

## **ORDINANCE APPENDIX A**

### **Standard Stormwater Facilities Maintenance and Monitoring Agreement**



## Ordinance Appendix A

### STANDARD STORMWATER FACILITIES MAINTENANCE AND MONITORING AGREEMENT

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 Subdivision/Land Management Plan (hereinafter "Plan") for the \_\_\_\_\_ Subdivision which is expressly made a part hereof, as approved or to be approved by the Municipality, provides for detention or retention of stormwater within the confines of the Property; and

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

WHEREAS, the Municipality requires, through the implementation of the \_\_\_\_\_ Watershed Stormwater Management Plan, 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 on-site 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 Municipality so that they are performing their design functions.

3. The Landowner, his successors and assigns, hereby grants permission to the Municipality, his authorized agents and employees, upon presentation of proper identification, to enter upon the Property at reasonable times, such as following a storm of the intensity for which the facility was designed to control, and to inspect the stormwater management facilities whenever the Municipality 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 Municipality shall give the Landowner, his successors and assigns, copies of the inspection report with findings and evaluations. At a minimum, maintenance inspections shall be performed in accordance with the following schedule:
  - Annually for the first 5 years after the construction of the stormwater facilities,
  - Once every 2 years thereafter, or
  - During or immediately upon the cessation of a 100-year or greater precipitation event.
4. All reasonable costs for said inspections shall be born by the Landowner and payable to the Municipality.
5. The owner shall convey to the municipality easements and/or rights-of-way to ensure access for periodic inspections by the Municipality 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 Municipality, the Municipality 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 Municipality to erect any structure of a permanent nature on the land of the Landowner, outside of any easement belonging to the Municipality. It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.
7. 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 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 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 Municipality upon demand, within 30 days of receipt of invoice thereof, for all costs incurred by the Municipality hereunder. If not paid within said 30-day period, the Municipality 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 the provisions of the (Second Class Township)(Borough) Code.
9. The Landowner, his successors and assigns, shall indemnify the Municipality and its agents and employees against any and all damages, accidents, casualties, occurrences or claims that might arise or be asserted against the Municipality 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 Municipality, its agents, or employees, the Municipality 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 Municipality, 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 advent of an emergency or the occurrence of special or unusual circumstances or situations, the Municipality 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 Municipality shall notify the Landowner of any inspection, maintenance, or repair undertaken within five days of the activity. The Landowner shall reimburse the Municipality for its costs.

This Agreement shall be recorded among the land records 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)

## **ORDINANCE APPENDIX B**

### **Stormwater Management Design Criteria**

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# **ORDINANCE APPENDIX B**

## **Stormwater Management Design Criteria**

- Table B-1. Design Storm Rainfall Amount (inches)
- Figure B-1. Alternating Block Method for Rainfall Distribution
- Figure B-2. PennDOT Delineated Regions
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- Table B-4. Manning Roughness Coefficients
- Table B-5. 24-Hour Storm Values Representing 90 Percent of Annual Rainfall
- Table B-6. Stormwater Credits for Computing Proposed Conditions Hydrograph

**Table B-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 B-2.

Source: Field Manual of Pennsylvania Department of Transportation

Duration	Region 4						
	Precipitation Depth (in)						
	1 Yr.	2 Yr.	5 Yr.	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 B-1**  
**ALTERNATING BLOCK METHOD FOR**  
**RAINFALL DISTRIBUTION**

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

The Alternating Block Method can be utilized by 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 B-1 below shows this method for a 100-year, 2-hour duration storm with 20-minute time intervals.

**Example B-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 :**

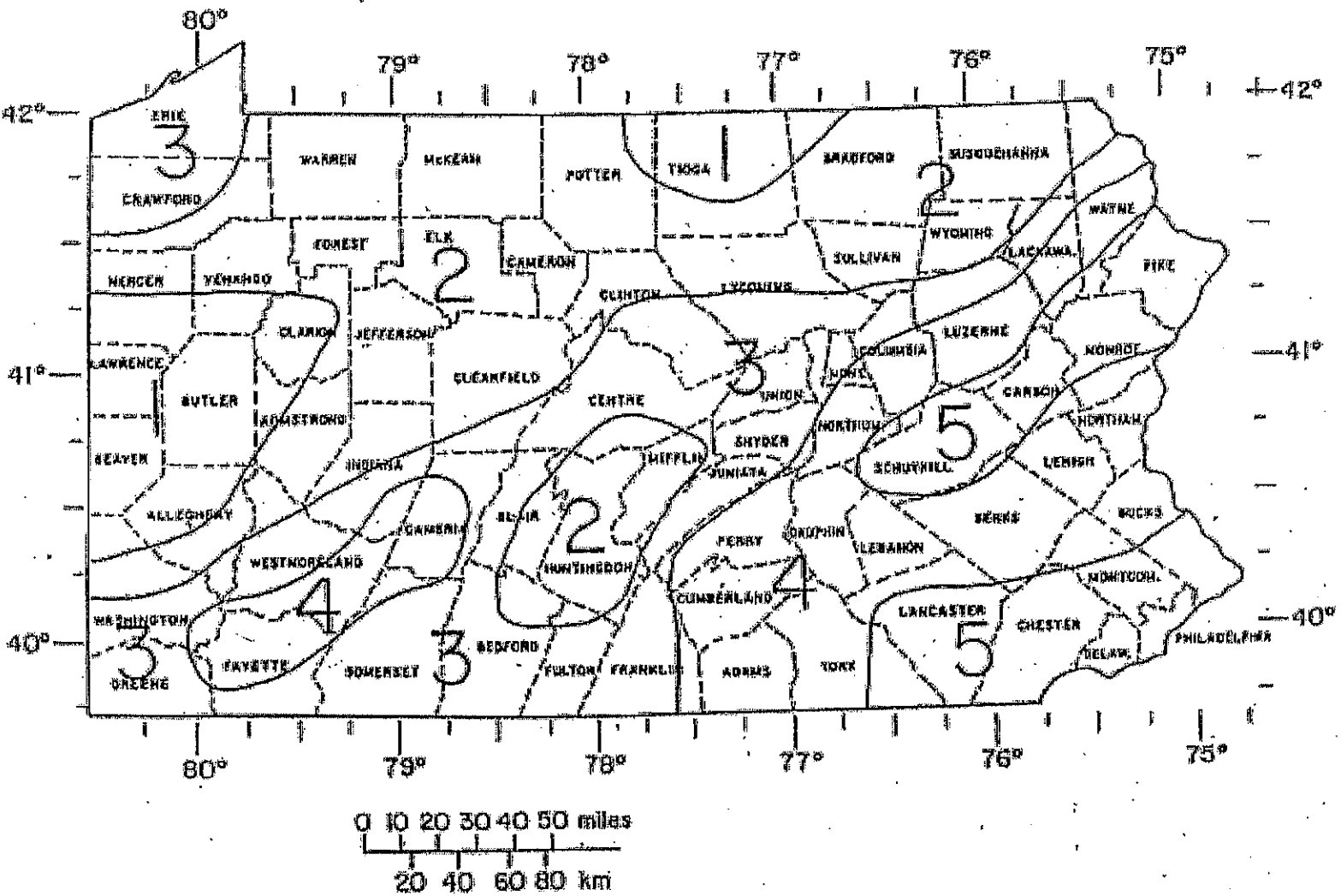
Values from Column (2) are derived from the appropriate rainfall chart based on the location of the site under analysis. (Region 4 in this example, therefore use Figure B-3)

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

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

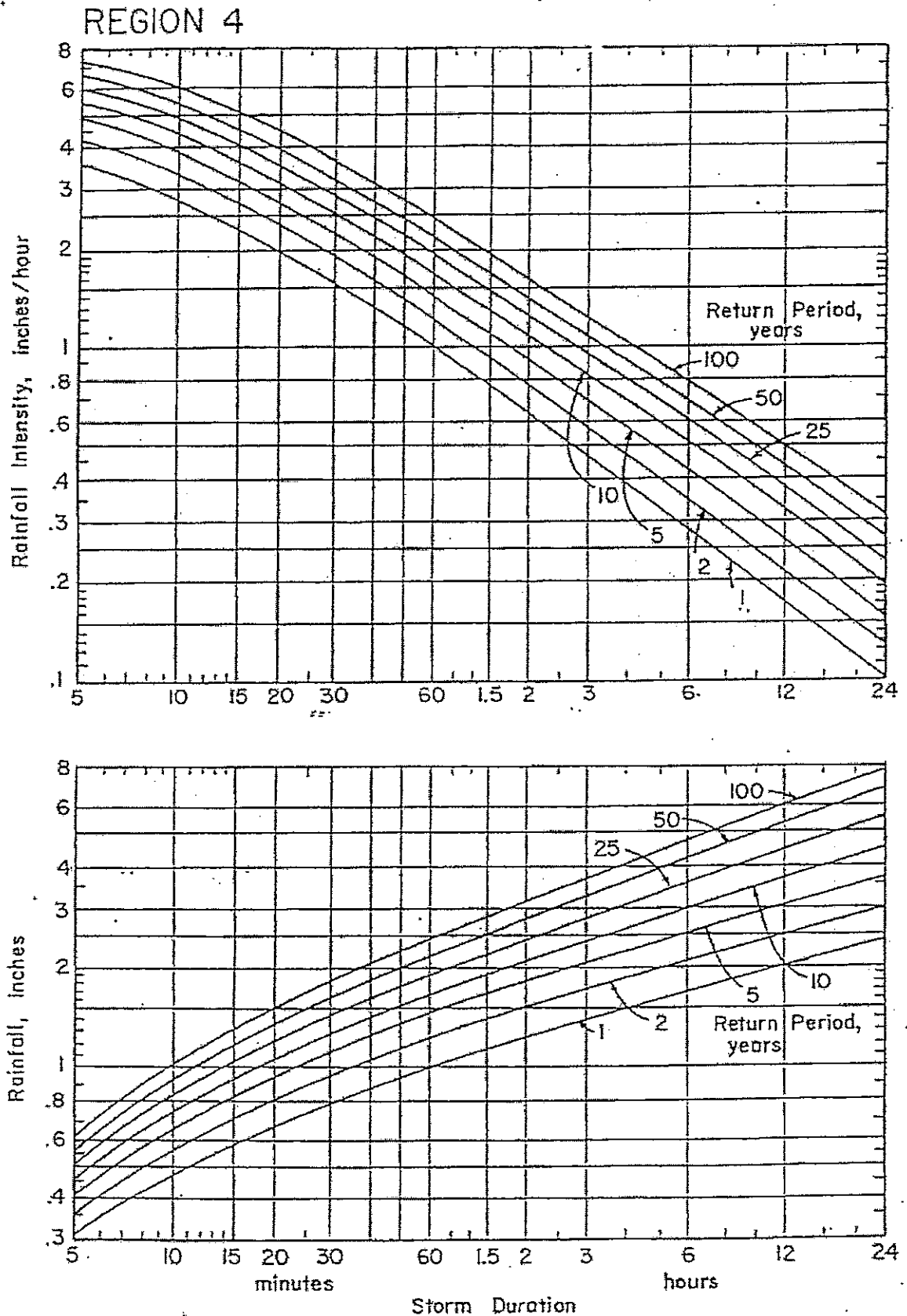
Column (5) is Column (4) rearranged with the maximum increment from Column (4) placed at the middle of the event (Time = 60 minutes, in this example), then rearranging the remaining values from Column (4) in descending order, alternately right and left (below and above) the central block.

FIGURE B-2  
PENNDOT DELINEATED REGIONS  
Source: Field Manual of Pennsylvania Department of Transportation, May 1986



**FIGURE B-3**  
**PENNDOT STORM INTENSITY-DURATION-FREQUENCY CURVE**  
**REGION 4**

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



**Table B-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 or less*	65	77	85	90
1/8 – 1/3 acre	34	59	74	82
1/3 – 1 acre	23	53	69	80
1 – 4 acres	12	46	66	78
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 assumed 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 B-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, etc.		.99	.99	.99	.99
Streets and roads :					
Paved with curbs and storm sewers		.99	.99	.99	.99
Gravel		.57	.76	.84	.88
Dirt		.49	.69	.80	.84

Notes: Values are based on 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 B-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 1/4 inch)	0.10	-	0.15
- small depths (1/4 inch to several inches)	0.05	-	0.10

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

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

(1) Depending upon type, coating and diameter

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



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

PennDOT Rainfall Region	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 B-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 design techniques are applied to low density or rural residential development.

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

## **ORDINANCE APPENDIX C**

### **Sample Drainage Plan Application and Fee Schedule**

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# ORDINANCE APPENDIX C

## Sample Drainage Plan Application and Fee Schedule

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

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

\_\_\_\_\_ Final Plan \_\_\_\_\_ Preliminary Plan \_\_\_\_\_ Sketch  
Plan

Date of Submission \_\_\_\_\_ Submission No. \_\_\_\_\_

1. Name of subdivision or development \_\_\_\_\_

2. Name of applicant \_\_\_\_\_ Telephone No. \_\_\_\_\_  
(if corporation, list the corporation's name and the names of two officers of the corporation)

\_\_\_\_\_  
\_\_\_\_\_  
Officer 1  
Officer 2

Address \_\_\_\_\_  
Zip \_\_\_\_\_

Applicant's interest in subdivision or development \_\_\_\_\_  
(if other than property owner give owners name and address)

3. Name of property owner \_\_\_\_\_ Telephone No. \_\_\_\_\_

Address \_\_\_\_\_  
Zip \_\_\_\_\_

4. Name of engineer or surveyor \_\_\_\_\_ Telephone No. \_\_\_\_\_

Address \_\_\_\_\_  
Zip \_\_\_\_\_

5. Type of subdivision or development proposed:

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

6. Linear feet of new road proposed? \_\_\_\_\_ L.F.

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

- a. Existing (to remain) \_\_\_\_\_ S.F. \_\_\_\_\_ % of property  
b. Proposed \_\_\_\_\_ S.F. \_\_\_\_\_ % of property

8. Stormwater

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

- b. Design storm used (on-site conveyance systems) (24-hr.) \_\_\_\_\_

No. of Subarea \_\_\_\_\_

Watershed Name \_\_\_\_\_

Explain: \_\_\_\_\_  
\_\_\_\_\_

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

- d. Number of subarea(s) from Ordinance Appendix D of the East Branch Perkiomen Watershed Stormwater Management plan \_\_\_\_\_

- e. Type of proposed runoff control: \_\_\_\_\_  
\_\_\_\_\_

- f. Does the proposed stormwater control criteria meet the requirement/guidelines of the stormwater ordinance(s)? \_\_\_\_\_

If not, what variances/waivers are requested? \_\_\_\_\_

Reasons \_\_\_\_\_  
\_\_\_\_\_

- g. Does the plan meet the requirements of Article III of the stormwater ordinance? \_\_\_\_\_  
\_\_\_\_\_

If not, what variances/waivers are requested? \_\_\_\_\_

Reasons \_\_\_\_\_  
\_\_\_\_\_

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

- i. What hydrologic method was used in the stormwater computations? \_\_\_\_\_  
\_\_\_\_\_

- j. Is a hydraulic routing through the stormwater control structure submitted? \_\_\_\_\_  
\_\_\_\_\_

- k. Is a construction or staging schedule attached? \_\_\_\_\_
- l. Is a recommended maintenance program attached? \_\_\_\_\_
9. Erosion and Sediment Pollution Control (E&S):
- a. Has the stormwater management and E&S plan, supporting documentation and narrative been submitted to the \_\_\_\_\_ County Conservation District?
- b. Date of Submission \_\_\_\_\_
- c. Total area of earth disturbance \_\_\_\_\_ S.F.
10. Wetlands
- a. Have the wetlands been delineated by someone trained in wetland delineation? \_\_\_\_\_
- b. Have the wetland lines been verified by a state or federal permitting authority? \_\_\_\_\_
- c. Have the wetland lines been surveyed? \_\_\_\_\_
- d. Total acreage of wetland within the property \_\_\_\_\_
- e. Total acreage of wetland disturbed \_\_\_\_\_
- f. Supporting documentation \_\_\_\_\_
11. Filing
- a. Has the required fee been submitted? \_\_\_\_\_  
Amount \_\_\_\_\_
- b. Has the proposed schedule of construction inspection to be performed by the applicant's engineer been submitted? \_\_\_\_\_
- c. Name of individual who will be making the inspections \_\_\_\_\_
- d. General comments about stormwater management at development: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

COMMONWEALTH OF PENNSYLVANIA  
COUNTY OF \_\_\_\_\_

\_\_\_\_\_  
Property Owner

SIGNATURE OF APPLICANT \_\_\_\_\_

\_\_\_\_\_ Township official submission receipt:

Fees \_\_\_\_\_ date fees paid \_\_\_\_\_ received by \_\_\_\_\_

Official submission receipt date\_\_\_\_\_

Received by \_\_\_\_\_

Township



**Drainage Plan  
Proposed Schedule of Fees**

Subdivision name \_\_\_\_\_ Submittal No. \_\_\_\_\_

Owner \_\_\_\_\_ Date \_\_\_\_\_

Engineer \_\_\_\_\_

1. Filing fee \$ \_\_\_\_\_
2. Land use
  - 2a. Subdivision, campgrounds, mobile home parks, and multifamily dwelling where the units are located in the same local watershed. \$ \_\_\_\_\_
  - 2b. Multifamily dwelling where the designated open space is located in a different local watershed from the proposed units. \$ \_\_\_\_\_
  - 2c. Commercial/industrial. \$ \_\_\_\_\_
3. Relative amount of earth disturbance
  - 3a. Residential
    - road <500 l.f. \$ \_\_\_\_\_
    - road 500-2,640 l.f. \$ \_\_\_\_\_
    - road >2,640 l.f. \$ \_\_\_\_\_
  - 3b. Commercial/industrial and other impervious area <3,500 s.f. \$ \_\_\_\_\_
  - impervious area 3,500-43,560 s.f. \$ \_\_\_\_\_
  - impervious area >43,560 s.f. \$ \_\_\_\_\_
4. Relative size of project
  - 4a. Total tract area <1 ac \$ \_\_\_\_\_
  - 1 - ac \$ \_\_\_\_\_
  - 5 - 5 ac \$ \_\_\_\_\_
  - 25 - 00 ac \$ \_\_\_\_\_
  - 100 - 00 ac \$ \_\_\_\_\_
  - >200 ac \$ \_\_\_\_\_
5. Stormwater control measures
  - 5a. Detention basins and other controls that require a review of hydraulic routings (\$ per control). \$ \_\_\_\_\_
  - 5b. Other control facilities which require storage volume calculations but no hydraulic routings. (\$ per control) \$ \_\_\_\_\_
6. Site inspection (\$ per inspection) \$ \_\_\_\_\_
- Total \$ \_\_\_\_\_

All subsequent reviews shall be 1/4 the amount of the initial review fee unless a new application is required as per Section 406 of the stormwater ordinance. A new fee shall be submitted with each revision in accordance with this schedule.

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## **ORDINANCE APPENDIX D**

### **Stormwater Management District Watershed Map**

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## **SECTION VII**

### **Priorities for Implementation**

The completion of this *East Branch Perkiomen Creek Stormwater Management Plan* (Plan) and its subsequent approval by DEP sets in motion the mandatory schedule of adoption of ordinances needed to implement the Plan's stormwater management criteria. The East Branch Perkiomen Creek watershed municipalities are required to adopt the necessary ordinance provisions no later than six months after DEP approval. The following items address the ongoing process of Plan implementation and include responsibilities for state, county, and municipal governments as well as those of landowners and developers.

#### **A. DEP Approval of the Plan**

Following draft adoption of the Plan by Bucks County, it was submitted to DEP for approval. The draft Plan with draft model ordinance was sent to DEP for review and comment prior to adoption of the Plan. The DEP review and approval process involved determination that all of the activities specified in the Scope of Study have been completed. The DEP also reviewed the Plan for consistency with municipal floodplain management plans, State programs that regulate dams, encroachments and other water obstructions; and state and Federal flood control programs. The review process also ensures that the Plan is consistent with the policies of Act 167.

#### **B. Publication and Distribution of the Plan Documents**

This *East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan* is composed of two parts:

- Volume I—Plan, Standards/Criteria, and Model Ordinance (this document); and
- Volume II—Technical Appendices.

Volume I—Plan, Standards/Criteria, and Model Ordinance presents information required to implement the plan, most importantly the Standards and Criteria for Stormwater Control (Section IV) and the model stormwater management ordinance (Section VI). Volume II—Technical Appendices contains data and information collected during the study.

Following DEP approval, the Bucks County Planning Commission published and provided two copies of Volume I of the Plan to each watershed municipality. Volume II will not have municipal distribution, but a copy will be available for reference at the Bucks County Planning Commission library.

#### **C. Municipal Adoption of Ordinance to Implement the Plan**

The essential ingredient for implementation of the stormwater management plan is the adoption of the necessary ordinance provisions by the East Branch Perkiomen Creek municipalities. Provided as part of this Plan is the Model Act 167 Stormwater Management Ordinance which is a single purpose stormwater ordinance that could be adopted by each municipality essentially "as is" to implement the Plan. The single purpose ordinance was chosen for ease of incorporation into the existing structure of municipal ordinances. All that is required of any municipality would be to adopt the ordinance itself and adopt the necessary provisions for tying into the existing subdivision and land development ordinance and zoning ordinance. The tying provisions would simply refer any applicable regulated

activities within the East Branch Perkiomen Creek watershed from the other ordinances to the single purpose ordinance. It is recommended that the delineation of the watershed subareas and the stormwater management criteria assigned to each subarea be enacted as part of each municipality's zoning or subdivision ordinance. Thus, the requirements for management of stormwater will be applicable to all changes in land use and not limited to activities that are subject to subdivision and land development regulations.

#### **D. Level of Government Involvement in Stormwater Management**

The existing institutional arrangements for the management of stormwater include federal, state, and county governments, as well as every municipality within the watershed.

In the absence of a single entity with responsibility for all aspects of stormwater management within a watershed, it is clear that the "management" that occurs is primarily a function of a multiple permitting process where a developer attempts to satisfy the requirements of all of the permitting agencies. Each public agency has established its own regulations based on its own objectives and legislative mandates as well as its own technical standards according to its particular stormwater concerns.

The minimum objectives of this Plan and the minimum mandates of Act 167 can be accomplished with relatively minor modification of existing institutional arrangements. Participation by the county in the technical review of stormwater management plans is necessary. In addition, there must be maintenance and operation of the computer model (as necessary), and compilation of data required for periodically updating the Plan. In addition, upon adoption of the Plan, all future public facilities, facilities for the provision of public utility services, and facilities owned or financed by state funds will have to be consistent with the Plan, even though they might not otherwise be subject to municipal regulation.

The primary municipal level activity will be the adoption or amendment of development regulations to incorporate watershed stormwater management standards. Act 167 requires that to be accomplished within six months of the Plan's adoption and approval. Model ordinance provisions will be distributed as part of this Plan document to all of the watershed municipalities. The Bucks County Planning Commission will be available upon request to assist municipalities in the adoption of the model ordinance provisions to fit particular municipal ordinance structures.

The primary county level activity will be the establishing of review procedures. The model ordinance calls for review of stormwater management plans for development sites by the county planning commission, and erosion and sediment pollution control plans by the county conservation district. Evidence that the appropriate state and federal agencies responsible for administering wetland regulatory programs have been contacted for land development sites containing regulated wetlands is also required. The purpose is to ensure that plan standards have been applied appropriately and that downstream impacts have been adequately addressed.

The county will also be responsible for the maintenance of data, for performance of review, and for the "no-harm" evaluation. The materials prepared by consultants during the plan preparation process that are needed in the development of site specific stormwater management plans, including data needed to perform the "no-harm" evaluation, must be maintained in a place and form that is accessible to users.

Stormwater management should also be viewed as part of the broader picture of comprehensive water resources management for a watershed. To sustain the integrity of the water resources that support our communities, it is necessary to encourage growth that does not compromise those same water resources. Comprehensive water resources management includes many facets such as water supply (i.e., groundwater and surface water), stormwater management, flood control, nonpoint source pollution control, and wastewater treatment/disposal/reuse. The *Pennridge Water Resources Plan*, July 2002, is a comprehensive water resources plan for the eight Pennridge Area municipalities. The main objectives of the plan are to protect the quantity and quality of surface water and groundwater resources for existing and future recreational, industrial, commercial, and residential users. Water resource management for the Pennridge Area requires a wide-ranging effort including activities such as identifying and protecting wellhead areas, minimizing discharges, and managing stormwater. Implementation of the *Pennridge Water Resources Plan* will be coordinated with current and future Act 167 stormwater management planning in the four major watersheds of the Pennridge Area, including the East Branch Perkiomen Creek. The plan document, maps, and information about Plan implementation are available on Hilltown Township's web page (<http://www.hilltown.org/pacc/>).

## **E. Countywide Coordination**

There are possible situations of stormwater management functions and concerns that may not be adequately addressed within the structure of the existing institutional arrangements or by the adoption and enforcement of new regulations at the municipal level, as outlined above.

For example, the construction of regional stormwater storage facilities (e.g., detention or retention basins) may offer an economic and technically sound alternative to the construction of individual, on-site detention basins. However, no organization exists that is capable of implementing such a concept. To do so would require a multimunicipal entity capable of planning, financing, constructing, operating, and maintaining the shared storage facilities in a manner similar to the management required for the collection, treatment, and disposal of sanitary wastes. The East Branch Perkiomen Creek watershed is a drainage system. All of its parts are interrelated. What happens upstream affects what happens downstream, and what happens downstream places limitations on what happens upstream. If runoff is not controlled in upstream communities, downstream communities will flood. However, if in a downstream community, the capacity of a drainage channel can be safely increased, more upstream runoff may be released, thus reducing somewhat the cost of required upstream control facilities.

The reduced storm frequency standard proposed in this Plan is the primary standard for managing stormwater on a watershed basis and is a very simple concept that can be implemented on a property-by-property basis. It is equitable and can be used to achieve the law's "no-harm" mandate. But the same technical tool that allowed the modeling of rainfall routing throughout the watershed and the development of a usable standard for property-level control, is also capable of testing numerous, technically feasible solutions that would work for combinations of properties and for combinations of subareas. Some of these potential solutions may be preferable to those that would result from the application of release rates to individual properties.

There are, of course, ways to work out agreements on a case-by-case basis to accomplish almost any objective, whether a public or a private undertaking. However, as the number of stormwater detention and control facilities increases during future years, continuing maintenance to ensure the integrity of structures and their performance will become very important. A proliferation of "special agreements" to handle special situations may make future accountability very difficult.

An ideal structure for the management of stormwater on a watershed basis would be an entity, a regional stormwater management board, capable of dealing with all interrelated elements of the system to achieve the following:

- The best possible technical solutions in the most effective manner;
- The efficient and competent review of stormwater management components of development plans;
- The continued maintenance and proper functioning of all elements of the system;
- The repair and replacement of system components as necessary;
- Continuing monitoring and evaluation of the performance of the drainage system;
- Updating and revision of system requirements and standards as necessary;
- Responsible financial management including an equitable apportionment of operating and capital costs among the system's users and beneficiaries.

It is clear that not all of these objectives can be achieved on a watershed basis through municipal implementation of the stormwater plan, but that the existence of an intermunicipal entity capable of continuous action at the system or watershed level is required.

An optimum management system would be an entity capable of performing similar functions for multiple watersheds, a county-level stormwater management institution. There is a variety of models for such an entity, ranging from assigning new responsibilities to a coordinated team of existing county departments to the creation of a regional stormwater management board with a charter specific to stormwater management functions. Further, under any management system, some of the elements in the process could be contracted out as necessary to a private vendor.

The essential concept is that stormwater can be managed like a public utility and that the costs for planning, construction, operation and maintenance, monitoring and evaluation can be equitably shared by all of the system's users.

A basic assumption underlying the concept of user financing of stormwater management is that damage caused by existing and potential stormwater runoff without controls is intolerable. Therefore, it is in the public interest to undertake stormwater management immediately, and such management should not be delayed until federal and state funding is available.



Based on stormwater management experience elsewhere, users (including beneficiaries) can finance the full cost of stormwater management inexpensively and equitably. The cost to each user is calculated based on user's property characteristics. Because this method is based on a formula, it has the advantage of being objective in its application.

Financing stormwater management is an issue that is still vague and relatively uncertain due to the differences in the way the municipalities in the watershed approach stormwater management. This Plan can be used as a tool for beginning to evaluate how to finance stormwater management watershedwide, not only from the new development perspective, but also from the aspect of financing retrofitting projects for areas which are plagued by stormwater problems. It would be highly desirable to investigate the formation of an entity in the county which could be responsible for establishing the guidelines for financing issues.

## **F. Correction of Existing Drainage Problems**

The development of the watershed plan has provided a framework for the correction of existing drainage problems, a logical first step in the process of implementation of a stormwater management ordinance. It will prevent the worsening of existing drainage problems and prevent the creation of new drainage problems as well. The step-by-step outline below is by no means a mandatory action to be taken by the municipalities with watershed plan adoption options, it is just one method of solving problems uniformly throughout the watershed in order to solve current runoff situations.

1. Rank storm drainage problems within the municipalities based on frequency of occurrence, potential for injury, and damage history.
2. Develop a detailed engineering evaluation to determine the exact nature of the top priority drainage problems within the municipalities in order to determine solutions cost estimates and a recommended course of municipal action.
3. Incorporate implementation of recommended solutions regarding stormwater runoff in the annual municipal capital or maintenance budget.

## **G. Culvert Replacement**

The general procedures for municipalities to determine size of replacement culverts using Act 167 data is as follows:

1. For each municipality, determine the location of obstruction, assign an obstruction number, and record it on the Obstruction Map (Section II, Figure II-11).
2. From Section 105.161 of DEP's Chapter 105, determine the design storm frequency.
3. From "Municipal Stream Obstruction Data" tables in Section II of the Plan, locate the municipality and obstruction number. Locate the flow value (cfs) for the design storm frequency determined in #2 above.

4. Have the culvert sized for the determined design flow and obtain any necessary approvals/permits.

Note: Any culverts/stream crossings not identified on the Obstruction Map would need to have storm flows computed for sizing purposes.

## **H. PENNVEST Funding**

One way in which the completion and implementation of this plan can be of assistance in addressing storm drainage problems is by opening the avenue of funding assistance through the PENNVEST program. The PENNVEST Act of 1988, as amended, provides low interest loans to governmental entities for the construction, improvement or rehabilitation of stormwater projects including the transport, storage and infiltration of stormwater and best management practices to address non-point source pollution associated with stormwater.

To qualify for a loan under PENNVEST, the municipality or county:

1. Must be located in a watershed for which there is an existing county-adopted and DEP-approved stormwater plan with enacted stormwater ordinances consistent with the plan, or
2. Must have enacted a stormwater control ordinance consistent with the Stormwater Management Act (e.g., the Model Act 167 Stormwater Management Ordinance in Section VI of this Plan).

## **I. Landowner's/Developer's Responsibilities**

Any landowner and any person engaged in the alteration or development of land that may affect stormwater runoff characteristics shall implement such measures consistent with the provisions of the applicable watershed stormwater plan as are reasonably necessary to prevent injury to health, safety, or other property. Such measures shall include such actions as are required:

1. To ensure the maximum rate of stormwater runoff is no greater after development than prior to development activities; or
2. To manage the quantity, velocity and direction of resulting stormwater runoff in a manner that otherwise adequately protects health and property from possible injury.

Many developers throughout the state, after realizing the natural resource, public safety, and potential economic advantages of proper stormwater management, are constructing development consistent with natural resources protection objectives by using best management practices such as those presented in this Plan.

## **SECTION VIII**

### **Plan Review Adoption and Updating Procedures**

#### **A. County Adoption**

Prior to plan completion, the Bucks County Planning Commission transmitted a sample of the proposed model stormwater ordinance for review to affected municipal planning commissions, local governing bodies, the Watershed Plan Advisory Committee, and other interested parties. Following review and comment on the model ordinance, the Bucks County Planning Commission then transmitted the draft stormwater management plan which included the revised draft ordinance for review to the governing body of each involved municipality, the County Conservation District, and the Watershed Plan Advisory Committee (WPAC) by official correspondence. That review included an evaluation of the plan's consistency with other plans and programs affecting the watershed. The reviews and comments received by the county were tabulated and the Plan was revised as necessary.

Bucks County held a public meeting. A notice for the hearing was published two weeks prior to the hearing date. The meeting notice contained a summary of the principal provisions of the Plan and listed the places where copies of the Plan could be examined or obtained within each municipality. The comments received at the public hearing were reviewed by the county and appropriate modifications to the Plan were made.

The Plan was adopted via a resolution by the county commissioners. The resolution included references to the text of the Plan, maps, plates, and model ordinance. The County resolution was recorded in the minutes of a regular meeting of the Bucks County commissioners.

Bucks County then submitted a letter of transmittal and three copies of the adopted plan, the review by each affected municipal planning agency and local governing body and the Bucks and Montgomery county planning commissions, public hearing notice and minutes, and the resolution of adoption of the Plan by the county to the Department of Environmental Protection. The letter of transmittal stated that Bucks County has complied with all procedures outlined in Act 167 and requested that the Department of Environmental Protection approve the adopted plan.

#### **B. Provisions for Plan Revision**

Section 5 of the Stormwater Management Act requires that the stormwater management plan be updated at least every five years. This requirement considers the changes in land use, obstructions, flood control projects, floodplain identification, and management objectives or policy that may take place within the watershed.

It will be necessary to collect and manage the required data in a consistent manner and preferably store it in a central location. The data can be used to prepare an updated plan, but also, if required, to make interim runs of the runoff simulation model to analyze the impact of a proposed major development or a proposed major stormwater management facility.

The following recommendations are the minimum requirements to maintain an effective technical position for periodically reviewing and revising the Plan.

1. It is recommended that the Bucks County Board of Commissioners and the Montgomery County Board of Commissioners authorize the respective county planning commissions to undertake the task of organizing stormwater management plans and supporting data submitted for review. The planning commissions should also assume responsibility for periodically reviewing, revising, and updating the stormwater management plan.
2. It is recommended that the Bucks County Planning Commission prepare a workable program for the identification, collection, and management of the required data. The program should not be limited to the cooperative efforts of the constituent member municipalities within the East Branch Perkiomen watershed, but should also include both state and county agencies concerned with stormwater management.
3. It is recommended that the Watershed Plan Advisory Committee convene once every other year or as needed to review the stormwater management plan and determine if the Plan is adequate for minimizing the runoff impacts of new development. At a minimum, the information (to be reviewed by the committee) will be as follows:
  - a. Development activity data as monitored by the Bucks County Planning Commission;
  - b. Information regarding additional storm drainage problem areas as provided by the municipal representatives to the Advisory Committee;
  - c. Amendments to municipal zoning and subdivision/land development ordinances within the watershed;
  - d. Impacts associated with any regional or subregional detention alternatives implemented in the watershed;
  - e. Adequacy of the administrative aspects of regulated activity review;
  - f. Additional hydrologic data available through preparation of the stormwater management plan for the East Branch Perkiomen watershed.

The committee will review the above data and make recommendations to the County for revisions to the *East Branch Perkiomen Creek Watershed Stormwater Management Plan*. Bucks County will review the recommendations of the Watershed Plan Advisory Committee and determine if revisions are to be made. A revised Plan would be subject to the same rules of adoption as the original Plan. Should the county determine that no revisions to the Plan are required for a period of five consecutive years, the county will adopt a resolution stating that the Plan has been reviewed and been found satisfactory to meet the requirements of Act 167. The resolution will then be forwarded to the Department of Environmental Protection.

## SECTION IX

### Watershed Plan Advisory Committee and Public Review

#### A. Watershed Plan Advisory Committee (WPAC) Meetings

Meetings of the Watershed Plan Advisory Committee (WPAC) were held at various points throughout the preparation and adoption of the *East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan*.

WPAC meetings dates and their intended purposes were as follows:

Meeting	Date	Purpose
1	3/28/00	Introduction to Stormwater Management Review Act 167. Distribution of data collection forms.
2	12/07/00	Discussion of problem areas, and Municipal Ordinance Matrix and distribution of sample ordinance.
3	12/17/02	Summary of modeling results, ordinance review, distribute draft plan.
4	10/23/03	Joint WPAC and Municipal Engineer Committee (MEC) meeting to discuss the implementation of the plan standards.
5	11/13/03	Best management practices (BMP) workshop for WPAC and municipal representatives.

#### B. Public Review Comments

The public review comments received during the plan preparation process and the responses to those comments are included in the remainder of this section. Written comments were received from the following reviewers and responded to by Borton-Lawson Engineering:

East Branch Perkiomen Creek			
Borough/Township	Reviewer	Date	Response Date
Silverdale	Township Engineer (Volberg)	10/23/03	11/03/03
Dublin	Borough Engineer (Zarko)	10/22/03	11/03/03
Dublin	Borough Manager (Williams)	10/23/03	11/03/03
Hilltown, East Rockhill, West Rockhill	Township Engineer (Janetka)	No date	11/03/03
Telford	Borough Manager (Fournier)	03/12/03	04/12/03
Perkiomen	Township Engineer (Hand)	03/05/03	04/12/03
Dublin	Township Solicitor (Howard)	02/12/03	04/12/03
Hilltown, East Rockhill, West Rockhill	Township Engineer (Wynn)	02/10/03	04/12/03

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## Public Review Comments

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## SECTION X

### EPA's Phase II NPDES Permit Program

#### Introduction

The U.S. Environmental Protection Agency (EPA) requires, under the Phase II Regulation (adopted on October 28, 1999) of the National Pollutant Discharge Elimination System (NPDES), that owners and operators of small, urbanized municipal separate storm sewer systems (MS4s) reduce the pollutant loading from regulated systems to the "maximum extent practicable" in order to protect the Waters of the United States. EPA has required that this be accomplished through a permitting program established by the states. The affected municipalities are required to obtain a permit from the state by March 10, 2003. Municipalities required to implement the MS4 program must address the six minimum control measures listed below:

- Public Education and Outreach
- Public Involvement/Participation
- Illicit Discharge Detection and Elimination
- Construction Site Storm Water Runoff Control
- Postconstruction Stormwater Management in New Development and Redevelopment
- Pollution Prevention/Good Housekeeping for Municipal Operations

At a minimum, municipal entities regulated under MS4 *must*:

- Specify best management practices (BMPs) and implement them to the "maximum extent practicable;"
- Identify measurable goals for control measures;
- Develop implementation schedule of activities or frequency of activities;
- Define the entity responsible for implementation.

The affected municipalities must, if they already do not have one in place, develop a stormwater management program. If a municipality has an established stormwater management program and is subject to the provisions of the Phase II Rule, provisions of the rule must be implemented to satisfy the requirements.

#### BMPs for Six Minimum Control Measures

Best management practices (BMPs) for stormwater management are: recognized practices; schedules of activities; prohibited practices; maintenance procedures; and use of pollution control devices and other means to prevent or reduce the amount of pollutant loading being discharged in stormwater runoff, into water bodies of the U.S. The stormwater management program must specify BMPs for the following six minimum control measures:

##### Minimum Control Measure #1—Public Education and Outreach on Stormwater Impacts

- Municipality *must* implement a public education program, including distributing educational materials that:
  - describe impacts of stormwater
  - describe steps to reduce stormwater pollution

- Municipality *should* inform households and individuals about steps they can take such as:
  - proper septic system maintenance
  - limiting use and runoff of garden chemicals
  - local stream restoration
  - storm drain marking
  - stream bank protection
- Municipality *should* direct information to commercial, industrial, and institutional entities likely to cause stormwater impacts.
 

Examples include:

  - restaurants (potential grease clogging/blocking of storm drains)
  - auto service facilities
- Municipalities *should* address viewpoints and concerns of:
  - minorities
  - disadvantaged
  - development/construction
  - business
  - education
  - government entities
  - industry

#### **Minimum Control Measure #2—Public Involvement/Participation**

- Municipality *must* comply with state and local public notice requirements (adoption of stormwater management program, policies, ordinances, etc.)
- Municipality *should* involve the public in developing, implementing and reviewing stormwater management program:
  - Reach out to and engage all economic and ethnic groups;
  - Consider establishing a citizen group to participate in decision-making;
  - Work with volunteers.

#### **Minimum Control Measure #3—Illicit Discharge Detection and Elimination**

- Municipality *must* develop stormwater system maps:
  - Show location of major pipelines, outfalls, and topography;
  - Show areas of concentrated activities likely to be a source of stormwater pollutants.
- Municipality *must* effectively prohibit illicit discharges into MS4 system:
  - Use ordinances, orders, etc.;
  - Implement enforcement procedures/actions.
- Municipality *must* implement a plan to detect illicit discharges and illegal dumping.

- Municipality *must* inform public employees, businesses, and citizens of hazards arising from illegal discharges and improper disposal of waste.

#### Minimum Control Measure #4—Construction Site Stormwater Runoff Control

- Municipality *must* develop, implement, and enforce a program to reduce nonpoint stormwater runoff from construction activities to regulated MS4s:
  - Control construction sites greater than or equal to one acre;
  - Use an ordinance that controls erosion and sedimentation;
  - Control construction site waste materials (discarded building material, concrete washout, sanitary waste).
- Municipality's program *must* include:
  - requirement for construction site owners or operators to implement BMPs
  - pre-construction review of site plans
  - procedures to receive and consider public input
  - regular inspections during construction
  - penalties to ensure compliance

#### Minimum Control Measure #5—Postconstruction Stormwater Management in New Development and Redevelopment

To maintain predevelopment runoff conditions:

- Municipality *must* develop, implement, and enforce a program to address stormwater runoff from new development and redevelopment projects:
  - Land disturbance sites greater than or equal to one acre and discharge to regulated MS4;
  - Project sites that discharge to MS4.
- Municipality's program *must*:
  - Include site-appropriate, cost-effective structural and nonstructural BMPs;
  - Ensure long-term ownership and maintenance of BMP connected to regulated MS4s;
  - Ensure that controls are in place that prevent or minimize water quality impacts.
- Municipality's program *should* include structural and nonstructural BMPs.
  - locally-based watershed planning
  - preventative measures to prevent or minimize water quality impacts

EPA *recommends* (for Minimum Control Measure #5):

- BMPs that minimize water quality impacts;
- BMPs that maintain predevelopment runoff conditions;

- Nonstructural BMPs that emphasize management and source controls such as:
  - policies and ordinances that protect natural resources and prevent runoff
  - limiting growth to identified areas
  - protecting sensitive areas such as wetlands
  - minimizing the amount of impervious surfaces
  - maintaining open space
  - minimizing disturbance of soils and vegetation
- Structural BMPs that may include:
  - storage facilities (retention/detention ponds)
  - filtration facilities (grassed swales, sand filters, filter strips)
  - infiltration facilities (recharge basins, porous pavement)

#### **Minimum Control Measure #6—Pollution Prevention/Good Housekeeping for Municipal Operations**

A municipality must develop and implement a cost-effective infrastructure, operations, and maintenance (O&M) program to prevent or reduce pollutant runoff from municipal operations.

- Municipality *must* provide employee training:
  - park and open space maintenance
  - fleet maintenance
  - planning
  - building management
  - stormwater system maintenance

EPA *recommends* (for minimum Control Measure #6) that, at a minimum, Municipality *consider* the following as components of the Municipality's program:

- maintenance activity schedules and inspections to reduce floatable and other pollutants
- controls for reducing pollutants from streets, parking lots, yards, and solid waste operations
- proper disposal of waste removed from storm drains
- assessment of water quality impact of new flood control projects
- maximization of current activities before adding new ones

# GLOSSARY

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

**Agricultural Activities** The work of producing crops and raising livestock including tillage, plowing, disking, harrowing, pasturing, and installation of conservation measures. Construction of new buildings or impervious area is not considered an agricultural activity.

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

**Applicant** A landowner or developer who has filed an application for approval to engage in any regulated activities of land subdivision and/or land development.

**Best Management Practice (BMP)** Stormwater structures, facilities, and techniques to control, maintain, or improve the quantity and/or quality of surface runoff.

**Channel Erosion** The widening, deepening, and headward cutting of small channels and waterways, due to erosion caused by moderate to large floods.

**Cistern** An underground reservoir or tank for storing rainwater.

**Conservation District(s)** The Bucks County Conservation District and/or the Montgomery County Conservation District.

**Curve Number (also known as the SCS Runoff Curve Number or CN)** A number between 0 and 100 that represents a convenient representation of potential maximum soil and cover retention.

**Culvert** A structure with appurtenant works, which carries a stream under or through an embankment, or fill.

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

**DEP** The Pennsylvania Department of Environmental Protection.

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

**Designee** The agent of the [municipality's name] Planning Commission and/or agent of the governing body involved with the administration, review or enforcement of any provisions of this ordinance by contract or memorandum of understanding.

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

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

**Detention Basin** An impoundment structure designed to manage stormwater runoff by temporarily storing the runoff and releasing it at a predetermined rate.

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

**Developer** A person, partnership, association, corporation, or other entity, or any responsible person therein or agent thereof, that undertakes any regulated activity of land development.

**Development Site** The specific tract of land for which a regulated activity is proposed.

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

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

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

**Drainage Permit** A permit issued by the municipal governing body after the drainage plan has been approved. Said permit is issued prior to or with the final municipal approval.

**Drainage Plan** The documentation, typically required by municipal ordinance, of the stormwater management system to be used for a given development site.

**Earth Disturbance** Any activity including, but not limited to, construction, mining, timber harvesting, and grubbing which alters, disturbs, and exposes the existing land surface.

**Erosion** The movement of soil particles by the action of water, wind, ice, or other natural forces.

**Erosion and Sediment Pollution Control Plan** A plan that is designed to minimize accelerated erosion and sedimentation.

**ERSAM Existing Resource and Site Analysis Map.**

**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 antidegradation).

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

**Flood** A general but temporary condition of partial or complete inundation of normally dry land areas from the overflow of streams, rivers, and other Waters of the Commonwealth.

**Floodplain** Any land area susceptible to inundation by water from any natural source or delineated by applicable Department of Housing and Urban Development, Federal Insurance Administration Flood Hazard Boundary—mapped as being a special flood hazard area. Also included are areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania

Department of Environmental Protection (PaDEP) *Technical Manual for Sewage Enforcement Officers* (as amended or replaced from time to time by PaDEP).

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

**Forest Management/Timber Operations** Planning and 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, site preparation, 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 ridge. The space is required as a safety margin in a pond or basin.

**Grade** A slope, usually of a road, channel, or natural ground specified in percent and shown on plans as specified herein.

**(To) Grade** To finish the surface of a roadbed, top of embankment, or bottom of excavation.

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

**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).

**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).

**Impervious Surface** A surface that prevents the percolation of water into the ground.

**Impoundment** A pond, lake, tank, basin, or other space, either natural or created in whole or in part by the building of engineering structures, which is used for storage, regulation, and control of water. Also, a retention or detention basin designed to retain stormwater runoff and release it at a controlled rate.

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

**Inlet** A surface connection to a closed drain. A structure at the diversion end of a conduit. The upstream end of any structure through which water may flow.

**Land Development** (i) the improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving (a) a group of two or more buildings, or (b) the division or allocation of land or space between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups, or other features; (ii) any subdivision of land; (iii) development in accordance with Section 503(1.1) of the PA Municipalities Planning Code.

**Land Earth Disturbance** Any activity involving grading, tilling, digging, or filling of ground or stripping of vegetation or any other activity that causes an alteration to the natural condition of the land.

**Main Stem (Main Channel)** Any stream segment or other runoff conveyance facility used as a reach in a watershed hydrologic model.

**Manning Equation in (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.

**Municipality** A borough or township in Bucks and/or Montgomery Counties, 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.

**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 where water flows from a conduit, stream, or drain.

**Outlet** Points of water disposal from a stream, river, lake, tidewater or artificial drain.

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

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

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

**PMF - Probable Maximum Flood** The flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in any area. The PMF is derived from the probable maximum precipitation (PMP) as determined based on data obtained from the National Oceanographic and Atmospheric Administration (NOAA).

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

**Reach** A segment of channel, stream or river and its floodplain with similar hydraulic (velocity, depth, width) properties.

**Regulated Activities** Actions or proposed actions that have an impact on stormwater runoff and that are specified by ordinance (e. g., Section 104 of the model ordinance in Section VI of this Plan).

**Release Rate** The percentage of predevelopment peak rate of runoff from a site or subarea to which the postdevelopment peak rate of runoff must be reduced to protect downstream areas.

**Retention Basin** An impoundment in which stormwater is stored and not released during the storm event. Stored water may be released from the basin at some time after the end of the storm.



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

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

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

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

**SALDO** Subdivision and land development ordinance.

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

**Sediment Pollution** The placement, discharge or any other introduction of sediment into the Waters of the Commonwealth occurring from the failure to design, construct, implement, or maintain control measures and control facilities.

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

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

**Sheet Flow** Runoff that flows over the ground surface as a thin, even layer, not concentrated in a channel.

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

**Soil Group, Hydrologic** 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.

**Source Water Protection Area (SWPA)** The zone through which contaminants are likely to migrate and reach a drinking water well or surface water intake.

**Spillway** A depression in the embankment of a pond or basin that is used to pass peak discharge greater than the maximum design storm controlled by the pond.

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

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

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

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

**Stormwater Management 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 Plan** The plan for managing stormwater runoff in a DEP-designated watershed as required by the Pennsylvania Stormwater Management Act of October 4, 1978, P.L. 864, (Act 167). Also known as an Act 167 Plan.

**Stormwater Management Site Plan** The plan prepared by the developer or his representative indicating how stormwater runoff will be managed at the particular site of interest.

**Stream Enclosure** A bridge, culvert or other structure in excess of 100 feet in length upstream to downstream that encloses regulated Waters of the Commonwealth.

**Subarea** The smallest drainage unit of a watershed for which stormwater management criteria has been established in the Stormwater Management Plan.

**Subbasin** See "Subarea."

**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, transfer of ownership, or building or lot development.

**Subwatershed** See "Subarea."

**Swale** A low-lying stretch of land which 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 and flow time in pipes or channels, if any.

**Watercourse** A river, brook, creek, channel, or ditch for water, whether natural or manmade.

**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 of Pennsylvania.

**Wellhead** The point at which a groundwater well bore hole meets the surface of the ground.

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

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

## REFERENCES

Delaware Riverkeeper Network. *Stormwater Runoff, Lost Resource or Community Asset*. Washington Crossing, Pennsylvania, March 2001.

Maryland Department of the Environment. *Maryland Stormwater Design Manual*. Baltimore, Maryland, October 2000.

New Jersey Department of Environmental Protection. *New Jersey and Nonpoint Source Pollution Control Best Management Practices Manual*. Trenton, New Jersey, Draft. March 2000.

Pennsylvania Association of Conservation Districts, Inc. *Pennsylvania Handbook of Best Management Practices for Developing Areas*. Harrisburg, Pennsylvania, 1998.

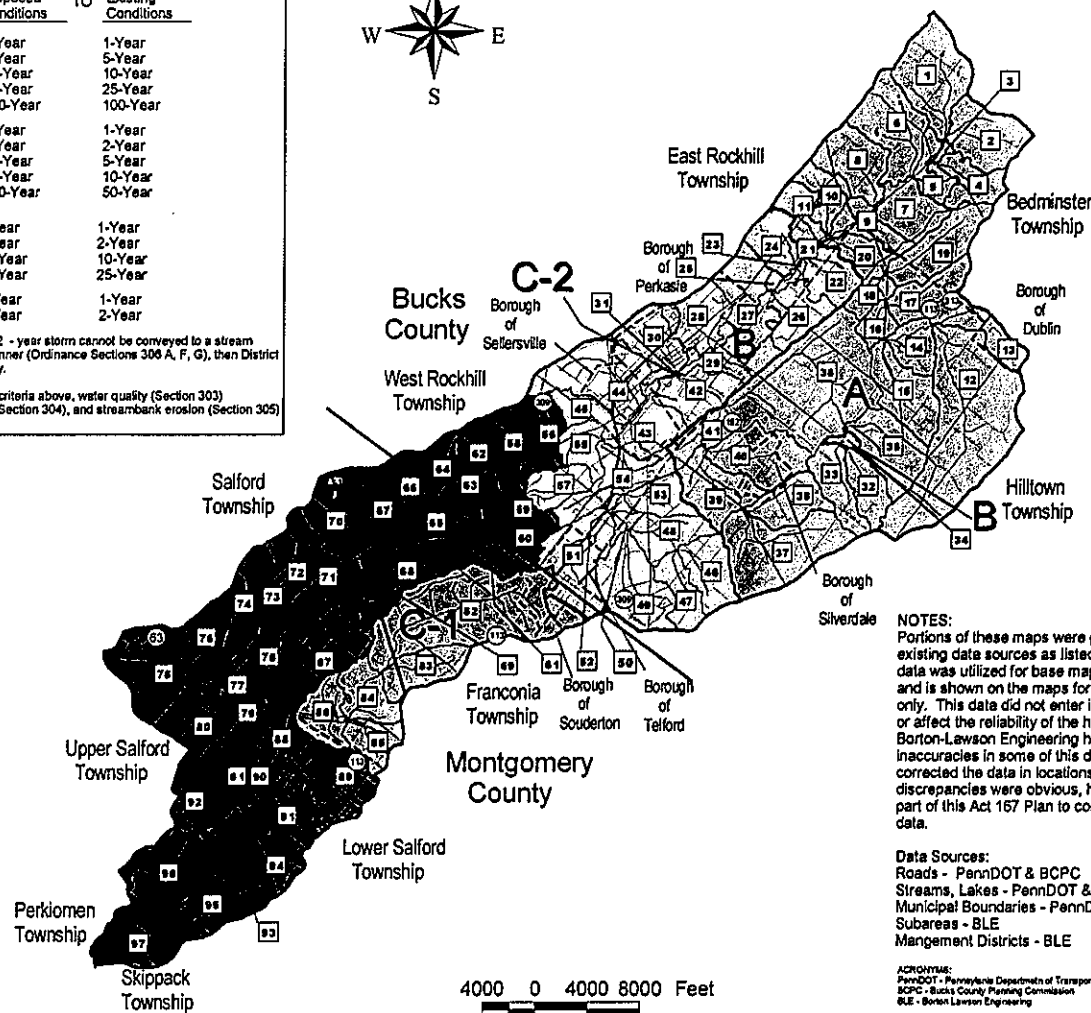
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# Management District Legend

	Design Storm Proposed Conditions	TO	Design Storm Existing Conditions
<b>A</b>	2-Year 5-Year 10-Year 25-Year 100-Year		1-Year 5-Year 10-Year 25-Year 100-Year
<b>B</b>	2-Year 5-Year 10-Year 25-Year 100-Year		1-Year 5-Year 10-Year 50-Year
<b>C-1</b>	2-Year 5-Year 10-Year 25-Year		1-Year 5-Year 10-Year 25-Year
<b>C-2</b>	2-Year 5-Year		1-Year 2-Year

\* If storms greater than the 2 - year storm cannot be conveyed to a stream or watercourse in a safe manner (Ordinance Sections 306 A, F, G), then District C-1 requirements shall apply.

In addition to the ordinance criteria above, water quality (Section 303) the ground water recharge (Section 304), and streambank erosion (Section 305) shall also apply.

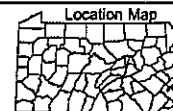


4000 0 4000 8000 Feet

**NOTES:**  
Portions of these maps were generated from existing data sources as listed below. This existing data was utilized for base mapping purposes and is shown on the maps for spatial reference only. This data did not enter into any computations or affect the reliability of the hydrologic analysis. Barton-Lawson Engineering has found some inaccuracies in some of this data and has corrected the data in locations where these discrepancies were obvious, however, it was not a part of this Act 167 Plan to correct all the base data.

**Data Sources:**  
Roads - PennDOT & BCPC  
Streams, Lakes - PennDOT & BCPC  
Municipal Boundaries - PennDOT, BLE & BCPC  
Subareas - BLE  
Management Districts - BLE

**ACRONYMS:**  
PennDOT - Pennsylvania Department of Transportation  
BCPC - Bucks County Planning Commission  
BLE - Barton-Lawson Engineering



## Management Districts

East Branch Perkiomen Creek Watershed  
Bucks County, PA

ACT 167  
Stormwater Management Plan  
Phase II

## Appendix - D

### Map Legend

- Watershed Boundary
- County Boundary
- Municipal Boundaries
- Streams
- Water Bodies
- Interstate Roads
- PA. Traffic Routes
- State Routes
- Local Roads
- Subarea

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