is located.
- E. Off-Site Areas - Off-site areas that drain through a proposed development site are not subject to release rate criteria when determining allowable peak runoff rates. However, on-site drainage facilities shall be designed to safely convey off-site flows through the development site.
- F. Site Areas - Where the site area to be impacted by a proposed development activity is less than fifty (50) percent of the total site area, only the proposed impact area shall be subject to the Management District Criteria. In other words, unimpacted areas bypassing the stormwater management facilities would not be subject to the Management District Criteria.
- G. Developed Sites which are expanding or are being partially redeveloped and currently have stormwater storage facilities which were approved by the Township – The new impervious areas and redeveloped areas shall comply with the provisions of this Ordinance while the existing impervious area may continue to be controlled by the existing stormwater management facilities providing that the existing stormwater management facilities are functioning properly and no drainage problem exists. The design engineer shall contact the Township Engineer prior to performing the stormwater management calculation to determine the best approach to demonstrating compliance with this Ordinance.
- H. Developed Sites which are expanding or are being partially redeveloped and currently do not have stormwater storage facilities that were approved by the Township - The new impervious areas and redeveloped portions of the site shall comply with the provisions of

this Ordinance while the existing impervious area may continue function without the benefit of stormwater management facilities providing that no drainage problem exist. If drainage problems do exist on the site or at the point of stormwater discharge from the site the correction of the drainage problem to the satisfaction of the Township shall be incorporated into the design for the new impervious area or separate facilities shall be provided. The design engineer shall contact the Township Engineer prior to performing the stormwater management calculation to determine the best approach to demonstrating compliance with this Ordinance.

- I. Redevelopment of sites – Sites that are being redeveloped, as defined in this Ordinance, shall be in conformance with the provisions of this Ordinance.

Section 309. Calculation Methodology

- A. Stormwater runoff from all development sites with a drainage area of greater than 200 acres shall be calculated using a generally accepted calculation technique that is based on the NRCS soil cover complex method. Table 309-1 summarizes acceptable computation methods and the method selected by the design professional shall be based on the individual limitations and suitability of each method for a particular site. The Rational Method shall be used to estimate peak discharges from drainage areas that contain less than 200 acres. The Soil Complex Method shall be used for drainage areas greater than 200 acres.

**TABLE 309-1
Acceptable Computation Methodologies For
Stormwater Management Plans**

<u>METHOD</u>	<u>METHOD DEVELOPED BY</u>	<u>APPLICABILITY</u>
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 within limitations described in TR-55.
HEC-1 / HEC-HMS	US Army Corps of Engineers	Applicable where use of full hydrologic computer model is desirable or necessary. Applicable where use of a hydrologic computer model is desirable or necessary;
PSRM	Penn State University	simpler than TR-20 or HEC-1.
Rational Method or commercial computer package based on Rational Method)	Emil Kuichling(1889)	For sites less than 200 acres and with time of concentration less than 60 minutes (tc < 60 min), or as approved by the Township of Exeter

METHOD

METHOD DEVELOPED BY

APPLICABILITY

Other Methods

Varies

Other computation methodologies approved by the Township of Exeter.

* Note: Successors to the above methods are also acceptable. These successors include WINNTR55 for TR55 and WINTR20 for TR20 and SWMM.

B. All calculations consistent with this Ordinance using the soil cover complex method shall use the appropriate design rainfall depths for the various return period storms according to the region in which they are located as presented in Table B-1 in Appendix B of this Ordinance. If a hydrologic computer model such as PSRM or HEC-1 / HEC-HMS is used for stormwater runoff calculations, then the duration of rainfall shall be 24 hours. The rainfall distribution should reference to NOAA Atlas 14.

C. For the purposes of existing conditions flow rate determination, undeveloped land and redeveloped land shall be considered as "meadow" in good condition, unless the natural ground cover has a Curve Number or Rational 'C' value (i.e., forest) lower than that for meadow, as listed in Table B-1 or B-2 in Appendix B of this Ordinance.

D. All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times-of-concentration for overland flow and return periods from the NOAA Atlas 14 Precipitation-Frequency Atlas of the United States (2004, revised 2006). Times-of-concentration for overland flow shall be calculated using the methodology presented in Chapter 3 of Urban Hydrology for Small Watersheds, NRCS, TR-55 (as amended or replaced from time to time by NRCS). Times-of-concentration for channel and pipe flow shall be computed using Manning's equation. NRCS lag equation divided by 0.6 as acceptable method for Tc in undeveloped areas.

E. Time of concentration shall be based on the following design parameters:

1. Sheet flow: The maximum length for each reach of sheet or overland flow before shallow concentrated or open channel flow develops is one hundred fifty (150) feet. Flow lengths greater than one hundred (100) feet shall be justified based on the actual conditions at each development site. The maximum construction phase and post-development sheet flow length for unpaved surfaces shall be one hundred (100) feet for most situations (one hundred fifty (150) feet for areas which will remain undisturbed).
2. Shallow concentrated flow: Travel time for shallow concentrated flow shall be determined using Figure 3-1 from TR-55, Urban Hydrology for Small Watersheds, as shown in Appendix B6.
3. Open Channel flows: At points where sheet and shallow concentrated flows concentrate in field depressions, swales, gutters, curbs, or pipe collection systems, the travel times and downstream end of the development site between these design points shall be based upon manning's Equation and/or acceptable engineering design standards as determined by the Township Engineer.

- F. Runoff Curve Numbers (CN) for both existing and proposed conditions to be used in the soil cover complex method shall be obtained from Table B-1 in Appendix B of this Ordinance.
- G. Runoff coefficients (c) for both existing and proposed conditions for use in the Rational method shall be obtained from Table B-2 in Appendix B of this Ordinance.
- H. Where uniform flow is anticipated, the Manning's equation shall be used for hydraulic computations, and to determine the capacity of open channels, pipes, and storm sewers. Values for Manning's roughness coefficient (n) shall be consistent with Table B-3 in Appendix B of the Ordinance. Full flow shall be assumed for closed conduits.
- I. Outlet structures for stormwater management facilities shall be designed to meet the performance standards of this Ordinance using any generally accepted hydraulic analysis technique or method.
- J. The design of any stormwater detention facilities intended to meet the performance standards of this Ordinance shall be verified by routing the design storm hydrograph through these facilities using the Storage-Indication Method. For drainage areas greater than 200 acres in size, the design storm hydrograph shall be computed using a calculation method that produces a full hydrograph (i.e. TR-20, TR-55, HEC-1, PSRM). The Township of Exeter may approve the use of any generally accepted full hydrograph approximation technique that shall use a total runoff volume that is consistent with the volume from a method that produces a full hydrograph.
- K. During the construction progression of a project, the discharge of stormwater runoff from the site may follow distinct patterns that will be altered during the course of the construction. In such an event, the comparison of the construction phase discharge rate to the pre-development rate shall be performed for each separate and distinct pattern. At no time throughout the construction phase of a project shall the peak discharge rate discharging from any location along the boundary of a site exceed the pre-development peak discharge rate at that location.
- L. Where applicable, construction phase and post-development time of concentration to a storage facility shall be the time of concentration in the storm sewer to its point of discharge into the storage facility. Overland flow from the discharge point to the outlet structure shall not be included in the time of concentration.
- M. When designing regional storage facilities for office parks, industrial parks, etc., the following design criteria shall be followed:
 - 1. Assumed impervious, lawn, etc., coverage areas shall be noted in the calculations for each lot which will drain to the storage facility. Impervious coverage shall be assumed to be the maximum coverage allowed by the Zoning Ordinance.
 - 2. A six (6.0) minute time of concentration shall be used to calculate the post-development basin inflow hydrographs (five (5.0) minutes for the Rational Method). Longer times of concentration shall be allowed for the portions of the drainage area that will remain undeveloped or where it can be demonstrated that

longer times will occur in the developed area after full potential development occurs. The hydrographs for the developed and undeveloped portions of the drainage area shall be combined prior to routing through the stormwater facility.

3. For lots which will have on lot detention or retention basins, the pre-development time of concentration for the lot shall be the same as the pre-development time of concentration for the entire pre-development drainage area in which it is located.

Section 310. Design Criteria for Stormwater Management and Conveyance BMPs

A. General regulations

1. Applicants may select a combination of runoff control techniques that are most suitable to control stormwater runoff from the site. All controls shall be subject to approval of the Township of Exeter. The Township Engineer may request specific information on design and/or operating features of the proposed stormwater controls in order to determine their suitability and adequacy in terms of the standards of this Section, which must be promptly submitted by the Applicant.
2. The Applicant shall consider the effect of the proposed stormwater management techniques on any special soil conditions or geological hazards that may exist on the development site. In the event such conditions are identified on the site, the Township Engineer may require in-depth studies by a Geotechnical Engineer.
3. Any facilities that constitute water obstructions (e.g., culverts, bridges, outfalls, or stream enclosures), water encroachments, and any work involving wetlands governed by PaDEP Chapter 105 regulations (as amended or replaced from time to time by PaDEP), are subject to PaDEP Chapter 105 regulations.
4. Adequate erosion protection shall be provided along all open channels, and at all points of discharge (DEP erosion and Erosion, Sediment and Pollution Control Manual).
5. The Township of Exeter reserves the right to deny or reject any design that would result in the construction of or continuation of a stormwater problem area.

B Detention and Retention Basins

Any BMP that is a dam, as defined in 25 Pa. Code Chapter 105, shall be designed according to the requirements in those regulations. Any stormwater BMP that does not constitute a dam under 25 Pa. Code Chapter 105, but is designed to store runoff and requires a berm or earthen embankment (i.e. detention basin), shall be designed to comply with the following:

1. All wet basin designs shall incorporate biologic minimization controls consistent with the West Nile Guidance found in Appendix F.
2. No stormwater detention facility shall be placed within fifty (50) feet of a special geologic feature. No stormwater conveyance facility shall be constructed within

fifty (50) feet of a special geologic feature unless it is constructed of durable pipe utilizing watertight joints.

3. Privately owned detention facilities and BMPs shall be situated such that lot lines do not divide the facility. Maintenance of an individual facility shall be the responsibility of only one lot owner unless the facility is located in a common area maintained by a homeowner's association.
4. Basins with earthen embankments shall be designed with an emergency spillway that has capacity and stability to accommodate the 100-year post-development hydrograph in a manner that will not damage the integrity of the facility and will not create a downstream hazard. Emergency spillway design shall assume that all other basin outlets are non-functional. Where practical, the emergency spillway shall be constructed in undisturbed ground, and locations in fill should be avoided. Regardless of location, appropriate stabilization measures shall be provided and the use of a concrete spillway maybe required in areas where it is constructed in fill.
5. The height of the embankment shall be designed to provide a minimum 1.0 foot of freeboard above the maximum elevation computed when the 100-year peak post-development flow passes through the emergency spillway. Embankment heights shall not exceed 15 feet, unless approved by the Township of Exeter.
6. The minimum top width of earthen embankments shall be equal to three-fourths (3/4) of the embankment height, but in no case shall the top width be less than eight feet (8').
7. Side slopes shall be kept as close to the natural land contours as practical. Interior and exterior embankment side slopes shall not be greater than three (3) horizontal to one (1) vertical. Depending upon the location and the intended use of the detention facilities during nonfunctioning times, a side slope of less than three (3) horizontal to one (1) vertical may be required by the Board of Supervisors. When a detention basin is to be maintained by a future residential lot owner, the maximum side slope shall be four (4) horizontal to one (1) vertical.
8. All pipes, conduits, etc. passing through basin embankments shall have properly spaced concrete anti-seep collars. Minimum collar projection beyond the pipe shall be two feet (2'), maximum collar spacing is 14 times the projection, and the minimum thickness shall be twelve (12) inches. The joint between collar and pipe shall be watertight.
9. Where the outfall point of a proposed detention facility is located at a point subject to tailwater conditions, a tailwater elevation at the outfall point shall be calculated and considered when performing the detention facility routing calculations. The tailwater elevation shall be based on the frequency of the storm being routed.
10. A key trench at least two (2) feet deep, or extending down to stable subgrade, whichever is deeper, of compacted relatively impervious material (Unified Soil Classification CL or ML) shall be provided within all basin embankments. The

minimum bottom width for the key trench shall be four (4) feet. Maximum side slopes for the key trench shall be one (1) horizontal to one (1) vertical shall extend the full length of the embankment. A compacted impervious core at least four (4) feet wide at the top, having a maximum side slope of one (1) horizontal to one (1) vertical, shall extend for the full length of the embankment, and the top elevation shall be set at the 25-year design year water surface elevation.

11. All basins shall be structurally sound and shall be constructed of durable materials. The completed structure and the foundation of all basins shall be stable under all probable conditions of operation. Embankments shall be placed in maximum eight-inch (8") lifts to a minimum of 95 percent of maximum dry density, as established by ASTM D-1557. Compaction test results shall be provided to the Township of Exeter upon request. Embankments shall be constructed a minimum of six inches (6") above design elevations to allow for settlement.
12. All basins not including Groundwater Recharge and/or Water Quality Volume shall include an outlet structure to permit draining the basin to a completely dry condition within twenty-four (24) hours following the end of the design rainfall.
13. All discharge control devices (outlet structures) with appurtenances (except discharge pipes) shall be made of reinforced concrete and stainless or hot dip galvanized steel. Bolts/fasteners and any orifice plates are to be stainless or galvanized steel. Outlet barrels/pipes shall have a minimum diameter of fifteen (15) inches and shall be made of reinforced concrete pipe with watertight joints, or approved equivalent. Where installation conditions merit, structural calculations that address the actual design requirements will be required.
14. All basins employing small orifices (i.e., orifices less than six (6) inches diameter or equivalent area), shall be provided with an apron of concrete or similar durable material which abuts the orifice invert and extends a minimum of eighteen (18) inches in all directions from the orifice, to prevent potential blockage by vegetative growth or debris, and to allow for easy cleaning of the area approaching the orifice. Appropriate trash racks are required for all orifice openings.
15. All outlet structures in above ground detention/retention basin shall have the top of grate set at least three (3) inches lower than the invert of the emergency spillway to allow discharge through the outlet structure and associated outlet barrel/pipes prior to discharge through the emergency spillway.
16. Outlet structures for underground detention facilities shall be provided within a reinforced concrete junction box or inlet box. Flows through the outlet structure shall be attenuated with a concrete weir wall with adequately sized orifices. The dimensions of the weir wall should be designed to allow passage of the 100-year post-development inflow without surcharging the junction box.
17. Underground detention facilities that propose pipe/culvert storage as a means of detention shall be constructed of reinforced concrete or smooth-lined corrugated high-density polyethylene pipe (HDPE). with watertight joints meeting ASTM D-

3212. Where installation conditions merit, structural calculations that address the actual design requirements will be required.
18. Underground detention and infiltration facilities utilizing pipe, box culverts or chambers as the means of storage and located in areas receiving vehicular traffic shall be designed to carry earth dead and AASHTO HS20 live load conditions. Under warranted conditions AASHTO HS25 shall be the design live load.
 19. Low flow channels shall be provided from each water carrying facility to the outlet structure for all basins that do not include Groundwater Recharge and/or Water Quality Storage. Low flow channels shall be one (1) percent minimum slope and shall be designed to enable ease of maintenance. All basins that do include Groundwater Recharge and/or Water Quality storage shall not be required to have a low flow channel.
 20. The minimum slope within a basin that does not include Groundwater Recharge and/or Water Quality storage shall be two (2) percent positive grade to the low flow channel.
 21. The effect on downstream areas if the basin embankment fails shall be considered in the design of all basins. The basin shall be designed to minimize the potential damage caused by such failure of the embankment.
 22. All structures (detention basins, cisterns, etc.) other than those used for Groundwater Recharge Volume and Water Quality Volume, must completely drain within 24 hours after the end of the design storm.
 23. Whenever a basin will be located in an area underlain by limestone, a geological evaluation of the proposed location shall be conducted to determine susceptibility to sinkhole formations. The design of all facilities over limestone formations shall include measures to prevent groundwater contamination and, where necessary, sinkhole formation. Soils used for the construction of basins shall have low-erodibility factors ("K" factors). The Township of Exeter may require the installation of an impermeable liner in detention basins.
 24. Minimum floor elevations for all structures that would be affected by a basin, other temporary impoundments, or open conveyance systems where ponding may occur shall be two (2) feet above the 100-year water surface. If basement or underground facilities are proposed, detailed calculations addressing the effects of stormwater ponding on the structure and water-proofing and/or flood-proofing design information shall be submitted for approval.
 25. In addition to the above, Wet Ponds shall be designed in accordance with the design parameters as found in the Pennsylvania Department of Environmental Protection, Pennsylvania Stormwater Best Management Practices Manual, latest edition and the following:
 - a. Water surface area shall not exceed 1/10 of the tributary drainage area,

- b. Shoreline protection shall be provided to prevent erosion from wave action.
- c. Minimum normal water depth shall be 4 feet. If fish are to be used to keep the pond clean, a minimum of 1/4 of the pond area shall be a minimum of 10 feet deep.
- d. Facilities shall be provided to allow the pond level to be lowered by gravity flow for cleaning purposes and shoreline maintenance.
- e. Aeration facilities as may be required to prevent pond stagnation shall be provided. Design calculations to substantiate the effectiveness of these aeration facilities shall be submitted with final engineering plans. Agreements for the perpetual operation and maintenance of aeration facilities shall be prepared to the satisfaction of the Township of Exeter.
- f. In the event that the water surface of the pond is to be raised for the purposes of storing water for irrigation or in anticipation of the evapotranspiration demands of dry weather, the volume remaining for storage of excess stormwater runoff shall still be sufficient to contain the design year storm runoff.

C. Stormwater Collection and Conveyance Systems: Gutters, inlets, pipes, conduits, swales, ditches and any other means for collecting and/or conveying stormwater shall be designed to comply with the following:

- 1. All storm sewer pipes, culverts and bridges (excluding detention and retention basin outfall structures), gutters and swales conveying water originating only from within the boundaries of the development site shall be designed for a twenty-five (25) year storm event. All storm sewer pipes, culverts and bridges (excluding detention and retention basin outfall structures) conveying water originating from off-site shall be designed for a fifty (50) year storm event. Facilities that convey runoff to stormwater management facilities (e.g., detention basins, etc.) shall be designed for the 100-year storm event, unless adequate alternate means for conveying 100-year flow to the facilities are provided. Drainage easements having widths no less than 20 feet shall be provided to contain and convey the 100-year frequency flood throughout the development site. Easements shall begin at the furthest upstream property line of the proposed development site in a watershed.
- 2. When designing storm sewers that discharge into a detention/retention facility, a tailwater condition at the storm sewer discharge point shall be considered where applicable. The tailwater elevation shall be equal to the detention facility water surface elevation resulting from the design storm that was used to design the storm sewer.
- 3. Water obstructions shall convey runoff from the 25-year design storm with a minimum of 2.0 feet of freeboard measured below the lowest point along the top of the roadway, without damage to the drainage structure or the roadway, unless more restrictive local, state and/or federal regulations apply. A concentrated discharge of

stormwater to an adjacent property shall be within an existing watercourse or otherwise an easement and appropriate agreements shall be required.

4. Storm sewer pipes, to be constructed within the right-of-way of existing streets or streets offered for dedication to the Township of Exeter, other than those used as roof drains, detention basin underdrains, and street subbase underdrains, shall have a minimum diameter of fifteen (15) inches and be Class III reinforced concrete pipe (RCP). RCP joints shall have pre-lubed O-ring gaskets. Water-tight specification is required in areas of carbonate geology and elsewhere as may be specified by the Township. Where installation conditions merit (e.g., deep fills), structural calculations that address the actual design requirements will be required.
5. Storm sewer pipes, to be constructed on private property or streets not offered for dedication to the Township of Exeter, other than those used as roof drains, detention basin underdrains, and street subbase underdrains, shall have a minimum diameter of fifteen (15) inches and be Class III reinforced concrete pipe (RCP) or smooth-lined corrugated high-density polyethylene pipe (HDPE). Corrugated metal pipe is not permitted. HDPE pipe joints shall be silt-tight at a minimum (e.g., ADS N-12 ST/IB, or equal), and RCP joints shall have pre-lubed O-ring gaskets. Water-tight specification is required in areas of carbonate geology and elsewhere as may be specified by the Township. Where installation conditions merit (e.g., deep fills), structural calculations that address the actual design requirements will be required.
6. Storm sewer pipes and culverts shall be installed on sufficient slopes to provide a minimum velocity of three (3) feet per second when flowing full; however, a minimum slope of not less than 0.005 ft/ft shall be provided.
7. Storm sewers shall be placed within in the cartway of curbed streets and parallel to the road shoulders of streets without curbs. At curbed street intersections, inlets shall be placed on the tangent and not on the curved portion of the curbing. Storm sewer crossings of streets shall be perpendicular to the street centerline to the maximum extent practicable.
8. Storm facilities not located within a public right-of-way shall be contained in and centered within an easement not less than 20 feet wide. Easements shall follow property boundaries where possible.
9. Manning “n” values used for design of pipes and culverts shall be in accordance with generally accepted engineering practice. Adequate documentation shall be provided in support of the chosen values.
10. All storm sewer pipe and culverts shall have a minimum cover of 18 inches. Embedment for all storm sewer pipe and culverts shall consist of AASHTO No. 8 (1B) aggregate from a minimum of six (6) inches of bedding beneath the pipe, to a minimum of 12 inches over the pipe. Aggregate requirements for street construction shall take precedence over the 1B specification, but in no case shall total aggregate cover over the pipe be less than 12 inches. Compaction shall be in conformance with manufacturer’s specifications. PA 2A stone placed in eight (8)

inches lifts and compacted to 95 percent of maximum dry density, as per PennDOT Publication 408, latest edition, shall complete the trench to pavement subgrade. Compaction test results shall be provided to the Township of Exeter upon request. Select backfill shall complete the trench to topsoil layer in grassed areas.

11. Curves, tees, elbows and wyes are not permitted in pipes other than those used as roof drains, detention basin underdrains, and street subbase underdrains. Manholes or inlets are required to facilitate such configurations.
12. Manholes and inlets shall not be spaced more than 400 feet apart for pipes with diameters of 24 inches and less, and not more than 500 feet apart for pipes of greater diameter. Ladder rungs shall be placed in manholes and inlets with depths exceeding five feet (5').
13. When there is a change in the pipe size in a manhole or inlet, the elevations of the top of the pipes shall be the same, or the smaller pipe(s) higher. A minimum drop of one-tenth foot (0.1') shall be provided from the inlet invert elevation(s) to the outlet invert elevation.
14. Manholes, inlets, headwalls, endwalls and end sections proposed for dedication or located along streets or subject to vehicular traffic, shall conform to the requirements of PennDOT, or to specifications as otherwise modified by the Township of Exeter. Manhole covers shall have the word "STORM" cast clearly on the lid.
15. Inlets along curbed streets shall be spaced to limit gutter spread to maximum of one half of the width of the travel lane during a 10-year storm. Inlet capacities and by-pass calculations shall be determined by PennDOT design techniques.
16. All proposed inlets within curbed streets shall be designed such that the top of grate elevations are equal to the top of base course elevation to permit proper drainage of the streets prior to wearing course placement.
17. Inlets shall be located at curb tangents on the uphill side of street intersections and at other locations as may be required by the Township as necessary to intercept runoff". Design and location of curb inlets shall be in accordance with Pennsylvania Department of Transportation Design Manual Part 2 and be approved by the Township Engineer.
18. Storm sewer inlets proposed to be sumped shall be a minimum of 6' long.
19. All proposed inlets within curbed streets shall be designed such that the top of grate elevations are equal to the top of base course elevation to permit proper drainage of the streets prior to wearing course placement.
20. Inlets shall be designed and located to prevent hazards to vehicles, bicycles and pedestrians.

21. Pipe underdrains and/or pavement base drains shall be provided in areas known or otherwise documented to have a seasonal high water table, and as directed by the Township Engineer.
22. Appropriate headwalls, endwalls or end sections shall be used where stormwater runoff enters or leaves the storm sewer horizontally from a natural or manmade channel. Such facilities shall conform to the requirements of PennDOT, or to specifications as otherwise modified by the Township of Exeter.
23. Adequate erosion and sediment control protection shall be provided along all open channels, and at all points of discharge.
24. Stormwater roof drains, sump pumps, and pipes installed after the effective date of this Ordinance shall not directly discharge water into a street right-of-way or discharge into a sanitary sewer or storm sewer unless approval is given by the Township.
25. All existing and natural watercourses, channels, drainage systems, wetlands and areas of surface water concentration shall be maintained in their existing condition unless an alteration is approved by the Township of Exeter and any other necessary approving body.
26. Flow velocities from any storm sewer may not result in erosion of the receiving channel.
27. Energy dissipaters shall be placed at the outlets of all storm sewer pipes, culverts, and bridges where flow velocities exceed maximum permitted channel velocities as specified in the PADEP Erosion and Sediment Pollution Control Manual, as amended.
28. Drainage facilities, including detention ponds, shall not convey water onto any existing or proposed public road right-of-way

D. Open Channels

1. Open channels shall be designed in accordance with the Channel Design procedures found in the Department of Environmental Protection Bureau of Water Quality Protection, Erosion and Sediment Pollution Control Program Manual.
2. All open channels shall be designed to convey the 25-year stormwater flow. In addition, open channels shall be designed to convey the 100-year stormwater flow to detention/retention facilities and from emergency spillways and areas where damage to property would result.
3. Open channels located adjacent to streets in residential subdivision and/or developments shall be limited to a top width of 6-feet, depth of 1.5-feet, and if trapezoidal in cross section, a minimum bottom width of 2-feet.

4. Open channels located along non-residential streets, in side yards, rear yards, or open space shall be limited to a top width of 12-feet, a depth of 3-feet, and, if trapezoidal in cross section, a minimum bottom width of 2-feet. Open channels located in side yards, rear yards, or open space shall provide a minimum of 6-inches of freeboard.
 5. The minimum longitudinal slope shall not be less than 0.010 ft/ft nor greater than 0.100 ft/ft.
- E. The following standards shall apply to all stormwater management facilities proposing infiltration as a method to reduce the proposed condition runoff to the existing condition design storm as required by Section 308.
1. Infiltration testing shall be conducted in accordance with Section 305.B
 2. A minimum depth of 36 inches shall be provided between the bottom of the infiltration facility and the limiting zone.
 3. The infiltration and/or percolation rate shall be sufficient to accept the additional stormwater load and drain completely as determined by field tests conducted by the Applicant's design professional.
 4. The infiltration facility shall be capable of completely infiltrating the required retention/detention volume within twenty-four (24) hours.
 5. Pretreatment shall be provided prior to infiltration.
 6. When stormwater runoff accesses the infiltration bed or trench via surface flow, the volume of runoff controlled by infiltration shall be limited to 25 percent of the detention volume required to satisfy Section 308. This is in consideration of loss of function during freezing weather.
 7. When runoff is piped underground to the infiltration facility; 50 percent of the detention volume required to satisfy Section 308 may be infiltrated providing the following conditions are also met:
 - (i) There exists at least eighteen (18) inches between the top of the infiltration facility and the ground surface.
 - (ii) An emergency overflow is provided capable of controlling the maximum year design storm for the watershed and district in which the facility is located when the infiltration facility is independent of the detention facility.
 - (iii) The point of discharge of the emergency overflow shall be in accordance with the provisions of this ordinance. The preferred point of discharge is into a detention or retention facility.
- F. Any infiltration and water quality facilities proposed to meet the requirements of Sections 305 and 306 shall be designed in a manner consistent with the requirements of the NPDES

Permit, if one is required. Design of the infiltration and water quality facilities shall be in accordance with the guidelines provided in the Pennsylvania Stormwater Best Management Practices Manual, latest edition.

G. Construction of Streets

1. All streets shall be designed to provide for the discharge of surface water from their rights-of-way.
2. The slope of the crown on proposed streets shall not be less than 1/4" per foot and not more than 1/2 inch per foot.
3. The typical slope of the shoulder areas shall not be less than 3/4 inches per foot and not more than 1 inch per foot.
3. Cross drainage in intersections or in tangent sections of roadway will not be permitted.
4. Gutter flow shall not exceed 1/2 of the travel lane width.

ARTICLE IV-DRAINAGE PLAN REQUIREMENTS

Section 401. General Requirements

For any of the activities regulated by this Ordinance, the preliminary or final approval of subdivision and/or land development plans, the issuance of any building or occupancy permit, or the commencement of any earth disturbance activity may not proceed until the Property Owner or Applicant or his/her agent has received written approval of a Drainage Plan from the Township of Exeter, unless the project qualifies for an exemption from the requirements to submit a Drainage Plan.

Section 402. Exemptions

A. General Exemptions

The following land use activities are exempt from the drainage plan submission requirements of this ordinance.

1. Use of land for gardening for home consumption.
2. Agricultural plowing and tilling are exempt from the rate control and Stormwater Management site plan preparation requirements of this ordinance, provided the activities are performed according to the requirements of 25 PA Code Chapter 102, and applicable Township Ordinances. The property owner shall have an approved Erosion and Sedimentation Pollution Control Plan for the agricultural activity.
3. Forest Management and timber operations are exempt from the rate control and Stormwater Management site plan preparation requirements of this ordinance provided the activities are performed according to the requirements of 25 PA Code Chapter 102, and applicable Township Ordinances. An approved Erosion and Sedimentation Pollution Control Plan must be submitted to the Township prior to the start of a forest management or timber operation that would cause disturbance to the site.
4. The construction of improvements on a lot where the impervious surface of the proposed improvements does not exceed the percentage of the net tract area, or the maximum square footage in the aggregate, whichever is lesser as found in Table 402-1 Impervious Area Exemption Criteria. The applicable minimum distance requirement set forth in Table 402-1 and the additional exemption requirements of Section 402.C shall also be met by the applicant. Such determinations shall be made by the Township Zoning Officer, after consultation with the Township Engineer. Further, to the extent that the Township Zoning Officer determines that the particular characteristics of the subject property and/or of the proposed improvements may result in deleterious stormwater impacts to a neighboring property, the Township Zoning Officer may deny such exemption request and a drainage plan would be required.

Multiple exemptions may be requested and granted up to the maximum percentage or square footage permitted for the tract of land after which compliance with this Ordinance shall be demonstrated by the applicant.

TABLE 402-1
Impervious Area Exemption Criteria

Total Parcel Size	Percentage of Net Lot Area Exempt	Maximum Impervious Area Exempt (sq.ft.)	Minimum Distance * (feet)
less than ¼ acre	4.0	400	10 ft.
¼ to less than ½ acre	3.0	600	15 ft.
½ to less than 1 acre	2.5	1,000	25 ft.
1 to less than 2 acres	2.0	1,500	50 ft.
2 to less than 3 acres	1.5	1,900	100 ft.
3 acres and greater	1.0	4,000	150 ft.

* Note : The minimum distance is between the proposed impervious area and / or stormwater controls / structures discharge point to the downstream property line.

B. Stormwater Quantity Control Exemption

Any Regulated Activity that meets the impervious area exemption criteria in Table 402-2 shall not be required to implement the stormwater quantity controls, specified in Section 308 of this Ordinance. These criteria shall apply to the total development even if development is to take place in phases. February 28, 2005 the date of the Township adoption of Ordinance No. 591 shall be the starting point from which to consider tracts as “parent tracts” in which future subdivisions and respective impervious area computations shall be cumulatively considered. Impervious areas existing on the "parent tract" prior to adoption of Ordinance No. 591 shall not be considered in cumulative impervious area calculations for exemption purposes.

TABLE 402-2
Impervious Area Exemption Criteria
(Applicable to Section 308 Stormwater Quantity Controls Only)

Total Parcel Size	Impervious Area Exemption (sq.ft.)	Minimum Distance * (feet)
1/8 less than ¼ acre	10% of total parcel size; not to exceed 10,000s.f.	10 ft.
¼ to less than ½ acre	"	15 ft.
½ to less than 1 acre	"	25 ft.
1 to less than 2 acres	"	50 ft.
2 to less than 3 acres	"	100 ft.
3 acres and greater	"	150 ft.

* Note : The minimum distance is between the proposed impervious area and / or stormwater controls / structures discharge point to the downstream property line.

Submissions for projects that utilize the exemption under section 402.B shall still be required to meet the groundwater recharge (Section 305), water quality (Section 306), and streambank erosion (Section 307) controls of this Ordinance. Drainage plans in accordance with Sections 403 A.2, 403 B.7, 8, 11, 15, and 22 and 403.D.2 must still be submitted. Any exemption must first be approved by the Township of Exeter.

C. Additional Exemption Requirement:

1. Exemption responsibilities – An exemption shall not relieve the Applicant from implementing such measures as are necessary to protect the public health, safety, and property.
2. HQ and EV streams - This exemption shall not relieve the Applicant from meeting the special requirements for watersheds draining to high quality (HQ) or exceptional value (EV) waters, identified and Source Water Protection Areas (SWPA) and requirements for nonstructural project design sequencing (Section 304), groundwater recharge (Section 305), water quality (Section 306), and streambank erosion (Section 307).
3. Drainage Problems - If a drainage problem is documented or known to exist downstream of, or expected from the proposed activity, then the Township of Exeter may require a drainage plan submittal by the upstream landowner.
4. All regulated activities occurring in drainage areas tributary to waters designated HQ/EV pursuant to 25 PA Code, Chapter 93, shall not change any biological, chemical, or physical characteristics, including volume, rate, velocity, course, current, cross section, or temperature of the waters, unless the activity is specifically permitted in accordance with the environmental laws of the Commonwealth.

Section 403. Drainage Plan Contents

The Drainage Plan shall consist of a general description of the project including sequencing 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 Drainage Plan materials shall be submitted to the Township of Exeter in a format that is clear, concise, legible, neat, and well organized; otherwise, the Drainage Plan shall not be accepted for review and shall be returned to the Applicant.

The following items shall be included in the Drainage Plan:

A. General

1. General description of the project including those areas described in Section 304;
2. General description of permanent stormwater management techniques, including construction specifications of the materials to be used for stormwater management facilities;

3. Complete hydrologic, hydraulic, and structural computations for all stormwater management facilities; and
4. An Erosion and Sediment Control Plan, including all reviews and approvals by the Conservation District.
5. A general description of nonpoint source pollution controls.

B. Maps

Map(s) of the project area shall be submitted on 24-inch x 36-inch sheets and/or shall be prepared in a form that meets the requirements for recording at the offices of the Recorder of Deeds of Berks County. If the Subdivision and Land Development Ordinance (SALDO) has more stringent criteria than the more stringent criteria shall apply. The contents of the map(s) shall include, but not be limited to:

1. The location of the project relative to highways, municipalities or other identifiable landmarks.
2. Existing contours at intervals of two feet. In areas of steep slopes (greater than 15 percent), five-foot contour intervals may be used.
3. Existing streams, lakes, ponds or other Waters of the Commonwealth within the project area.
4. Other physical features including flood hazard boundaries, stream buffers, existing drainage courses, areas of natural vegetation to be preserved, and the total extent of the upstream area draining through the site.
5. The locations of all existing and proposed utilities, sanitary sewers, and water lines extending fifty (50) feet beyond property lines.
6. An overlay showing soil names and boundaries.
7. Limits of earth disturbance, including the type and amount of impervious area that would be added.
8. Proposed structures, roads, paved areas, and buildings.
9. Final contours at intervals of two feet. In areas of steep slopes (greater than 15 percent), five-foot contour intervals may be used.
10. The name of the development, the name and address of the owner of the property, and the name of the individual or firm preparing the plan.
11. The date of submission.

12. A graphic and written scale of one (1) inch equals no more than fifty (50) feet; for tracts of twenty (20) acres or more, the scale shall be one (1) inch equals no more than one hundred (100) feet.
13. A north arrow and/or compass.
14. The total tract boundary and size with distances marked to the nearest foot and bearings to the nearest degree.
15. Existing and proposed land use(s).
16. A key map showing all off site existing man-made features which may be affected by stormwater runoff or stormwater management controls for the project.
17. Location of all open channels.
18. Overland drainage patterns and swales.
19. A twenty-foot (20) wide access easement around all stormwater management facilities that would provide ingress to and egress from a public right-of-way.
20. The location of all erosion and sediment control facilities.
21. A note on the plan indicating the location and responsibility for maintenance of stormwater management facilities that would be located on/off-site. All on/off-site facilities shall meet the performance standards and design criteria specified in this Ordinance.
22. A statement, signed by the landowner, acknowledging that any revision to the approved Drainage Plan must be approved by the Township of Exeter and the Conservation District.
23. The following signature block for the Design Engineer:

I, (Design Engineer), on this date (date of signature), hereby certify that the Drainage Plan meets all design standards and criteria of the Schuylkill River Watershed Act 167 Stormwater Management Ordinance."
24. The approved Stormwater Management Plan shall be submitted to the Township in ArcView shapefile (preferable) or AutoCAD.DWG format.

C. Supplemental Information

1. A written description of the following information shall be submitted.
 - a. The overall stormwater management concept for the project designed in accordance with Section 304.
 - b. Stormwater runoff computations as specified in this Ordinance.

- c. Stormwater management techniques to be applied both during and after development.
 - d. Expected project time schedule.
 - e. Development stages (project phases) if so proposed.
 - f. An operation and maintenance plan in accordance with Section 702 of this Ordinance.
- 2. An erosion and sediment control plan.
 - 3. The effect of the project (in terms of runoff volumes and peak flows) on adjacent properties and on any existing municipal stormwater collection system that may receive runoff from the project site.

D. Stormwater Management Facilities

- 1. All stormwater management facilities must be located on a plan, described in detail, and details/cross-sections provided illustrating their construction.
- 2. Profiles shall be provided for all storm sewers and underground detention/retention facilities at one of the following sets of scales:
 - a. One inch (1") equals ten feet (10') horizontal and one inch (1") equals one foot (1') vertical, or
 - b. One inch (1") equals twenty feet (20') horizontal and one inch (1") equals two feet (2') vertical, or
 - c. One inch (1") equals forty feet (40') horizontal and one inch (1") equals four feet (4') vertical, or
 - d. One inch (1") equals fifty feet (50') horizontal and one inch (1") equals five feet (5') vertical, or
- 3. When infiltration facilities such as seepage pits, beds or trenches are used, the locations of existing and proposed septic tank infiltration areas and wells must be shown.
- 4. All calculations, assumptions, and criteria used in the design of the stormwater management facilities must be shown.

E. Responsibilities for Operations and Maintenance of Stormwater Controls and BMPs

- 1. No Regulated Earth Disturbance activities within the Township of Exeter shall commence until approval by the Township of Exeter of a Stormwater Control and BMP Operations and Maintenance Plan which describes how the permanent (e.g., post-construction) stormwater controls and BMPs will be properly operated and maintained.

2. The following items shall be included in the Stormwater Control and BMP Operations and Maintenance Plan:
 - a. Map(s) of the project area, in a form that meets the requirements for recording at the offices of the Recorder of Deeds of Berks County, and shall be submitted on sheets up to 36-inches x 48-inches. The approved map(s) shall be submitted to the Township in ArcView shapefile (preferable) or AutoCAD.DWG format. The contents of the maps(s) shall include, but not be limited to:
 - (i) Clear identification of the location and nature of permanent stormwater controls and BMPs,
 - (ii) The location of the project site relative to highways, municipal boundaries or other identifiable landmarks,
 - (iii) Existing and final contours at intervals of two feet, or others as appropriate,
 - (iv) Existing streams, lakes, ponds, or other bodies of water within the project site area,
 - (v) Other physical features including flood hazard boundaries, sinkholes, streams, existing drainage courses, and areas of natural vegetation to be preserved,
 - (vi) The locations of all existing and proposed utilities, sanitary sewers, and water lines within 50 feet of property lines of the project site,
 - (vii) Proposed final changes to the land surface and vegetative cover, including the type and amount of impervious area that would be added,
 - (viii) Proposed final structures, roads, paved areas, and buildings, and
 - (ix) A twenty-foot (20) wide access easement around all stormwater controls and BMPs that would provide ingress to and egress from a public right-of-way.
 - b. A description of how each permanent stormwater control and BMP will be operated and maintained, and the identity of the person(s) responsible for operations and maintenance.
 - c. The name of the project site, the name and address of the owner of the property, and the name of the individual or firm preparing the plan.
 - d. A statement, signed by the landowner, acknowledging that the stormwater controls and BMPs are fixtures that can be altered or removed only after approval by the Township of Exeter.

3. The Stormwater Control and BMP Operations and Maintenance Plan for the project site shall establish responsibilities for the continuing operation and maintenance of all permanent stormwater controls and BMPs, as follows:
 - a. If a plan includes structures or lots which are to be separately owned and in which streets, sewers and other public improvements are to be dedicated to the Township of Exeter, stormwater controls and BMPs may also be dedicated to and maintained by the Township of Exeter;
 - b. If a plan includes operations and maintenance by a single ownership, or if sewers and other public improvements are to be privately owned and maintained, then the operation and maintenance of stormwater controls and BMPs shall be the responsibility of the owner or private management entity.
4. The Township of Exeter shall make the final determination on the continuing operations and maintenance responsibilities. The Township of Exeter reserves the right to accept or reject the operations and maintenance responsibility for any or all of the stormwater controls and BMPs.

F. Township Review of Stormwater Control and BMP Operations and Maintenance Plan

1. The Township of Exeter shall review the Stormwater Control and BMP Operations and Maintenance Plan for consistency with the purposes and requirements of this ordinance, and any permits issued by DEP.
2. The Township of Exeter shall notify the Applicant in writing whether the Stormwater Control and BMP Operations and Maintenance Plan is approved.
3. The Township of Exeter may require a "Record Drawing" of all stormwater controls and BMPs, and an explanation of any discrepancies with the Operations and Maintenance Plan.

Section 404. Plan Submission

The Township of Exeter shall require receipt of a complete plan, as specified in this Ordinance.

For any activities that require an NPDES Permit for Stormwater Discharges from Construction Activities, a PaDEP Joint Permit Application, a PennDOT Highway Occupancy Permit, or any other permit under applicable state or federal regulations or are regulated under Chapter 105 (Dam Safety and Waterway Management) or Chapter 106 (Floodplain Management) of PaDEP's Rules and Regulations, the proof of application for said permit(s) or approvals shall be part of the plan. The plan shall be coordinated with the state and federal permit process and the Township's SALDO review process.

- A. For projects that require SALDO approval, the Drainage Plan shall be submitted by the Applicant as part of the Preliminary Plan submission where applicable for the Regulated Activity.

- B. For these regulated activities that do not require SALDO approval, See Section 401, General Requirements.
- C. Six (6) copies of the Drainage Plan shall be submitted to the Township and distributed as follows:
 - 1. Two (2) copies to the Township of Exeter accompanied by the requisite Township Review Fee, as specified in The Exeter Township Fee Schedule.
 - 2. Two (2) copies to the Conservation District.
 - 3. One (1) copy to the Township Engineer.
 - 4. One (1) copy to the Berks County Planning Commission.

Section 405. Drainage Plan Review

- A. The Township Engineer shall review the Drainage Plan with the standards set forth in the Township of Exeter's Stormwater Management Ordinance for consistency with the adopted Schuylkill River Watershed Act 167 Stormwater Management Plan. Any Drainage Plan found incomplete shall not be accepted for review and shall be returned to the Applicant.
- B. For activities regulated by this Ordinance, the Township Engineer shall notify the Applicant and the Township of Exeter in writing, within ninety (90) calendar days, of whether the Drainage Plan is consistent with the Stormwater Management Plan.
 - 1. Should the Drainage Plan be determined to be consistent with the Stormwater Management Plan, the Township Engineer shall forward an approval letter to the Municipal Secretary who will then forward a copy to the Applicant.
 - 2. Should the Drainage Plan be determined to be inconsistent with the Stormwater Management Plan, the Township Engineer shall forward a disapproval letter to the Municipal Secretary who will then forward a copy to the Applicant. The disapproval letter shall cite the reason(s) and specific Ordinance sections for the disapproval. Disapproval may be due to inadequate information to make a reasonable judgment as to compliance with the stormwater management plan. Any disapproved Drainage Plans may be revised by the Applicant and resubmitted consistent with this Ordinance.
- C. For Regulated Activities specified in Section 104 of this Ordinance, which require a building permit, the Township Engineer shall notify the Municipal Building Permit Officer in writing, within a time frame consistent with the Municipal Building Code and/or SALDO, whether the Drainage Plan is consistent with the Stormwater Management Plan and forward a copy of the approval/disapproval letter to the Applicant. Any disapproved drainage plan may be revised by the Applicant and resubmitted consistent with this Ordinance.

- D. For regulated activities under this ordinance that require an NPDES Permit Application, the Applicant shall forward a copy of the Township Engineer's letter stating that the Drainage Plan and supporting calculations are consistent with this Ordinance to the Conservation District. PaDEP and the Conservation District may consider the Township Engineer's review comments in determining whether to issue a permit.
- E. The Township of Exeter shall not grant approval or grant preliminary approval to any subdivision or land development for Regulated Activities specified in Section 105 of this Ordinance if the Drainage Plan has been found to be inconsistent with this Ordinance, as determined by the Township Engineer.
- F. The Applicant shall be responsible for completing record drawings of all stormwater management facilities included in the approved Drainage Plan. The record drawings and an explanation of any discrepancies with the design plans shall be submitted to the Township Engineer and the Township of Exeter for final approval. The Township of Exeter may withhold approval of the record drawings until the Township of Exeter receives a copy of an approved Highway Occupancy Permit from the PennDOT District Office, NPDES Permit, and any other applicable permits or approvals, from PaDEP or the Conservation District. The above permits and approvals must be based on the record drawings.
- G. The Township of Exeter's approval of a Drainage Plan shall be valid for a period not to exceed five (5) years commencing on the date that the Township of Exeter signs the approved Drainage Plan. If stormwater management facilities included in the approved Drainage Plan have not been constructed, or if constructed and record drawings of these facilities have not been approved within this five (5) year time period, then the Township of Exeter may consider the Drainage Plan disapproved and may revoke any and all permits. Drainage Plans that are considered disapproved by the Township of Exeter shall be resubmitted in accordance with Section 407 of this Ordinance.

Section 406. Modification of Plans

- A. A modification to a Drainage Plan under review by the Township of Exeter for a development site that involves a change in stormwater management facilities or techniques, or that involves the relocation or re-design of stormwater management facilities, or that is necessary because soil or other conditions are not as stated on the Drainage Plan as determined by the Township Engineer and/or the Township of Exeter, shall require a resubmission of the modified Drainage Plan consistent with Section 404 of this Ordinance and be subject to review as specified in Section 405 of this Ordinance.
- B. A modification to an already approved or disapproved Drainage Plan shall be submitted to the Township of Exeter, accompanied by the applicable Municipal Review and Inspection Fee. A modification to a Drainage Plan for which a formal action has not been taken by the Township of Exeter shall be submitted to the Township of Exeter, accompanied by the applicable Review and Inspection Fee.

Section 407. Resubmission of Disapproved Drainage Plans

A disapproved Drainage Plan may be resubmitted, with the revisions addressing the Township Engineer's and the Township of Exeter's concerns documented in writing and addressed to the Township Secretary in accordance with Section 404 of this Ordinance and distributed accordingly and be subject to review as specified in Section 405 of this Ordinance. The applicable Review and Inspection Fee must accompany a resubmission of a disapproved Drainage Plan.

ARTICLE V-INSPECTIONS

Section 501. Schedule of Inspections

- A. The Township Engineer or his designee shall inspect all phases of the installation of the permanent stormwater management facilities as deemed appropriate by the Township Engineer.
- B. During any stage of the work, if the Township Engineer and/or Township of Exeter or their designee determines that the permanent stormwater management facilities are not being installed in accordance with the approved Stormwater Management Plan, the Township of Exeter shall revoke any existing building permits and issue a cease and desist order until a revised Stormwater Management Plan is submitted and approved except as directed by the Township Engineer and the Township of Exeter or Conservation District, as specified in this Ordinance.
- C. A final inspection of all stormwater management facilities shall be conducted by the Township Engineer and/or the Township of Exeter or their designee to confirm compliance with the approved Stormwater Management Plan prior to the issuance of any Occupancy Permit.

ARTICLE VI-FEES AND EXPENSES

Section 601. Municipality Drainage Plan Review and Inspection Fee

Fees shall be established by the Township of Exeter to defray plan review and construction inspection costs incurred by the Township of Exeter. All fees shall be paid by the Applicant at the time of Drainage Plan submission. Review and Inspection Fee Schedule shall be established by resolution of the Board of Supervisors based on the size of the Regulated Activity and based on the Township of Exeter's costs for reviewing Drainage Plans and conducting inspections pursuant to Section 501. The Township of Exeter shall periodically update the Review and Inspection Fee Schedule to ensure that review costs are adequately reimbursed.

Section 602. Expenses Covered by Fees

The fees required by this Resolution shall at a minimum cover:

- A. Administrative costs.
- B. The review of the Drainage Plan by the Township of Exeter and the Township Engineer.
- C. The site inspections.
- D. The inspection of stormwater management facilities and drainage improvements during construction.
- E. The final inspection upon completion of the stormwater management facilities and drainage improvements presented in the Drainage Plan.
- F. Any additional work required to enforce any permit provisions regulated by this Resolution, correct violations, and assure proper completion of stipulated remedial actions.

ARTICLE VII-MAINTENANCE RESPONSIBILITIES

Section 701. Performance Guarantee

- A. For subdivisions and land developments, the Applicant shall provide a financial guarantee to the Township of Exeter to secure the timely and proper installation and construction of all stormwater management controls as: 1) required by the approved drainage plan equal to or greater than the full construction cost of the required controls; and 2) in the amount and method of payment provided for in the SALDO.
- B. For other regulated activities, the Township of Exeter may require a financial guarantee from the Applicant.
- C. At the completion of the project, and as a prerequisite for the release of the performance guarantee, the Applicant or his representatives shall:
 - 1. Provide a certification of completion from an engineer, architect, surveyor or other qualified person verifying that all permanent facilities have been constructed according to the plans and specifications and approved revisions thereto.
 - 2. Provide a set of record drawings.
- D. After the Township of Exeter receives the certification, a final inspection shall be conducted by the Township Engineer and/or the Township of Exeter or designee to certify compliance with this ordinance.

Section 702. Adherence to Approved Stormwater Control and BMP Operations and Maintenance Plan

It shall be unlawful to alter or remove any permanent stormwater control and BMP required by an approved Stormwater Control and BMP Operations and Maintenance Plan, or to allow the property to remain in a condition which does not conform to an approved Stormwater Control and BMP Operations and Maintenance Plan.

Section 703. Operations and Maintenance Agreement for Privately Owned Stormwater Controls and BMPs

- A. The property owner shall sign an Operations and Maintenance Agreement with the Township of Exeter covering all stormwater controls and BMPs that are to be privately owned. The Agreement shall be substantially the same as the agreement in Appendix A of this Ordinance.
- B. Other items may be included in the Agreement where determined necessary to guarantee the satisfactory operation and maintenance of all permanent stormwater controls and BMPs. The Agreement shall be subject to the review and approval of the Township of Exeter.

Section 704. Stormwater Management Easements

- A. Stormwater management easements are required for all areas used for off-site stormwater control, unless a waiver is granted by the Township of Exeter.
- B. Stormwater management easements shall be provided by the property owner if necessary for (1) access for inspections and maintenance, or (2) preservation of stormwater runoff conveyance, infiltration, and detention areas and other stormwater controls and BMPs, by persons other than the property owner. The purpose of the easement shall be specified in any agreement under Section 705.

Section 705. Recording of Approved Stormwater Control and BMP Operations and Maintenance Plan and Related Agreements

- A. The owner of any land upon which permanent stormwater controls and BMPs will be placed, constructed or implemented, as described in the Stormwater Control and BMP Operations and Maintenance Plan, shall record the following documents in the Office of the Recorder of Deeds for Berks County, within fifteen (15) days of approval of the Stormwater Control and BMP Operations Plan by the Township of Exeter:
 - 1. The Operations and Maintenance Plan, or a summary thereof,
 - 2. Operations and Maintenance Agreements under Section 705, and
 - 3. Easements under Section 706.
- B. The Township of Exeter may suspend or revoke any approvals granted for the project site upon discovery of the failure of the owner to comply with this Section.

Section 706. Municipal Stormwater Control and BMP Operation and Maintenance Fund

- A. Persons installing stormwater controls or BMPs shall be required to pay a specified amount to the Township Stormwater Control and BMP Operation and Maintenance Fund to help defray costs of periodic inspections and maintenance expenses. The amount of the deposit shall be determined as follows:
 - 1. If the stormwater control or BMP is to be privately owned and maintained, the deposit shall cover the cost of periodic inspections performed by the Township of Exeter for a period of ten (10) years, as estimated by the Township Engineer. The inspections should take place on or about the first, third, seventh, and tenth anniversary of the satisfactory completion of the installation of the facilities. After that period of time, inspections will be performed at the expense of the Township of Exeter.
 - 2. If the stormwater control or BMP is to be owned and maintained by the Township of Exeter, the deposit shall cover the estimated costs for maintenance and inspections for ten (10) years. The Township Engineer will establish the estimated costs utilizing information submitted by the Applicant.

3. The amount of the deposit to the fund shall be converted to present worth of the annual series values. The Township Engineer shall determine the present worth equivalents, which shall be subject to the approval of the governing body.
- B. If a stormwater control or BMP is proposed that also serves as a recreation facility (e.g., ballfield, lake), the Township of Exeter may reduce or waive the amount of the maintenance fund deposit based upon the value of the land for public recreation purpose.
 - C. If at some future time a stormwater control or BMP (whether publicly or privately owned) is eliminated due to the installation of storm sewers or other storage facility, the unused portion of the maintenance fund deposit will be applied to the cost of abandoning the facility and connecting to the storm sewer system or other facility. Any amount of the deposit remaining after the costs of abandonment are paid will be returned to the depositor.
 - D. Stormwater Related Problems - The Township of Exeter may require applicants to pay a fee to the Municipal Stormwater Maintenance Fund to cover stormwater related problems which may arise from the land development and earth disturbance. The Township Engineer will establish the estimated cost of utilizing information submitted by the Applicant.

ARTICLE VIII- PROHIBITIONS

Section 801. Prohibited Discharges and Connections

- A. Any drain or conveyance, whether on the surface or subsurface, which allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter the waters of this Commonwealth is prohibited.
- B. No person shall allow, or cause to allow, discharges into surface waters of this Commonwealth which are not composed entirely of stormwater, except (1) as provided in Subsection C below, and (2) discharges allowed under a state or federal permit.
- C. The following discharges are authorized unless they are determined to be significant contributors to pollution to the waters of this Commonwealth:

- Discharges from fire fighting activities	- Flows from riparian habitats and wetlands
- Potable water sources including water line flushing	- Uncontaminated water from foundations or from footing drains
- Irrigation drainage	- Lawn watering
- Air conditioning condensate	- Dechlorinated swimming pool discharges
- Springs	- Uncontaminated groundwater
- Water from crawl space pumps	- Water from individual residential car washing
- 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	- Routine external building wash down (which does not use detergents or other compounds)

- D. In the event that the Township of Exeter or DEP determines that any of the discharges identified in Subsection C significantly contribute to pollution of the waters of this Commonwealth, the Township of Exeter or DEP will notify the responsible person(s) to cease the discharge.

Section 802. Roof Drains

Roof drains and sump pumps installed after the effective date of this Ordinance in association with new building construction shall discharge to infiltration or vegetative BMP's and, to the maximum extent practicable, satisfy the criteria for Disconnected Impervious Areas.

Section 803. Alteration of SWM BMPs

No person shall modify, remove, fill, landscape, or alter any SWM BMPs, facilities, areas, or structures, without the written approval of the Township of Exeter.

ARTICLE IX- ENFORCEMENT AND PENALTIES

Section 901. Right-of-Entry

- A. Upon presentation of proper credentials, duly authorized representatives of the Township of Exeter may enter at reasonable times upon any property within the Township of Exeter to inspect the implementation, condition, or operation and maintenance of the stormwater controls or BMPs in regard to any aspect governed by this Ordinance.
- B. Stormwater control and BMP owners and operators shall allow persons working on behalf of the Township of Exeter ready access to all parts of the premises for the purposes of determining compliance with this Ordinance.
- C. Persons working on behalf of the Township of Exeter shall have the right to temporarily locate on any stormwater control or BMP in the Township of Exeter such devices as are necessary to conduct monitoring and/or sampling of the discharges from such stormwater control or BMP.
- D. Unreasonable delays (>24 hrs.) in allowing the Township of Exeter access to a stormwater control or BMP is a violation of this Article.

Section 902. Public Nuisance

- A. The violation of any provision of this Ordinance is hereby deemed a Public Nuisance.
- B. Each day that a violation continues shall constitute a separate violation.

Section 903. Enforcement Generally

- A. Whenever the Township of Exeter finds that a person has violated a prohibition or failed to meet a requirement of this Ordinance, the Township of Exeter may order compliance by written notice to the responsible person. Such notice may require without limitation:
 - 1. The performance of monitoring, analyses, and reporting;
 - 2. The elimination of prohibited connections or discharges;
 - 3. Cessation of any violating discharges, practices, or operations;
 - 4. The abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property;
 - 5. Payment of a fine to cover administrative and remediation costs;
 - 6. The implementation of stormwater controls and BMPs; and
 - 7. Operation and maintenance of stormwater controls and BMPs.
- B. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of these violations(s). Said notice may further advise that, if applicable, should the violator fail to take the required action within the established deadline, the

work will be done by the Township of Exeter or designee and the expense thereof shall be charged to the violator.

- C. Failure to comply within the time specified shall also subject such person to the penalty provisions of this Ordinance. All such penalties shall be deemed cumulative and shall not prevent the Township of Exeter 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 the Township of Exeter may be suspended or revoked, in whole or in part, by the Township of Exeter for:
 - 1. Non-compliance with or failure to implement any provision of the permit;
 - 2. A violation of any provision of this Ordinance; or
 - 3. The creation of any condition or the commission of any act during construction or development which constitutes or creates a hazard or nuisance, pollution or which endangers the life or property of others.
- B. A suspended permit or approval may be reinstated by the Township of Exeter, in whole or in part, when:
 - 1. The Township Engineer and/or the Township of Exeter or designee has inspected and approved the corrections to the stormwater controls and BMPs, or the elimination of the hazard or nuisance, and/or;
 - 2. The Township of Exeter is satisfied that the violation of the Ordinance, law, or rule and regulation has been corrected.
- C. A permit or approval which has been revoked in whole or in part by the Township of Exeter cannot be reinstated. The applicant may apply for a new permit under the procedures outlined in this Ordinance.

Section 905. Penalties

- A. Any person violating the provisions of this ordinance shall be subject to a fine of not more than \$1,000 for each violation, recoverable with costs. Each day that the violation continues shall constitute a separate offense and the applicable fines are cumulative.
- B. The Township of Exeter may institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of the Ordinance with the court of competent jurisdiction to obtain restraining orders, temporary or permanent injunctions, mandamus or other appropriate forms of remedy or relief.

Section 906. Notification

In the event that a person fails to comply with the requirements of this Ordinance, or fails to conform to the requirements of any permit issued hereunder, the Township of Exeter will provide notification of the violation. After notice is provided, failure to correct violations in a timely manner may result in additional violations.

Section 907. Enforcement

The Township Board of Supervisors is hereby authorized and directed to enforce all of the provisions of this ordinance. All inspections regarding compliance with the drainage plan shall be the responsibility of the Township Engineer or other qualified persons designated by the Township of Exeter.

- A. No person shall modify, remove, fill, landscape or alter any SWM BMPs, facilities, areas, or structures, without the written approval of the Township of Exeter.
- B. Upon presentation of proper credentials, the Township may enter at reasonable times upon any property within the Township of Exeter to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.
- C. It shall be unlawful for a person to undertake any Regulated Activity except as provided in an approved SWM Site Plan, unless specifically exempted from the requirement to submit a SWM Site Plan by this Ordinance.
- D. The Developer shall be responsible for providing as-built plans of all SWM BMPs included in the approved SWM Site Plan. The as-built plans and an explanation of any discrepancies with the construction plans shall be submitted by the Developer to the Township of Exeter.
- E. The as-built submission shall include a certification of completion signed by a Qualified Professional verifying that all permanent SWM BMPs have been constructed according to the approved plans and specifications. If any licensed Qualified Professionals contributed to the construction plans, then a licensed Qualified Professional must sign the completion certificate.
- F. After receipt of the completion certificate by the Township of Exeter, the Township of Exeter may conduct a final inspection.
- G. Inspections regarding compliance with the SWM Site Plan are a responsibility of the Township of Exeter.
- H. The Township of Exeter may withhold an occupancy permit until a certificate of completion has been provided by the Developer.

Section 908. Appeals

- A. Any person aggrieved by any action of Exeter Township or its designee may appeal to Exeter Township Board of Supervisors within thirty (30) days of that action.
- B. Any person aggrieved by any decision of Exeter Township Board of Supervisors may appeal to the County Court of Common Pleas in the County where the activity has taken place within thirty (30) days of the Township's decision.

ENACTED and ORDAINED at a regular meeting of the _____
_____ on the ____ of _____, 19___. This
Ordinance shall take effect immediately.

[Name]

[Title]

ATTEST:

Secretary

I hereby certify that the foregoing Ordinance was advertised in the
_____ on _____, 20__, a newspaper of general
circulation in the Township of Exeter and was duly enacted and approved as set forth at a regular
meeting of the Township of Exeter's governing body held on _____, 20__.

Secretary

ORDINANCE APPENDIX A

STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES OPERATIONS AND MAINTENANCE AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of _____, 200__, by and between _____, (hereinafter the “Landowner”), and _____, _____ County, Pennsylvania, (hereinafter “Municipality”);

WITNESSETH

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

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

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

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

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

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

- Infiltration Trench – A BMP surface structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer,
- Seepage Pit – An underground BMP structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer,
- Rain Garden – A BMP overlain with appropriate mulch and suitable vegetation designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or underground aquifer, and

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

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

1. The BMPs shall be constructed by the Landowner in accordance with the plans and specifications identified in the Plan.
2. The Landowner shall operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality and in accordance with the specific maintenance requirements noted on the Plan.
3. The Landowner hereby grants permission to the Municipality, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper identification, to inspect the BMP(s) whenever it deems necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the property.
4. In the event the Landowner fails to operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). This provision shall not be construed to allow the Municipality to erect any permanent structure on the land of the Landowner. It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.
5. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the Municipality.
6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.
7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Municipality's employees and designated representatives from all damages, accidents, casualties, occurrences or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Municipality. In the event that a claim is asserted against the Municipality, its designated representatives or employees, the Municipality shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgment or claims against the Municipality's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.

8. The Municipality shall inspect the BMP(s) at a minimum of once every three years to ensure their continued functioning.

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

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Township of Exeter:

(SEAL)

For the Landowner:

ATTEST:

_____ (City, Borough, Township)

County of _____, Pennsylvania

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

GIVEN UNDER MY HAND THIS _____ day of _____, 2008.

NOTARY PUBLIC

(SEAL)

ORDINANCE APPENDIX B
STORMWATER MANAGEMENT DESIGN CRITERIA

TABLE B-1
RUNOFF CURVE NUMBERS
Source: NRCS (SCS) TR-55

TABLE B-2
RATIONAL RUNOFF COEFFICIENTS

TABLE B-3
MANNING ROUGHNESS COEFFICIENTS

FIGURE B-1
RECOMMENDATION CHART FOR INFILTRATION STORMWATER
MANAGEMENT BMPS IN CARBONATE AREAS

TABLE B-1
Runoff Curve Numbers
(From NRCS (SCS) TR-55)

LAND USE DESCRIPTION		HYDROLOGIC SOIL GROUP			
		A	B	C	D
Open Space		44	65	77	82
Meadow / Orchard		30	58	71	78
Agricultural		59	71	79	83
Forest		36	60	73	79
Commercial	(85% Impervious)	89	92	94	95
Industrial	(72% Impervious)	81	88	91	93
Institutional	(50% Impervious)	71	82	88	90
Residential					
Average Lot Size	% impervious				
1/8 acre or less*	65	77	85	90	92
1/8 - 1/3 acre	34	59	74	82	87
1/3 - 1 acre	23	53	69	80	85
1 - 4 acres	12	46	66	78	82
Farmstead		59	74	82	86
Smooth Surfaces (Concrete, Asphalt, Gravel or Bare Compacted Soil)		98	98	98	98
Water		98	98	98	98
Mining/Newly Graded Areas (Pervious Areas Only)		77	86	91	94

* Includes Multi-Family Housing unless justified lower density can be provided.

Note: Existing site conditions of bare earth or fallow ground shall be considered as meadow when choosing a CN value.

TABLE B-2
RATIONAL RUNOFF COEFFICIENTS
 By Hydrologic Soils Group and Overland Slope (%)

Land Use	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
Cultivated Land	0.08 ^a	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.23	0.31
	0.14 ^b	0.18	0.22	0.16	0.21	0.28	0.20	0.25	0.34	0.24	0.29	0.41
Pasture	0.12	0.20	0.30	0.18	0.28	0.37	0.24	0.34	0.44	0.30	0.40	0.50
	0.15	0.25	0.37	0.23	0.34	0.45	0.30	0.42	0.52	0.37	0.50	0.62
Meadow	0.10	0.16	0.25	0.14	0.22	0.30	0.20	0.28	0.36	0.24	0.30	0.40
	0.14	0.22	0.30	0.20	0.28	0.37	0.26	0.35	0.44	0.30	0.40	0.50
Forest	0.05	0.08	0.11	0.08	0.11	0.14	0.10	0.13	0.16	0.12	0.16	0.20
	0.08	0.11	0.14	0.10	0.14	0.18	0.12	0.16	0.20	0.15	0.20	0.25
Residential												
Lot Size 1/8 Acre	0.30	0.36	0.44	0.33	0.40	0.47	0.38	0.44	0.51	0.40	0.46	0.53
[25% Impervious]	0.36	0.44	0.51	0.40	0.47	0.55	0.45	0.53	0.60	0.48	0.56	0.64
Lot Size 1/4 Acre	0.28	0.34	0.42	0.31	0.38	0.46	0.36	0.42	0.50	0.38	0.44	0.52
[22% Impervious]	0.33	0.41	0.49	0.38	0.45	0.53	0.43	0.51	0.59	0.46	0.54	0.63
Lot Size 1/3 Acre	0.26	0.32	0.40	0.29	0.37	0.44	0.34	0.41	0.48	0.36	0.42	0.51
[19% Impervious]	0.31	0.38	0.47	0.36	0.43	0.52	0.41	0.49	0.57	0.44	0.52	0.61
Lot Size 1/2 Acre	0.23	0.29	0.38	0.26	0.34	0.42	0.31	0.38	0.46	0.34	0.40	0.49
[15% Impervious]	0.28	0.37	0.44	0.33	0.41	0.49	0.38	0.47	0.55	0.41	0.50	0.60
Lot Size 1 Acre	0.21	0.27	0.36	0.24	0.32	0.40	0.30	0.37	0.45	0.32	0.38	0.47
[12% Impervious]	0.25	0.34	0.42	0.31	0.39	0.48	0.36	0.45	0.54	0.40	0.48	0.58
Industrial												
[80% Impervious]	0.70	0.73	0.75	0.71	0.74	0.76	0.72	0.75	0.77	0.73	0.75	0.78
	0.79	0.82	0.85	0.80	0.83	0.86	0.82	0.84	0.87	0.82	0.85	0.88
Commercial												
[85% Impervious]	0.74	0.76	0.78	0.75	0.77	0.79	0.76	0.78	0.80	0.76	0.78	0.80
	0.83	0.86	0.88	0.84	0.86	0.89	0.85	0.87	0.90	0.86	0.88	0.90
Lawn												
	0.12	0.19	0.29	0.16	0.25	0.34	0.22	0.30	0.39	0.25	0.32	0.42
	0.16	0.26	0.35	0.22	0.31	0.41	0.28	0.38	0.48	0.32	0.42	0.53
Impervious												
	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97

^a Runoff coefficients for storm recurrence intervals less than 25 years.

^b Runoff coefficients for storm recurrence intervals of 25 years or more.

TABLE B-3

**Roughness Coefficients (Manning's "n") For Overland Flow
(U.S. Army Corps Of Engineers, HEC-1 Users Manual)**

Surface Description	n		
		-	
Dense Growth	0.4	-	0.5
Pasture	0.3	-	0.4
Lawns	0.2	-	0.3
Bluegrass Sod	0.2	-	0.5
Short Grass Prairie	0.1	-	0.2
Sparse Vegetation	0.05	-	0.13
Bare Clay-Loam Soil (eroded)	0.01	-	0.03
Concrete/Asphalt - very shallow depths (less than 1/4 inch)	0.10	-	0.15
- small depths (1/4 inch to several inches)	0.05	-	0.10

Roughness Coefficients (Manning's "n") For Channel Flow

Reach Description	n
Natural stream, clean, straight, no rifts or pools	0.03
Natural stream, clean, winding, some pools or shoals	0.04
Natural stream, winding, pools, shoals, stony with some weeds	0.05
Natural stream, sluggish deep pools and weeds	0.07
Natural stream or swale, very weedy or with timber underbrush	0.10
Concrete pipe, culvert or channel	0.012
Corrugated metal pipe	0.012-0.027 ⁽¹⁾
High Density Polyethylene (HDPE) Pipe	
Corrugated	0.021-0.029 ⁽²⁾
Smooth Lined	0.012-0.020 ⁽²⁾

(1) Depending upon type, coating and diameter

(2) Values recommended by the American Concrete Pipe Association, check Manufacturer's recommended value.

FIGURE B-1
Recommendation Chart for Infiltration Stormwater Management BMP's in Carbonate Bedrock

SITE RISK FACTORS	Geology Type	CARBONATE BEDROCK																							
	Effective Soil Thickness	Less than 2 Feet	2 to 4 Feet						Over 4 Feet to 8 Feet						Over 8 Feet										
	Special Geologic Features*	Low/Med/High Buffer	Low Buffer		Medium Buffer		High Buffer		Low Buffer		Medium Buffer		High Buffer		Low Buffer		Medium Buffer		High Buffer						
SITE INVESTIGATION RECOMMENDED	(Unacceptable)	Preliminary		Preliminary		Preliminary		Preliminary		Preliminary		Preliminary		Preliminary		Preliminary		Preliminary		Preliminary		Preliminary			
DESIGN FACTORS	Infiltration Loading Rates (% Increase)**	(Unacceptable)	0-100%	100-300%	300-500%	0-100%	100-300%	300-500%	0-100%	100-300%	300-500%	0-100%	100-300%	300-500%	0-100%	100-300%	300-500%	0-100%	100-300%	300-500%	0-100%	100-300%	300-500%		
PROGRAM SUMMARY GUIDANCE***					1	1			1	2							1	2				1			

RECOMMENDED
 NOT RECOMMENDED

* Special Geologic Feature Buffer widths are as follows:

- Low Buffer is less than 50 feet
- Medium Buffer is 50 feet to 100 feet
- High Buffer is greater than 100 feet

** Rates greater than 500% not recommended.

*** Assumes adequately permeable soils and lack of natural constraints as required for all infiltration systems.

1 Infiltration systems may be allowed at the determination of the Engineer and/or Geologist, provided that a Detailed Site Investigation is undertaken which confirms nature of rock, location of Special Geologic Features, and adequacy of the buffer between the SGF and the proposed stormwater system(s).

2 In these Special Geologic Features: Low Buffer situations, infiltration systems may be allowed at the determination of the Engineer and/or Geologist, provided that a Detailed Site Investigation is undertaken and a 25 foot buffer from SGFs is maintained.

Source: Little Lehigh Creek Watershed ACT 167 – Stormwater Management Ordinance. May 2004

ORDINANCE APPENDIX C
DRAINAGE PLAN APPLICATION

(To be attached to the "land subdivision plan or development plan review application or "minor land subdivision plan review application")

Application is hereby made for review of the Stormwater Management and Erosion and Sedimentation Control Plan and related data as submitted herewith in accordance with the _____ Township Stormwater Management and Earth Disturbance Ordinance.

_____ Final Plan _____ Preliminary Plan _____ Sketch
Plan

Date of Submission _____ Submission No. _____

1. Name of subdivision or development _____

2. Name of Applicant _____ Telephone No. _____

(If corporation, list the corporation's name and the names of two officers of the corporation)

_____ Officer 1

_____ Officer 2

Address _____

Zip _____

Applicants' interest in subdivision or development

(If other than property owner give owners name and address)

3. Name of property owner _____ Telephone No. _____

Address _____

Zip _____

4. Name of engineer or surveyor _____ Telephone No. _____

Address _____

Zip _____

5. Type of subdivision or development proposed:

_____ Single-Family Lots	_____ Townhouses	_____ Commercial (Multi-Lot)
_____ Two Family Lots	_____ Garden Apartments	_____ Commercial (One-Lot)
_____ Multi-Family Lots	_____ Mobile-Home Park	_____ Industrial (Multi-Lot)
_____ Cluster Type Lots	_____ Campground	_____ Industrial (One-Lot)
_____ Planned Residential Development	_____ Other (_____)	

6. Lineal feet of new road proposed _____ L.F.

7. Area of proposed and existing impervious area on entire tract.

a. Existing (to remain) _____ S.F. _____ % of Property
b. Proposed _____ S.F. _____ % of Property

8. Stormwater

a. Does the peak rate of runoff from proposed conditions exceed that flow which occurred for existing conditions for the designated design storm? _____

b. Design storm utilized (on-site conveyance systems) (24 hr.) _____
No. of Subarea _____
Watershed Name _____

Explain: _____

c. Does the submission and/or district meet the release rate criteria for the applicable subarea? _____

d. Number of subarea(s) from Appendix D of the Schuylkill River Watershed Stormwater Management Ordinance. _____

e. Type of proposed runoff control _____

f. Does the proposed stormwater control criteria meet the requirement/guidelines of the Stormwater Ordinances? _____

If not, what variances/waivers are requested? _____

Reasons _____

g. Does the plan meet the requirements of Article III of the Stormwater Ordinances? _____

If not, what variances/waivers are requested? _____

Reasons Why _____

h. Was TR-55, June 1986 utilized in determining the time of concentration? _____

i. What hydrologic method was used in the stormwater computations? _____

j. Is a hydraulic routing through the stormwater control structure submitted? _____

k. Is a construction schedule or staging attached? _____

l. Is a recommended maintenance program attached? _____

9. Erosion and Sediment Pollution Control (E&S):

a. Has the stormwater management and E&S plan, supporting documentation and narrative been submitted to the _____ [County Name] County Conservation District? _____

b. Total area of earth disturbance _____ S.F.

10. Wetlands

a. Have the wetlands been delineated by someone trained in wetland delineation? _____

b. Have the wetland lines been verified by a state or federal permitting authority? _____

c. Have the wetland lines been surveyed? _____

d. Total acreage of wetland within the property _____

e. Total acreage of wetland disturbed _____

f. Supporting documentation _____

11. Filing

a. Has the required fee been submitted? _____

Amount _____

- b. Has the proposed schedule of construction inspection to be performed by the Applicant's engineer been submitted? _____
- c. Name of individual who will be making the inspections _____
- d. General comments about stormwater management at the development _____

CERTIFICATE OF OWNERSHIP AND ACKNOWLEDGMENT OF APPLICATION:

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF BERKS

On this the _____ day of _____, 20____, before me, the undersigned officer, personally appeared _____ who being duly sworn, according to law, deposes and says that _____ owners of the property described in this application and that the application was made with _____ knowledge and/or direction and does hereby agree with the said application and to the submission of the same.

_____Property Owner

My Commission Expires _____ 20____
Notary Public _____

THE UNDERSIGNED HEREBY CERTIFIES THAT TO THE BEST OF HIS KNOWLEDGE AND BELIEF THE INFORMATION AND STATEMENTS GIVEN ABOVE ARE TRUE AND CORRECT.

SIGNATURE OF APPLICANT _____



(Information Below This Line To Be Completed By The Township of Exeter)

_____ (Name of) Municipality official submission receipt:

Date complete application received _____ Plan Number _____

Fees _____ date fees paid _____ received by _____

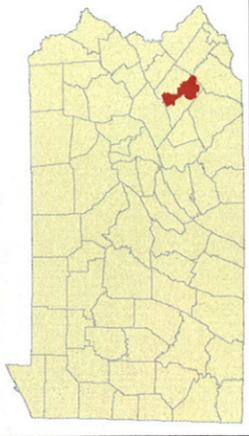
Official submission receipt date _____

Received by _____

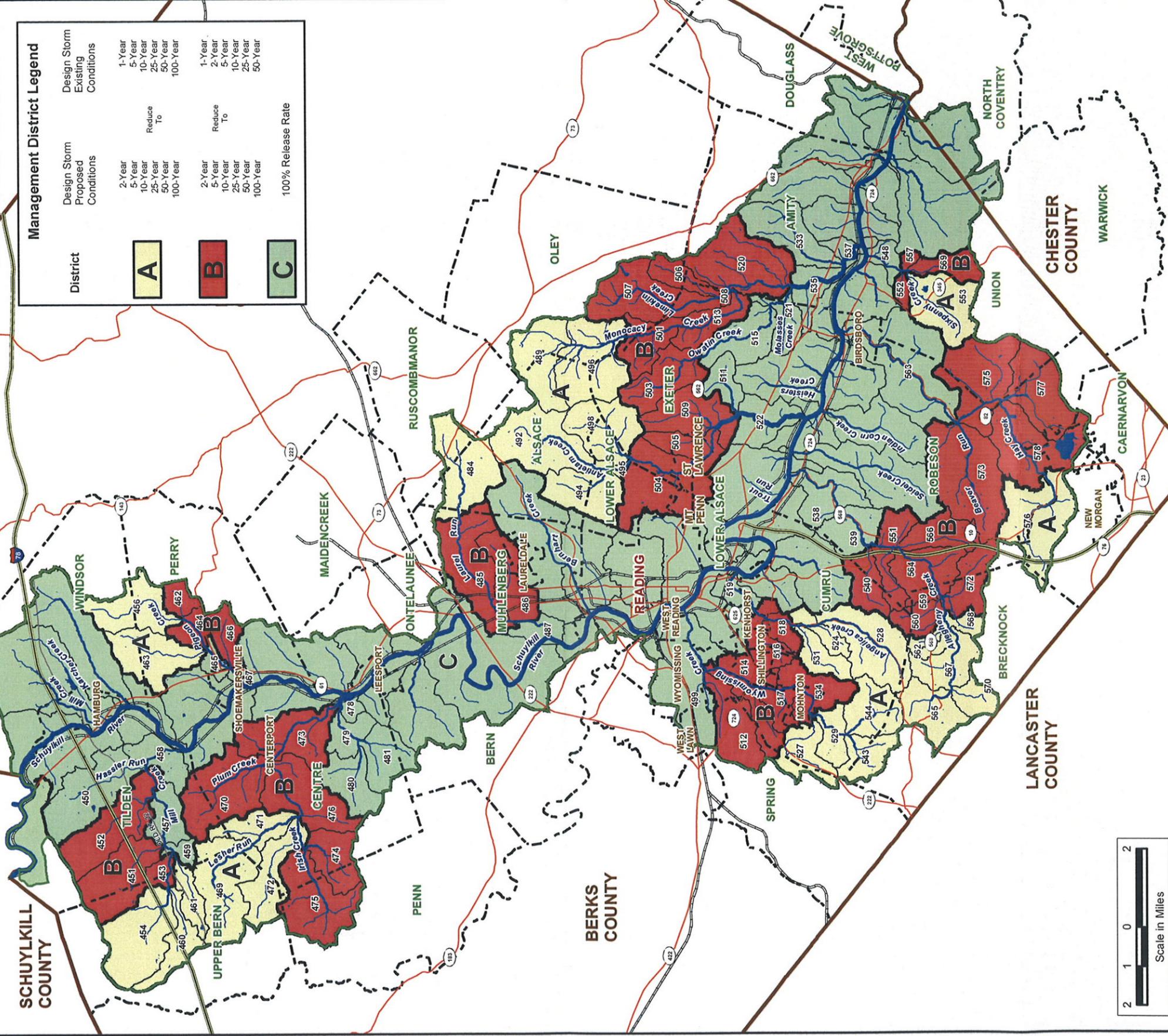
Township of Exeter

ORDINANCE APPENDIX D
STORMWATER MANAGEMENT DISTRICT
WATERSHED MAP

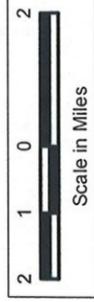
TRIBUTARIES TO THE SCHUYLKILL RIVER IN BERKS COUNTY PHASE II - ACT 167 STORMWATER MANAGEMENT PLAN



LOCATION MAP



Management District Legend		
District	Design Storm Proposed Conditions	Design Storm Existing Conditions
A	2-Year 5-Year 10-Year 25-Year 50-Year 100-Year	1-Year 5-Year 10-Year 25-Year 50-Year 100-Year
B	2-Year 5-Year 10-Year 25-Year 50-Year 100-Year	Reduce To 1-Year 5-Year 10-Year 25-Year 50-Year 100-Year
C	100% Release Rate	



ORDINANCE APPENDIX D MANAGEMENT DISTRICTS

Prepared For:
Berks County
Planning Commission
County Services Center
633 Court Street
Reading, PA 19601
610-478-6300



- Legend**
- WATERSHED BOUNDARY
 - SUBAREAS
 - WATER BODIES
 - STREAMS
 - COUNTY BOUNDARIES
 - MUNICIPAL BOUNDARIES
 - Roads**
 - INTERSTATE
 - HIGHWAYS
 - OTHER ROADS
 - RAILROADS

NOTE:
Portions of this map were generated from existing data sources as listed below. These data are shown on the map for spatial reference only. These data did not enter into any computations or affect the reliability of the hydrologic analysis. Borton-Lawson Engineering has found some inaccuracies in some of these data and has corrected the data in locations where discrepancies were obvious, however, it was not a part of this ACT 167 Plan to correct all of the mapping data.

DATA SOURCES:
Watershed Boundary - PADEP (Modified by BLE)
Roads - Berks County
Counties - PennDOT
Municipalities - Berks County
Streams - PADEP
Water Bodies - USFWS (Derived from NWI Wetlands)
Management Districts and Subareas - Delineated by BLE



Lehigh Valley
3893 Adler Place
Bethlehem, PA 18017
Tel: 484-821-0470

Northeast Pennsylvania
613 Baltimore Drive
Wilkes-Barre, PA 18702
Tel: 570-821-1999

PREPARED BY: WSB
DATE: 5/14/2007
CHECKED BY: SJD
PROJECT #: 2004-1489-00

ORDINANCE APPENDIX E

LOW IMPACT DEVELOPMENT (LID) PRACTICES

ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

Natural hydrologic conditions may be altered radically by poorly planned development practices, such as introducing unneeded impervious surfaces, destroying existing drainage swales, constructing unnecessary storm sewers, and changing local topography. A traditional drainage approach of development has been to remove runoff from a site as quickly as possible and capture it in a detention basin. This approach leads ultimately to the degradation of water quality as well as expenditure of additional resources for detaining and managing concentrated runoff at some downstream location.

The recommended alternative approach is to promote practices that will minimize proposed conditions runoff rates and volumes, which will minimize needs for artificial conveyance and storage facilities. To simulate pre-development hydrologic conditions, infiltration is often necessary to offset the loss of infiltration by creation of impervious surfaces. The ability of the ground to infiltrate depends upon the soil types and its conditions.

Preserving natural hydrologic conditions requires careful alternative site design considerations. Site design practices include preserving natural drainage features, minimizing impervious surface area, reducing the hydraulic connectivity of impervious surfaces, and protecting natural depression storage. A well-designed site will contain a mix of all those features. The following describes various techniques to achieve the alternative approach:

- **Preserving Natural Drainage Features.** Protecting natural drainage features, particularly vegetated drainage swales and channels, is desirable because of their ability to infiltrate and attenuate flows and to filter pollutants. However, this objective is often not accomplished in land development. In fact, commonly held drainage philosophy encourages just the opposite pattern -- streets and adjacent storm sewers typically are located in the natural headwater valleys and swales, thereby replacing natural drainage functions with a completely impervious system. As a result, runoff and pollutants generated from impervious surfaces flow directly into storm sewers with no opportunity for attenuation, infiltration, or filtration. Developments designed to fit site topography also minimizes the amount of grading on site.

- **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 farm fields during the wet season or after large runoff events. Traditional development practices eliminate these depressions by filling or draining, thereby obliterating their ability to reduce surface runoff

volumes and trap pollutants. The volume and release-rate characteristics of depressions should be protected in the design of the development site. The depressions can be protected by simply avoiding the depression or by incorporating its storage as additional capacity in required detention facilities.

- **Avoiding introduction of impervious areas.** Careful site planning should consider reducing impervious coverage to the maximum extent possible. Building footprints, sidewalks, driveways and other features producing impervious surfaces should be evaluated to minimize impacts on runoff.
- **Reducing the Hydraulic Connectivity of Impervious Surfaces.** Impervious surfaces are significantly less of a problem if they are not directly connected to an impervious conveyance system (such as storm sewer). Two basic ways to reduce hydraulic connectivity are routing of roof runoff over lawns and reducing the use of storm sewers. Site grading should promote increasing travel time of stormwater runoff, and should help reduce concentration of runoff to a single point in the development.
- **Routing Roof Runoff Over Lawns.** Roof runoff can be easily routed over lawns in most site designs. The practice discourages direct connections of downspouts to storm sewers or parking lots. The practice also discourages sloping driveways and parking lots to the street. By routing roof drains and crowning the driveway to run off to the lawn, the lawn is essentially used as a filter strip.
- **Using Permeable Paving Materials.** These materials include permeable interlocking concrete paving blocks or porous bituminous concrete. Such materials should be considered as alternatives to conventional pavement surfaces, especially for low use surfaces such as driveways, overflow parking lots, and emergency access roads.
- **Constructing Cluster Developments.** Cluster developments can also reduce the amount of impervious area for a given number of lots. The biggest savings is in street length, which also will reduce costs of the development. Cluster development clusters the construction activity onto less-sensitive areas without substantially affecting the gross density of development.

In summary, a careful consideration of the existing topography and implementation of a combination of the above mentioned techniques may avoid construction of costly stormwater control measures. Other benefits include reduced potential of downstream flooding, water quality degradation of receiving streams/water bodies and enhancement of aesthetics and reduction of development costs. Beneficial results include more stable baseflows in receiving streams, improved groundwater recharge, reduced flood flows, reduced pollutant loads, and reduced costs for conveyance and storage.

ORDINANCE APPENDIX F

West Nile Virus Guidance

(This source is from the Monroe County, PA Conservation District who 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 2/23/04**

The Monroe County Conservation District recognizes the need to address the problem of non-point 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 (DEP) will make non-point 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 Pollution Discharge Elimination System (NPDES) permitting program, applicants will be required to employ Best Management Practices (BMPs) to address non-point 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 surface 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 non-point 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, groundwater recharge 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 out weigh their potential to become breeding grounds for mosquitoes.

ORDINANCE APPENDIX G REFERENCES

BMP Manuals

California

California Stormwater BMP Handbook: New Development and Redevelopment (January 2003) – separate file available at <http://www.cabmphandbooks.org/Development.asp>

Georgia

Georgia Stormwater Management Manual Volume 2: Technical Handbook (August 2001) separate file (<http://www.georgiastormwater.com/>)

Maryland

2000 Maryland Stormwater Design Manual –
[http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/stormwater design/index.asp](http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/stormwater%20design/index.asp)

Massachusetts

Stormwater Management, Volume Two: Stormwater Technical Handbook (Massachusetts, 1997) – separate file available at
<http://www.state.ma.us/dep/brp/stormwtr/stormpub.htm>

Minnesota

Minnesota Urban Small Sites BMP Manual: Stormwater Best Management Practices for Cold Climates (July 2001) –
<http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm>

New Jersey

Revised Manual for New Jersey: Best Management Practices for Control of Non-point Source Pollution from Stormwater (Fifth Draft May 2000) –
<http://www.state.nj.us/dep/watershedmgt/bmpmanual.htm>

New York

New York State Stormwater Management Design Manual (2001) –
<http://www.dec.state.ny.us/website/dow/swmanual/swmanual.html>

Pennsylvania

Pennsylvania Association of Conservation Districts, Pennsylvania Handbook of Best Management Practices for Developing Areas, November 14, 1997.

Pennsylvania Department of Environmental Protection, Pennsylvania Stormwater Best Management Practices Manual, December 30, 2006 –
<http://www.depweb.state.pa.us/watershedgmt/cwp/view.asp?a=1437&Q=518682&PM=1>

Washington

Stormwater Management Manual for Western Washington (August 2001) –

<http://www.ecy.wa.gov/programs/wq/stormwater/manual.html>

Federal

Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring (FHWA) – <http://www.fhwa.dot.gov/environment/ultraurb/3fs1.htm>

USEPA Infiltration Trench Fact Sheet (September 1999) –

<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm>

Riparian Buffer References

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

Penn State College of Agricultural Sciences, 1996. *Establishing Vegetative Buffer Strips Along Streams to Improve Water Quality*. Publication # AGRS-67.

Fike, Jean, June 1999. *Terrestrial & Palustrine Plant Communities of Pennsylvania*, Pennsylvania Natural Diversity Inventory, The Nature Conservancy, Western Pennsylvania Conservancy, and Pennsylvania Department of Conservation and Natural Resources.

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

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

The Federal Interagency Stream Restoration Working Group (FISRWG, 10/1998). *Stream Corridor Restoration Principles, Processes, and Practices*. GPO Item No. 0120-A; SuDocs No. A57.6/2:EN3/PT.653. ISBN-0-934213-59-3. Published October 1998. Revised August 2000.

ORDINANCE APPENDIX I

**Stormwater Management Practices
for projects which are exempt under Section 402 of this
Ordinance**

STORMWATER MANAGEMENT PROCEDURES FOR PROJECTS MEETING THE LAND COVER EXEMPTION CRITERIA

What are the Act 167 Stormwater Management Requirements?

Pennsylvania Act 167 was authorized on October 4, 1978 (32 P.S., P.L. 864) and gave Pennsylvania Municipalities the power to regulate activities that affect stormwater runoff, surface and groundwater quantity and quality.

Who is affected by these requirements?

The Act 167 Stormwater Management Requirements affect all NEW development in the Schuylkill River Watershed. Individual home construction projects on single family lots which are exempt under Section 402 of this Ordinance, are not required to submit formal drainage plans to the Municipality or County; however, they are still required to address Water Quality and Groundwater Recharge criteria specified in the Schuylkill River Watershed Stormwater Ordinance (Ord. Sections 305 and 306).

Do I require professional services to meet these requirements?

This brochure has been developed to assist the individual homeowner in meeting the water quality and groundwater recharge goals of the Schuylkill River Watershed Stormwater Ordinance. If the guidelines presented in this brochure are followed, the individual homeowner will not require professional services to comply with these water quality and groundwater recharge goals.

What do I need to Send to the Municipality?

Even though a formal drainage plan is not required for individual lot owners, a brief description of the proposed infiltration facilities, including types of material to be used, total impervious areas and volume calculations as shown above, and a simple sketch plan showing the following information shall be submitted to the contractor prior to construction:

- Location of proposed structures, driveways or other paved areas with approximate size in square feet.
- Location of any existing or proposed on site septic system and/or potable water wells showing rough proximity to infiltration facilities.

Determination of Recharge Volume

The amount of recharge volume that should be provided can be determined by following the simple steps below. Impervious area calculations should include all areas on the individual lots that are covered by roof area or pavement which would prevent rain from naturally percolating into the ground, including sidewalks, driveways or parking areas. Sidewalks, driveways or patios that are constructed with gravel or turf pavers and will not be blacktopped in the future, need not be included in this calculation.

Example Recharge Volume:

STEP 1 – Determine Total Impervious Surfaces:

House Roof (Front)	12 ft. x 48 ft.	=	576 sq. ft.
House Roof (Rear)	12 ft. x 48 ft.	=	576 sq. ft.
Driveway	12 ft. x 50 ft.	=	600 sq. ft.
Parking Pad	12 ft. x 12 ft.	=	144 sq. ft.
Walkway	6 ft. x 20 ft.	=	120 sq. ft.

			2,016 sq. ft.

STEP 2 – Determine Required Infiltration Volume (Rv) Using the Following Equation

$$R_v = \frac{0.50 \text{ inches} \times (\text{total impervious area in square feet})}{12} = \text{_____ cubic feet of recharge}$$

$$R_v = \frac{0.50 \text{ in.} \times 2,016 \text{ sq. ft.}}{12} = 84.0 \text{ cu. ft.}$$

STEP 3 – Sizing of Select Infiltration Method

The following pages show several methods of infiltrating stormwater runoff from residential areas. Their appropriateness depends on the amount of infiltration volume required and the amount of land available. More than one method can be implemented on a site, depending on site constraints. Dry wells should be used only for receiving runoff from roof drains. Infiltration trenches are appropriate for receiving runoff from driveways, sidewalk or parking areas. Other methods may be appropriate, but these should be discussed with the Township Engineer prior to installation.

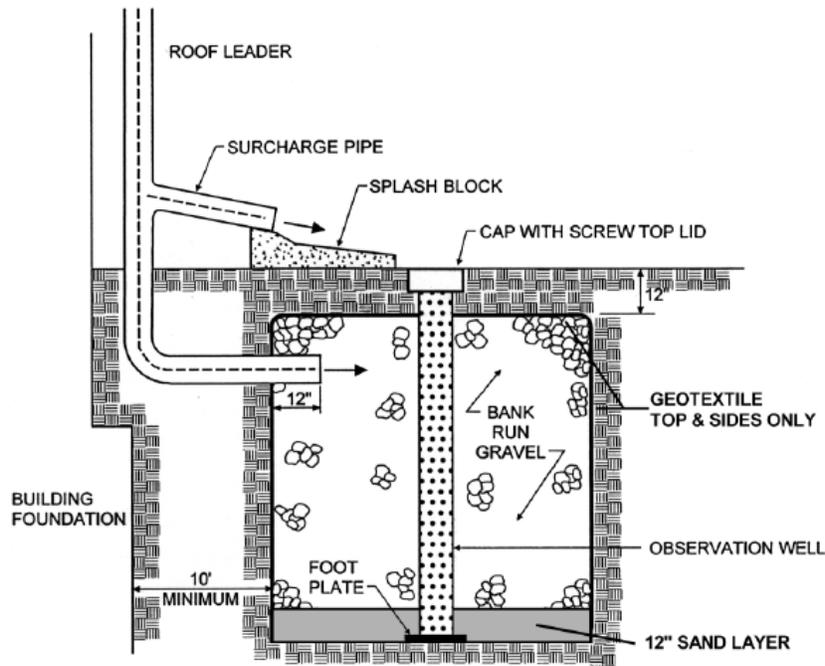
Dry Wells

Dry wells are effective methods of infiltrating runoff from roof leaders. These facilities should be located a minimum of 10 feet from the building foundation to avoid seepage

problems. A dry well can be either a structural prefabricated chamber or an excavated pit filled with aggregate. Construction of a dry well should be performed after all other areas of the site are stabilized, to avoid clogging. During construction, compaction of the subgrade soil should be avoided and construction should be performed with only light machinery. Depth of dry wells in excess of 3 ½ feet should be avoided. Gravel fill should be an average 1.5 – 3.0 inches in diameter. Dry wells should be inspected at least four times annually as well as after large storm events.

FIGURE I-1

TYPICAL DRY WELL CONFIGURATION



Source: Maryland Stormwater Design Manual, 2000

Example Sizing:

STEP 1 – Determine Total Impervious Surfaces

House Roof Area: 12 ft. x 48 ft. = 576 sq. ft.

STEP 2 – Determine Required Infiltration Volume using Equation

$$\frac{0.50 \text{ in.} \times 576 \text{ sq. ft.}}{12} = 24.0 \text{ cu. ft.}$$

$$\frac{24.0 \text{ cu. ft.}}{0.4^*} = 60.0 \text{ cu. ft.} \text{ (* assume 40\% void ratio in gravel bed)}$$

STEP 3 – Sizing of Select Infiltration Method

Volume of facility = Depth x Width x Length

Set D = 3.5 ft.; Set W = L for a square chamber

60.0 cu. ft. = 3.5 ft. x L X L; L = 4.1 ft

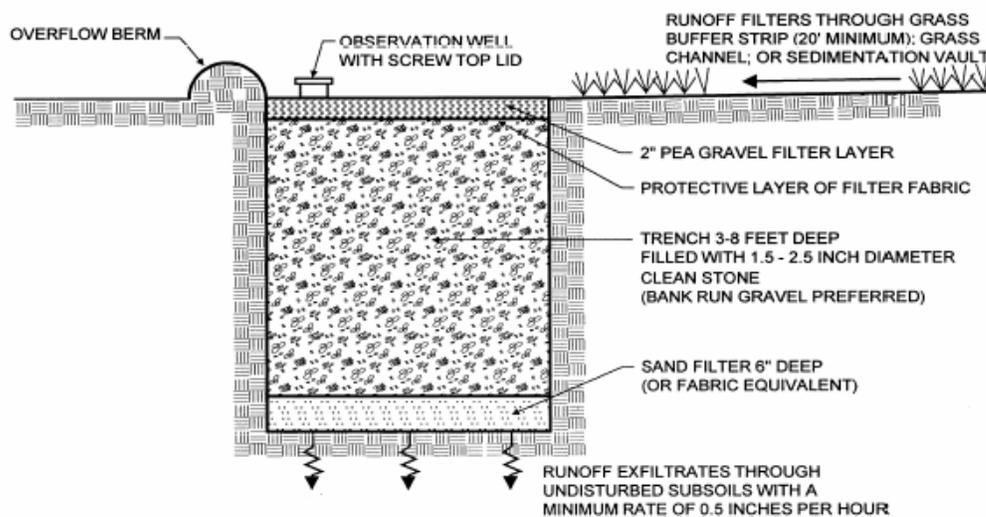
Final Facility Dimensions: 3.5 ft. (D) x 4.1 ft. (W) x 4.1 ft. (L)

Infiltration Trenches

An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. Runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix. Infiltration trenches perform well for removal of fine sediment and associated pollutants. Pretreatment using buffer strips, swales, or detention basins is important for limiting amounts of coarse sediment entering the trench which can clog and render the trench ineffective.

FIGURE I-2

TYPICAL INFILTRATION TRENCH CONFIGURATION



Source: Maryland Stormwater Design Manual, 2000

Example Sizing:

STEP 1 – Determine Total Impervious Surfaces

Driveway	12 ft. x 50 ft.	=	600 sq. ft.
Parking Pad	12 ft. x 12 ft.	=	144 sq. ft.
Walkway	6 ft. x 20 ft.	=	120 sq. ft.

			864 sq. ft.

STEP 2 – Determine Required Infiltration Volume using Equation

$$\frac{0.50 \text{ in.} \times 864 \text{ sq. ft.}}{12} = 36.0 \text{ cu. ft.}$$

$$\frac{36.0 \text{ cu. ft.}}{0.4^*} = 90.0 \text{ cu. ft.} \text{ (* assume 40\% void ratio in gravel bed)}$$

STEP 3 – Sizing of Select Infiltration Method

Volume of facility = Depth x Width x Length

Set D = 3 ft.; Determine Required Surface Area of Trench

$$90.0 \text{ cu. ft.} / 3 \text{ ft.} = 30.0 \text{ sq. ft.}$$

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

$$\text{Determine trench length: } L = 30.0 \text{ sq. ft.} / 6 \text{ ft.} = 5.0 \text{ ft.}$$

Final Trench Dimensions: 3 ft. (D) x 6 ft. (W) x 5.0 ft. (L)

FIGURE I-3

SAMPLE SITE SKETCH PLAN

