ORDINANCE NO. 2006 - 3

AN ORDINANCE OF THE HILLTOWN TOWNSHIP BOARD OF SUPERVISORS AMENDING PROVISIONS OF ORDINANCE 2004-04, CODE OF HILLTOWN TOWNSHIP, CHAPTER 134, STORMWATER MANAGEMENT.

The Hilltown Township Board of Supervisors hereby enacts and ordains the following Ordinance:

Article I **Section 134-1. Statement of Findings** Subsection C is added as follows:

C. Through project design, impacts from stormwater runoff can be minimized to maintain the natural hydrologic regime, and sustain high water quality, groundwater recharge, stream baseflow, and aquatic ecosystems. The most cost effective and environmentally advantageous way to manage stormwater runoff is through nonstructural project design, minimizing impervious surfaces and sprawl, avoiding sensitive areas (i.e. stream buffers, floodplains, steep slopes), and designing to topography and soils to maintain the natural hydrologic regime.

Article II **Section 134-2. Purpose** Subsection A, B, C, and D are added to read as follows and all existing subsections are relettered E thru N:

A. Promote alternative project designs and layouts that minimizes impacts to surface and groundwater.

B. Promote nonstructural Best Management Practices.

C. Minimize increases in stormwater volume.

D. Minimize impervious surfaces.

Article III **Section 134-8. Definitions and Work Usage**, Subsection B is amended to revise or add the following:

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

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

Base Flow The portion of stream flow that is sustained by groundwater discharge.

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

BMP (Best Management Practice) Stormwater structures, facilities and techniques to control, maintain or improve the quantity and quality of surface runoff. The *PA Handbook of BMPs for Developing Areas* and the *Maryland Stormwater Design Manual* may be referenced for specific BMP practices.

DEP The Pennsylvania Department of Environmental Protection.

Department The Pennsylvania Department of Environmental Protection.

Design Professional (Qualified) A Pennsylvania Registered Professional Engineer, Registered Landscape Architect, or a Registered Professional Land Surveyor trained to develop stormwater management plans.

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

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

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

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

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

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

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

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

Hydric Soil A soil that is saturated, flooded, or ponded long enough during the growing season to develop an aerobic condition in the upper part.

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.

Hyetograph A graphical representation of average rainfall, rainfall excess rates, or volumes over specified areas during successive units of time during a storm.

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

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

(i) A seasonal high water table, whether perched or regional, determined by direct observation of the water table or indicated by soil mottling.

(ii) A rock with open joints, fracture or solution channels, or masses of loose rock fragments, including gravel, with insufficient fine soil to fill the voids between the fragments.

(iii) A rock formation, other stratum or soil condition which is so slowly permeable that is effectively limits downward passage of effluent.

Parent Tract The parcel of land from which a land development or subdivision originates as of the date of adoption of the original Stormwater Management Ordinance on May 22, 2000 (Ordinance No. 2000-5).

Pretreatment Techniques employed in stormwater BMPs to provide storage or filtering to help trap coarse materials and other pollutants before they enter the system.

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

Article IV Section 134-9. Requirements Applicable to All Stormwater Management Systems is revised to add Subsection E as follows and reletter existing Subsections E thru K to F thru L:

E. For all subdivision and land development applications, the tributary area discharging drainage to any location along the site property boundary shall not increase by more than twenty-five percent (25%) over the predevelopment condition without written approval from the adjacent affected property owner(s).

Article V Section 134-9. Requirements Applicable to All Stormwater Management Systems Subsection M and N are added as follows:

M. Special requirements for watersheds draining to high quality (HQ) and exceptional value (EV) waters: The temperature and quality of water and streams that have been declared as exceptional value and high quality are to be maintained as defined in Chapter 93, Water Quality Standards, Title 25 Pennsylvania Department of Environmental Protection Rules and Regulations. Temperature sensitive BMPs and stormwater conveyance systems are to be used and designed with storage pool areas and supply outflow channels, and shaded with trees. This will require modification of berms for permanent ponds and the relaxation of restrictions on planting vegetation within the facilities, provided that capacity for volumes and rate control is maintained. At a minimum, the southern half on pond shorelines shall be planted with shade or canopy trees within 10 feet of the pond shoreline. In conjunction with this requirement, the maximum slope allowed on the berm area to be planted is 10 to 1. This will lessen the destabilization of berm soils due to root growth. A long-term maintenance schedule and management plan for the thermal control BMPs is to be established and recorded for all development sites.

N. All stormwater runoff shall be pretreated for water quality prior to discharge to surface or groundwater as required by Section 134-13 of this Ordinance.

Article VI Section 134-10. Stormwater Management Districts – Peak Rate Control Subsection E is revised as follows:

E. For the purposes of implementing the provisions of the East Branch Perkiomen Creek Watershed Stormwater Management Plan, Management District "B" design storm proposed conditions shall be controlled to design storm existing conditions as follows:

Design Storm Proposed Conditions	to	Design Storm Existing Conditions
2-year		1-year
5-year		5-year
10-year		10-year
25-year		25-year
100-year		100-year

Article VII Section 134-11. Stormwater Management District Implementation Provisions (Performance Standards) Subsection A is revised as follows:

A. General – Proposed conditions peak rates of runoff from any regulated activity shall meet the peak release rates of runoff prior to development for the design storms specified on the Stormwater Management District Watershed Map (Ordinance Appendix E) and Section 134-10, of the Ordinance.

Article VIII Section 134-11. Stormwater Management District Implementation Provisions (Performance Standards) is revised to delete Subsections B and C in their entirety and renumber D thru J as B thru H.

Article IX Sections 134-12, 134-13, and 134-14 are numbered Sections 134-14-2, 134-14-3, and 134-14-4.

Article X Section 134-12. Nonstructural Project Design (Sequencing to Minimize Stormwater Impacts) is added as follows:

A. The design of all regulated activities shall include the following steps in sequence to minimize stormwater impacts.

1. The applicant is required to find practicable alternatives to the surface discharge of stormwater, the creation of impervious surfaces, and the degradation of Waters of the Commonwealth, and must maintain as much as possible the natural hydrologic regime of the site.

2. An alternative is practicable if it is available and capable of being completed after considering cost, existing technology, and logistics in light of overall project purposes, and other Township requirements.

3. All practicable alternatives to the discharge of stormwater are presumed to have less adverse impact on quantity and quality of Waters of the Commonwealth unless otherwise demonstrated.

B. The applicant shall demonstrate that regulated activities are designed in the following sequence to minimize the increases in stormwater runoff and impacts to water quality:

1. Prepare an Existing Resource and Site Analysis Map (ERSAM), showing environmentally sensitive areas including, but not limited to, steep slopes, ponds, lakes, streams, wetlands, hydric soils, vernal pools, floodplains, stream buffer zones, hydrologic soil groups A, B, C, and D, any existing recharge areas and any other requirements outlined in the Subdivision and Land Development Ordinance.

2. Prepare a draft project layout avoiding sensitive areas identified in Section 134-12.B.1 and minimizing total site earth disturbance as much as possible. The ratio of disturbed

area to the entire site area and measures taken to minimize earth disturbance shall be included in the ERSAM.

3. Identify site specific existing conditions drainage areas, discharge points, recharge areas, and hydrologic soil groups A and B.

4. Evaluate Nonstructural Stormwater Management Alternatives (See Appendix B, Table B-6).

   a. Minimize earth disturbance.

   b. Minimize impervious surfaces.

   c. Break up large impervious surfaces.

5. Satisfy water quality objective (Section 134-13).

6. Satisfy groundwater recharge (infiltration) objective (Section 134-14) and provide for stormwater treatment prior to infiltration.

7. Satisfy stream bank erosion protection objective (Section 134-14-1).

8. Determine the Management District within which the site is located (Appendix E) and conduct a predevelopment runoff analysis.

9. Prepare final project design to maintain predevelopment drainage areas and discharge points, to minimize earth disturbance and impervious surfaces, to reduce runoff to the maximum extent possible, and to minimize the use of surface or point discharges.

10. Conduct a proposed conditions runoff analysis based on the final design and to meet the release rate and in turn the overbank flow and extreme event requirements (Section 134-14-1).

11. Manage any remaining runoff through treatment prior to discharge, as part of detention, biorentention, direct discharge or other structural control.

Article XI Section 134-13. Water Quality is added as follows:

A. In addition to the performance standards and design criteria requirements of this Ordinance, adequate storage and treatment facilities must be provided to capture and treat stormwater runoff from developed or disturbed areas. The Recharge Volume computed under Section 306 may be a component of the Water Quality Volume if the applicant chooses to manage both components in a single facility. If the Recharge Volume is less than the Water Quality Volume, the remaining Water Quality Volume may be captured and treated by methods other than recharge/infiltration BMPs. The required Water Quality Volume (WQv) is the storage capacity needed to capture and to treat a portion of stormwater runoff from the developed areas of the site produced from 90 percent of the average annual rainfall (P).

The following calculation formula is to be used to determine the water quality storage volume, (WQv), in acre-feet of storage:

$$WQv = [(P)(Rv)(A)]/12 \quad \textbf{Equation: 134.13}$$

WQv = Water Quality Volume (acre-feet).

P = Rainfall Amount equal to 90% of events producing this rainfall (in).

A = Area of the project contributing to the water quality BMP (acres).

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

The P value for the five PennDOT rainfall regions is shown in Figure A-2 in Appendix A of this Ordinance.

B. Design of BMPs used for water quality control shall be in accordance with design specifications outlined in the *Pennsylvania Handbook of Best Management Practices for Developing Areas* or other applicable manuals. The following factors must be considered when evaluating the suitability of BMPs used to control water quality at a given development site:

1. Total contributing drainage area.
2. Permeability and infiltration rate of the site soils.
3. Slope and depth to bedrock.
4. Seasonal high water table.
5. Proximity to building foundations and wellheads.
6. Erodibility of soils.
7. Land availability and configuration of the topography.
8. Peak discharge and required volume control.
9. Streambank erosion.
10. Efficiency of the BMPs to mitigate potential water quality problems.
11. Volume of runoff that will be effectively treated.
12. Nature of the pollutant being removed.
13. Maintenance requirements.
14. Creation/protection of aquatic and wildlife habitat.
15. Recreational value.
16. Enhancement of aesthetic and property value.

C. To accomplish the above, the applicant shall submit original and innovative designs for review. Such designs may achieve the water quality objectives through a combination of BMPs (Best Management Practices).

Article XII Section 134-14-1. Groundwater Recharge (Infiltration) is added as follows:

A. Infiltration BMPs shall meet the following minimum requirements:

Where site/soil conditions are suitable, regulated activities must recharge (infiltrate) a portion of the runoff created by the development as part of an overall stormwater management plan designed for the site. The volume of runoff to be recharged shall be determined from Sections 134-14-1.A.2.a or 134-14-1.A.2.b.

1. 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 and have the following characteristics:

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

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

   c. The recharge facility shall be capable of completely infiltrating the recharge volume within four days (96 hours).

   d. Pretreatment shall be provided prior to infiltration.

   e. The requirements for recharge are applied to all disturbed areas, even if they are ultimately to be an undeveloped land use such as grass, since studies have found that compaction of the soils during disturbance reduces their infiltrative capacity.

2. Recharge volume (Re) shall be computed by first obtaining the infiltration requirement using methods in either Section 134-14-1.A.2.a or 134-14-1.A.2.b then multiplying by the total proposed impervious area. The overall required recharge volume for a site is computed by multiplying total impervious area by the infiltration requirement.

   a. NRCS Curve Number equation.

   The following criteria shall apply.

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

   For zero runoff: P = I (Infiltration) = (200/CN) – 2 **Equation: 134-14-1.1**

   Where: P= I = infiltration requirement (inches).

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

This equation can be displayed graphically in, and the infiltration requirement can also be determined from Figure 134-14-1-1.

The recharge volume (Re_v) required would therefore be computed as:

Re_v = I * impervious area (SF)/12 = Cubic Feet (CF) **Equation: 134-14-1.1**

b. Annual Recharge Water Budget Approach.

It has been determined that infiltrating 0.6 inches of runoff from the impervious areas will aid in maintaining the hydrologic regime of the watershed. If the goals of Section 134-14-1.A.2.a cannot be achieved, then 0.6 inches of rainfall shall be infiltrated from all impervious areas, up to an existing site conditions curve number of 77. Above a curve number of 77, Equation 134-14-1.1 or the curve in Figure 134-14-1-1 should be used to determine the Infiltration requirement.

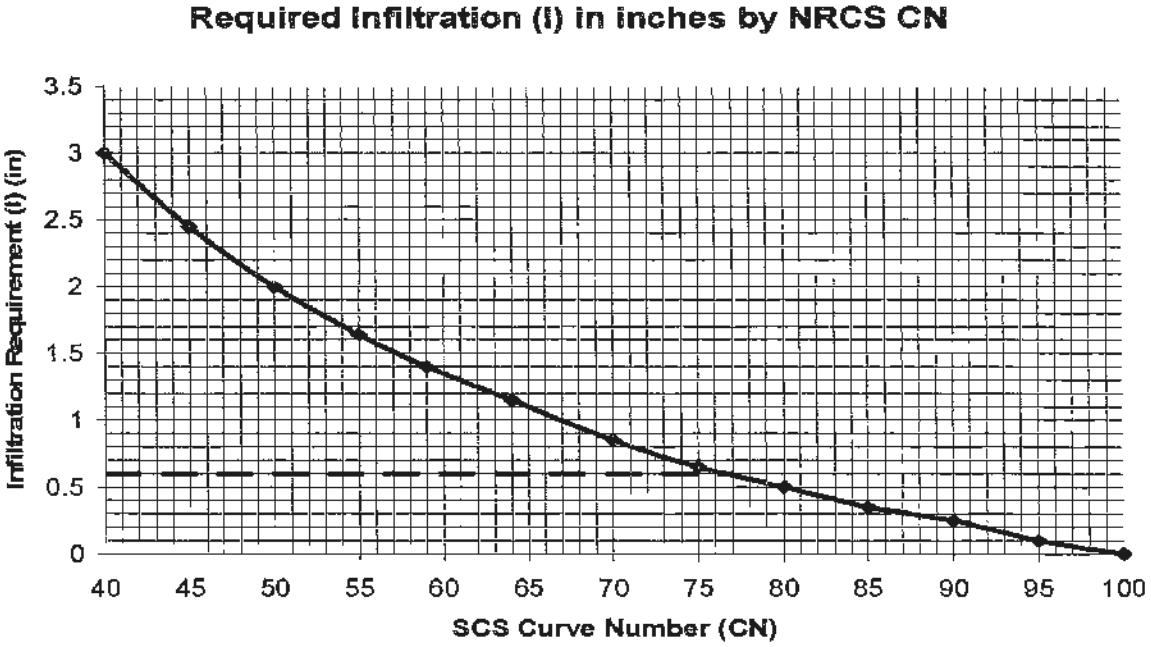
Where: I = 0.6 inches.

The recharge volume (Re_v) required would therefore be computed as:

Re_v = I * percent impervious area (SF)/12 = (CF)

The recharge values derived from these methods are the minimum volumes the applicant must control through an infiltration/recharge BMP facility. However, if a site has areas of soils where additional volume of infiltration can be achieved, the applicant is encouraged to recharge as much of the stormwater runoff from the site as possible.

Figure 134-14. Infiltration Requirement Based upon NRCS Curve Number.



A. The general process for designing the infiltration BMP shall be:

A detached soils evaluation of the project site shall be required to determine the suitability of recharge facilities. The evaluation shall be performed by a qualified applicant and, at a minimum, address soil permeability, depth of bedrock, and subgrade stability.

1. Analyze hydrologic soil groups as well as natural and manmade features within the watershed to determine general areas of suitability for infiltration stability.

2. Provide field tests, such as double ring infiltration tests at the level of the proposed infiltration surface to determine the appropriate hydraulic conductivity rate.

3. Design the infiltration structure for the required storm volume based on field determined capacity at the level of the proposed infiltration surface.

4. Where the recharge volume requirement cannot be physically accomplished due to the results of the field soils testing, supporting documentation, and justification must be submitted with the drainage plan.

5. If on-lot infiltration structures are proposed, it must demonstrate that the soils are conducive to infiltrate on the lots identified.

B. Extreme caution shall be exercised where infiltration is proposed in geologically susceptible limestone areas. Extreme caution shall also be exercised where salt or chloride would be a pollutant since soils do little to filter this pollutant and it may contaminate the groundwater. Extreme caution shall be exercised where infiltration is proposed in source water protection areas. The qualified design professional shall evaluate the possibility of groundwater contamination from the proposed infiltration/recharge facility and perform a hydrogeologic justification study if necessary. The infiltration requirement in High Quality/Exceptional Value waters shall be subject to DEP's Title 25: Chapter 93 Antidegradation Regulations. The municipality may require the installation of an impermeable liner in BMP and/or detention basins where the possibility of groundwater contamination exists. A detailed hydrogeologic investigation may be required by the municipality.

C. The plan must include safeguards against groundwater contamination for uses which may cause groundwater contamination, should there be a mishap or spill.

D. Recharge/infiltration facilities shall be used in conjunction with other innovative or traditional BMPs, stormwater control facilities, and nonstructural stormwater management alternatives.

Article XIII Section 134-14-1. Stream Bank Erosion Requirements is added as follows:

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

Release of water may begin at the start of the storm (i.e. the invert of the water quality orifice is at the invert of the facility). The design of the facility shall minimize clogging and sedimentation. Orifices smaller than 3 inches in diameter are not recommended. However, if the design engineer can verify that the smaller orifice is protected from clogging by use of trash racks, etc., smaller orifices may be permitted. Trash racks are required for any primary orifice.

Article XIV Section 134-14-2. Design Criteria for Stormwater Management Facilities and Best Management Practices Subsection J.11 is added as follows:

11. Basin Berm Construction Requirements:

    (1) Site preparation – Areas under the embankment and any structural works shall be cleared, grubbed, and the topsoil stripped to remove the trees, vegetation, roots or other objectionable material. In order to facilitate clean-out and restoration, the pool area will be cleared of all brush and excess trees.

    (2) Cut off trench – A cut-off trench will be excavated along the centerline dam on earth fill embankments. The minimum depth shall be two feet. The cut-off trench shall extend up both abutments to the riser crest elevation. The minimum bottom width shall be eight feet but wide enough to permit operation of compaction equipment. The side slopes shall be no steeper than 1:1. Compaction requirements shall be the same as those for the embankment. The trench shall be kept free from standing water during the backfilling operations.

    (3) Embankment – The fill material shall be taken from the selected borrow areas. It shall be free of roots, wood vegetation, oversized stones, rocks or other objectionable material. Areas on which fill is to be placed shall be scarified prior to placement of fill.

    The fill material should contain sufficient moisture so that it can be formed by hand into a ball without crumbling. If water can be squeezed out of the ball, it is too wet for proper compaction.

    Fill material will be placed in 6 to 8 inch layers and shall be continuous over the entire length of the fill. Fill material must be compacted to a minimum of 95% of Modified Proctor Density as established by ASTM D-1557. Compaction testing by a certified soils engineer/geologist must be completed as directed by the Township Engineer to verify adequate compaction has been achieved.

Article XV Section 134-14-2. Design Criteria for Stormwater Management Facilities and Best Management Practices Subsections S.1.a and b are revised as follows:

a. Infiltration BMPs shall be constructed on soils with a minimum depth of 24 inches between the intended bottom of the facility and the seasonal high water table and/or bedrock (limiting zone).

b. Infiltration BMPs intended to receive rooftop runoff shall include appropriate measures such as leaf traps and cleanouts to prevent clogging by vegetation.

Article XVI Section 134-14-2. Design Criteria for Stormwater Management Facilities and Best Management Practices Subsection S.1.b is deleted in its entirety, and Sections c, d, and e are relettered b, c, and d.

Article XVII Section 134-14-3. Calculation Methodology Subsection A, B, and C are revised as follows and Subsections J, K, and L are deleted in their entirety:

Stormwater runoff from all development sites shall be calculated using either the rational method or a soil cover complex methodology.

A. Any stormwater runoff calculations shall use generally accepted calculation technique that is based on the NRCS soil cover complex method. Table 309-I summarizes acceptable computation methods. Method must be selected by the applicant based on the individual limitations and suitability of each method for a particular site.

The Rational Method may be used to estimate peak discharges from drainage areas that contain less than 200 acres. The Rational Method is recommended for drainage areas under 100 acres.

Table 134-14-3-1 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	US Army Corps of Engineers	Applicable where use of full hydrologic computer model is desirable or necessary
PSRM	Penn State University	Applicable where use of a hydrologic computer model is desirable of necessary; simpler than TR-20 or HEC-1.
Rational Method (or commercial computer package based on Rational Method)	Emil Kuichling (1889)	For sites les than 200 acres, or as approved by the municipal engineer.
Other methods	Varies	Other computation methodologies approved by the municipal engineer.

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

C. Runoff Curve Numbers (CN) for both existing and proposed conditions to be used in the soil cover complex method shall be obtained from Table A-2 in Appendix A of Ordinance. For the purposes of existing conditions flow rate determination for all subdivision and land development applications, undeveloped land and existing impervious surfaces shall be considered as "meadow" in good condition, unless the natural ground cover generates a lower curve number of Rational 'C' value (i.e. forest), as listed in Table A-2 or A-3 in Appendix A of this Ordinance.

Article XVIII Section 134-16. Stormwater Management Plan Contents Subsection E.22 is revised to read as follows:

22. A statement, signed by the landowner, acknowledging the stormwater management system to be a permanent fixture that can be altered or removed only after approval of a revised plan by the Township, which shall be recorded with the record plan and which shall be applicable to all future landowners.

Article XIX Section 134-16. Stormwater Management Plan Contents Subsection E.24 is added to read as follows:

24. The following signature block for the design engineer:

(*Design engineer*), on this date (*date of signature*), has reviewed and hereby certify that the stormwater management plan meets all design standards and criteria of Hilltown Township Watershed Act 167 Stormwater Management Ordinance.

Article XX Section 134-26 Maintenance Agreement for Privately Owned Stormwater Facilities is revised as follows:

A. Prior to final approval of the site's stormwater management plan, the applicant shall sign and record a maintenance agreement approved by the Township Solicitor covering all stormwater control facilities that are to be privately owned. A sample agreement is contained in Appendix F of this Ordinance.

B. Other items may be included in the agreement where determined necessary to guarantee the satisfactory maintenance of all facilities. The maintenance agreement shall be subject to review and approval of the Township.

Article XXI Section 134-27 Municipal Stormwater Maintenance Fund, Subsection A is revised as follows:

A. Persons installing stormwater management facilities and Best Management Practices shall be required to pay a specified amount to the Township Stormwater Maintenance Fund to held defray costs of periodic inspections and maintenance expenses. The amount of the deposit shall be determined as follows:

1. If the stormwater management facilities and Best Management Practices is to be privately owned and maintained, the deposit shall cover the estimated cost of periodic inspections performed by the Township for a period of ten (10) years, as established by separate resolution of the Board of Supervisors.

2. If the stormwater management facilities and Best Management Practices is to be owned and maintained by the Township, the deposit shall cover the estimated costs for maintenance and inspections for ten (10) years. The Township engineer will establish the estimated costs upon review of information submitted by the applicant.

3. The amount of the deposit to the fund shall be converted to present worth of the annual series values. The Township engineer shall determine the present worth equivalents, which shall be subject to the approval of the governing body.

Article XXII Section 134-29. Notification is revised to add the following sentence:

In the case where the violation poses an immediate threat to the health, safety, and welfare of the community, no notice under this section shall be required.

Article XXIII **Appendix A** is revised in its entirety as follows:

ORDINANCE APPENDIX A

Stormwater Management Design Criteria

Table A-1 Design Storm Rainfall Amount (inches)

Figure A-1 Alternating Block Method for Rainfall Distribution

Figure A-2 PennDOT Delineated Regions

Figure A-3 PennDOT Storm Intensity-Duration-Frequency Curve Region 4

Table A-2 Runoff Curve Numbers

Table A-3 Rational Runoff Coefficients

Table A-4 Manning Roughness Coefficients

Table A-5 24-Hour Storm Values Representing 90 Percent of Annual Rainfall

Table A-6 Stormwater Credits for Computing Proposed Conditions Hydrograph

Article XXIV **Appendix F** is added.

Article XXV **Repealer**

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

Article XXVI **Severability**

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

ENACTED and ORDAINED at a regular meeting of the Hilltown Township Board of Supervisors on the 22nd day of May, 2006. This Ordinance shall take effect immediately.

Jack McIlhinney, Chairman

Richard Manfredi, Vice Chairman

Barbara Salvadore, Member

Table A-1
Design Storm Rainfall Amount (Inches)

The design storm rainfall amount chosen for design should be obtained from the PennDOT region for which the site is located according to Figure A-2.

Source: Field Manual of Pennsylvania Department of Transportation

Region 4
Precipitation Depth (in)

Duration	1 Yr.	2 Yr.	5Yr.	10 Yr.	25 Yr.	50 Yr.	100 Yr.
5 min.	0.30	0.35	0.41	0.45	0.50	0.55	0.61
15 min.	0.58	0.68	0.80	0.93	1.03	1.13	1.25
1 hr.	1.01	1.22	1.48	1.70	1.91	2.16	2.41
2 hrs.	1.24	1.50	1.84	2.14	2.46	2.80	3.18
3 hrs.	1.38	1.71	2.10	2.43	2.82	3.24	3.69
6 hrs	1.68	2.04	2.52	3.06	3.60	4.14	4.74
12 hrs.	2.04	2.52	3.00	3.84	4.56	5.16	6.00
24 hrs.	2.40	2.88	3.60	4.56	5.76	6.48	7.44

FIGURE A-1
ALTERNATING BLOCK METHOD FOR RAINFALL DISTRIBUTION

Source: *Applied Hydrology,* Chow, Maidment, Mays, 1988

The Alternating Block Method can be utilized to develop design hyetographs from the PennDOT Storm Intensity-Duration-Frequency (PDT-IDF) curves. This method redistributes the incremental rainfall values developed from the PDT-IDF curves in a quasi-symmetrical form, where the block of maximum incremental depth is positioned at the middle of the required duration and the remaining blocks of rainfall are arranged in descending order, alternately to the right and to the left of the central block. Example A-1 below shows this method for a 100-year, 2-hour duration storm within 20-minute time intervals.

Example A-1
100-Year, 2-Hour Duration Storm Hyetograph Development
Region 4

(1)	(2)	(3)	(4)	(5)
Time (min)	100-Yr. Rainfall Intensity (Inches/hr)	100-Yr. Accumulated Rainfall Depth (Inches)	100-Yr. Incremental Rainfall Depth (Inches)	100-Yr. Rainfall Distribution (Inches)
0	0.00	0.00	0.00	0.00
10	5.90	0.98	0.98	0.08
20	4.39	1.46	0.48	0.14
30	3.58	1.79	0.33	0.17
40	3.05	2.03	0.24	0.21
50	2.69	2.24	0.21	0.33
60	2.41	2.41	0.17	0.98
70	2.24	2.61	0.20	0.48
80	2.06	2.75	0.14	0.24
90	1.89	2.84	0.08	0.20
100	1.79	2.98	0.15	0.15
110	1.69	3.10	0.12	0.12
120	1.59	3.18	0.08	0.08

Notes:

Values from Column (2) are derived from the appropriate rainfall chart based on the location of the site under analysis. (Region 4 in this example, therefore use Figure A-3).

Column (3) = Column (2) * Column (1)/60 minutes (i.e. 5.9 inches/hr * 10min/60 = 0.98).

Column (4) = Difference in Column (3) for each time interval (i.e. 1.46 – 0.98 = 0.48).

Column (5) is Column (4) rearranged with the maximum increment from Column (4) placed in the middle of the event (Time = 60 minutes, in this example), then rearranging the remaining values from Column (4) in descending order, alternately right and left (below and above) the central block.

FIGURE A-2

PENNDOT DELINEATED REGIONS

Source: Field Manual of Pennsylvania Department of Transportation, May 1986

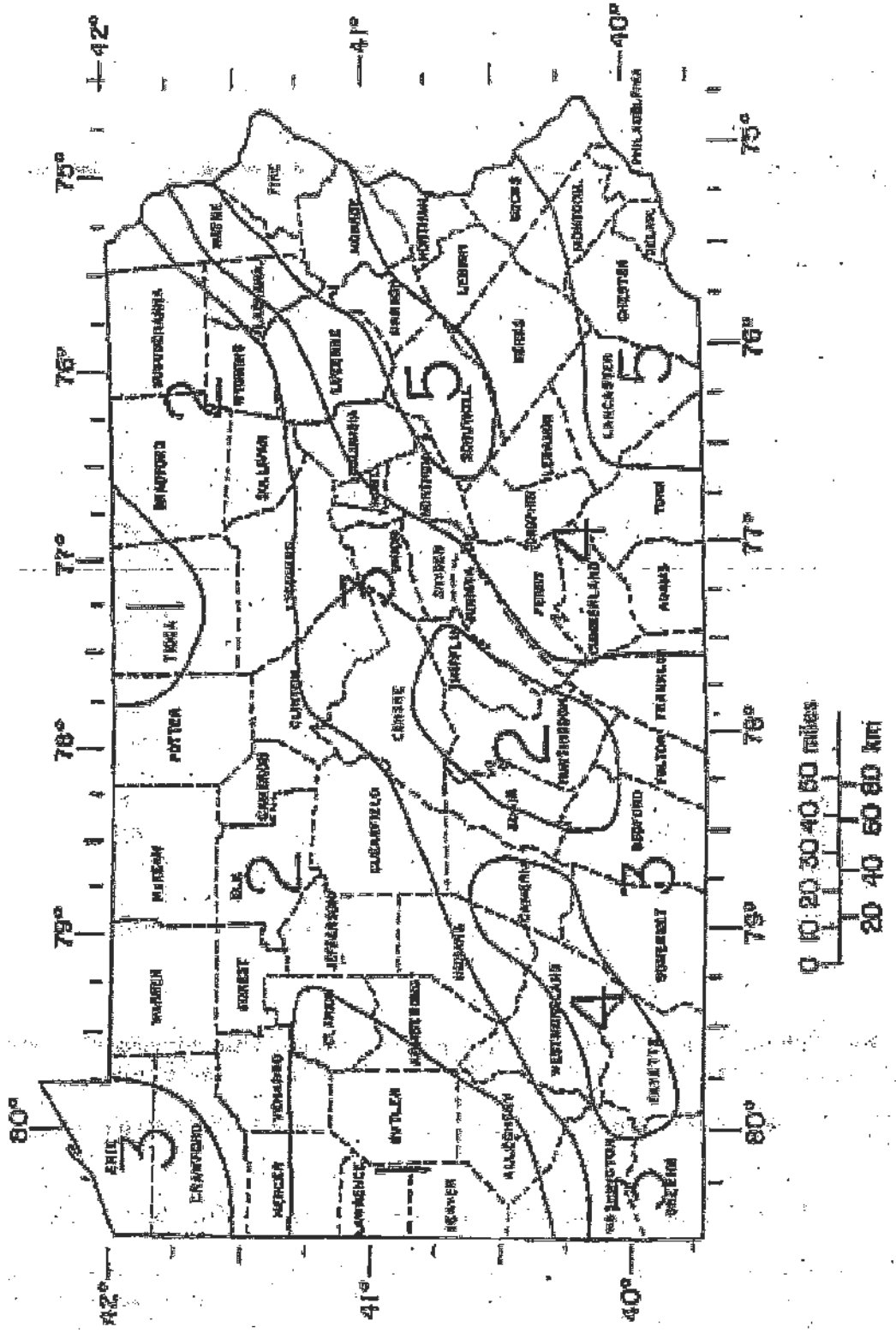


FIGURE A-3
PENNDOT STORM INTENSITY-DURATION-FREQUENCY CURVE
REGION 4
Source: Field Manual of Pennsylvania Department of Transportation, May 1986

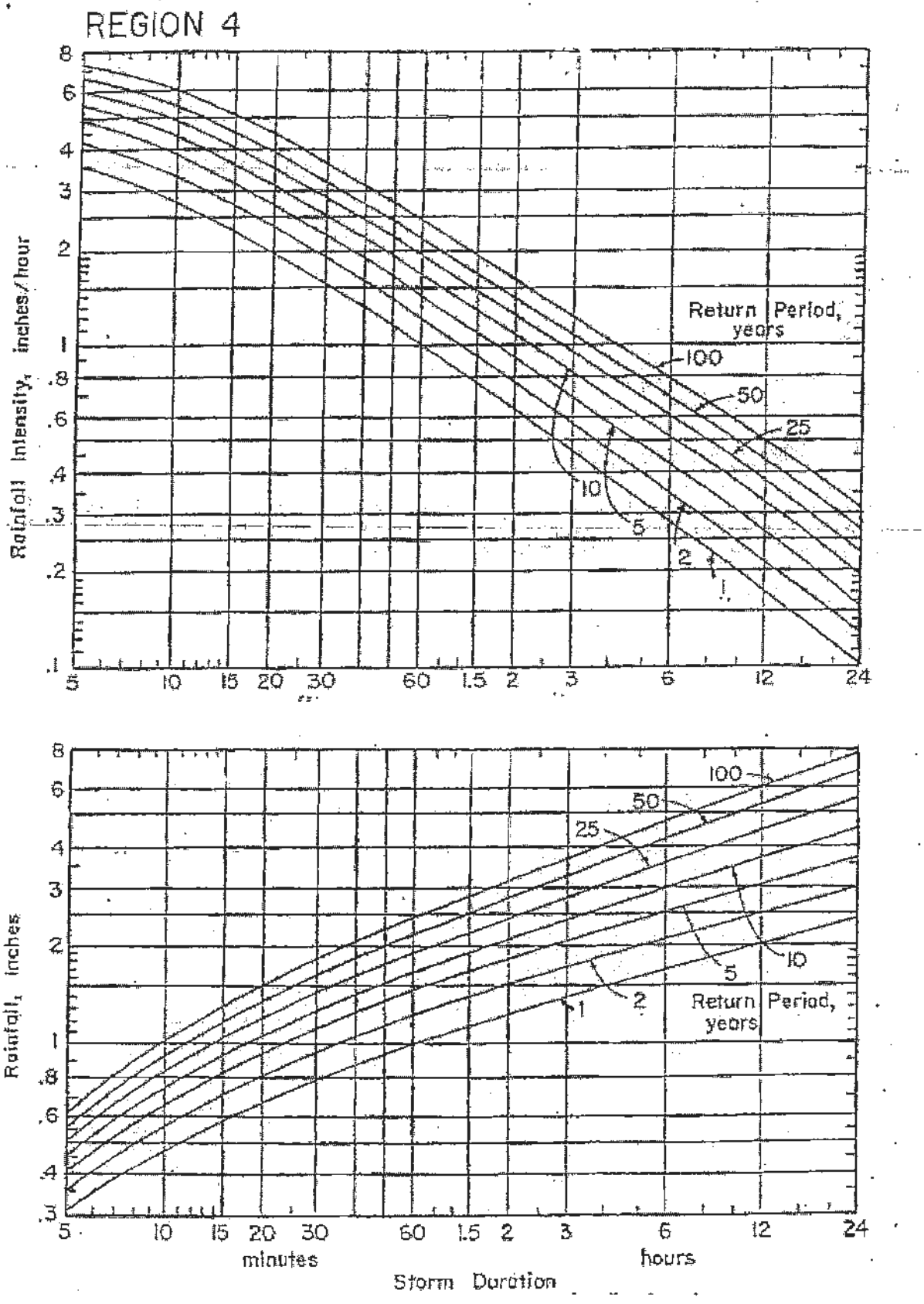


Table A-2 Runoff Curve Numbers
Source: NRCS (SCS) TR-55

LAND USE DESCRIPTION		HYDROLOGIC SOIL GROUP A	B	C	D
Open Space		44	65	77	82
Orchard		44	65	77	82
Meadow		30	58	71	78
Agriculture		59	71	79	83
Forest		36	60	73	79
Commercial	(85% Impervious)	89	92	94	95
Industrial	(72% Impervious)	81	88	91	93
Institutional	(50% Impervious)	71	82	88	90
Residential					
Average Lot Size	% Impervious				
1/8 acre of less*	65	77	85	90	92
1/ - 1/3 acre	34	59	74	82	87
1/3 – 1 acre	23	53	69	80	85
1 – 4 acres	12	46	66	78	82
Farmstead		59	74	82	86
Smooth Surfaces (concrete, asphalt, gravel or bare compacted soil)		98	98	98	98
Water		98	98	98	98
Forest/Mining Mix		75	75	75	75

* Includes Multifamily Housing unless justified lower density can be provided

Note: Existing site conditions of bare earth or fallow shall be considered as meadow when choosing a CN value. Existing conditions should be assigned to be meadow in good condition, unless the actual existing conditions result in a lower runoff curve number, in which case the lower number will be used.

Table A-3 Rational Runoff Coefficients (AMC II)

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

Notes: Values are based on S.C.S. definitions and are average values.
Values indicated by "__" should be determined by the design engineer based on site characteristics.

Source: New Jersey Department of Environmental Protection, *Technical Manual for Stream Encroachment,* August 1984, revised 1995

Table A-4. Roughness Coefficients (Manning's "n") For Overland Flow
Source: U.S. Army Corps of Engineers, HEC-1 Users Manual

Surface Description	n
Dense Growth	0.4 – 0.5
Pasture	0.3 – 0.4
Lawns	0.2 – 0.3
Bluegrass Sod	0.2 – 0.5
Short Grass Prairie	0.1 – 0.2
Sparse Vegetation	0.05 – 0.13
Bare Clay-Loam Soil (eroded)	0.01 – 0.03
Concrete/Asphalt - very shallow depths (less than ¼ inch)	0.10 – 0.15
- small depths (1/4 inch to several inches)	0.05 – 0.10

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

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

[1] Depending upon type, coating, and diameter
[2] Values recommended by the American Concrete Pipe Association, check manufacturer's recommended value.

Table A-5. 24-Hour Storm Values Representing 90% of Annual Rainfall

PennDOT Rainfall Regions	P Inches
1	1.13
2	1.48
3	1.60
4	1.95
5	2.04

Source: Field Manual Pennsylvania Department of Transportation, May 1986

The developer may, subject to approval of the Municipal Engineer, use the stormwater credits, described in the following table, in computing proposed conditions hydrograph:

Table A-6. Nonstructural Stormwater Management Measures

Stormwater Measure	Description
Natural Area Conservation	Conservation of natural areas such as forest, wetlands, or other sensitive areas in a protected easement thereby retaining their existing conditions hydrologic and water quality characteristics.
Disconnection of Rooftop Runoff	Rooftop runoff is disconnected and then directed over a pervious area where it may either infiltrate into the soil or filter over it. This is typically obtained by grading the site to promote overland flow or by providing bioretention on single family residential lots.
Disconnection of Non-Rooftop Runoff	Disconnect surface impervious cover by directing it to pervious areas where it is either infiltrated or filtered through the soil.
Stream Buffers	Stream buffer effectively treats stormwater runoff. Effective treatment constitutes capturing runoff from pervious and impervious areas adjacent to the buffer and treating the runoff through overland flow across a grass or forested area.
Grass Channel (Open Section Roads)	Open grass channels are used to reduce the volume of runoff and pollutants during smaller storms.
Environmentally Sensitive Rural Development	Environmental site techniques are applied to low density or rural residential development.

Source: Modified from *Maryland Best Management Practices Manual, 2000*

Appendix F

Standard Stormwater Facilities Maintenance and Monitoring Agreement

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

Witnesseth

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

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

WHEREAS, the Stormwater Management Plan (hereinafter "Plan") for _____ which is expressly made a part hereof, as approved or to be approved by the Township, provides for detention or retention of stormwater within the confines of the Property; and

WHEREAS, the Township and Landowner, his successors and assigns agree that the health, safety, and welfare of the residents of the Township require that onsite stormwater management facilities be constructed and maintained on the Property; and

WHEREAS, the Township requires, though the implementation of the Hilltown Township Stormwater Management Ordinance, that stormwater management facilities as shown on the Plan be constructed and adequately maintained by the Landowner, his successors and assigns.

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

1. The onsite stormwater management facilities shall be constructed by the Landowner, his successors and assigns, in accordance with the terms, conditions, and specifications identified in the Plan.

2. The Landowner, his successors and assigns, shall maintain the stormwater management facilities in good working condition, acceptable to the Township so that they are performing their design functions.

3. The Landowner, his successors and assigns, hereby grants permission to the Township, his authorized agents and employees, upon presentation of proper identification, to enter upon the Property at reasonable times, such as following as storm of the intensity for which the facility was designed to control, and to inspect the stormwater management facilities whenever the Township deems necessary. The purpose of the inspection is to ensure safe and proper functioning of the facilities. The inspection shall cover the entire facilities, berms, outlet structures, pond areas, access roads, etc. When inspections are conducted, the Township shall give the Landowner, his successors and assigns, copies of any inspection report which may have been prepared, with findings and evaluations. Maintenance inspections shall be performed at the discretion of the Township.

4. All reasonable costs for said inspections shall be born by the Landowner and payable to the Township.

5. The owner shall convey to the Township easements and/or rights-of-way to ensure access for periodic inspections by the Township and maintenance, if required.

6. In the event the Landowner, his successors and assigns, fails to maintain the stormwater management facilities in good working condition acceptable to the Township, the Township may enter upon the property and take such necessary and prudent action to maintain said stormwater management facilities and to charge the costs of the maintenance and/or repairs to the Landowner, his successors and assigns. This provision shall not be construed as to allow the Township to erect any structure of a permanent nature on the land of the Landowner, outside of any easement belonging to the Township. It is expressly understood and agreed that the Township is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Township.

7. The Landowner, his successors and assigns, will perform maintenance in accordance with the maintenance schedule for the stormwater management facilities including sediment removal as outlined on the approved schedule and/or drainage plan.

8. In the event the Township, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like on account of the Landowner's or his successors' and assigns' failure to perform such work, the Landowner, his successors and assigns, shall reimburse the Township upon demand, within thirty days of receipt of invoice thereof, for all costs incurred by the Township hereunder. If not paid within said thirty-day period, the Township may enter a lien against the property in the amount of such costs, or may proceed to recover his costs through proceedings in equity or at law as authorized under provisions of the Second Class Township Code.

9. The Landowner, his successors and assigns, shall indemnify the Township and its agents and employees against any and all damage, accidents, casualties, occurrences or claims that might arise or be asserted against the Township for the construction, presence, existence or maintenance of the stormwater management facilities by the Landowner and his successors and assigns.

10. In the event a claim is asserted against the Township, its agents or employees, the Township shall promptly notify the Landowner and his successors and assigns, and they shall defend, at their own expense, any suit based on such claim. If any judgment or claims against the Township, his agents or employees shall be allowed, the Landowner and his successors and assigns shall pay all costs and expenses in connection therewith.

11. In the event of an emergency or the occurrence of special or unusual circumstances or situations, the Township may enter the property, if the Landowner is not immediately available, without notification or identification, to inspect and perform necessary maintenance and repairs, if needed when the health, safety or welfare of the citizens is at jeopardy. However, the Township shall notify the Landowner of any inspection, maintenance or repair undertaken within five days of the activity. The Landowner shall reimburse the Township for its costs.

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

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Township:

_____

(SEAL)

For the Landowner:

_____

ATTEST:

_____

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)