

CHALFONT BOROUGH BUCKS COUNTY

STORMWATER MANAGEMENT ORDINANCE

(Ord. #398)

Enacted: 2011



CHAPTER 26

WATER

Part 1 (RESERVED)

Part 2 WATER CONSERVATION

- §26-201. General Policy
- §26-202. Water Conservation Performance Standards for Plumbing Fixtures and Fittings
- §26-203. Special Provisions
- §26-204. Official Review and Modification
- §26-205. Penalties

Part 3 STORMWATER MANAGEMENT

A. General Provisions

- §26-301. General Provisions
- §26-302. Title
- §26-303. Statement of Findings
- §26-304. Purpose
- §26-305. Statutory Authority
- §26-306. Applicability
- §26-307. Compatibility With Other Ordinance Requirements
- §26-308. Exemptions
- §26-309. Repealer

B. Definitions

- §26-311. General
- §26-312. Terms

C. Stormwater Management Requirements

- §26-321. General Requirements
- §26-322. Volume Control
- §26-323. Stormwater Peak Rate Control and Management Districts

- § 26-324. Calculation Methodology
- §26-325. Stormwater Design Standards and Criteria
- §26-326. Erosion and Sedimentation Standards and Criteria

D. Stormwater Management Plan Requirements

- §26-331. General Requirements
- §26-332. Plan Contents
- §26-333. Plan Submission
- §26-334. Plan Review and Approval
- §26-335. Modification of Plans

E. Permit Requirements and Procedures

- §26-341. General
- §26-342. Application Requirements
- §26-343. Application for Permit
- §26-344. Modification of Plans
- §26-345. Expiration and Renewal
- §26-346. Suspension and Revocation

F. Administration

- §26-351. Schedule of Inspections
- §26-352. Fees and Expenses
- §26-353. Financial and Maintenance Guarantees
- §26-354. Right-of-Entry
- §26-355. Stormwater Violation Sanctions and Notification
- §26-356. Penalties
- §26-357. Appeals
- §26-358. Adoption

Appendix I	Stormwater Management Plan Certificate
Appendix II	Application for Stormwater Management Permit
Appendix III	Watershed Map
Appendix IV	Stormwater Management Controls
Appendix V	Stormwater Controls and Best Management Practices Operations and Maintenance Agreement (Example)
Appendix VI	Stormwater Management Design Criteria
Appendix VII	Stormwater Management Site Plan Checklist
Appendix VIII	Low Impact Development
Appendix IX	Disconnected Impervious Area
Appendix X	Small Project Stormwater Management (SWM) Site Plan

PART 3

STORMWATER MANAGEMENT

A. General Provisions.

§26-301. General Provisions.

This Part regulates:

- A. Stormwater runoff associated with land development, subdivision of land and construction of impervious surface.
- B. Diversion of natural or man-made channels.
- C. The installation of stormwater systems in all portions of Chalfont Borough.
- D. Prohibition Against Nonstormwater Discharges.

1. Prohibited Discharges.

(a) No person in the Borough shall allow, or cause to allow, stormwater discharges into the Borough's separate storm sewer system that are not composed entirely of stormwater, except:

- (1) As provided in Subsection 1(b) below; and
- (2) Discharges allowed under a state or federal permit.
- (3) Sump pump discharges to the curblin and any discharge onto any street as listed in Chapter 21, §21-804 of the Borough Code. Existing sump pump discharges to the street are not grandfathered under this requirement.

(b) Discharges which may be allowed, based on a finding by the Borough that the discharge(s) do not significantly contribute to pollution to surface Waters of the Commonwealth, are:

- (1) Discharge from fire-fighting activities.
- (2) Potable water sources, including dechlorinated water line and fire hydrant flushings.
- (3) Irrigation drainage.

- (4) Routine external building washdown (which does not use detergents or other compounds).
 - (5) Air-conditioning condensate.
 - (6) Water from individual residential car washing.
 - (7) Springs.
 - (8) Water from crawl-space pumps.
 - (9) Sump Pumps: Connection of a sump pump discharge pipe directly into the storm sewer system is encouraged; however, discharge to a lawn area is acceptable. A permit and approval from the Borough will be required for any connection to the storm sewer system.
 - (10) Flows from riparian habitats and wetlands.
 - (11) Lawn watering.
 - (12) Dechlorinated swimming-pool discharges (per DEP requirements).
 - (13) Uncontaminated groundwater.
 - (14) Uncontaminated water from foundation or from footing drains.
- (c) In the event that the Borough determines that any of the discharges identified in Subsection 1(b) significantly contribute to pollution of Waters of the Commonwealth, or it is so notified by the Pennsylvania Department of Environmental Protection (DEP), the municipality will notify the responsible person to cease the discharge.
- (d) Upon notice provided by the Borough under Subsection 1(c), the discharger will have a reasonable time, as determined by the Borough, to cease the discharge, consistent with the degree of pollution caused by the discharge.
- (e) Nothing in this section shall affect a discharger's responsibilities under state law.
2. Prohibited Connections. The following connections are prohibited, except as provided in Subsection 1(b) above:

- (a) Any drain or conveyance, whether on the surface or subsurface, which allows any nonstormwater discharge, including sewage, process wastewater and washwater, to enter the separate storm sewer system. No grass clippings, trash, debris, etc. shall be allowed into the separate storm sewer system.
- (b) Any drain or conveyance connected from a commercial or industrial land use to the separate storm sewer system that has not been documented in plans, maps or equivalent records and approved by the Borough.

§26-302. Title.

This Part shall be known as the “Chalfont Borough Stormwater Management Ordinance.”

§26-303. Statement of Findings.

The Chalfont Borough Council finds that:

- A. Inadequate management of accelerated stormwater runoff resulting from development and redevelopment throughout a watershed increases flood flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to 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 streambeds and stream banks, thereby elevating sedimentation), destroying aquatic habitat, and elevating aquatic pollutant concentrations and loadings such as sediments, nutrients, heavy metals, and pathogens.
- C. A comprehensive program of stormwater management (SWM), including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, welfare, and the protection of the people of the municipality and all the people of the Commonwealth, their resources, and the environment.
- D. Stormwater is an important water resource by providing groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.

- E. Public education on the control of pollution from stormwater is an essential component in successfully addressing stormwater.
- F. 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).

§26-304. Purpose.

The purpose of this Part is to promote the public health, safety and welfare within Chalfont Borough by minimizing the damages described in 26-303(1) of this Part by provisions designed to:

- A. Manage stormwater runoff created by development activities, taking into account the cumulative stormwater impacts from peak runoff rates and runoff volume.
- B. Maintain and/or improve existing water quality of streams, watercourses and impoundments by preventing the additional loading of various stormwater runoff pollutants into the stream system and enhancing baseflow as much as possible.
- C. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code, Chapter 93, to protect, maintain, reclaim, and restore the existing and designated uses of the Waters of the Commonwealth.
- D. Minimize increases in stormwater volume and control peak flows.
- E. Minimize impervious surfaces.
- F. Provide review procedures and performance standards for stormwater planning and management.
- G. Preserve the natural drainage systems as much as possible.
- H. Manage stormwater impacts close to the runoff source, requiring a minimum of structures and relying on natural processes.
- I. Focus on infiltration of stormwater to maintain groundwater recharge, to prevent degradation of surface and groundwater quality, and to otherwise protect water resources.
- J. Preserve and restore the flood-carrying capacity of streams.

- K. Prevent scour and erosion of stream banks and stream beds.
- L. Provide standards to meet National Pollution Discharge Elimination System (NPDES) permit requirements.
- M. Address certain requirements of the Municipal Separate Stormwater Sewer System (MS4) NPDES Phase II Stormwater Regulations.
- N. Provide for proper operation and maintenance of all stormwater management facilities and Best Management Practices (BMPs) that are implemented in the Municipality.

§26-305. Statutory Authority.

Chalfont Borough Council is empowered to regulate land use activities that affect runoff, surface and groundwater quality and quantity by the authority of the Pennsylvania Municipalities Code, Act 247, as amended, the Pennsylvania Stormwater Management Act, Act No. 167 of October 4, 1978 (P.L. 864), and the Borough Code. The Chalfont Borough Council hereby enacts and ordains this Part as the “Chalfont Borough Stormwater Management Ordinance.” This Part shall apply to the activities defined in 26-306 of this Part.

§26-306. Applicability.

1. The following activities are defined as regulated activities and shall be regulated by this Part:
 - A. Land development.
 - B. Subdivision.
 - C. Construction, reconstruction, or addition of new impervious surfaces (driveways, parking lots, roads, etc. except for reconstruction of roads, driveways, parking lots where there is no increase in impervious surface).
 - D. Construction of new buildings or additions to existing buildings.
 - E. Diversion or piping or encroachment in any natural or man-made stream channel or conveyance channel.
 - F. Regulated earth disturbance activity.
 - G. Prohibited or polluted discharges.
 - H. Alteration of the natural hydrologic regime.

I. Redevelopment.

J. Nonstructural and structural stormwater management Best Management Practices (BMPs) or appurtenances thereto.

2. Additional stormwater management design and construction criteria, such as inlet spacing, collection system details, construction material specifications, etc., shall be as described in this Part or in the Chalfont Borough Subdivision and Land Development Regulations. Appropriate sections from the Chalfont Borough's Subdivision and Land Development Ordinance, and other applicable local Ordinances, shall be followed in the design, construction, and maintenance of all stormwater BMPs if not listed in this Ordinance.
3. This Part shall apply to all regulated activities detailed above. The more stringent requirements of this Part, the Zoning Ordinance, the Subdivision and Land Development Regulations (Chapter 22) or other requirements of Chalfont Borough shall apply if any regulated activity requires compliance with other Ordinances and Regulations of Chalfont Borough.
4. 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.

§26-307. Compatibility With Other Ordinance Requirements.

Approvals issued pursuant to this Part do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act or ordinance.

§26-308. Exemptions.

1. Regulated Activities that create impervious surfaces less than or equal to 1,000 square feet are exempt from the peak rate control and the SWM Site Plan preparation requirements located in this Ordinance unless the activity is found to be a significant contributor of pollution to the Waters of the Commonwealth. These activities are not exempt from the volume requirements of the Ordinance. Volume control best management practices are required to be provided by the applicant. It is up to the applicant to meet the volume control requirements and install and maintain the best management practices.
2. Regulated Activities that create impervious surfaces greater than 1,000 square feet, up to and including 5,000 square feet, are exempt only from the peak rate control requirements of this Ordinance. These activities are not exempt from the SWM Site Plan requirements and the Volume requirements of the Ordinance. The Non-Engineered Small Project Site Plan detailed In

Appendix X can be used to satisfy the SWM Site Plan requirements for residential activities only and the Volume Control requirements.

Table 26-308. Impervious Surface Exemption Thresholds for the Neshaminy Creek Watershed

Ordinance Article or Section	Type of Project	Proposed Impervious Surface		
		0 – 1,000 sq. ft.	>1,000 – 5,000 sq. ft.	5,000 + sq. ft.
Part D. SWM Site Plan Requirements	All Development	Exempt	Not Exempt (except residential activity)	Not Exempt
Appendix X Non-Engineered Small Project Site Plan	Only Residential Development Applicable	Exempt	Applicable	Non-Applicable
§26-322 Volume Control Requirements	All Development	Not Exempt	Not Exempt	Not Exempt
§26-323 Peak Rate Control Requirements	All Development	Exempt	Exempt	Not Exempt
§26-326 Erosion and Sediment Pollution Control Requirements	Must comply with Title 25, Chapter 102 of the PA Code and any other applicable state, county and municipal codes. PA DEP requires an engineered post construction SWM Plan with projects proposing earth disturbance greater than 1 acre.			

3. Agricultural activity is exempt from the peak rate control requirements and SWM Site Plan preparation requirements of this Ordinance, provided the activities are performed according to the requirements of 25 Pa. Code, Chapter 102.
4. Forest management and timber operations are exempt from the peak rate control requirements and SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code, Chapter 102.
5. Any aspect of BMP maintenance to an existing SWM system made in accordance with plans and specifications approved by Chalfont Borough is exempt.
6. The use of land for gardening for home consumption is exempt from the requirements of this Ordinance.
7. Exemptions from any provisions of this Ordinance shall not relieve the applicant from the requirements in Section 321.13 through 321.21.

8. Additional Exemption Criteria:

- A. Exemption Responsibilities – An exemption shall not relieve the Applicant from implementing such measures as are necessary to protect public health, safety, and property.
- B. Drainage Problems – Where drainage problems are documented or known to exist downstream of, or is expected from, the proposed activity, Chalfont Borough may deny exemptions.
- C. Exemptions are limited to specific portions of this Ordinance.
- D. HQ and EV Streams – Chalfont Borough may deny exemptions in high quality (HQ) or exceptional value (EV) waters and Source Water Protection Areas (SWPA).

§26-309. Repealer.

Any other Ordinance or Ordinance provision of Chalfont Borough inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

B. Definitions.

§26-311. General.

1. Unless otherwise expressly stated, the following terms shall, for the purpose of this Part, have the meaning indicated below.
2. Words used in the singular include the plural, and words in plural include the singular. The word “building” shall be construed as if followed by the words “or a part thereof.” The word “may” and “should” are permissive, the words “shall”, “must” and “will” are mandatory.
3. Words used in the present tense include the future tense; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.
4. 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.
5. The word “person” includes an individual, firm, association, organization, partnership, trust, company, corporation, unit of government, or any other similar entity.
6. The words “used” or “occupied” include the words “intended, designed, maintained, or arranged to be used, occupied or maintained.”

§26-312. Terms.

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

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 as the result of changing the land cover including the water, vegetation and bare soil.

APPLICANT – A landowner, as herein defined, or agent of the landowner, who has filed an application for a stormwater management permit or an application to engage in a regulated activity.

AS-BUILT DRAWINGS – Engineering or site drawings maintained by the Contractor as he constructs the project and upon which he documents the actual

locations of the building components and changes to the original contract documents. These documents, or a copy of same, are to be submitted to the Township for review and approval at the completion of the project.

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

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

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

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

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.

BUILDING – Any structure, either temporary or permanent, having walls and a roof, designed or used for the shelter of any person, animal or property, and occupying more than 100 square feet of area.

CHANNEL – An open drainage feature through which stormwater flows. Channels include, but shall not be limited to, natural and man-made watercourses, swales, streams, ditches, canals, and pipes that convey continuously or periodically flowing water.

CISTERN – An underground reservoir or tank for storing rainwater.

CONSERVATION DISTRICT – Bucks County Conservation District

CONVEYANCE – A stormwater management facility designed to transmit stormwater runoff, which shall include streams, channels, swales, pipes, conduits, culverts, storm sewers, etc.

CULVERT – A pipe, conduit or similar structure, including appurtenant works that carries surface water.

CURVE NUMBER – Value used in the Soil Cover Complex Method. It is a measure of the percentage of precipitation that is expected to run off from the watershed and is a function of the soil, vegetative cover, and tillage method.

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

DEDICATION – The deliberate devotion of property by its owner for general public use.

DEP or DEPARTMENT – Pennsylvania Department of Environmental Protection

DESIGNEE – The agent of the Bucks County Conservation District and/or agent of Chalfont Borough with the administration, review, or enforcement of any provisions of this Ordinance by contract or memorandum of understanding.

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

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

DEVELOPER – A person, partnership, association, corporation or other entity, or any responsible person therein or agent thereof, that undertakes any regulated activity of this Part.

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 for which a regulated activity is proposed.

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. See also Peak Discharge.

DISCHARGE POINT – The point of discharge for a stormwater facility.

DISCONNECTED IMPERVIOUS AREA (DIA) – An impervious or impermeable surface that is disconnected from any stormwater drainage or conveyance system and is redirected or directed to a pervious area, which allows for infiltration, filtration, and increased time of concentration as specified in Appendix IX, Disconnected Impervious Area.

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

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

DRAINAGE EASEMENT – A right granted by a landowner to a grantee, allowing the use of private land for stormwater management purposes.

EARTH DISTURBANCE ACTIVITY – A construction or other human activity which disturbs the surface of the land, including, but not limited to, clearing and grubbing, grading, excavations, embankments, land development, agricultural plowing or tilling, timber harvesting 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 removal of soil particles by the action of water, wind, ice or other geological agents.

EROSION AND SEDIMENT CONTROL PLAN – A plan for a project site, which identifies BMPs to minimize erosion and sedimentation.

EXISTING CONDITIONS – The initial condition of a project site prior to the proposed construction.

EXCEPTIONAL VALUE WATERS (EV) – Surface waters of high quality which satisfy Pennsylvania Code Title 25 Environmental Protection, Chapter 93, Water Quality Standards, §93.4b(b) (relating to antidegradation).

EXISTING RECHARGE AREA – Undisturbed surface area or depression where stormwater collects and a portion of which infiltrates and replenishes the groundwater.

EXISTING RESOURCE AND SITE ANALYSIS MAP – A base map which identifies fundamental environmental site information including floodplains, wetlands, topography, vegetative site features, natural areas, prime agricultural land and areas supportive of endangered species.

FLOOD – A temporary inundation of the floodplain outside the floodway.

FLOODPLAIN – A relatively flat or low land area which is subject to partial or complete inundation from an adjoining or nearby stream, river or watercourse and/or any area subject to the unusual and rapid accumulation of surface waters from any source.

FLOODWAY - The designated area of a floodplain required to carry and discharge flood waters of a given magnitude.

FOREST MANAGEMENT/TIMBER OPERATIONS – Planning and associated activities necessary for the management of forestland. 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, or diversion swale. The space is required as a safety margin in a pond or basin.

GOVERNING BODY – Elected municipal officials of Chalfont Borough.

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.

GROUNDWATER RECHARGE – Replenishment of existing natural underground water supplies.

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

HIGH QUALITY WATERS (HQ) – 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).

HOT SPOT – An area where land use or activity generates highly contaminated runoff, with concentrations of pollutants in excess of those typically found in stormwater. Typical pollutant loadings in stormwater may be found in Chapter 8, Section 6 of the *Pennsylvania Stormwater Best Management Practices Manual*, Pennsylvania Department of Environmental Protection (PADEP) No. 363-0300-002 (2006).

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

HYDROLOGIC REGIME – The hydrologic cycle or balance that sustains quality and quantity of stormwater, base flow, storage, and groundwater supplies under natural conditions.

HYDROLOGIC SOIL GROUP – A classification of soils by the Natural Resources Conservation Service, 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 percolation of water into the ground. Impervious surfaces include, but are not limited, to, streets, sidewalks, pavement, roofs, parking areas, or driveway areas. Any of these surface areas designed to be gravel or crushed stone shall be regarded as impervious surfaces. In addition, other areas determined by the Borough Engineer to be impervious within the meaning of this definition will also be classified as impervious.

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

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

INFILTRATION STRUCTURES – A structure designed to direct runoff into the ground (e.g., French drains, seepage pits, seepage trench).

INITIAL ABSTRACTION (I_a): The value used to calculate the volume or peak rate of runoff in the soil cover complex method. It represents the depth of rain retained on vegetation plus the depth of rain stored on the soil surface plus the depth of rain infiltrated prior to the start of runoff.

INLET – The upstream end of any structure through which water may flow.

INTERMITTENT STREAM – A stream that flows only part of the time. Flow generally occurs for several weeks or months in response to seasonal precipitation or groundwater discharge.

KARST – A type of topography or landscape characterized by surface depressions, sinkholes, rock pinnacles/uneven bedrock surface, underground drainage, and caves. Karst is formed on carbonate rocks, such as limestone or dolomite.

LAND DEVELOPMENT – Any of the following activities:

- A. The improvement of one lot or two or more contiguous lots, tracts or parcels of land for any purpose involving:
 - 1. A group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single non residential building on a lot or lots regardless of the number of occupants or tenure; or
 - 2. The division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of, streets, common areas, leaseholds, condominiums, building groups or other features.
- B. A subdivision of land.
- C. Development in accordance with Article V, Section 503(1.1) of the Pennsylvania Municipalities Planning Code, Act of 1968, P.L. 805, No. 247 as reenacted and amended.

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.

LOW IMPACT DEVELOPMENT (LID) PRACTICES – Practices that will minimize proposed conditions runoff rates and volumes, which will minimize needs for artificial conveyance and storage facilities.

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.

MUNICIPAL ENGINEER – A registered professional engineer licensed as such in the Commonwealth of Pennsylvania, duly appointed as the engineer for Chalfont Borough.

MUNICIPALITY – Chalfont Borough, Bucks County, Pennsylvania

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

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

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

NRCS – Natural Resource Conservation Service (previously "SCS")

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

OUTFALL – "Point source" as described in 40 CFR §122.2 at the point where the municipality's storm sewer system discharges to surface Waters of the Commonwealth.

OUTLET – Points of water disposal from a stream, river, lake, tidewater or artificial drain.

PADEP or PA DEP – See DEP.

PEAK DISCHARGE – The maximum rate of flow of storm runoff at a given point and time resulting from a specified storm event.

PERENNIAL STREAM – A stream that contains water at all times except during extreme drought.

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

PLANNING COMMISSION – Planning Commission of Chalfont Borough

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

POST CONSTRUCTION – Period after construction during which disturbed areas are stabilized, stormwater controls are in place and functioning, and all proposed improvements in the approved land development plan are completed.

PREDEVELOPMENT – See Existing Condition.

PRETREATMENT – Techniques employed in stormwater BMPs to provide storage or filtering to trap coarse materials and other pollutants before they enter the system, but not necessarily designed to meet the volume requirements of this Ordinance.

PERVIOUS SURFACE – A surface that allows the infiltration of water into the ground.

PROJECT SITE – The specific area of land where any Regulated Activities in the municipality are planned, conducted or maintained.

QUALIFIED DESIGN PROFESSIONAL - Any person licensed by the state of Pennsylvania or otherwise qualified by law to perform the work required by the Ordinance.

RATIONAL METHOD – A method of computing the peak rate of runoff at any location in a watershed as a function of the drainage area, runoff coefficient, and mean rainfall intensity for a duration equal to the time of concentration.

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

REDEVELOPMENT – Any development that requires demolition or removal of existing structures or impervious surfaces at a site and replacement with new impervious surfaces. Maintenance activities such as milling/removal of pavement 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.

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

RELEASE RATE – The post development peak rate of runoff for a development site that must be controlled to protect downstream areas.

RETENTION BASIN – A basin designed to retain stormwater runoff so that a permanent pool is established.

RETENTION VOLUME/REMOVED RUNOFF – The volume of runoff that is captured and not released directly into the surface Waters of the Commonwealth during or after a storm event.

RETURN PERIOD – The probability an event will occur in any given year. Typically displays as a whole number; e.g. 25-year event, and represents the inverse of the frequency of that event.

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.

ROOF DRAINS – A drainage conduit or pipe that collects water runoff from a roof and leads it away from the structure.

RUNOFF – The part of precipitation that flows over the land.

SALDO – Subdivision and Land Development Ordinance

SCS – Soil Conservation Service, U.S. Department of Agriculture

SEDIMENT – Solid material, both mineral and organic, that is in suspension, is being transported or has been moved from its site of origin by water.

SEDIMENTATION BASIN – A barrier, dam, retention or detention basin to retain sediment.

SEEPAGE PIT/SEEPAGE TRENCH – An area of excavated earth filled with loose stone or similar material and into which water is directed for infiltration into the ground.

SEPARATE STORM SEWER SYSTEM – A conveyance or system of conveyances (including roads with drainage systems, Borough 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 rills and swales of a shallow depth prior to entering a defined channel or waterway.

SHEET FLOW – Runoff that flows over the ground surface as a broad, shallow water movement, not concentrated in a channel.

SOIL-COVER COMPLEX METHOD – A method of runoff computation developed by SCS, which is based upon relating soil type and land use/cover to a runoff parameter called a curve number.

STATE WATER QUALITY REQUIREMENTS – As defined under state regulations – protection of designated and existing uses. (See 25 Pa. Code Chapters 93 and 96.)

STORM SEWER – A system of pipes or other conduits, which carries intercepted surface runoff, street water and other waters or drainage, but excludes domestic sewage and industrial waste.

STORMWATER – The surface runoff generated by precipitation reaching the ground surface.

STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES – Is abbreviated as BMPs or SWM BMPs throughout this Ordinance. (See BMP.)

STORMWATER MANAGEMENT FACILITY – Any structure, natural or man-made, that, due to its condition, design or construction, conveys, stores or otherwise affects stormwater runoff. Typical “stormwater management facilities” include, but are not limited to, detention and retention basins, open channels, storm sewers, pipes and infiltration structures.

STORMWATER MANAGEMENT PERMIT – A permit issued by the municipality after the SWM Site Plan has been approved.

STORMWATER MANAGEMENT ACT 167 PLAN – The plan for managing stormwater runoff adopted by Bucks County for the Neshaminy Creek Watershed as required by the Act of October 4, 1978, (P.L. No. 864) (Act 167), and known as the “Stormwater Management Act.”

STORMWATER SITE PLAN (SWM 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 watercourse

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

SUBAREA – The smallest unit of watershed breakdown for hydrologic modeling purposes for which the runoff control criteria have been established in the Neshaminy Creek Watershed Stormwater Management Act 167 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.

SURFACE WATERS OF THE COMMONWEALTH – Any and all rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

SWALE – A low-lying stretch of land that gathers or carries surface water runoff.

TIME OF CONCENTRATION (T_c) – 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, concentrate 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.

VEGETATED SWALE – A natural or man-made waterway, usually broad and shallow, covered with erosion-resistant grasses, used to convey surface water.

VERNAL POOL – 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.

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

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

WATERSHED – The region or area drained by a river, watercourse or other body of water, whether natural or artificial.

C. Stormwater Management Requirements.

§26-321. General Requirements.

1. The standards contained in this Part shall apply as minimum design standards; however, federal, state and other Chalfont Borough regulations may impose additional standards subject to their jurisdiction. Approvals issued and actions taken under this Ordinance do not relieve the Applicant of the responsibility to secure required permits or approvals for activities regulated by any other code, law, regulation or Ordinance.
2. Retention of Existing Watercourses and Natural Drainage Features.
 - A. Whenever a watercourse, stream or intermittent stream is located within a development site, it shall remain open in its natural state and location and shall not be piped, unless required or approved by the Borough.
 - B. No stormwater runoff or natural drainage shall be so diverted as to overload existing drainage systems (including existing stormwater management facilities) or create flooding.
 - C. The Borough Council may require a developer to provide a permanent easement along any watercourse located within or along the boundary of any property being subdivided or developed. The purpose of any such easement shall be for the maintenance of the channel of any watercourse, and their structures and any alterations which may adversely affect the watercourse. The required width of any such easement shall be the greater width as determined by the Borough Engineer, U.S. Army Corps of Engineers, Pennsylvania Department of Environmental Protection or other public agency having jurisdiction but, in no case, shall such easement be less than 50 feet in width. The developer will retain the easement until such time as one of the following is accomplished:
 - (1) The easement is offered for dedication by the developer and accepted by Chalfont Borough.
 - (2) If an easement acceptable to the Borough is established, the maintenance shall then be the responsibility of the individual lot owners over whose property the easement passes. For land developments, the maintenance shall then be the responsibility of the owner of the affected property. The maintenance responsibility shall be clearly established and recorded with the deed of easement.
 - (3) A homeowners association or other legal entity, approved by Chalfont Borough, assumes responsibility for the maintenance of the

development, including the retention and maintenance of the watercourse easement.

3. Developers shall construct and/or install stormwater management facilities, and BMPs on-site and off-site, as necessary to:
 - A. Prevent erosion damage and to satisfactorily carry off, detain or retain and control the rate of release of stormwater.
 - B. Manage the anticipated peak discharge from property being subdivided or developed and existing runoff being contributed from all land at a higher elevation in the same watershed.
 - C. Convey stormwater along or through the property to a natural outfall. If a developer concentrates dispersed stormwater flow or redirects stormwater flow to exit at another location on the property, the developer is responsible for constructing an adequate channel on the adjacent property and on all downstream properties until a natural outfall is reached. A natural outfall shall have sufficient capacity to receive stormwater without deterioration of the facility and without adversely affecting property in the watershed. This natural outfall may be a river, creek or other drainage facility so designated by Chalfont Borough for the proposed system.
 - D. Protect and maintain existing levels of water quality in all streams.
4. Where applicable, stormwater management facilities or programs shall comply with the requirements of Chapter 102 ("Erosion Control"), Chapter 105 ("Dam Safety and Waterway Management") and Chapter 106 ("Floodplain Management") of Title 25, "Rules and Regulations of the DEP."
5. Stormwater management facilities which involve a State highway shall be subject to the approval of PennDOT.
6. Stormwater management facilities located within or affecting the floodplain of any watercourse shall also be subject to the requirements of any Chalfont Borough Ordinance that regulates construction and development within areas which are subject to flooding.
7. Access to facilities shall be provided for maintenance and operation. This access shall be a cleared access that is, when possible, approximately 20 feet wide. Proximity of facilities to public right-of-ways shall be encouraged in order to minimize the length of accessways. Multiple accesses shall be encouraged for major facilities.

8. Additional studies and higher levels of control than the minimum provided in the requirements and criteria of this Part may be required by the Borough Council to ensure adequate protection to life and property.
9. In addition to runoff control, all stormwater management plans shall also incorporate BMPs in conjunction with the permitting, implementation and operation and maintenance of the selected stormwater runoff controls.
10. Applicants proposing Regulated Activities shall submit a Stormwater Management (SWM) Site Plan to the Chalfont Borough for review, unless exempt by provisions of this Ordinance. The SWM criteria of this Ordinance shall apply to the total proposed development even if development is to take place in stages. Preparation and implementation of an approved SWM Site Plan is required. No Regulated Activities shall commence until the Chalfont Borough issues written approval of a SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance.
11. SWM Site Plans approved by Chalfont Borough shall be on-site throughout the duration of the Regulated Activity.
12. Chalfont Borough may, after consultation with the Department of Environmental Protection (PADEP), approve measures for meeting the state water quality requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, state law including, but not limited to, the Clean Streams Law.
13. For all regulated earth disturbance activities, Erosion and Sediment (E&S) Control Best Management Practices (BMPs) shall be designed, implemented, operated, and maintained during the Regulated Earth Disturbance Activities (e.g., during construction) to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code and the Clean Streams Law. Various BMPs and their design standards are listed in the *Erosion and Sediment Pollution Control Program Manual*, No. 363-2134-008 (April 15, 2000), as amended and updated.
14. For all Regulated Activities, implementation of the volume controls is required as regulated by this Ordinance.
15. Impervious areas:
 - A. The measurement of impervious areas shall include all of the impervious areas in the total proposed development even if development is to take place in stages.

- B. For development taking place in stages, the entire development plan must be used in determining conformance with this Ordinance.
 - C. For projects that add impervious area to a parcel, the total impervious area on the parcel is subject to the requirements of this Ordinance.
16. Stormwater flows onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written notification of the adjacent property owner(s). Such stormwater flows shall be subject to the requirements of this Ordinance.
17. All Regulated Activities shall include such measures as necessary to:
- A. Protect health, safety, and property;
 - B. Meet the water quality goals of this Ordinance by implementing measures to:
 - (1) Minimize disturbance to floodplains, wetlands, and wooded areas.
 - (2) Create, maintain, repair or extend riparian buffers.
 - (3) Avoid erosive flow conditions in natural flow pathways.
 - (4) Minimize thermal impacts to waters of this Commonwealth.
 - (5) Disconnect impervious surfaces (i.e., Disconnected Impervious Areas, DIAs) by directing runoff to pervious areas, wherever possible. See Appendix IX for detail on DIAs.
 - C. To the maximum extent practicable, incorporate the techniques for Low Impact Development Practices (e.g., protecting existing trees, reducing area of impervious surface, cluster development, and protecting open space) described in the *Pennsylvania Stormwater Best Management Practices Manual*, Pennsylvania Department of Environmental Protection (PADEP) No. 363-0300-002 (2006), as amended and updated. See Ordinance Appendix VIII for a summary description.
18. Infiltration BMPs should be spread out, made as shallow as practicable, and located to maximize the use of natural on-site infiltration features while still meeting the other requirements of this Ordinance.
19. The design of all facilities over karst shall include an evaluation of measures to minimize the risk of adverse effects.

20. Storage facilities should completely drain both the volume control and rate control capacities over a period of time not less than 24 and not more than 72 hours from the end of the design storm.
21. The design storm volumes to be used in the analysis of peak rates of discharge should be obtained from the Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 2, Version 3.0, U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Hydrometeorological Design Studies Center, Silver Spring, Maryland, as amended. NOAA's Atlas 14 can be accessed at <http://hdsc.nws.noaa.gov/hdsc/pfds/> .
22. For all regulated activities, SWM BMPs shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Stormwater Management Act.
23. Various BMPs and their design standards are listed in the *Pennsylvania Stormwater Best Management Practices Manual* (PA BMP Manual).

§26-322. Volume Control.

Volume controls will mitigate increased runoff impacts, protect stream channel morphology, maintain groundwater recharge, and contribute to water quality improvements. Stormwater runoff volume control methods are based on the net change in runoff volume for the two-year storm event.

Volume controls shall be implemented using the Design Storm Method in subsection A or the Simplified Method in subsection B below. For Regulated Activities equal to or less than one (1) acre, this Ordinance establishes no preference for either methodology; therefore, the applicant may select either methodology on the basis of economic considerations, the intrinsic limitations of the procedures associated with each methodology, and other factors. All regulated activities greater than one (1) acre must use the Design Storm Method.

- A. Design-Storm Method (Any Regulated Activity): This method requires detailed modeling based on site conditions. For modeling assumptions refer to Section 26-324.1.
 1. Post development total runoff should not be increased from pre-development total runoff for all storms equal to or less than the 2-year, 24-hour duration precipitation.
 2. The following applies in order to estimate the increased volume of runoff for the 2-year, 24-hour duration precipitation event:

To calculate the runoff volume (cubic feet) for existing site conditions (pre-development) and for the proposed developed site conditions (post development), it is recommended to use the soil cover complex method as shown on the following page. Table B-3 in Appendix VII is available to guide a qualified design professional and/or an applicant to calculate the stormwater runoff volume. The calculated volume shall be either reused, evapotranspired, or infiltrated through structural or nonstructural means.

Soil Cover Complex Method:

Step 1: Runoff (in) = $Q = (P - 0.2S)^2 / (P + 0.8S)$ where

P = 2-year Rainfall (in.)

S = $(1000 / CN) - 10$, the potential maximum retention (including initial abstraction, Ia)

Step 2: Runoff Volume (Cubic Feet) = $Q \times \text{Area} \times 1/12$

Q = Runoff (in.)

Area = SWM Area (sq. ft.)

B. Simplified Method (Regulated activities less than or equal to 1 acre):

1. Stormwater facilities shall capture the runoff volume from at least the first two inches (2") of runoff from all new impervious surfaces.

Volume (cubic feet) = (2" runoff / 12 inches) X impervious surface (sq. ft.)

2. At least the first inch (1") of runoff volume from the new impervious surfaces shall be permanently removed from the runoff flow—i.e., it shall not be released into the surface Waters of the Commonwealth. The calculated volume shall be either reused, evapotranspired or infiltrated through structural or nonstructural means.

Volume (cubic feet) = (1" runoff / 12 inches) X impervious surface (sq. ft.)

3. Infiltration facilities should be designed to accommodate the first half inch (0.5") of the permanently removed runoff.
4. No more than one inch (1") of runoff volume from impervious surfaces shall be released from the site. The release time must be over 24 to 72 hours.

C. Stormwater Control Measures.

The applicant must demonstrate how the required volume is controlled through Stormwater Best Management Practices (BMPs) which shall

provide the means necessary to capture, reuse, evaporate, transpire or infiltrate the total runoff volume.

1. If natural resources exist on the site, per the Chalfont Borough Zoning Ordinance §27-513, the applicant is required to submit a SWM Site Plan. The SWM Site Plan shall determine the total acreage of protected area where no disturbance is proposed. The acreage of the protected area should be subtracted from the total site area and not included in the stormwater management site area acreage used in determining the volume controls.

Stormwater Management Site Area =

{Total Site Area (for both pre and post development conditions) – Protected Area}

Natural Resource Areas should be calculated based upon the Borough's Zoning Ordinance §27-513. See Table B-2 in Appendix VI for guidance to assess the total protected area. For additional reference, see Chapter 5, Section 5.4.1, of the PA BMP manual.

2. Calculate the volume controls provided through nonstructural BMPs. Table B-5 in Appendix VI is recommended as guidance.
3. Volume controls provided through nonstructural BMPs should be subtracted from the required volume to determine the necessary structural BMPs.

Required	Nonstructural	Structural Volume
Volume Control (ft.³) – Volume Control (ft.³) = Requirement (ft.³)		

4. Calculate the volume controls provided through structural BMPs. Table B-6 in Appendix VI is recommended as guidance. See PA BMP manual Chapter 6 for description of the BMPs.
5. Infiltration BMPs intended to receive runoff from developed areas shall be selected based on the suitability of soils and site conditions (see Table B-6 in Appendix VI for a list of Infiltration BMPs). Infiltration BMPs shall be constructed on soils that have the following characteristics:
 - (a) A minimum soil depth of twenty-four (24") inches between the bottom of the infiltration BMPs and the top of bedrock or seasonally high water table.
 - (b) An infiltration rate sufficient to accept the additional stormwater load and dewater completely as determined by field tests. A minimum of 0.2 inches/hour (in./hr.) should be utilized and for acceptable rates a safety factor of 50% should be applied for design purposes (e.g., for soil which measured 0.4 in./hr., the

BMP design should use 0.2 in/hr to ensure safe infiltration rates after construction).

- (c) All open-air infiltration facilities shall be designed to completely infiltrate runoff volume within three (3) days (72 hours) from the start of the design storm.
6. Soils – A soils evaluation of the project site shall be required to determine the suitability of infiltration facilities. All regulated activities are required to perform a detailed soils evaluation by a qualified design professional, which at minimum addresses soil permeability, depth to bedrock, and subgrade stability. The general process for designing the infiltration BMP shall be:
- (a) Analyze hydrologic soil groups, as well as natural and man-made features, within the site to determine general areas of suitability for infiltration practices. In areas where development on fill material is under consideration, conduct geotechnical investigations of subgrade stability; infiltration may not be ruled out without conducting these tests.
 - (b) 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.
 - (c) Design the infiltration structure based on field determined capacity at the level of the proposed infiltration surface and based on the safety factor of 50%.
 - (d) If on-lot infiltration structures are proposed, it must be demonstrated to the Borough that the soils are conducive to infiltrate on the lots identified.
 - (e) An impermeable liner will be required in detention basins where the possibility of groundwater contamination exists. A detailed hydrogeologic investigation may be required by the Borough.

§ 26-323. Stormwater Peak Rate Control and Management Districts.

Peak rate controls for large storms, up to the 100-year event, is essential in order to protect against immediate downstream erosion and flooding. The following peak rate controls have been determined through hydrologic modeling of the Neshaminy Creek watershed:

- A. Standards for managing runoff from each subarea in the Neshaminy Creek Watershed for the 2-, 5-, 10-, 25-, 50-, and 100-year design storms

are shown in Table 26-323.1. Development sites located in each of the management districts must control proposed development conditions runoff rates to existing conditions runoff rates for the design storms in accordance with Table 26-323.1.

Table 26-323.1
Peak Rate Runoff Control Standards by Stormwater Management Districts
In The Neshaminy Creek Watershed
(includes Little Neshaminy Creek)

District	Design Storm Post Development (Proposed Conditions)	Design Storm Predevelopment (Existing Conditions)
A	2-year	1-year
	5-year	5-year
	10-year	10-year
	25-year	25-year
	50-year	50-year
	100-year	100-year
B	2-year	1-year
	5-year	2-year
	10-year	5-year
	25- year	10-year
	50-year	25-year
	100-year	50-year
C	2-year	2-year
	5-year	5-year
	10-year	10-year
	25- year	25- year
	50-year	50-year
	100-year	100-year

- B. General – Proposed conditions rates of runoff from any Regulated Activity shall not exceed the peak release rates of runoff from existing conditions for the design storms specified on the Stormwater Management District Watershed Map and in this section of the Ordinance. Chalfont Borough is only in Stormwater Management Districts A and B listed above.
- C. District Boundaries – The boundaries of the Stormwater Management Districts are shown on official maps and are available for inspection county planning offices. A copy of the map for the Borough is included in Ordinance Appendix III. 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 SWM Site 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 the district in which the discharge is located.
- E. Offsite Areas – When calculating the allowable peak runoff rates, developers do not have to account for runoff draining into the subject development site from an offsite area. On-site drainage facilities shall be designed to safely convey offsite flows through the development site.
- F. Site Areas – The stormwater management site area is the only area subject to the management district criteria. Nonimpacted areas or non-regulated activities bypassing the stormwater management facilities would not be subject to the management district criteria.
- G. Alternate Criteria for Redevelopment Sites – For redevelopment sites, one of the following minimum design parameters shall be accomplished, whichever is most appropriate for the given site conditions as determined by Chalfont Borough.
 - 1. Meet the full requirements specified by Table 26-323.1 and Sections 26-323.A through 26-323.F;
 - or
 - 2. Reduce the total impervious surface on the site by at least 20 percent based upon a comparison of existing impervious surface to proposed impervious surface.

§ 26-324. Calculation Methodology.

- 1. The following criteria shall be used for runoff calculations:
 - A. For development sites not considered redevelopment, the ground cover used to determine the existing conditions runoff volume and flow rate shall be as follows:
 - (1) Wooded sites shall use a ground cover of “woods in good condition.” A site is classified as wooded if a continuous canopy of trees exists over a ¼ acre.
 - (2) The undeveloped portion of the site, including agriculture, bare earth, and fallow ground, shall be considered as “meadow in good condition,”

unless the natural ground cover generates a lower curve number (CN) or Rational “c” value (i.e., woods) as listed in Tables B-4 or B-7 in Appendix VI of this Ordinance.

- B. For development and redevelopment sites, the ground cover used to determine the existing conditions runoff volume and flow rate for the developed portion of the site shall be based upon actual land cover conditions. If the developed site contains impervious surfaces, 20 percent of the impervious surface area shall be considered meadow in the model for existing conditions.
2. Stormwater runoff peak discharges from all development sites with a drainage area equal to or greater than 200 acres shall be calculated using a generally accepted calculation technique that is based on the NRCS Soil Cover Complex Method. Table 26-324.1 summarizes acceptable computation methods. The method selected by the qualified design professional shall be based on the individual limitations and suitability of each method for a particular site. The Borough may allow the use of the Rational Method ($Q=CIA$) to estimate peak discharges from drainage areas that contain less than 200 acres.
- Q = Peak flow rate, cubic feet per second (CFS)
C = Runoff coefficient, dependent on land use/cover
I = Design rainfall intensity, inches per hour
A = Drainage Area, acres
3. 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 National Oceanic and Atmospheric Administration (NOAA) Atlas 14 rain data corresponding to the Doylestown rain gage. See Table B-1 in Appendix VI. This data may be directly retrieved from the NOAA Atlas 14 website. If a hydrologic computer model such as PSRM or HEC-1/HEC-HMS is used for stormwater runoff calculations, then the duration of the rainfall shall be 24 hours.

TABLE 26-324.1
Acceptable Computation Methodologies For
Stormwater Management Plans

METHOD	METHOD DEVELOPED BY	APPLICABILITY
TR-20 (or commercial computer package based on TR-20)	USDA NRCS	Applicable where use of full hydrology computer model is desirable or necessary.
TR-55 (or commercial computer package based on TR-55)	USDA NRCS	Applicable for land development plans within limitations described in TR-55.
HEC-1 / HEC-HMS	U.S. Army Corps of	Applicable where use of full hydrologic computer model is
PSRM	Penn State University	Applicable where use of a hydrologic computer model is desirable or necessary; simpler than TR-20 or HEC-1.
Rational Method (or commercial computer package based on Rational Method)	Emil Kuichling (1889)	For sites less than 200 acres, or as approved by Chalfont Borough and/or the Chalfont Borough Engineer.
Other Methods	Varies	Other computation methodologies approved by the Municipality and/or Municipal Engineer.

4. All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times-of-concentration for overland flow and return periods from NOAA Atlas 14, Volume 2, Version 2.1. Times-of-concentration for overland flow shall be calculated using the methodology presented in Chapter 3 of *Urban Hydrology for Small Watersheds*, NRCS, TR-55 (as amended or replaced from time to time by NRCS). Times-of-concentration for channel and pipe flow shall be computed using Manning's equation.
5. Runoff Curve Numbers (CN) for both existing and proposed conditions to be used in the soil cover complex method shall be based on Table B-4 in Appendix VI.
6. Runoff coefficients (C) for both existing and proposed conditions for use in the Rational Method shall be consistent with Table B-7 in Ordinance Appendix VI.
7. Runoff from proposed sites graded to the subsoil will not have the same runoff conditions as the site under existing conditions because of soil compaction, even after topsoiling or seeding. The proposed condition "CN" or "C" shall increase by 5% to better reflect proposed soil conditions.
8. The Manning equation is preferred for one-dimensional, gradually varied, open channel flow. In other cases, appropriate, applicable methods should be applied; however, early coordination with the municipality is necessary.

9. Outlet structures for stormwater management facilities shall be designed to meet the performance standards of this Ordinance using the generally accepted hydraulic analysis technique or method of the municipality.
10. The design of any stormwater management facility intended to meet the performance standards of this Ordinance shall be verified by routing the design storm hydrograph through these facilities. 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. The municipality 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.

§26-325. Stormwater Design Standards and Criteria.

1. Design Storms.

- A. Any stormwater management controls, required by this Part and subject to the volume requirement (§26-322) and the stormwater runoff peak rate requirements (§26-323), shall meet the applicable requirements consistent with the calculation methodology specified in §26-324. Provisions must also be made for safely passing the runoff greater than that occurring from the largest design storm.

2. Runoff Control Measures or Best Management Practices (BMPs).

- A. Increased stormwater runoff, which may result from regulated activities, shall be controlled by permanent stormwater runoff control measures. Any selected BMP must meet the required volume and runoff peak rate requirements of this Part.
- B. As a minimum, first flush detention basin BMPs must be used to meet the volume requirement, and dual purpose detention basin BMPs must be used to meet the water quality requirement and the stormwater runoff peak rate requirements where appropriate as specified in §26-323.
- C. Infiltration Best Management Practices (BMPs). Infiltration BMPs shall be designed in accordance with the design criteria and specifications in the PA BMP Manual and shall meet the following minimum requirements:
 - (1) Maximizing the groundwater recharge capacity of the area being leveled is encouraged. Design of the infiltration facilities shall consider groundwater recharge to compensate for the reduction in the recharge that occurs when the ground surface is disturbed or impervious surface is created. It is recommended that roof runoff be directed to infiltration BMPs which may be designed to compensate for the runoff from parking

areas. These measures are required to take advantage of utilizing any existing recharge areas.

- (2) Minimum Requirements. Infiltration BMPs shall meet the following minimum requirements:
 - (a) 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:
 - (i) A minimum depth of 24 inches between the bottom of the BMP and the top of the limiting zone.
 - (ii) An infiltration rate sufficient to accept the additional stormwater load and dewater completely as determined by field tests conducted by the applicant's design professional.
- (3) Extreme caution should be exercised where infiltration is proposed in source water protection areas as defined by the Borough, County, DEP, or Water Authority.
- (4) Infiltration facilities shall be used in conjunction with other innovative or traditional BMPs, stormwater control facilities and nonstructural stormwater management alternatives.
- (5) Extreme caution shall be exercised where salt or chloride (municipal salt storage) would be a pollutant since soils do little to filter this pollutant and it may contaminate the groundwater. The qualified design professional shall evaluate the possibility of groundwater contamination from the proposed infiltration facility and perform a hydrogeologic justification study, if necessary.
- (6) The infiltration requirement in high quality or exceptional value waters shall be subject to the PADEP's Chapter 93, Antidegradation Regulations.
- (7) An impermeable liner will be required in detention basins where the possibility of groundwater contamination exists. A detailed hydrogeologic investigation may be required by the municipality.
- (8) The Borough 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.
- (9) General note for all groundwater recharge/infiltration subsurface recharge system. The following note shall be placed on all plans which

propose a groundwater recharge/infiltration system: “The infiltration facilities shown on these plans are a basic and perpetual part of the stormwater management system of the proposed site located in Chalfont Borough, Bucks County, Commonwealth of Pennsylvania, and, as such, are to be protected and preserved in accordance with the approved final plans by the owners, their successors and assigns of these lands, Chalfont Borough and/or its agents reserve the right and privilege to enter upon these lands from time to time for the inspection of said facilities in order to determine that proper operation and maintenance and the structural and design integrity are being maintained by the owner.”

- D. Wet Pond and Artificial Wetland Best Management Practices (BMPs). Wet pond and artificial wetland BMPs shall be designed in accordance to the design criteria and specifications in the PA BMP Manual and shall meet the following minimum requirement:
- (1) Wet pond and artificial wetland BMPs shall be constructed on hydric or wet soils and/or soils which have an infiltration rate and percolation rate of less than 0.2 inches/hours.
- E. Regional or Subregional Control Alternatives. The initiative and funding for any regional or subregional runoff control alternatives are the responsibility of a prospective developer(s). The design of any regional control facility must incorporate reasonable development of the entire upstream watershed. The peak outflow of a regional facility would be determined on a case-by-case basis using the hydrologic model of the watershed consistent with protection of the downstream watershed areas. “Hydrologic model” refers to the calibrated Neshaminy Creek model as developed for the stormwater management Act 167 Plan. Nevertheless, the volume requirement of §26-322 must be met by the regional facility design.
- F. All stormwater control facility designs shall conform to the applicable standards and specifications of the following governmental and institutional agencies:
- (1) American Society of Testing and Materials (ASTM)
 - (2) Asphalt Institute (AI)
 - (3) Bucks County Conservation District
 - (4) Federal Highway Administration (FHWA)
 - (5) National Crushed Stone Association (NCSA)

- (6) National Sand and Gravel Association (NSGA)
- (7) Pennsylvania Department of Environmental Protection (DEP)
- (8) Pennsylvania Department of Transportation (PennDOT)
- (9) U.S. Department of Agriculture, Soil Conservation Service, Pennsylvania (USDA, SCS, PA)

G. If special geological hazards or soil conditions, such as carbonate-derived soils, are identified on the site, the developer's engineer shall consider the effect of proposed stormwater management measures on these conditions. In such cases, the Borough may require an in-depth report by a competent soils engineer.

3. Engineering Design Standards.

A. General.

- (1) Storm drainage required. Overland or sheet flow is encouraged over concentrated flow. A storm sewer system and all appurtenances shall be required to be constructed by the developer or subdivider in any area from which the surface or subsurface drainage could impair public safety or cause physical damage to adjacent lands or public property. The system shall be designed to collect water at any point where three to five cubic feet per second is accumulated, at the bottom of all vertical grades, and immediately upgrade from all street intersections. The system shall discharge to the nearest practical natural drainage channel or storm sewer.
- (2) Offsite improvements. Any increase in runoff may require necessary corrective measures, including deeds of easement, deemed appropriate by the Borough to alleviate any offsite drainage problem affected by the earth disturbance activity. The costs for such measures will be borne entirely by the developer or subdivider.
- (3) Total watershed evaluation. The future use of undeveloped areas upstream, as shown on the approved Borough Comprehensive Plan, shall be taken into account in the design of all storm sewer systems. The capacity and maximum anticipated present flow of the body or system receiving the proposed system(s) discharge shall be calculated to verify its capability of receiving any additional flow caused by the development or subdivision. The runoff from any proposed development shall be subject to an evaluation, which includes the anticipated runoff from other existing or proposed developments within the same watershed. Stormwater management facilities designed to serve more

than one property or development in the same watershed are encouraged. Consultation with the Borough is required prior to the design of such facilities.

B. Underdrains.

- (1) All building foundations, grade slabs, and cellar floors located in soils that have a community development limitation degree of moderate to severe seasonal high-water table, as defined by an on-site soils test witnessed by the Borough Engineer, shall be provided with an underdrain system. This system shall provide for drainage of the enclosed volume above the slab and relief of subsurface water to a depth of not less than six inches below the slab or foundation bottom. The system shall consist of a perforated pipe field of the herringbone or gridiron configuration in coarse, gravel-filled trenches that are in direct contact with the slab or foundation sub base. The excavation shall provide a minimum of 0.005-foot/foot slope to the gravel-filled trenches.
- (2) All proposed roadways shall be constructed with an underdrain system consisting of six-inch perforated pipe wrapped in a Class 1 geotextile material. The underdrain shall be bedded with a minimum of 6 inches of 2B stone. The bedding material shall extend to the bottom of the base course. The underdrain shall discharge to an inlet.

C. Storm drain pipes and inlets.

- (1) All pipe and inlets shall meet material capacity and construction specifications as outlined in the latest revisions of the PennDOT Form 408 and the PennDOT Design Manual.
- (2) Design flow rate. All stormwater collection pipes and inlets which flow to the detention basin's stormwater rate management facilities shall be designed to handle the peak flow rate for the 25-year storm. All other stormwater system facilities shall be designed to handle the peak flow rate for the 100-year storm. The design flow rate shall be determined by the rational formula, as follows:

$$Q = CiA$$

Where:

Q = Peak runoff rate in cubic feet per second (cfs)

C = Runoff coefficient equal to the ratio of the peak runoff rate to the average rate of rainfall over a time period equal to the time of concentration.

i = Average rainfall intensity in inches per hour for a time equal to the time of concentration.

A = Drainage area in acres.

NOTE: Appropriate values for the runoff coefficient and rainfall intensity can be found in the Commonwealth of Pennsylvania Department of Transportation Design Manual, Part 2, as amended and updated.

- (3) Inlet capacity. The capacity of all C-type, M-type or S-type inlets shall be determined from the Commonwealth of Pennsylvania Department of Transportation Design Manual, Part 2, as amended and updated.
- (4) Straight pipe sections. Wherever possible, all storm drain pipes shall be designed to follow straight courses. No angular deflections of storm sewer pipe sections in excess of five degrees shall be permitted. No vertical curves shall be permitted in the storm drain pipe system.
- (5) Minimum grade and size.
 - (a) All storm drain pipes shall be designed to maintain a minimum grade of one-half percent. All storm pipes shall have a minimum inside diameter of 18 inches or a cross-sectional area of 254 square inches, except that pipes under a fill of 25 feet or greater, shall not be less than 24 inches or have a cross-sectional area of less than 453 square inches.
 - (b) Reinforced concrete pipe shall be used in all public rights-of-way and when the pipe is subject to vehicular or excessive overburden loading conditions. High-density polyethylene pipe (HDPE) may be permitted only within field or lawn areas if approved by the Borough Engineer.
- (6) Pipe capacity. The capacity of all pipe culverts shall, as a minimum, provide the required carrying capacity as determined by the following sources:

United States Department of Transportation
Federal Highway Administration
Hydraulic Design Series No. 5
Hydraulic Design of Highway Culverts, Latest Edition

- (7) Pipe arches. Where headroom is restricted, equivalent pipe arches may be used in lieu of circular pipe.

- (8) Allowable headwater depth. At all inlets or manholes, the maximum allowable headwater depth shall be one foot below the top of the inlet grate or the manhole cover.
- (9) Horizontal pipe deflections. A manhole or inlet shall be provided at all horizontal deflections in the storm pipe system exceeding five degrees.
- (10) Minimum and maximum cover. A minimum of three feet of cover shall be maintained over all storm drain pipes. The top of storm drain pipes shall be at least one-half foot below subgrade elevation. The maximum cover over storm drain pipes shall be 10 feet unless special structural design calculations are submitted or approved.
- (11) Match crowns. The crowns of all pipes tying into an inlet or manhole shall be set at equal elevations.
- (12) Diversions of runoff. All storm drain pipes shall be designed to carry the runoff into a detention basin or similar facility utilized to control the rate of runoff.
- (13) Structural backfill. All storm drainage structures shall be backfilled in twelve-inch layers with 2A stone to a dimension at the base of the structure 12 inches outside all faces of the structure tapering to a width of 24 inches outside all faces of the structure at the top of the structure.

D. Detention basins/stormwater rate management facilities.

- (1) Design of detention basins. All detention basins shall be designed as per the procedures developed by the United States Department of Agriculture, NRCS, as outlined in its Technical Release No. 55, Urban Hydrology for Small Watersheds, Soil Cover Complex Method.
- (2) Basin design criteria. All detention basins and/or other stormwater management facilities in the Borough shall be designed in accordance with the stormwater runoff peak rate requirements and districts contained in §26-323 herein and the runoff calculation methodology specified in §26-324 herein. All flows in excess of the basin design standards shall flow over an emergency spillway.
- (3) Maximum depth of detention basins. The maximum depth of water in a detention basin shall not exceed five feet.
- (4) Emergency spillway. Whenever possible, the emergency spillway for detention basins shall be constructed on undisturbed ground. Emergency spillways shall be constructed of reinforced concrete,

vegetated earth or other approved material. All emergency spillways shall be constructed so that the detention basin berm is protected against erosion. The minimum capacity of all emergency spillways shall be equal to the peak flow rate from the post development 100-year design storm. Emergency spillways shall extend along the upstream and downstream berm embankment slopes. The upstream edge of the emergency spillway shall be a minimum of three feet below the spillway crest elevation. The downstream slope of the spillway shall, as a minimum, extend to the top of the berm embankment. The emergency spillway shall not discharge over earthen fill and/or easily erodible material.

- (5) Anti-seep collars. Anti-seep collars shall be poured-in-place concrete and installed around the principal pipe barrel within the normal saturation zone of the detention basin berms. The collar shall be poured against the pipe bell. The anti-seep collars and their connections to the pipe barrel shall be watertight. The anti-seep collars shall extend a minimum of two feet beyond the outside of the principal pipe barrel. The spacing between collars shall be 10 feet. The use of an O-ring pipe shall be required for all detention discharge pipes.
- (6) Freeboard. Freeboard is the difference between the design flow elevation in the emergency spillway and the top of the settled detention basin embankment. The minimum freeboard shall be one foot, and the maximum freeboard shall be two feet.
- (7) Slope of detention basin embankment. The maximum slope of earthen detention basin embankments shall be 4 to 1. The top or toe of any slope shall be located a minimum of five feet from any property line. Whenever possible, the side slopes and basin shape shall be amenable to the natural topography. Straight side slopes and rectangular basins shall be avoided whenever possible.
- (8) Width of berm. The minimum top width of detention basin berms shall be 10 feet.
- (9) Slope of basin bottom. In order to ensure proper drainage of the detention basin, a minimum grade of 2% shall be maintained for all sheet flow.
- (10) Energy dissipaters. Energy-dissipating devices (rip-rap, level spreaders, end sills, etc.) shall be placed at all basin outlets. Forebays or split flow controls are encouraged at the inlet to all basins. When a forebay or split flow control is not used, an energy-dissipating device shall be used and extend to the bottom of the basin.

- (11) Key trench. All basin berms in fill areas are to have a key trench. The minimum depth shall be one foot and increased to a depth of three feet at the minimum point of fill. The minimum width of the key trench shall be eight feet.

E. Culverts and drainage channels.

- (1) Design flow standard. All culverts and drainage channels tributary to detention basins/stormwater rate management facilities shall be designed to carry a flow rate equal to a 25-year, 24-hour storm. All other culverts and drainage channels shall be designed to carry a flow rate equal to a 100-year, 24-hour storm (Soil Cover Complex Method by the NRCS, Technical Release No. 55).
- (2) Erosion prevention. All drainage channels shall be designed to prevent the erosion of the bed and bank slopes. The flow velocity in all vegetated drainage channels shall not exceed the maximum permissible velocity to prevent erosion. Suitable bank stabilization shall be provided, where required, to prevent erosion of the drainage channels. Where storm sewers discharge into existing drainage channels at an angle greater than 30° from parallel to the downstream channel flow, the far-side bank shall be stabilized by the use of rip-rap or masonry and/or concrete walls. The stabilization shall be designed to prevent erosion and frost heave under and behind the stabilizing media.
- (3) Maximum side slope. Any vegetated drainage channel requiring mowing of the vegetation shall have a minimum grade of four horizontal to one vertical.
- (4) Design standard. Because of the critical nature of vegetated drainage channels, the design of all vegetated channels shall, as a minimum, conform to the design procedures outlined in the Erosion and Sediment Control Program Manual. Several acceptable sources outline procedures for nonvegetated drainage channels, including the following:

United States Department of Transportation
Federal Highway Administration
Hydraulic Design Series No. 5
Hydraulic Design of Highway Culverts, Second Edition

§26-326. Erosion and Sedimentation Standards and Criteria.

1. No regulated earth disturbance activities within the Borough shall commence until approval of an Erosion and Sediment Control Plan for construction activities. The Bucks County Conservation District requires that

an Erosion and Sediment Control Plan for any earth disturbance activity of 1,000 square feet or more.

2. In addition, under 25 Pa. Code Chapter 102.5, a DEP “NPDES permit for Stormwater Discharges Associated With Construction Activities” is required for any earth disturbance activity that involves equal to or greater than one acre of earth disturbance prior to commencing the earth disturbance activity. This includes earth disturbance on any portion, part, or during any stage of, a larger common plan of development or sale.

3. Detailed construction schedules shall be included in all erosion and sedimentation plans and stormwater management plans reviewed by the Bucks County Conservation District.

4. Evidence of any necessary permit(s) for regulated earth disturbance activities from the appropriate DEP regional office or County Conservation District must be provided to the Borough. The issuance of an NPDES construction permit or permit coverage under the statewide general permit (PAG-2) satisfies the requirements of Subsection 1. 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.

(Sections §26-327 to §26-330 reserved)

D. Stormwater Management Site Plan Requirements.

§26-331. General Requirements.

For any of the regulated activities of this Part, prior to the final approval of subdivision and/or land development plans, or the issuance of any permit, or the commencement of any earth disturbance activity for which no exemptions have been granted, the owner, subdivider, developer or his agent, shall submit a stormwater management site plan for approval by the Borough. In addition to the requirements of this Part, the plan shall meet the requirements of Title 25 "Rules and Regulations of the DEP", Chapter 102 "Erosion Control," Chapter 105 "Dam Safety and Waterway Management," and Chapter 106 "Floodplain Management."

§26-332. Stormwater Management Site Plan Contents.

The SWM Site Plan shall consist of a general description of the project, including calculations, maps, and plans. A note on the maps shall refer to the associated computations and E&S Control Plan by title and date. The cover sheet of the computations and E&S Control Plan shall refer to the associated maps by title and date. All SWM Site Plan materials shall be submitted to the Borough in a format that is clear, concise, legible, neat, and well organized; otherwise, the SWM Site Plan shall not be accepted for review and shall be returned to the Applicant.

The following items must be included in the stormwater management plan.

A. General.

1. General description of the project including plan contents described in Section 26-332.B.
2. General description of proposed SWM techniques to be used for SWM facilities.
3. Complete hydrologic and hydraulic computations for all SWM facilities.
4. All reviews and letters of adequacy from the Conservation District for the Erosion & Sedimentation Control Plan as required by Chalfont Borough, Bucks County, or state regulations.
5. A general description of proposed nonpoint source pollution controls.
6. The SWM Site Plan Application and associated fee for all regulated activities not already paying fees under the SALDO regulations.
7. The SWM Site Plan Checklist.

8. Appropriate sections from the Chalfont Borough's Subdivision and Land Development Ordinance, and other applicable local Ordinances, shall be followed in preparing the SWM Site Plan.

B. B. Maps.

1. Drafting Standards.

- (a) The plan shall be drawn at a scale of 1 inch equals 100 feet, 1 inch equals 50 feet, 1 inch equals 40 feet, 1 inch equals 30 feet, 1 inch equals 20 feet, or 1 inch equals 10 feet.
- (b) Dimensions shall be set in feet and decimal parts thereof and bearings in degrees, minutes and seconds.
- (c) Each sheet shall be numbered and shall show its relationship to the total number of sheets.
- (d) The plan shall be so prepared and bear an adequate legend to indicate clearly which features are existing and which are proposed.
- (e) The boundary line of the subdivision of land development shall be shown as a solid heavy line.
- (f) Plans shall be on sheets no smaller than 18 inches by 22 inches and no larger than 36 inches by 44 inches.

2. General Information.

- (a) Name or identifying title of project and tax parcel number (if applicable).
- (b) Name and address of the owner/applicant/developer.
- (c) Name and address of individual who prepared the plan.
- (d) A location map for the purpose of locating the site at a scale not less than 800 feet to the inch showing the relation of the tract to adjoining property and to all streets, roads and Borough boundaries, existing within 1,000 feet of any part of the tract.
- (e) Plan date and date of latest revision to plan, north point, graphic scale and written scale.
- (f) Note on plan indicating any area that is to be offered for dedication.

- (g) Certificate, signed and sealed by an individual registered in the Commonwealth of Pennsylvania and qualified to perform such duties, indicating compliance with the provisions of this Part (see Appendix "I").
- (h) Total acreage of tract.
- (i) A certification statement from the design engineer stating that the plan meets the requirements of this Ordinance.
- (j) A statement signed by the applicant and notarized acknowledging that any revision to the approved SWM Site Plan must be approved by Chalfont Borough and that a revised Erosion and Sedimentation Control Plan must be submitted to the Bucks County Conservation District for approval.

3. Existing Features.

- (a) Complete outline survey of the property to be subdivided or developed shall be provided showing all courses, distances and area and tie-ins to all adjacent intersections.
- (b) The location, names and widths of streets, the location of property lines and names of owners, the location of sanitary sewers, storm drains and similar features within the site and within 100 feet of any part of the land to be subdivided or developed, the location of streams, lakes, ponds or other watercourses outside the project area which will be affected by runoff from the project.
- (c) The location, size and ownership of all underground utilities and services (e.g., wells, on-site sewage disposal systems) and any rights-of-way or easements within the property.
- (d) The location of existing buildings, streets and other significant features within the property, the location and area of all floodplains, forests, lakes, ponds, watercourses (including drainage swales), wetlands, slopes 8 to 15%, steep slopes 15 to 25%, steep slopes 25% or steeper.
- (e) Contours at vertical intervals of 2 feet, vertical intervals of 5 feet for steep slopes (greater than 15%).
- (f) Any overlay showing soil types and boundaries and a statement as to where the soils data was obtained.

- (g) Stormwater management district boundaries applicable to the site.
- (h) A detailed site evaluation for projects proposed in areas of frequent flooding, karst topography and other sensitive areas such as brown fields and source water protection areas.

4. Proposed Features.

- (a) Proposed land use, total number of lots and dwelling units and extent of commercial, industrial or other non-residential uses.
- (b) Locations and dimensions of all proposed streets, sidewalks, lot lines, building locations, parking compounds, impervious and semi-impervious surfaces (total area), sanitary sewer facilities, water facilities and areas proposed for public dedication.
- (c) Proposed changes to land surfaces and vegetative cover, including areas to be cut or filled as shown on a plan for surface drainage.
- (d) Final contours at vertical intervals of 2 feet, vertical intervals of 5 feet for steep slopes (greater than 15%).
- (e) Plan and profiles of proposed stormwater management facilities, including horizontal and vertical location, size and type of material. This information shall be of the quality required for the construction of all facilities and include any calculations, assumptions and criteria used in the design of the facilities, a schedule for installation of such facilities and a proposed sequence of construction.
- (f) The locations of septic tank infiltration areas and wells when infiltration methods such as cisterns, seepage beds or trenches, infiltration basins or porous pavement are used. Also, soil percolation tests or other approved infiltration tests and submission of the data and test locations to substantiate infiltration rates used in the drainage calculations.
- (g) Plans and profiles of all erosion and sedimentation control measures, temporary as well as permanent, including all calculations, assumptions and criteria used in designing the controls and a schedule for their implementation.
- (h) A map which illustrates:
 - (1) All natural features.

- (2) A preliminary regrading plan that illustrates all disturbance of the identified natural feature areas, the amount of each natural feature disturbed indicated and illustrated on the map.
 - (i) Right-of-way and/or easements proposed to be created for all drainage purposes, utilities or other reasons.
 - (j) The total extent of the drainage area upstream from the site and all down gradient receiving channels, swales and water to which stormwater runoff or drainage will be discharged.
- C. Description of an ownership and maintenance program, in a recordable form, that clearly sets forth the ownership and maintenance responsibility for all temporary and permanent stormwater management facilities, including the following:
 - 1. Description of the method and extent of the maintenance requirements.
 - 2. When maintained by a private entity, identification of a responsible individual, corporation, association or other entity for ownership and maintenance. Deed covenants and restrictions must be submitted to provide for maintenance by this entity.
 - 3. When maintained by a private entity, a copy of the legally binding document which provides that Chalfont Borough shall have the right to:
 - (a) Inspect the facilities at any time.
 - (b) Require the private entity to take corrective measures and assign the private entity reasonable time periods for any necessary action.
 - (c) Authorize maintenance to be done and lien the cost of the work against the properties of the private entity responsible for maintenance.
 - 4. Where the stormwater management site plan proposes that Chalfont Borough own or maintain the facilities, a description of the methods, procedures and the extent to which any facilities shall be turned over to Chalfont Borough.
- D. Financial security for the completion of stormwater management facilities as set forth in §26-353 of this Part.
- E. Maintenance guarantee, as set forth in §26-353 of this Part.
- F. When a stormwater management plan is submitted in sections, a generalized stormwater management plan for the entire project site shall

be submitted in addition to the detailed stormwater management plan for the proposed section. This generalized plan shall demonstrate how the stormwater of the proposed section will relate to the entire development. If temporary facilities are required for construction of a section of such facilities shall be included in the submitted stormwater management plan.

§26-333. Plan Submission.

1. For regulated activities specified in §206-306:
 - A. The stormwater management site plan shall be submitted by the developer to the Code Enforcement Officer either as part of the preliminary plan submission for the subdivision or land development or as a separate application for any other regulated activity.
 - B. Three copies of the stormwater management site plan shall be submitted.
 - C. Distribution of the stormwater management site plan shall be made by the Code Enforcement Officer, as follows:
 - (1) One copy to the Borough.
 - (2) One copy to the Borough Engineer.
 - (3) One copy to the Code Enforcement Officer.
2. Additional copies shall be submitted as requested by the Borough or DEP. All stormwater management site plans submitted as part of a Subdivision or Land Development shall follow the submission requirements of the SALDO.
3. The applicant shall make submissions to the Bucks County Planning Commission and/or the Bucks County Conservation District, as required.
4. For regulated activities requiring permits from Pennsylvania DEP or the U.S. Army Corps of Engineers, the applicant shall make all submittals directly to the agency with all required submittal documents and fees. Proof of application or documentation of required permit(s) and approvals must be submitted as part of the Plan.
5. The stormwater management site plan shall be accompanied by the requisite fee, as set forth in §26-352 of this Part.

§26-334. Plan Review and Approval.

1. The SWM Site Plan shall be reviewed by the Borough Engineer on behalf of Chalfont Borough for consistency with the provisions of this Ordinance. After review, the Borough Engineer shall provide a written recommendation for the Borough to approve or disapprove the SWM Site Plan. If it is recommended to disapprove the SWM Site Plan, the Borough Engineer shall state the reasons for the disapproval in writing. The Borough Engineer also may recommend approval of the SWM Site Plan with conditions and, if so, shall provide the acceptable conditions for approval in writing. The SWM Site Plan review and recommendations shall be completed within the time allowed by the Municipalities Planning Code for reviewing subdivision plans.
2. The municipality will notify the applicant in writing within 45 days whether the SWM Site Plan is approved or disapproved. If the SWM Site Plan involves a Subdivision and Land Development Plan, the notification period is 90 days. If a longer notification period is provided by other statute, regulation, or Ordinance, the applicant will be so notified by the municipality. If the municipality disapproves the SWM Site Plan, the municipality shall cite the reasons for disapproval in writing.

§26-335. Modification of Plans.

A modification to a submitted stormwater management site plan for a proposed development site which involves a change in control methods or techniques, or which involves the relocation or redesign of control measures, or which is necessary because soil or other conditions are not as stated on the stormwater site management plan (as determined by the Borough Engineer), shall require a resubmission of the modified stormwater management site plan consistent with §26-333, subject to review per §26-334 of this Part. Minor design changes may be permitted as authorized by the Borough and advised by the Borough Engineer without submission consistent with §§26-333 and 26-334 of this Part.

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

(Sections 26-336 to 26-340 reserved)

E. Permit Requirements and Procedures.

§26-341. General.

In accordance with this Ordinance, a regulated activity shall not be initiated until a stormwater management permit has been issued.

§26-342. Application Requirements.

1. The applicant will be issued the required stormwater management permit for regulated activities specified in §306 after obtaining the required subdivision or land development plan approval and/or stormwater management site plan approval as specified in Part D of this Ordinance. The stormwater management permit will be issued by the Borough concurrently with the final subdivision and land development approval.
2. The applicant will be issued the required stormwater management permit for regulated activities specified in §26-306 after obtaining the required building permit approval and stormwater management plan approval as specified in Part D of this Ordinance. The stormwater management permit will be issued by the Code Enforcement Officer concurrently with the issuance of the building permit.
3. The applicant will be issued the required stormwater management permit for regulated activities specified in §26-306 from the Code Enforcement Officer after obtaining the necessary State permits, as required and as specified in Part D of this Ordinance.

§26-343. Application for Permit.

Applications for stormwater management permits required by this Part shall be made on forms (see Appendix II) supplied by the Borough. The application may be modified by the Borough Manager, as deemed necessary. Such applications shall provide a brief description of the stormwater management controls and regulated activities. This application shall become part of the stormwater management plan submission required.

§26-344. Modification of Plans.

A modification to an approved stormwater management plan, when required under §26-335 of this Part, shall require a new stormwater management permit. The permit shall be issued following approval of the revised plan.

§26-345. Expiration and Renewal.

1. All stormwater management permits shall expire 24 months from the date of issuance, unless construction is commenced prior to this date or an extension of time is required.
2. An extension of an expired stormwater management permit shall be issued by the Borough following the submission of a written request if, in the opinion of the Borough Engineer, the subject property or affected surrounding area has not been altered in a manner which requires alteration to the stormwater management plan.
3. A renewal of an expired stormwater management permit may be issued by the Borough following a resubmittal of the permit application form and review by the Borough Engineer to determine if any changes have occurred in project site conditions or stormwater management plan requirements since the original permit was issued. If such changes have occurred, the Borough may require the applicant to resubmit the stormwater management plan for a new review pursuant to the Ordinance.
4. The refusal of the Borough to reissue an expired stormwater management permit shall contain the reasons for such refusal.
5. A stormwater management permit shall not expire while a request for an extension is pending.

§26-346. Suspension and Revocation.

1. Any stormwater management permit issued under this Part may be suspended or revoked by the Borough Council or their authorized agent for:
 - A. Noncompliance with or failure to implement any provision of the permit.
 - B. A violation of any provision of this Part or any other applicable law, Ordinance, rule or regulation relating to the project.
 - C. The creation of any condition or the commission of any act during construction or development which constitutes or creates a hazard or nuisance or which endangers the life or property of others.
2. A suspended stormwater management permit shall be reinstated by the Borough when:

- A. The Borough Engineer has inspected and approved the corrections to the stormwater management control measure(s) or the elimination of the hazard or nuisance; and/or,
 - B. The Borough Council is satisfied that the violation of the Part, law or rule and regulation has been corrected.
3. A stormwater management permit which has been revoked by the Borough cannot be reinstated. The applicant may apply for a new permit under the procedures outlined in this Part.

(Sections §26-347 to §26-350 reserved)

F. Administration.

§26-351. Schedule of Inspections.

1. Prior to construction of the stormwater management facilities specified in the approved stormwater management site plan, the developer must provide a schedule of inspections to the Borough Engineer. These inspection provisions pertain only to construction activities regulated by the land preparation provisions of the Ordinance. However, any activities granted exemption from plan preparation provisions as described in §26-308 and therefore exempt from the inspection provisions must manage stormwater in the manner specified in the other provisions of this Ordinance.
2. The Borough Engineer shall inspect all phases of development of the site including, but not limited to:
 - A. Completion of preliminary site preparation, including stripping of vegetation, stockpiling of topsoil, and construction of temporary stormwater management and erosion control facilities.
 - B. Completion of rough grading, but prior to placing topsoil, permanent drainage or other site development improvements and groundcovers.
 - C. During construction of the permanent stormwater facilities.
 - D. During construction of the permanent stormwater management facilities, including established groundcovers and plantings.
 - E. Upon completion of any final grading, vegetative control measures or other site restoration work done in accordance with the approved stormwater management site plan and permit.

3. No work shall begin on a subsequent stage until the preceding stage has been inspected and/or approved by the Borough Engineer.
4. It is the responsibility of the developer to notify the Borough Engineer 48 hours in advance of any work and of the completion of each phase of development.
5. Any portion of the work that does not comply with the approved stormwater management plan must be corrected by the developer within 10 days after written notification to the developer. No work may proceed on any subsequent phase of the stormwater management site plan, the subdivision or land development or building construction until the required corrections have been made.
6. If at any stage of the work the Borough Engineer determines that the soil or other conditions are not as stated or shown in the approved application, the same may refuse to approve further work and the Borough may revoke existing permits until a revised stormwater management site plan is submitted and approved, as required by §26-335 of this Ordinance. If the revised stormwater management plan cannot remedy the situation, Chalfont Borough reserves the right to cancel its approval and halt all work except that work required to eliminate the activity and return the site to pre-activity conditions as much as is reasonably possible.
7. If the Borough Engineer discovers that the facilities or measures installed may be in violation of Chapter 102 ("Erosion Control") of the Clean Streams Law provision, the Borough Engineer will refer these violations to the Bucks County Conservation District.
8. When the developer has completed all the required facilities for a subdivision or land development, he shall notify Chalfont Borough, in writing, by certified or registered mail, and shall send a copy of such notice to the Code Enforcement Officer of Chalfont Borough. The Borough Council shall, within 10 days after receipt of such notice, authorize the Borough Engineer to inspect the required facilities. Following this final inspection, the Borough Engineer shall promptly file a report, in writing, with the Borough Council, and shall mail a copy of the report to the developer by certified or registered mail. The report shall be made and mailed within 30 days after receipt by the Borough Engineer of the aforesaid authorization by the Borough Council.
9. Following final inspection, the developer shall submit drawings indicating the "as-built" improvements called for in the approved plan. All as-built drawings associated with a land development must include the seal of a Pennsylvania registered professional engineer or surveyor.

§26-352. Fees and Expenses.

1. Fees shall be established, from time to time, by resolution of the Borough Council, which at a minimum will cover:
 - A. The review of stormwater management site plans. Review shall mean all technical review, meetings and discussions relative to the plan.
 - B. Stormwater management permit issuance.
 - C. Site inspection.
 - D. Inspection of required controls and improvements during construction.
 - E. The final inspection upon completion of the controls and improvements required in the plan.
 - F. Any additional work required to enforce any permit provisions, regulated by this Part, correct violations and ensure the completion of stipulated remedial actions.
2. No permit to begin any work on the project shall be issued until the requisite fees have been paid.
3. If it is determined that a modification to the existing stormwater management site plan is required under §26-335 of the Ordinance, a new stormwater management permit shall not be issued until the additional fees have been paid by the applicant.

§26-353. Financial and Maintenance Guarantees.

1. Performance Guarantees.
 - A. The Borough Council may, prior to the issuance of a stormwater management permit and/or approval of a final subdivision/land development plan, require financial security as a performance guarantee for stormwater management control facilities in a form to be approved by the Chalfont Borough Solicitor. If requested by the developer, in order to facilitate financing, the Borough Council may furnish the developer with a signed resolution indicating approval of the subdivision/land development plan and/or stormwater management plan contingent upon the developer obtaining a satisfactory financial security. The record plan shall not be signed nor recorded and a stormwater management permit issued until a financial improvement agreement is executed. The resolution or letter of contingent approval shall expire and be deemed to be revoked if the

financial security agreement is not executed within 90 days, unless a written extension is granted by the Borough Council, such extension shall not be unreasonably withheld and shall be placed in writing at the request of the developer.

- B. Where required, the developer shall file with the Borough Council financial security in an amount sufficient to cover the costs of the stormwater management facilities. Without limitation as to other types of financial security which the Borough may approve, Federal or Commonwealth chartered lending institution irrevocable letters of credit and restrictive or escrow accounts shall be deemed acceptable financial security. Such financial security shall be posted with a bonding company or Federal or Commonwealth chartered lending institution chosen by the developer, provided said bonding company or lending institution is authorized to conduct such business within the Commonwealth. Such bond, or other security, shall provide for, and secure to the public, completion of the stormwater management facilities, which may be required on or before the date fixed in the formal action of approval or accompanying agreement for completion of the improvements.
- C. The amount of financial security shall be equal to 110% of the cost to install the required facilities estimated as of 90 days following the date scheduled for completion.
- D. If a developer requires more than one year from the date of posting of the financial security to complete the required facilities, the amount of financial security may be increased by an additional 10% for each one-year period beyond the first anniversary date from posting of financial security or to an amount not exceeding 110% of the cost of completing the required facilities as reestablished on or about the expiration of the preceding one-year period by using the above bidding procedure.
- E. The amount of financial security required shall be based upon an estimate of the cost of the facilities submitted by the developer and prepared by a professional engineer licensed as such in this Commonwealth and certified by such engineer to be a fair and reasonable estimate of such cost. The Borough Council, upon the recommendation of the Borough Engineer, may refuse to accept such estimate for good cause shown. If the developer and the Borough Council are unable to agree upon an estimate, then the estimate shall be recalculated and recertified by another professional engineer licensed as such in this Commonwealth and chosen mutually by the Borough Council and the developer. The estimate certified by the third engineer shall be presumed fair and reasonable and shall be the final estimate. In the event that a third engineer is chosen, fees for the services of said engineer shall be paid equally by Chalfont Borough and the developer.

- F. In the case where development is projected over a period of years, the Borough Council may authorize submission of stormwater management site plan applications by sections or stages of development so as to require or guarantee that stormwater management facilities in both current and future stages of development will provide the protection of the finally approved stage of the development.
- G. As the work of installing the required stormwater facilities proceeds, the developer may request the Borough Council to release or authorize release, from time to time, such portions of the financial security necessary for payment to the contractor or contractors performing the work. Any such requests shall be in writing addressed to the Borough Council which shall have 45 days from receipt of such request within which to allow the Borough Engineer to certify, in writing, to the Borough Council that such portion of the work upon the facilities has been completed in accordance with the stormwater management site plan and permit. Upon such certification, the Borough Council shall authorize release by the bonding company or lending institution of an amount as estimated by the Borough Engineer fairly representing the value of the facilities completed, or, if the Borough Council fails to act within a forty-five day period, the Borough Council shall be deemed to have approved the release of funds as requested. The Borough Council may, prior to final release, require retention of 10% of the estimated cost of the aforesaid facilities. The final release of the financial security provisions shall be permitted only after receipt by the Borough Council of certification and "as-built" plans as required in §26-351.9.
- H. In the event that any stormwater management facilities which may be required have not been installed as provided in this Part or in accordance with the approved stormwater management plan, the Borough Council has the power to enforce any corporate bond or other security by appropriate legal and equitable remedies. If proceeds of such bond or other security are insufficient to pay the cost of installing or making repairs or corrections to all the facilities covered by said security, the Borough Council may, at its option, install part of such facilities in all or part of the development and may institute appropriate legal or equitable action to recover the monies necessary to complete the remainder of the facilities. All of the proceeds, whether resulting from the security or from any legal or equitable action brought against the developer, or both, shall be used solely for the installation of the stormwater management facilities covered by such security and not for any other purpose.

2. Maintenance Responsibility and Guarantees.

- A. The maintenance responsibilities for permanent stormwater runoff control facilities shall be determined based upon the type of ownership of the property which is controlled by the facilities.

(1) Single Entity Ownership. Where the permanent stormwater runoff control facilities are designed to manage runoff from property in a single entity ownership as defined below, the maintenance responsibility for the stormwater control facilities shall be with the single entity owner. The stated responsibility of the entity related to owning and maintaining the facilities shall be submitted with the stormwater management plan for determination of their adequacy. Approval of the stormwater management plan shall depend upon the approval of these terms. These terms shall be in writing, shall be in a recordable form and shall, in addition to any other terms deemed necessary by the Borough Council, contain a provision permitting inspection at any reasonable time by the Borough Engineer of all such facilities deemed critical in the public welfare. A single entity shall be defined as an association, public or private corporation, partnership firm, trust, estate of any other legal entity empowered to own real estate exclusive of an individual lot owner.

(2) Borough Ownership. Where the Borough Council has accepted an offer of dedication of the permanent stormwater management facilities, the Borough Council shall be responsible for maintenance. Upon approval of the stormwater management facilities by the Borough Council, the developer shall provide financial security, in a form approved by the Chalfont Borough Solicitor for maintenance guarantees, as follows:

(a) Construction Maintenance Bond. The Borough Council may require the posting of a maintenance bond to secure the structural integrity of said facilities, as well as the functioning of said facilities in accordance with the design and specifications, as well as the functioning of said facilities in accordance with the design and specifications as depicted on the approved stormwater management plan, for a term not to exceed 18 months from the date of acceptance of dedication. Said financial security shall be the same type as required in §26-353(1) with regard to installation of said facilities. A cash contribution can be used as the financial security in lieu of a maintenance bond, although the contribution must be equivalent to the amount that would be estimated for the maintenance bond.

- (b) Long-Term Maintenance Bond. The long-term maintenance bond shall be in an amount equal to the present worth of maintenance of the facilities for a ten-year period. The estimated annual maintenance cost for the facilities shall be based on a fee schedule provided by the Borough Engineer and adopted by the Borough Council. The fee schedule must be reasonable. A cash contribution can be used in lieu of the long-term maintenance bond, although the contribution must be equivalent to the amount that would be estimated for the maintenance bond.
- (c) Documentation. The terms of the maintenance guarantee shall be documented as part of the stormwater management phase as per §26-332(D) of the Ordinance.

For certain types of facilities, the Borough Council may benefit by transferring the maintenance responsibility to an individual or group of individuals residing within the controlled area. These individuals may have the permanent stormwater control facilities adjacent to their lots or otherwise have an interest in the proper maintenance of the facilities. In these instances, the Borough Council and the individual(s) may enter into a formal agreement for the maintenance of the facilities whereby Chalfont Borough shall maintain ownership of the facilities and be responsible for periodic inspections.

- (3) Individual Lot Ownership. Where any stormwater management facility is located on an individual lot and maintenance thereof is the responsibility of that landowner, a description of the facility or systems and the terms of the required maintenance shall be incorporated as a part of the deed to the property. The deed shall be recorded with the County Recorder of Deeds within 90 days following the Borough Council approval. In addition, the Borough Council may require as a condition of approval that a deed conveying any interest in such lot contain language indicating that the conveyance is subject to an express covenant by the grantee that the grantee will maintain the stormwater management facility.
- (4) Multi-entity Ownership. In cases where property is in multiple ownership (i.e., many individuals ownership of various portions of the property on which stormwater facilities are located) the developer(s) shall enter into an agreement with the Borough to determine the maintenance of the permanent stormwater facilities. If maintenance is prescribed for each individual lot owner, the requirements of subsection (2)(A)(3) of this Part shall apply.

- B. Liability Insurance. If, in the opinion of the Borough Council based upon a report of the Borough Solicitor, the nature of the work is such that it may create a hazard to human life or endanger adjoining property or streets, the Borough Council shall, before issuing the stormwater management permit, require that the applicant file a certificate of insurance showing that there exists insurance against claims for damages for personal injury, bodily injury and property damage, including damage to Chalfont Borough by surface water flow which has been altered on the site. The liability insurance shall be to the amount prescribed by the Borough in accordance with the nature of the risks involved and include the Borough as an additional insured. Such insurance shall be written by a company licensed to do business in the Commonwealth. Neither issuance of the stormwater management permit nor compliance with the provisions hereto or any conditions imposed by the Borough shall relieve any person from any responsibility for damage otherwise imposed by law, nor impose any liability upon Chalfont Borough or its officers and employees for damages to persons or property.

§26-354. Right-of-Entry.

Upon presentation of proper credentials, duly authorized representatives of Chalfont Borough may enter at reasonable times upon any property within Chalfont Borough to investigate or ascertain the condition of the subject property in regard to any aspect regulated by this Part.

§26-355. Stormwater Violation Sanctions and Notification.

1. Public nuisance.

- A. The violation of any provision of this Part is hereby deemed a public nuisance.
- B. Each day that a violation continues shall constitute a separate violation.

2. Enforcement.

- A. Whenever the Borough finds that a person has violated a prohibition or failed to meet a requirement of this Part, the Borough 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 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 BMPs.
 - (7) Operation and maintenance of stormwater BMPs.
- B. Failure to comply within the time specified shall also subject such person to the penalty provisions of this Part. All such penalties shall be deemed cumulative and shall not prevent the Borough from pursuing any and all other remedies available in law or equity.
3. Suspension and revocation of permits and approvals. The stormwater management permit and any building, land development or other permit or approval for regulated earth disturbance activities issued by the Borough may be suspended or revoked by the governing body for:
- A. Noncompliance with, or failure to implement, any provision of the permit;
 - B. A violation of any provision of this Part; or
 - C. The creation of any condition or the commission of any act during construction or development which constitutes or creates a hazard or nuisance, pollution or which endangers the life or property of others.
4. In the event that an owner, subdivider, developer or his agent fails to comply with the requirements of this Part or fails to conform to the requirements of any permit issued thereunder, Chalfont Borough shall provide written notification of violation. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of the violation(s). Upon failure to comply within the time specified, the owner, subdivider, developer or his agent shall be subject to the penalty provisions of this Part (§26-356) or other penalty provisions contained in the Subdivision and Land Development Ordinance (Chapter 22), where applicable.

§26-356. Penalties.

- 1. Any person, firm or corporation who shall violate any provision of this Part, upon conviction thereof, shall be sentenced to pay a fine of not more than \$1,000 plus costs and, in default of payment of said fine and costs, to a term of imprisonment not to exceed 30 days. Each day that a violation of this Part continues or each Section of this Part, which shall be found to have been violated, shall constitute a separate offense.

2. The Bucks County Court of Common Pleas, upon petition, may grant an order to stay, upon cause shown, tolling the per diem fine pending a final adjudication of the violation and judgment.
3. Nothing contained in this Section shall be construed or interpreted to grant to any person or entity, other than Chalfont Borough, the right to commence any action for enforcement pursuant to this Section.

§26-357. Appeals.

1. An appeal from any action or decision of the Borough Council concerning regulated activities specified in §26-306(1)(A) and (B) shall be made to the Bucks County Court of Common Pleas pursuant to Article X-A of the Pennsylvania Municipalities Planning Code.
2. The Borough Council may hear and decide appeals where it is alleged that the building permit/zoning officer/engineer has failed to follow prescribed procedures or has misinterpreted or misapplied any provision of this Ordinance concerning regulated activities specified in §26-306(1)(C) through (J).
3. Any decision by the Borough Council regarding an appeal pursuant to subsections (2) shall be rendered to the applicant, in writing, within 60 days. Nothing in subsections (2) shall be construed to deny the appellant the right to proceed directly to the Bucks County Court of Common Pleas.
4. The approval of an appeal shall not have the effect of making null and void the intent and purpose of this Ordinance.

**BOROUGH OF CHALFONT
BUCKS COUNTY, PENNSYLVANIA**

ORDINANCE NO. 398

AN ORDINANCE OF THE BOROUGH OF CHALFONT, BUCKS COUNTY, PENNSYLVANIA ADOPTING AN ORDINANCE REGULATING STORMWATER MANAGEMENT AND REPEALING ANY OTHER ORDINANCE OR ORDINANCE PROVISION OF CHALFONT BOROUGH INCONSISTENT WITH ANY OF THE PROVISIONS OF THIS ORDINANCE TO THE EXTENT OF THE INCONSISTENCY ONLY.

NOW, THEREFORE, BE IT, AND IT IS HEREBY ORDAINED AND ENACTED by the Borough Council of Chalfont Borough, Bucks County, Pennsylvania, as follows:

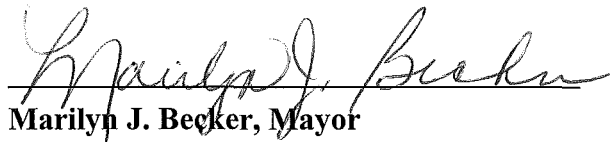
The full text of Ordinance 398, a Stormwater Management Ordinance for Chalfont Borough, Bucks County, is incorporated herein by reference as if set forth at length .

ENACTED AND ORDAINED THIS 10th DAY OF May, 2011.

CHALFONT BOROUGH COUNCIL

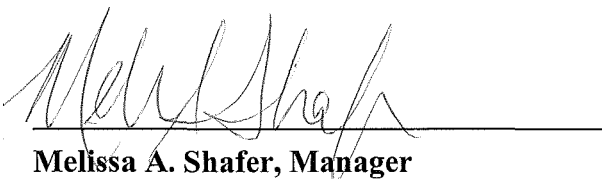


Robert M. Cleland, President



Marilyn J. Becker, Mayor

ATTEST:



Melissa A. Shafer, Manager

APPENDIX I

STORMWATER MANAGEMENT SITE PLAN CERTIFICATE

I hereby certify that, to the best of my knowledge, the stormwater management facilities shown and described hereon are designed in conformance with the Chalfont Borough Stormwater Management Ordinance [Chapter 26].

Date:

Signature and seal of the registered
professional responsible for the
preparation of the plan.

APPENDIX II

STORMWATER MANAGEMENT PERMIT APPLICATION

(The Borough Manager may modify this permit application as they deem appropriate without action from Council.)

Date of Submission _____ Permit No. _____

1. Name of Applicant/Property Owner _____

Telephone No. _____ Tax Parcel #: _____

Address _____

2. Is the proposed activity part of a subdivision or land development? Yes ___ No ___

3. General description of proposed improvements:

4. Name, Address, Phone Number and Email of plan preparer:

5. Proposed impervious surface coverage:

0 – 1000 sf. _____

>1000 – 5000 sf. _____

Greater than 5000 sf. _____

6. Area of proposed and existing impervious area on the entire tract.

a. Existing (to remain)	_____	S.F.	_____	% of Property Area
b. Proposed	_____	S.F.	_____	% of Property Area
c. Total (after development)	_____	S.F.	_____	% of Property Area

- (Project can include more than one)

Infiltration Trench _____

Vegetated Filter Strip _____

Other Non-structural BMP _____

Are supporting calculations attached? Yes ___ No ___

Is a Stormwater Management Agreement attached? Yes ____ No ____

- a. Have erosion control measures been shown on the plan? Yes No

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

SIGNATURE OF APPLICANT _____

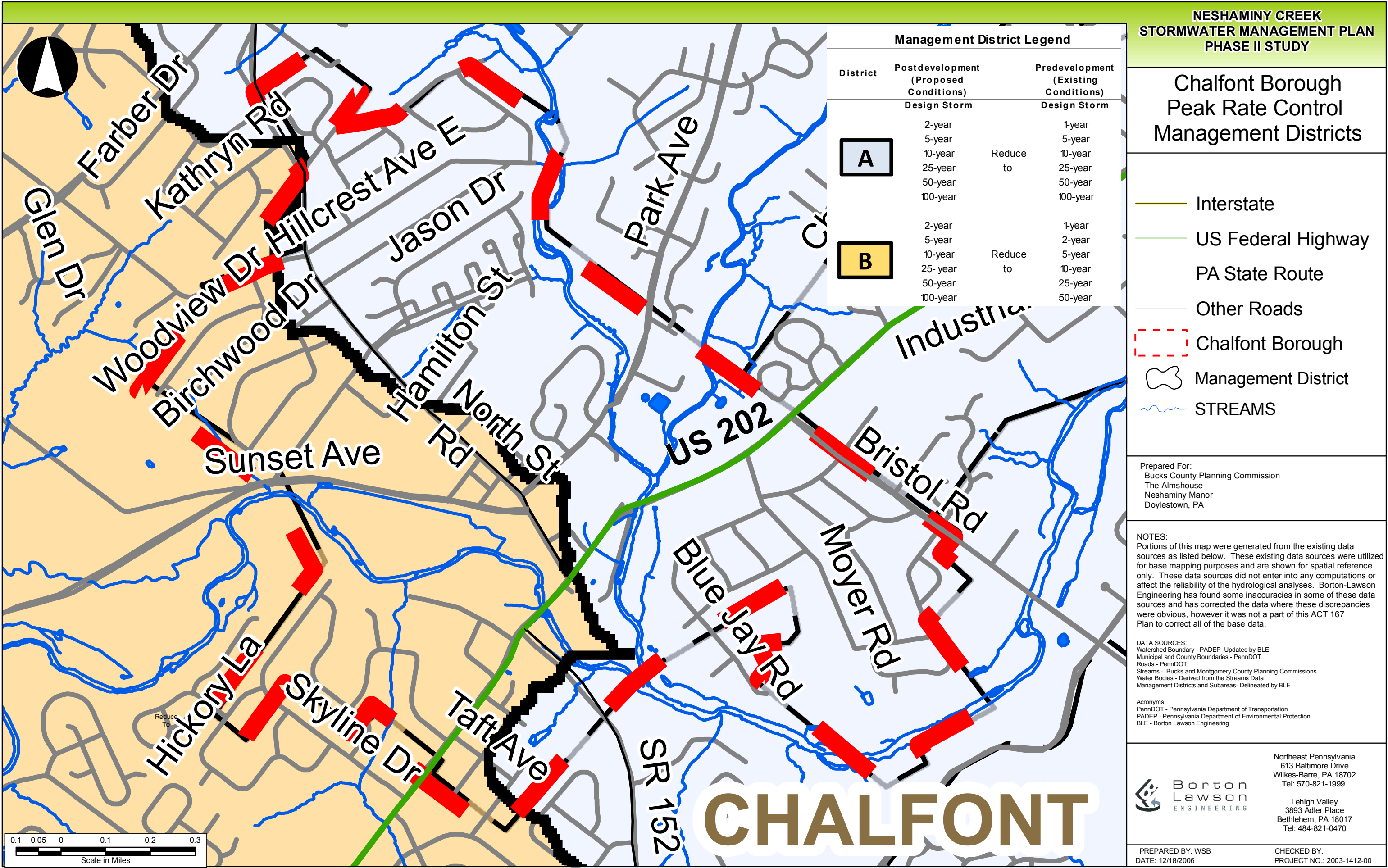
////////////////////////////////////

[illegible]

APPENDIX III

WATERSHED MAP

Watershed Management Districts.



**NESHAMINY CREEK
STORMWATER MANAGEMENT PLAN
PHASE II STUDY**

**Chalfont Borough
Peak Rate Control
Management Districts**

Interstate

US Federal Highway

PA State Route

Other Roads

Chalfont Borough

Management District

STREAMS

Prepared For:
Bucks County Planning Commission
The Almshouse
Neshaminy Manor
Doylestown, PA

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

DATA SOURCES:
Watershed Boundary - PADEP- Updated by BLE
Municipal and County Boundaries - PennDOT
Roads - PennDOT
Streams - Bucks and Montgomery County Planning Commissions
Water Bodies - Derived from the Streams Data
Management Districts and Subareas- Delineated by BLE

Acronyms
PennDOT - Pennsylvania Department of Transportation
PADEP - Pennsylvania Department of Environmental Protection
BLE - Borton Lawson Engineering

**Borton
Lawson
ENGINEERING**

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

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

PREPARED BY: WSB
DATE: 12/18/2006

CHECKED BY:
PROJECT NO.: 2003-1412-00

Management District Legend				
District	Postdevelopment (Proposed Conditions)		Predevelopment (Existing Conditions)	
	Design Storm		Design Storm	
A	2-year	Reduce to	1-year	
	5-year		5-year	
	10-year		10-year	
	25-year		25-year	
	50-year		50-year	
	100-year		100-year	
B	2-year	Reduce to	1-year	
	5-year		2-year	
	10-year		5-year	
	25-year		10-year	
	50-year		25-year	
	100-year		50-year	

APPENDIX IV

STORMWATER MANAGEMENT CONTROLS

Best Management Practices (BMPs) required throughout this Part shall be as detailed in the Neshaminy Creek Watershed Stormwater Management Plan Phase II as adopted by Bucks County on August 18, 2010, and DEP on November 23, 2010, or the Pennsylvania Handbook of Best Management Practices for Developing Areas, prepared by CH2Mhill, dated Spring 1998.

Specific reference shall also be made to the Neshaminy Creek Watershed Stormwater Management Plan Phase II as adopted by Bucks County on August 18, 2010, and DEP on November 23, 2010, for supplemental data and requirements with regard to stormwater management controls. Such data and requirements shall become a part of this Part as if included herein.

APPENDIX V

STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES OPERATIONS AND MAINTENANCE AGREEMENT (EXAMPLE)

THIS AGREEMENT, made and entered into this _____ day of _____, 20____, 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.

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 BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or affect 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 Municipality:

(SEAL)

For the Landowner:

ATTEST:

_____ (City, Borough, Township)

County of _____, Pennsylvania

I, _____, a Notary Public in and for the
County and State aforesaid, whose commission expires on the _____ day
of _____, 20__, do hereby certify that

_____ whose name(s) is/are signed
to the foregoing Agreement bearing date of the _____ day of
_____, 20__, has acknowledged the same before me in my said
County and State.

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

NOTARY PUBLIC

(SEAL)

APPENDIX VI: STORMWATER MANAGEMENT DESIGN CRITERIA

TABLE B-1 DESIGN STORM RAINFALL AMOUNT

Source: NOAA Atlas 14 website, Doylestown Gage (36-2221)
http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html.

FIGURE B-1 ATLAS 14 TYPE II S-CURVES FOR ALL FREQUENCY STORMS – DOYLESTOWN GAGE (36-2221)

Source: NOAA Atlas 14 website, Doylestown Gage (36-2221)
http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html.

TABLE B-2 NATURAL RESOURCE PROTECTION STORMWATER MANAGEMENT CONTROLS

Source: PA BMP Manual Chapter 8, pg 33

TABLE B-3 GUIDANCE TO CALCULATE THE 2-YEAR, 24-HOUR VOLUME INCREASE FROM PRE-DEVELOPMENT TO POST DEVELOPMENT CONDITIONS

Source: PA BMP Manual Chapter 8, pg 37

TABLE B-4 RUNOFF CURVE NUMBERS

Source: NRCS (SCS) TR-55

TABLE B-5 VOLUME CONTROL CALCULATION GUIDANCE FOR NONSTRUCTURAL BMPS

Source: PA BMP Manual Chapter 8, pg 34

TABLE B-6 VOLUME CONTROL CALCULATION GUIDANCE FOR STRUCTURAL BMPS

Source: PA BMP Manual Chapter 8, pg 38

TABLE B-7 RATIONAL RUNOFF COEFFICIENTS

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

TABLE B-8 MANNING ROUGHNESS COEFFICIENTS

**TABLE B-1
DESIGN STORM RAINFALL AMOUNT (INCHES)**

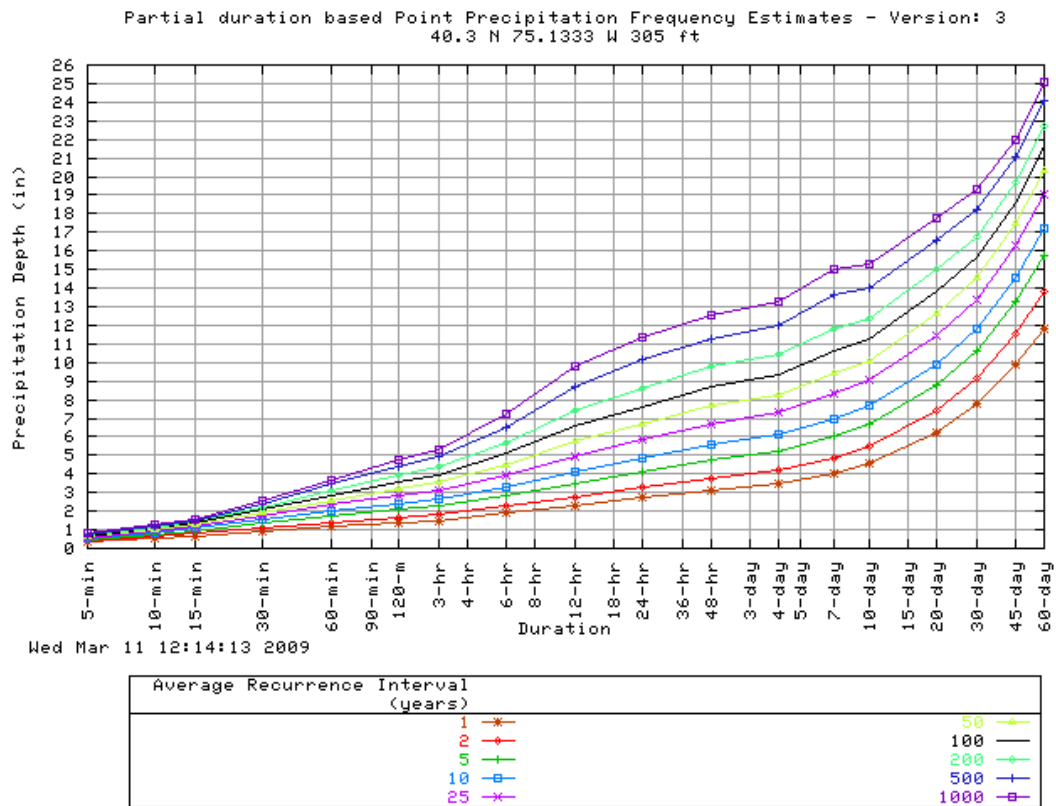
The design storm rainfall amount chosen for design should be obtained from the National Oceanic and Atmospheric Administration Atlas 14 interactive website:
http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html

Source: NOAA Atlas 14 website, Doylestown Gage (36-2221)
http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html

Precipitation Frequency Estimates (inches)																		
ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.34	0.54	0.68	0.93	1.15	1.38	1.51	1.89	2.30	2.71	3.13	3.48	4.07	4.61	6.23	7.76	9.85	11.81
2	0.40	0.64	0.81	1.12	1.40	1.67	1.83	2.28	2.78	3.26	3.78	4.19	4.87	5.51	7.39	9.14	11.57	13.83
5	0.47	0.76	0.96	1.36	1.75	2.10	2.30	2.86	3.50	4.11	4.76	5.24	6.02	6.71	8.81	10.65	13.30	15.78
10	0.53	0.84	1.06	1.54	2.01	2.42	2.66	3.32	4.11	4.81	5.57	6.09	6.96	7.68	9.93	11.83	14.60	17.23
25	0.59	0.94	1.19	1.76	2.34	2.86	3.15	3.98	4.99	5.83	6.71	7.30	8.30	9.03	11.44	13.36	16.25	19.04
50	0.63	1.00	1.27	1.92	2.60	3.21	3.54	4.52	5.74	6.70	7.66	8.29	9.41	10.11	12.61	14.52	17.46	20.35
100	0.67	1.07	1.35	2.07	2.85	3.56	3.94	5.09	6.55	7.63	8.67	9.33	10.59	11.23	13.79	15.66	18.61	21.57
200	0.71	1.13	1.42	2.21	3.11	3.92	4.35	5.69	7.43	8.64	9.75	10.44	11.83	12.39	14.98	16.79	19.69	22.70
500	0.76	1.20	1.51	2.40	3.44	4.41	4.90	6.54	8.73	10.12	11.30	12.01	13.60	14.00	16.58	18.23	21.02	24.08
1000	0.79	1.24	1.56	2.53	3.69	4.78	5.34	7.23	9.82	11.35	12.57	13.29	15.04	15.28	17.80	19.31	21.96	25.04

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.

FIGURE B-1
Atlas 14 Type II S-Curves for All Frequency Storms – Doylestown Gage (36-2221)



**TABLE B-2: NATURAL RESOURCE PROTECTION
STORMWATER MANAGEMENT CONTROLS**

Existing Natural Sensitive Resource	Mapped in the ERSAM? Yes/No/n/a	Total Area (Ac.)	Area to be Protected (Ac.)
Waterbodies			
Floodplains			
Riparian Areas / Buffers			
Wetlands			
Vernal Pools			
Woodlands			
Natural Drainage Ways			
Steep Slopes, 15%-25%			
Steep Slopes, over 25%			
Other:			
Other:			
Total Existing:			

TABLE B-3: GUIDANCE TO CALCULATE THE 2-YEAR, 24-HOUR VOLUME INCREASE FROM PRE-DEVELOPMENT TO POST-DEVELOPMENT CONDITIONS

Existing Conditions: Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (ft3)
Woodland								
Meadow								
Impervious								
Total:								

Developed Conditions: Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (ft3)
Total:								

**2-year Volume Increase
(ft3):**

TABLE B-4. Runoff Curve Numbers (from NRCS (SCS) TR-55)

LAND USE DESCRIPTION	Hydrologic Condition	HYDROLOGIC SOIL GROUP			
		A	B	C	D
Open Space					
Grass cover < 50%	Poor	68	79	86	89
Grass cover 50% to 75%	Fair	69	79	84	
Grass cover > 75%	Good	39	61	74	80
Meadow		30	58	71	78
Agricultural					
Pasture, grassland, or range – Continuous forage for grazing	Poor	68	79	86	89
Pasture, grassland, or range – Continuous forage for grazing.	Fair	49	69	79	84
Pasture, grassland, or range – Continuous forage for grazing	Good	39	61	74	80
Brush-weed-grass mixture with brush the major element.	Poor	48	67	77	83
Brush-weed-grass mixture with brush the major element.	Fair	35	56	70	77
Brush-weed-grass mixture with brush the major element.	Good	30	48	65	73
Fallow Bare soil	-----	77	86	91	94
Crop residue cover (CR)	Poor	76	85	90	93
	Good	74	83	88	90
Woods – grass combination (orchard or tree farm)	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30	55	70	77
Commercial (85% Impervious)		92	94	95	
Industrial (72% Impervious)		88	91	93	
Institutional (50% Impervious)		82	88	90	
Residential districts by average lot size:					
	% Impervious				
1/8 acre or less * (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
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-5: VOLUME CONTROL CALCULATION GUIDANCE FOR
NONSTRUCTURAL BMPS**

Type of Nonstructural BMP

$$\text{AREA (sq ft)} * \text{Runoff} * \frac{1}{12} = \text{Volume Reduction (ft}^3\text{)}$$

$$\text{Volume (in)}$$

Use of Natural Drainage Feature

Utilize natural flow pathways _____ sq ft * $\frac{1}{4}$ " * $\frac{1}{12}$ = _____ cu ft

Minimum Soil Compaction

Lawn _____ sq ft * $\frac{1}{3}$ " * $\frac{1}{12}$ = _____ cu ft

Meadow _____ sq ft * $\frac{1}{3}$ " * $\frac{1}{12}$ = _____ cu ft

Protecting existing trees (not located in protected area)

For trees within 20 feet of impervious cover:

Tree Canopy _____ sq ft * 1" * $\frac{1}{12}$ = _____ cu ft

For trees within 20-100 feet of impervious cover:

Tree Canopy _____ sq ft * $\frac{1}{2}$ " * $\frac{1}{12}$ = _____ cu ft

Rooftop Disconnection

For runoff directed to pervious and/or vegetative areas where infiltration occurs

Roof Area _____ sq ft * $\frac{1}{4}$ " * $\frac{1}{12}$ = _____ cu ft

Impervious Disconnection

For runoff from impervious surfaces such as streets and concrete directed to pervious and/or vegetative areas where infiltration occurs

Impervious Area _____ sq ft * $\frac{1}{4}$ " * $\frac{1}{12}$ = _____ cu ft

Total Volume Reduction

_____ cu ft

* represents multiply

**TABLE B-6: VOLUME CONTROL CALCULATION GUIDANCE FOR
STRUCTURAL BMPs**

$$\text{Required Volume Control (ft}^3\text{)} - \text{Nonstructural Volume Control (ft}^3\text{)} = \text{Structural Volume Requirement (ft}^3\text{)}$$

Table B-3

Table B-5

Type	Proposed Structural BMP	Section in BMP Manual	Area (sq ft)	Storage Volume (cu ft)
Infiltration and / or Evapotranspiration	Porous Pavement	6.4.1		
	Infiltration Basin	6.4.2		
	Infiltration Bed	6.4.3		
	Infiltration Trench	6.4.4		
	Rain Garden/Bioretention	6.4.5		
	Dry Well/Seepage Pit	6.4.6		
	Constructed Filter	6.4.7		
	Vegetative Swale	6.4.8		
	Vegetative Filter Strip	6.4.9		
	Infiltration Berm	6.4.10		
Evaporation and / or Reuse	Vegetative Roof	6.5.1		
	Capture and Re-use	6.5.2		
Runoff Quality	Constructed Wetlands	6.6.1		
	Wet Pond / Retention Basin	6.6.2		
	Dry Extended Detention Basin	6.6.3		
	Water Quality Filters	6.6.4		
Restoration	Riparian Buffer Restoration	6.7.1		
	Landscape Restoration / Reforestation	6.7.2		
	Soil Amendment	6.7.3		
Other	Level Spreader	6.8.1		
	Special Storage Areas	6.8.2		
	other			

TABLE B-7. 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 0.14 _a	0.13 0.18	0.16 0.22	0.11 0.16	0.15 0.21	0.21 0.28	0.14 0.20	0.19 0.25	0.26 0.34	0.18 0.24	0.23 0.29	0.31 0.41
Pasture	0.12 0.15	0.20 0.25	0.30 0.37	0.18 0.23	0.28 0.34	0.37 0.45	0.24 0.30	0.34 0.42	0.44 0.52	0.30 0.37	0.40 0.50	0.50 0.62
Meadow	0.10 0.14	0.16 0.22	0.25 0.30	0.14 0.20	0.22 0.28	0.30 0.37	0.20 0.26	0.28 0.35	0.36 0.44	0.24 0.30	0.30 0.40	0.40 0.50
Forest	0.05 0.08	0.08 0.11	0.11 0.14	0.08 0.10	0.11 0.14	0.14 0.18	0.10 0.12	0.13 0.16	0.16 0.20	0.12 0.15	0.16 0.20	0.20 0.25
Residential												
Lot Size 1/8 Acre	0.25 0.33	0.28 0.37	0.31 0.40	0.27 0.35	0.30 0.39	0.25 0.44	0.30 0.38	0.33 0.42	0.38 0.49	0.33 0.41	0.36 0.45	0.42 0.54
Lot Size 1/4 Acre	0.22 0.30	0.26 0.34	0.29 0.37	0.24 0.33	0.29 0.37	0.33 0.42	0.27 0.36	0.31 0.40	0.36 0.47	0.30 0.38	0.34 0.42	0.40 0.52
Lot Size 1/3 Acre	0.19 0.28	0.23 0.32	0.26 0.35	0.22 0.30	0.26 0.35	0.30 0.39	0.25 0.33	0.29 0.38	0.34 0.45	0.28 0.36	0.32 0.40	0.39 0.50
Lot Size 1/2 Acre	0.16 0.25	0.20 0.29	0.24 0.32	0.19 0.28	0.23 0.32	0.28 0.36	0.22 0.31	0.27 0.35	0.32 0.42	0.26 0.34	0.30 0.38	0.37 0.48
Lot Size 1 Acre	0.14 0.22	0.19 0.26	0.22 0.29	0.17 0.24	0.21 0.28	0.26 0.34	0.20 0.28	0.25 0.32	0.31 0.40	0.24 0.31	0.29 0.35	0.35 0.46
Industrial	0.67 0.85	0.68 0.85	0.68 0.86	0.68 0.85	0.68 0.86	0.69 0.86	0.68 0.86	0.69 0.86	0.69 0.87	0.69 0.86	0.69 0.86	0.70 0.88
Commercial	0.71 0.88	0.71 0.88	0.72 0.89	0.71 0.89	0.72 0.89	0.72 0.89	0.72 0.89	0.72 0.89	0.72 0.90	0.72 0.89	0.72 0.89	0.72 0.90
Streets	0.70 0.76	0.71 0.77	0.71 0.79	0.71 0.80	0.72 0.82	0.74 0.84	0.72 0.84	0.73 0.85	0.76 0.89	0.73 0.89	0.75 0.91	0.78 0.95
Open Space	0.05 0.11	0.10 0.16	0.14 0.20	0.08 0.14	0.13 0.19	0.19 0.26	0.12 0.18	0.17 0.23	0.24 0.32	0.16 0.22	0.21 0.27	0.28 0.39
Parking	0.85 0.95	0.86 0.96	0.87 0.97	0.85 0.95	0.86 0.96	0.87 0.97	0.85 0.95	0.86 0.96	0.87 0.97	0.85 0.95	0.86 0.96	0.87 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.

Source : Rawls, W.J., S.L. Wong and R.H. McCuen, 1981, "Comparison of Urban Flood Frequency Procedures", Preliminary Draft, U.S. Department

TABLE B-8. MANNING'S ROUGHNESS COEFFICIENTS

DESCRIPTION	Manning's n-value
Smooth-wall Plastic Pipe	0.011
Concrete Pipe	0.012
Smooth-lined Corrugated Metal Pipe	0.012
Corrugated Plastic Pipe	0.024
Annular Corrugated Steel And Aluminum Alloy Pipe (Plain or polymer coated)	
68 mm x 13 mm (2 2/3 in x 1/2 in) Corrugations	0.024
75 mm x 25 mm (3 in x 1 in) Corrugations	0.027
125 mm x 25 mm (5 in x 1 in) Corrugations	0.025
150 mm x 50 mm (6 in x 2 in) Corrugations	0.033
Helically Corrugated Steel And Aluminum Alloy Pipe (Plain or polymer coated)	
75 mm x 25 mm (3 in x 1 in), 125 mm x 25 mm (5 in x 1 in), or 150 mm x 50 mm (6 in x 2 in) Corrugations	0.024
Helically Corrugated Steel And Aluminum Alloy Pipe (Plain or polymer coated)	
68 mm x 13 mm (2 2/3 in x 1/2 in) Corrugations	
a. Lower Coefficients*	
450 mm (18 in) Diameter	0.014
600 mm (24 in) Diameter	0.016
900 mm (36 in) Diameter	0.019
1200 mm (48 in) Diameter	0.020
1500 mm (60 in) Diameter or larger	0.021
b. Higher Coefficients**	0.024
Annular or Helically Corrugated Steel or Aluminum Alloy Pipe Arches or Other Non-Circular Metal Conduit (Plain or Polymer coated)	0.024
Vitrified Clay Pipe	0.012
Ductile Iron Pipe	0.013
Asphalt Pavement	0.015
Concrete Pavement	0.014
Grass Medians	0.050
Grass – Residential	0.30
Earth	0.020
Gravel	0.030
Rock	0.035
Cultivated Areas	0.030 - 0.050
Dense Brush	0.070 - 0.140
Heavy Timber (Little undergrowth)	0.100 - 0.150
Heavy Timber (w/underbrush)	0.40
Streams:	
a. Some Grass And Weeds (Little or no brush)	0.030 - 0.035
b. Dense Growth of Weeds	0.035 - 0.050
c. Some Weeds (Heavy brush on banks)	0.050 - 0.070

Notes:

* Use the lower coefficient if any one of the following conditions apply:

- A storm pipe longer than 20 diameters, which directly or indirectly connects to an inlet or manhole, located in swales adjacent to shoulders in cut areas or depressed medians.
- A storm pipe which is specially designed to perform under pressure.

**Use the higher coefficient if any one of the following conditions apply:

- A storm pipe which directly or indirectly connects to an inlet or manhole located in highway pavement sections or adjacent to curb or concrete median barrier.
- A storm pipe which is shorter than 20 diameters long.
- A storm pipe which is partly lined helically corrugated metal pipe.

APPENDIX VII SWM SITE PLAN CHECKLIST

Project: _____
Municipality: _____
Engineer: _____
Submittal No: _____
Date: _____
Project ID: _____ (for Municipal use ONLY)

SECTION I: REGULATED ACTIVITIES

Reference: Section 105

1. Is the Proposed Project within the Neshaminy Creek watershed? ☐ Yes ☐ No
2. Does the Proposed Project meet the definition of a "Regulated Activity"? ☐ Yes ☐ No

STOP – If you have checked NO for either of the above questions, you are not required to submit a Stormwater Management Plan under the Neshaminy Creek Stormwater management Ordinance.

SECTION II: EXEMPTION

Reference: Section 106

1. Does the regulated activity create an Impervious Surface less than or equal to 1,000 square feet? ☐ Yes ☐ No
2. Does the regulated activity create an Impervious Surface greater than 1,000 square feet but less than 5,000 square feet? ☐ Yes ☐ No
3. Does the regulated activity involve an Agricultural Activity? ☐ Yes ☐ No
4. Does the regulated activity involve Forest Management or Timber Operations? ☐ Yes ☐ No

Parcel IS Exempt from the SWM Site Plan and Peak Rate Control ☐

Parcel IS Exempt from Peak Rate Control ☐

Parcel IS NOT Exempt ☐

SECTION III: VOLUME CONTROLS

Reference: Section 303

A. Site Disturbance Minimization

1. Has an Existing Resource and Site Analysis Map (ERSAM) been prepared?

☐ Yes ☐ No, Explain _____

2. Are any of the following environmentally sensitive areas identified on site?

Steep Slopes	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
Ponds / Lakes / Vernal Pools	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
Streams	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
Wetlands	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
Hydric Soils	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
Flood plains	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
Stream Buffer Zones	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
Hydrologic Soil Groups A or B	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
Recharge Areas	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
Others: _____	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown

3. Does the site layout plan avoid environmentally sensitive areas identified on site?

☐ Yes ☐ No, Explain _____

B. Post-development Runoff Volume Control

1. What method is used to calculate the required volume control?

☐ Design-storm method ☐ Simplified method

2. What is the level of runoff volume (ft³) required to be controlled from the post-development site?
_____ (ft³)

C. Stormwater runoff control measures

1. What is the level of runoff volume (ft³) controlled through nonstructural BMPs? _____ (ft³)

2. What is the level of runoff volume (ft³) controlled through structural BMPs? _____ (ft³)

3. Have provisions been installed to promote infiltration on site?

☐ Yes ☐ No, Explain _____

4. Have provisions been installed to promote evapotranspiration, capture or reuse on site?

☐ Yes ☐ No, Explain _____

SECTION V: PEAK RATES

Reference: Section 304

1. In which of the following Storm Water Management District(s) is the site located?

<input type="checkbox"/>	A
<input type="checkbox"/>	B
<input type="checkbox"/>	C

2. Does the Proposed Conditions Runoff meet the Criteria established in Table 304.1?

☐ Yes ☐ No, if you answered Yes proceed to Section VI.

SECTION VI: CALCULATION METHODOLOGY

Reference: Section 305 and Ordinance Appendix B

1. Which method(s) are utilized in the site stormwater management plan for computing stormwater runoff rates and volumes?

- | | |
|------------------------------------------|------------------------------------------|
| <input type="checkbox"/> TR-20 | <input type="checkbox"/> PSRM |
| <input type="checkbox"/> TR-55 | <input type="checkbox"/> Rational Method |
| <input type="checkbox"/> HEC-1 / HEC-HMS | <input type="checkbox"/> Other: _____ |

2. Was Table B-1 or Figure B-1 utilized in rainfall determination?

☐ Yes ☐ No, Explain _____

3. Was Table B-4 (Runoff Curve Numbers) or Table B-7 (Rational Runoff Coefficients) utilized in calculations for runoff?

☐ Yes ☐ No, Explain _____

SECTION IX: OTHER REQUIREMENTS

Reference: Section 306

1. Is the proposed activity considered a "Stormwater hot spot" as defined in Ordinance Appendix G?
☐ Yes ☐ No, If yes, what pre-treatment BMPs are planned?
-

2. Have proposed wet detention basins incorporated biologic control consistent with the West Nile Virus Guidelines presented in Ordinance Appendix G?

☐ Yes ☐ No ☐ Not Applicable

SECTION X: FACILITY OPERATION AND MAINTENANCE PLAN

Reference: Section 702

1. Has a Stormwater Control and BMP Operations and Maintenance Plan been approved by the Municipality?

☐ Yes ☐ No, Explain _____

2. Who shall assume responsibility for implementing the Stormwater Control and BMP Operations and Maintenance Plan?

<input type="checkbox"/> Municipality	<input type="checkbox"/> Homeowner Association
<input type="checkbox"/> Private Owner	<input type="checkbox"/> Other _____

APPENDIX VIII: LOW IMPACT DEVELOPMENT (LID) PRACTICES

ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

Natural hydrologic conditions can be altered radically by poorly planned development practices, such as 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 post development runoff rates and volumes and will minimize needs for artificial conveyance and storage facilities. To simulate predevelopment hydrologic conditions, infiltration is often necessary to offset the loss of infiltration by the creation of impervious surfaces. Preserving natural hydrologic conditions requires careful alternative site design considerations. Site design practices include preserving natural drainage features, 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 LID techniques that may be used:

1. **Protect Sensitive and Special Value Resources:** See Section 5.4 of the *Pennsylvania Stormwater Best Management Practices Manual, Pennsylvania Department of Environmental Protection (PADEP) No. 363-0300-002 (2006)*.
 - a. **Preserving Natural Drainage Features.** Protecting natural drainage features, particularly vegetated drainage swales and channels, is desirable because of their ability to infiltrate and attenuate flows and to filter pollutants. However, this objective is often not accomplished in land development. In fact, commonly held drainage philosophy encourages just the opposite pattern—streets and adjacent storm sewers are typically located in the natural headwater valleys and swales, thereby replacing natural drainage functions with a completely impervious system. As a result, runoff and pollutants generated from impervious surfaces flow directly into storm sewers with no opportunity for attenuation, infiltration, or filtration. Developments designed to fit site topography also minimizes the amount of grading on site.

- b. **Protecting Natural Depression Storage Areas.** Depressional storage areas either have no surface outlet or drain very slowly following a storm event. They can be commonly seen as ponded areas in farm fields during the wet season or after large runoff events. Traditional development practices eliminate these depressions by 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.
- 2. **Disconnect/Distribute/Decentralize:** See Section 5.8 of the *Pennsylvania Stormwater Best Management Practices Manual, Pennsylvania Department of Environmental Protection (PADEP) No. 363-0300-002 (2006)*.
 - a. **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.
 - b. **Reducing the Use of Storm Sewers.** By reducing use of storm sewers for draining streets, parking lots, and back yards, the potential for accelerating runoff from the development can be greatly reduced. The practice requires greater use of swales and may not be practical for some development sites, especially if there are concerns for areas that do not drain in a “reasonable” time. The practice requires educating local citizens and public works officials, who expect runoff to disappear shortly after a rainfall event.

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

APPENDIX IX: DISCONNECTED IMPERVIOUS AREA (DIA)

ROOFTOP DISCONNECTION

When rooftop downspouts are directed to a pervious area that allows for infiltration, filtration, and increased time of concentration, the rooftop may qualify as completely or partially DIA, and a portion of the impervious rooftop area may be excluded from the calculation of total impervious area.

A rooftop is considered to be completely or partially disconnected if it meets the requirements listed below:

- The contributing area of a rooftop to each disconnected discharge is 500 square feet or less, and
- The soil, in proximity of the roof water discharge area, is not designated as hydrologic soil group “D” or equivalent, and
- The overland flow path from roof water discharge area has a positive slope of 5% or less.

For designs that meet these requirements, the portion of the roof that may be considered disconnected depends on the length of the overland path as designated in Table F.1.

Table F.1: Partial Rooftop Disconnection

Length of Pervious Flow Path *	Roof Area Treated as Disconnected
(ft)	(% of contributing area)
0 – 14	0
15 – 29	20
30 – 44	40
45 – 59	60
60 – 74	80
75 or more	100

* Flow path cannot include impervious surfaces and must be at least 15 feet from any impervious surfaces.

If the discharge is concentrated at one or more discrete points, no more than 1,000 square feet may discharge to any one point. In addition, a gravel strip or other spreading device is required for concentrated discharges. For non-concentrated discharges along the edge of the pavement, this requirement is waived; however, there must be a provision for the establishment of vegetation along the pavement edge and temporary stabilization of the area until vegetation becomes stabilized.

REFERENCE

Philadelphia Water Department. 2006. *Stormwater Management Guidance Manual*. Section 4.2.2: Integrated Site Design. Philadelphia, PA.

APPENDIX X

SMALL PROJECT STORMWATER MANAGEMENT (SWM) SITE PLAN

Small Project Stormwater Management Site Plan

This small project stormwater site plan has been developed to assist those proposing residential projects to meet the requirements of the *Neshaminy Creek Watershed Stormwater Management Act 167 Plan Model Ordinance* without having to hire professional services to draft a formal stormwater management plan. This small project site plan is only permitted for residential projects proposing less than or equal to 5,000 square feet of impervious surface and less than 1 acre of earth disturbance.

A. What is an applicant required to submit?

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

- Location of proposed structures, driveways, or other paved areas with approximate surface area in square feet.
- Location of any existing or proposed on-site septic system and/or potable water wells showing proximity to infiltration facilities.
- Bucks County Conservation District erosion and sediment control “Adequacy” letter.

B. Determination of Required Volume Control and Sizing Stormwater Facilities

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

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

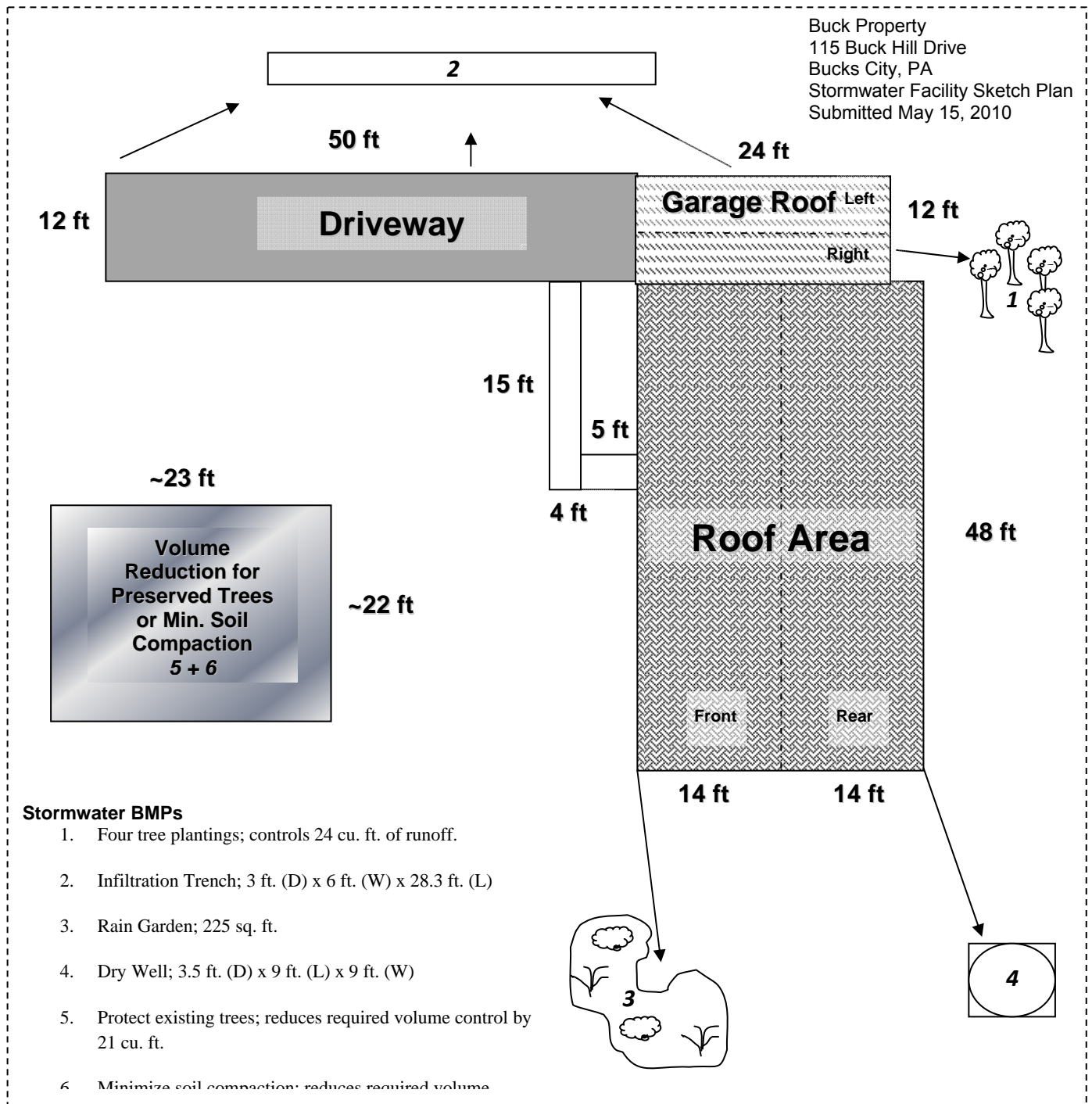
Step 1: Determine Total Impervious Surfaces

Impervious Surface			Area (sq. ft.)
House Roof (Front)	14 ft. x 48 ft.	=	672 sq. ft.
House Roof (Rear)	14 ft. x 48 ft.	=	672 sq. ft.
Garage Roof (Left)	6ft. x 24 ft.	=	144 sq. ft.

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

	Total Impervious		3000 sq ft

Figure 1: Sample Site Sketch Plan



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

Volume (cu. ft.) = (Total impervious area in square feet x 2 inches of runoff) /12 inches

(3,000 sq. ft. x 2 inches of runoff) /12 inches = 500 cu. ft.

Step 3: Sizing the Selected Volume Control BMP

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

Structural BMPs

1. Infiltration Trench

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

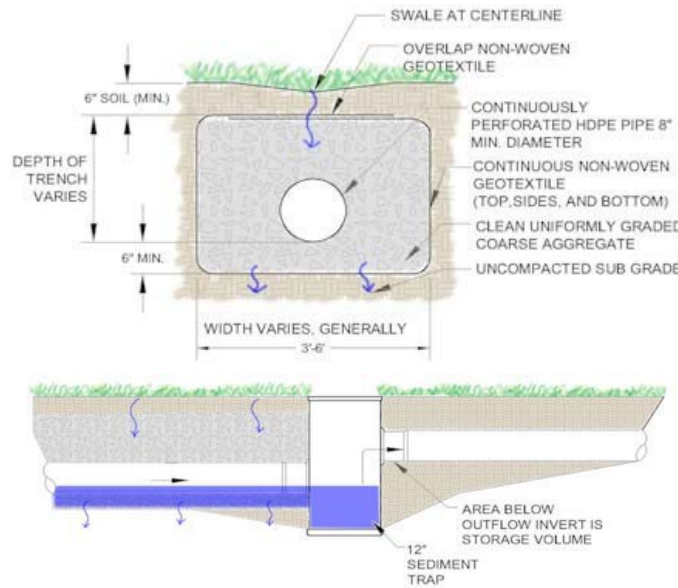
Design Considerations:

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

Maintenance:

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

Figure 3: Infiltration Trench Diagram



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

Figure 4: Example of Infiltration Trench Installation



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

Sizing Example for Infiltration Trench

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

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

2. Determine the required infiltration volume:

$$(1224 \text{ sq. ft.} \times 2 \text{ inches of runoff}) / 12 \text{ ft.} = 204 \text{ cu. ft.} / 0.4^* = 510 \text{ cu. ft.}$$

(*0.4 assumes 40% void ratio in gravel bed)

3. Sizing the infiltration trench facility:

Volume of Facility = Depth x Width x Length

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

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

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

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

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

2. Rain Garden

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

Design Considerations:

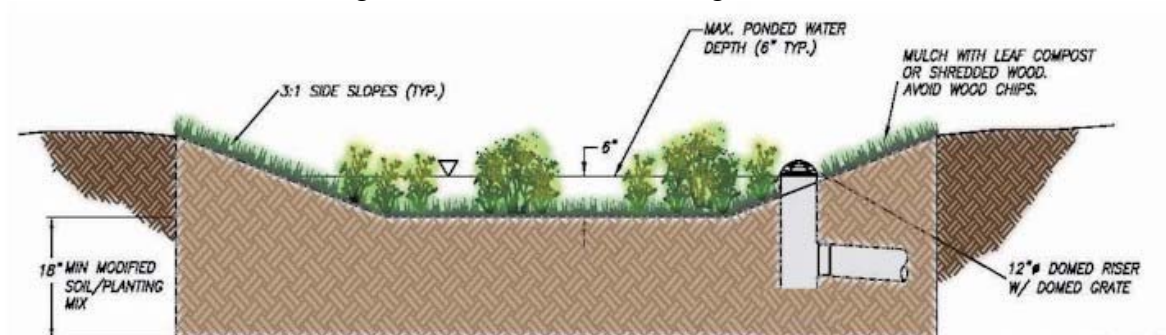
- A maximum of 3:1 side slope is recommended.
- The depth of a rain garden can range from 6 - 8 inches. Ponded water should not exceed 6 inches.
- The rain garden should drain within 72 hours.
- The garden should be at least 10-20 feet from a building's foundation and 25 feet from septic system drainfields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

can assume it has a higher water table and is not a good choice for a rain garden.

Maintenance:

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

Figure 5: Rain Garden Diagram



Source: PA BMP Guidance Manual, Chapter 6 Page 50

Sizing Example for Rain Garden

1. Pick a site for the rain garden between the source of runoff and between a low lying area, a.k.a., a drainage area.
2. Perform an infiltration test to determine the depth of the rain garden:
 - Dig a hole 8" x 8"
 - Fill with water and put a popsicle stick at the top of the water level.
 - Measure how far it drains down after a few hours (ideally 4).
 - Calculate the depth of water that will drain out over 24 hours.
3. Determine total impervious surface area to drain to rain garden:

House Roof (Front)	14 ft. x 48 ft.	=	672 sq ft
--------------------	-----------------	---	-----------

4. Sizing the rain garden:

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

$$(672 \text{ sq ft} / 6 \text{ ft.}) = 112 \text{ sq. ft.}$$

In order to control 2 inches of runoff volume, the rain garden area needs to be multiplied by 2.

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

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

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

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

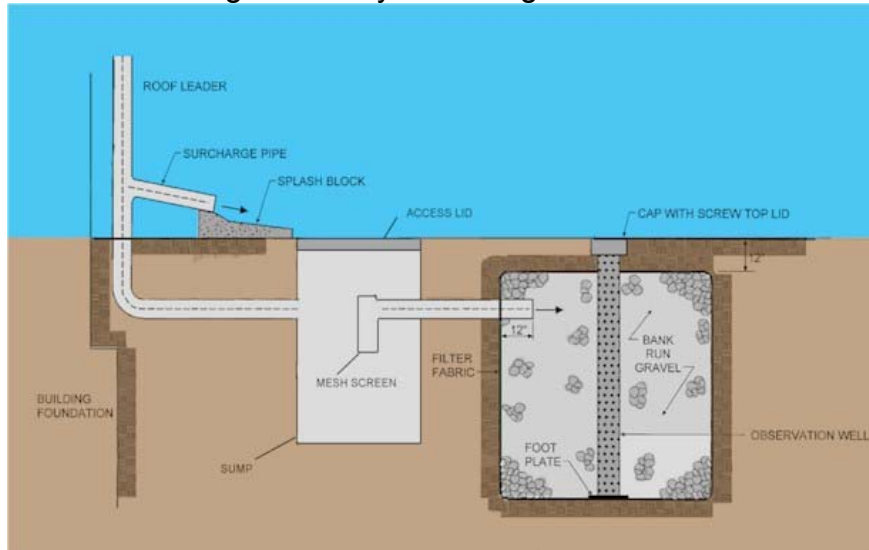
Design Considerations:

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

Maintenance:

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

Figure 6: Dry Well Diagram



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

Sizing Example for Dry Wells:

1. Determine contributing impervious surface area:

House Roof (Rear)	14 ft. x 48 ft.	=	672 sq. ft.
-------------------	-----------------	---	-------------

2. Determine required volume control:

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

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

3. Sizing the dry well:

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

$$280 \text{ cu. ft.} = 3.5 \text{ ft.} \times L \times L; L = 9 \text{ ft.}$$

$$\text{Dimensions} = 3.5 \text{ ft. (D)} \times 9 \text{ ft. (L)} \times 9 \text{ ft. (W)}$$

Non-Structural BMPs

1. Tree Plantings and Preservation

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

Tree Considerations:

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

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

1. Determine contributing impervious surface area:

Garage Roof (Right)	6 ft. x 24 ft.	=	144	ft
---------------------	----------------	---	-----	----

2. Calculate the required control volume:

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

3. Determine the number of tree plantings:

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

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

Determining the volume reduction for preserving existing trees:

1. Calculate approximate area of the existing tree canopy:
 $\sim 22 \text{ sq. ft.} \times \sim 23 \text{ sq. ft.} = 500 \text{ sq. ft.}$
2. Measure distance from impervious surface to tree canopy: 35 ft.
3. Calculate the volume reduction credit by preserving existing trees:
 - For Trees within 20 feet of impervious cover:
Volume Reduction cu. ft. = (Existing Tree Canopy sq. ft. \times 1 inch) / 12
 - For Trees beyond 20 feet but not farther than 100 feet from impervious cover:
Volume Reduction cu. ft. = (Existing Tree Canopy sq. ft. \times 0.5 inch) / 12

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

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

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

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

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

2. Minimize Soil Compaction and Replant with Lawn or Meadow

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

Design Considerations:

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

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

1. Calculate approximate area of preserved meadow:

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

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

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

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

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

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

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

REFERENCES:

Center for Watershed Protection and US Forest Service. (2008). *Watershed Forestry Resource Guide*. Retrieved on May 26, 2010 from <http://www.forestsforwatersheds.org/reduce-stormwater/>.

Department of Environmental Protection. (2006). *Pennsylvania Stormwater Best Management Practices Manual*.

Wissahickon Watershed Partnership. *Pennsylvania Rain Garden Guide*. Retrieved on May 4, 2010 from http://pa.audubon.org/habitat/PDFs/RGBrochure_complete.pdf.

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

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

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