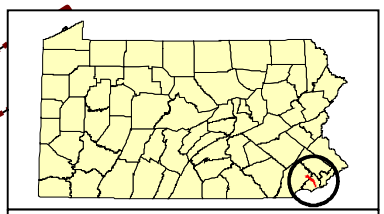
ORDINANCE APPENDIX A

WATERSHED STORMWATER MANAGEMENT
DISTRICT MAPS

CRUM CREEK
PHASE II - ACT 167 STORMWATER MANAGEMENT PLAN



TREDYFFRIN
EASTTOWN
MALVERN
NEWTOWN
WILLISTOWN
EDGMONT
MARPLE
UPPER PROVIDENCE
SPRINGFIELD
MEDIA
MORTON
SWARTHMORE
RUTLEDGE
NETHER PROVIDENCE
RIDLEY
RIDLEY PARK
EDDYSTONE
MONTGOMERY COUNTY
DELAWARE COUNTY
CHESTER COUNTY
DELAWARE COUNTY
Crum Creek
Lewis Run
Reese Run
Preston Run
Hunter Run
Trout Run
Springton Reservoir
Holland Run
Darby Creek
Darby-Crum Creek
Delaware River
PENNSYLVANIA
NEW JERSEY
A
B
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79

Management District Legend

District	Design Storm Proposed Conditions		Design Storm Existing Conditions
A	2-Year 5-Year 10-Year 25-Year 50-Year 100-Year	Reduce To	1-Year 5-Year 10-Year 25-Year 50-Year 100-Year
B	2-Year 5-Year 10-Year 25-Year 50-Year 100-Year	Reduce To	1-Year 2-Year 5-Year 10-Year 25-Year 100-Year

1.25 0.625 0 1.25
1 Inch = 1.25 Miles

APPENDIX A
MANAGEMENT DISTRICTS

Prepared For:
Delaware County Planning Department
Courthouse and Government Center Bldg
201 West Front Street
Media, PA 19063
610-891-5200

Legend

- WATERSHED BOUNDARY
- SURFACE WATER
- STREAMS
- SUBAREAS
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES

Roads

- INTERSTATE
- US HIGHWAY
- PA HIGHWAY
- OTHER ROADS

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

DATA SOURCES:
Watershed Boundary - PADEP
State Roads - PennDOT, 2004
Local Roads - PennDOT, 2001
Counties - PennDOT, 2002
Municipalities - PennDOT, 2001
Streams - PaDEP/ERRI, 2001
Lakes - Aqua America, 2001
Delaware River - USFWS (derived from NWI coverages)
Management Districts/ Subareas - Delineated by Borton-Lawson, 2006

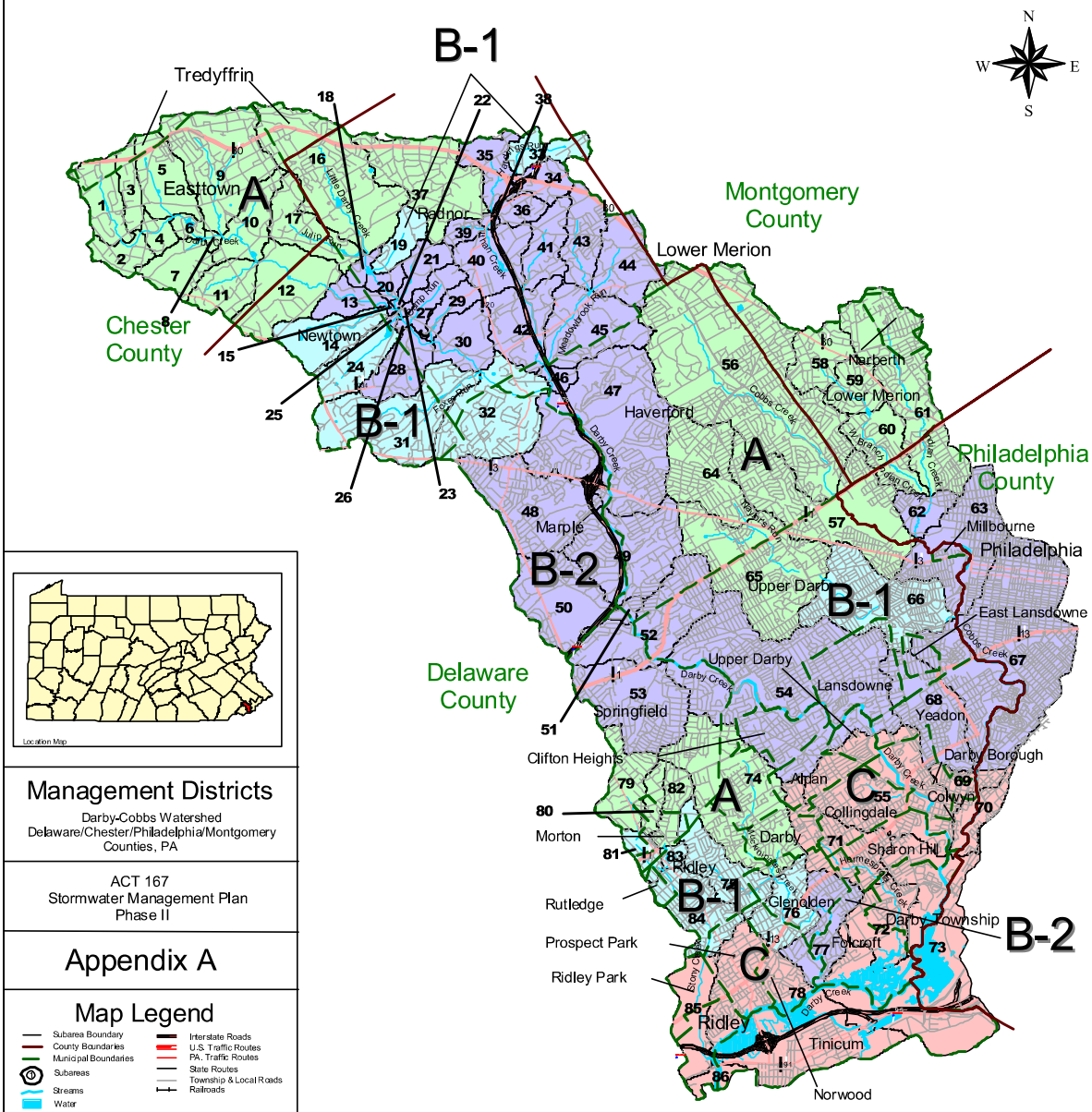
Borton Lawson ENGINEERING

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

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

PREPARED BY: WSB CHECKED BY: SJD
Date: 10/08/2008 PROJECT #: 2004-1553-00

FILE: \\Athena\dfs\Projects\2004\1553\00\DATA\GIS\FINAL_REPORT_MAPS\Arcmap\Appendix\A_Crum_Mgmt_Districts.mxd



Location Map

Management Districts

Darby-Cobbs Watershed
Delaware/Chester/Philadelphia/Montgomery Counties, PA

ACT 167
Stormwater Management Plan
Phase II

Appendix A

Map Legend

- Subarea Boundary
- County Boundaries
- Municipal Boundaries
- Subareas
- Streams
- Water
- Interstate Roads
- U.S. Traffic Routes
- PA. Traffic Routes
- State Routes
- Township & Local Roads
- Railroads

Management Districts Legend

	Design Storm Proposed Conditions	Reduce To	Design Storm Existing Conditions
A	2 - Year 5 - Year 10 - Year 25 - Year 100 - Year		1 - Year 5 - Year 10 - Year 25 - Year 100 - Year
B-1	2 - Year 10 - Year 25 - Year 50 - Year 100 - Year		1 - Year 5 - Year 10 - Year 25 - Year 100 - Year
B-2	2 - Year 5 - Year 25 - Year 50 - Year 100 - Year		1 - Year 2 - Year 5 - Year 10 - Year 100 - Year
C*	Provisional Discharge District (see notes below *)		

* If storms greater than the 2 - year storm cannot be conveyed to a stream or watercourse in a safe manner, then District A requirements shall apply. (See model ACT 167 Stormwater Management Ordinance, Article III Section 308 for details.)

In addition to the Management District Criteria above, the groundwater recharge (Section 305), water quality (Section 306), and streambank erosion (Section 307) requirements shall also apply to all Management Districts within the Darby-Cobbs Watershed.

Prepared For:
Delaware County Planning Department
Court House/Government Center
201 West Front Street
Media, PA 19063
610-891-5200

Note:

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. Borton-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 of the base data.

Data Sources:
DRGs - USGS
Subareas - BLE

Borton Lawson ENGINEERING
613 Baltimore Drive
Suite 300
Wilkes-Barre, PA 18702-7903
570-821-1999 Fax 570-821-1990
6614 Chitsphak Drive
Suite 200
Bath, PA 18014
610-837-5918 Fax: 610-837-5918
World Wide Web : http://www.borton-lawson.com

Prepared By: CGF | Check By:
Project Number: 99613.01 | Date of Plot: December 2003

file: p:\99613\01\data\gis\arcinfo\wshed.apr\Appendix A - Management Districts D

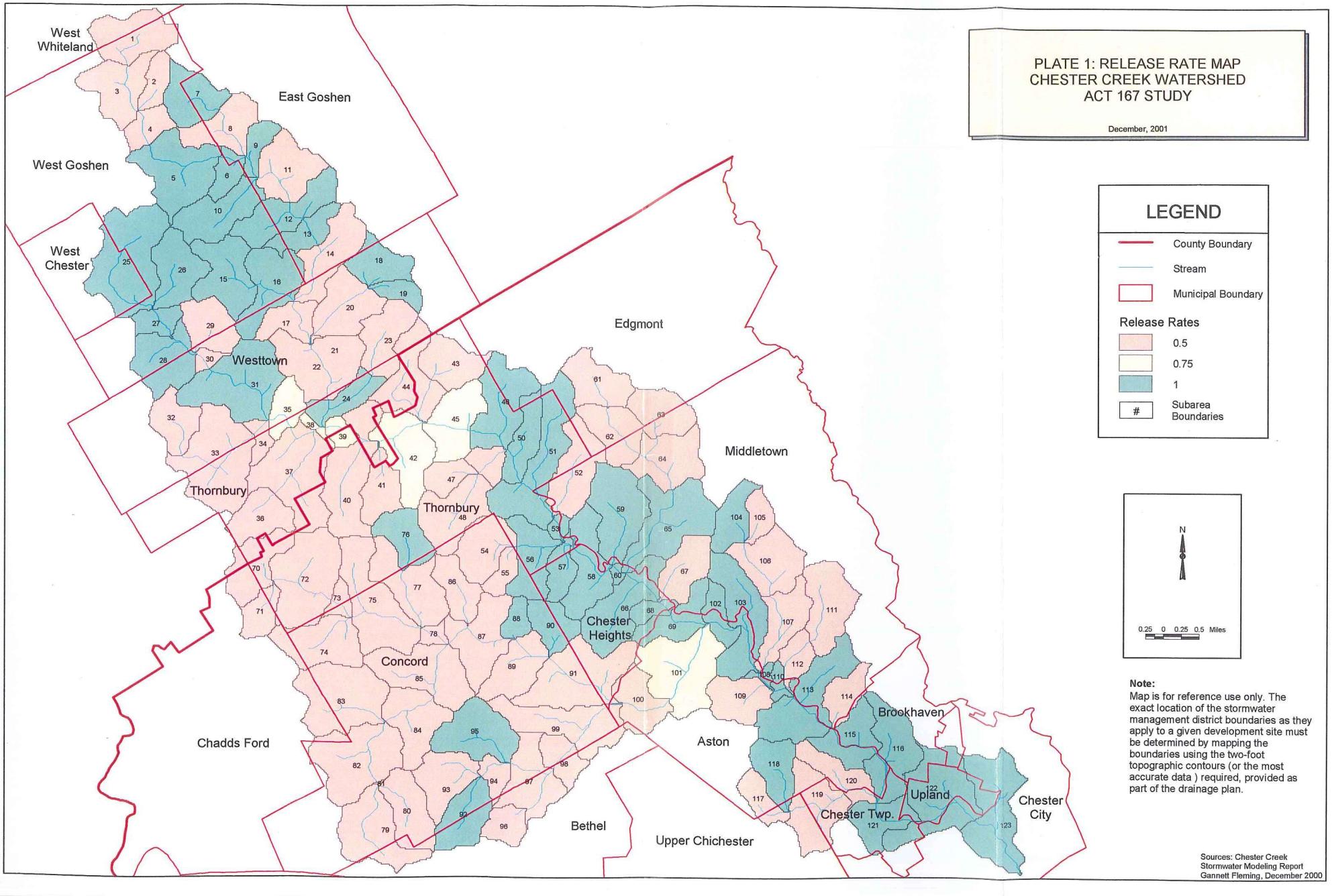


PLATE 1: RELEASE RATE MAP
CHESTER CREEK WATERSHED
ACT 167 STUDY
December, 2001
LEGEND
County Boundary
Stream
Municipal Boundary
Release Rates
0.5
0.75
1
Subarea Boundaries
N
0.25 0 0.25 0.5 Miles
Note:
Map is for reference use only. The exact location of the stormwater management district boundaries as they apply to a given development site must be determined by mapping the boundaries using the two-foot topographic contours (or the most accurate data) required, provided as part of the drainage plan.
Sources: Chester Creek Stormwater Modeling Report Gannett Fleming, December 2000
West Whiteland
East Goshen
West Goshen
West Chester
Westtown
Edgmont
Middletown
Thornbury
Thornbury
Chester Heights
Concord
Chadds Ford
Aston
Bethel
Upper Chichester
Brookhaven
Upland
Chester Twp.
Chester City

APPENDIX A

Ridley Creek Watershed
Peak Rate Control Map

[Insert locally prepared map for portions of the municipality in the Ridley Creek watershed or reference the peak rate control map in the Ridley Creek plan]

Note: Areas with a 100% release rate need to follow the Delaware Direct peak rates – additional language may be needed to replace outdated Ridley peak rate requirements.

ORDINANCE APPENDIX C – 1

SAMPLE SWM SITE PLAN APPLICATION

SAMPLE SWM SITE PLAN APPLICATION

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

Application is hereby made for review of the SWM Site Plan and related data as submitted herewith in accordance with the _____ Stormwater Management 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 code_____

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

3. Name of property owner _____Telephone No._____

   Address_____
   Zip code_____

4. Name of engineer or surveyor _____Telephone No._____

   Address_____
   Zip code_____

5. Type of subdivision or development proposed:

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

6. Linear feet of new road proposed_____ L.F.

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

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

8. Stormwater

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

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

      Explain:_____
      _____
      _____

   c. Does the submission and/or district meet the criteria for the applicable management district?_____

   d. Subarea number(s) from Ordinance Appendix A of the respective watershed stormwater management plan or other subareas identified in other watershed stormwater management plans _____

   e. Type of proposed runoff control_____

   f. Does the proposed stormwater control criteria meet the requirements/guidelines of the Stormwater Ordinance?_____

      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 why _____
      _____

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

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

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

k. Is a construction schedule or staging attached?_____

l. Is a recommended maintenance program attached?_____

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

a. Have the SWM site plan and E&S plan, supporting documentation, and narrative been submitted to the _[*County Name*]___County Conservation District?_____

b. Total area of earth disturbance _____S.F.

10. Wetlands

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

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

c. Have the wetland lines been surveyed?_____

d. Total acreage of wetland within the property _____

e. Total acreage of wetland disturbed_____

f. Supporting documentation_____

11. Filing

a. Has the required fee been submitted?_____

Amount_____

b. Has the proposed schedule of construction inspection to be performed by the Applicant's engineer been submitted?_____

c. Name of individual who will be making the inspections_____

d. General comments about stormwater management at the development_____
_____
_____

CERTIFICATE OF OWNERSHIP AND ACKNOWLEDGMENT OF APPLICATION:

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF [*County Name*] .

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

_____Property Owner

My Commission Expires_____20_____
Notary Public_____

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

SIGNATURE OF APPLICANT_____

//

(Information Below This Line To Be Completed By The Municipality)

_____ (Name of) Municipality official submission receipt:

Date complete application received _____plan number_____

Fees _____ date fees paid _____ received by_____

Official submission receipt date _____

Received by_____

_____
Municipality

PROPOSED SCHEDULE OF FEES

[Note: It is recommended that Municipalities adopt a fee schedule independent of the Ordinance so that fee schedules can be adjusted as need arises without having to go through the Ordinance revision public hearing process. This schedule of fees is to be submitted by the applicant with the land development plan]

Subdivision name_____ Submittal No._____

Owner _____ Date_____

Engineer_____

1. Filing fee $_____

2. Proposed land use
   - 2a. Subdivision, campgrounds, mobile home parks, and multi-family dwelling where the units are located in the same local watershed $_____
   - 2b. Multi-family dwelling where the designated open space is located in a different local watershed from the proposed units $_____
   - 2c. Commercial/industrial $_____
   - 2d. Other $_____

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. $_____
     - 1-5 ac. $_____
     - 5-25 ac. $_____
     - 25-100 ac. $_____
     - 100-200 ac. $_____
     - >200 ac. $_____

5. Stormwater control measures
   - 5a. Detention basins and other controls which 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 25% of 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.

ORDINANCE APPENDIX C – 2

SWM SITE PLAN CHECKLIST

Chester County Conservation District
688 Unionville Road, Suite 200
Kennett Square, PA 19348
Phone: 610-925-4920
Fax: 610-925-4925

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

ARTICLE I: GENERAL PROVISIONS

Reference: Section 105 Applicability/Regulated Activities

1. List all watersheds within which the proposed project is to take place:
   _____
2. Does the Proposed Project meet the definition of a "Regulated Activity" in any of the Stormwater Management Plans? ☐ Yes ☐ No

STOP – If you have checked NO for either of the above questions, you are not required to submit a SWM plan under the watershed's respective Stormwater Management Ordinance.

ARTICLE I: GENERAL PROVISIONS

Reference: Section 106 Exemptions

Note: Parent tract refers to the total parcel configuration on [*Insert date of ordinance adoption*] ,and includes any subdivision of lands which may have occurred after the date.

Parent Tract Area: _____ acres

Total Existing Impervious Area (as of [*Insert date of ordinance adoption*]): _____ acres
Total New Impervious Area (all Phases): _____ acres

Parcel IS Exempt ☐ Parcel IS NOT Exempt ☐

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 304 Nonstructural Project Design

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

   ☐ Yes ☐ No, Explain _____
   _____
   _____

ARTICLE III: STORMWATER MANAGEMENT (continued)

2. Are any of the following Environmentally Sensitive areas identified on site?

Steep Slopes	☐ Yes	☐ No	☐ Unknown
Ponds / Lakes / Vernal Pools	☐ Yes	☐ No	☐ Unknown
Streams	☐ Yes	☐ No	☐ Unknown
Wetlands	☐ Yes	☐ No	☐ Unknown
Hydric Soils	☐ Yes	☐ No	☐ Unknown
Floodplains	☐ Yes	☐ No	☐ Unknown
Stream Buffer Zones	☐ Yes	☐ No	☐ Unknown
Hydrologic Soil Groups A or B	☐ Yes	☐ No	☐ Unknown
Recharge Areas	☐ Yes	☐ No	☐ Unknown
Others: _____	☐ Yes	☐ No	☐ Unknown

3. Does the site layout plan avoid Environmentally Sensitive Areas identified on site?

☐ Yes ☐ No, Explain _____

_____

_____

4. Has a stream buffer been established per Section 306.C.?

☐ Yes ☐ No, Explain _____

_____

_____

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 305 Infiltration

1. Is the proposed activity considered a "Stormwater Hotspot"? (refer to Section 301.T) ☐ Yes ☐ No

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

☐ Yes ☐ No, Explain _____

_____

_____

3. Total Recharge Volume Required:_____cubic feet (using: ☐ Modified CG-1; ☐ Modified CG-2)

4. How is the Required Recharge Volume being addressed?

☐ Infiltration Trench ☐ Dry Swales
☐ Infiltration Basin ☐ Other: _____
☐ Bioretention

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 306 Water Quality Requirements

1. Have provisions been installed to address stormwater runoff water quality on site?

   ☐ Yes ☐ No, Explain _____

   _____

   _____

2. Total Water Quality Volume Required: _____ acre feet

3. Is the site in a Special Protection watershed which includes Exceptional Value (EV) or High Quality (HQ) waters? ☐ Yes ☐ No

4. How is the Required Water Quality Volume being addressed?

   ☐ Wet Detention Basin
   ☐ Extended Dry Detention Basin
   ☐ Bioretention
   ☐ Sand Filter
   ☐ Constructed Wetlands
   ☐ Other: _____

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 307 Stream Bank Erosion Requirements

1. Has the 2- year proposed conditions flow been reduced to the 1- year existing conditions flow?

   ☐ Yes ☐ No, Explain _____

   _____

   _____

2. Does the proposed conditions 1- year storm drain over a minimum 24- hour period?

   ☐ Yes ☐ No, Explain _____

   _____

   _____

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 308 Stormwater Peak Rate Control and Management Districts

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

   ☐ A
   ☐ B
   ☐ Other _____

ARTICLE III: STORMWATER MANAGEMENT (continued)

2. Does the Proposed Conditions Runoff meet the Criteria established in [Table 308.1,2,3, etc.]?

☐ Yes ☐ No If you answered Yes, proceed. If you answered No, consult with Municipality.

a. Are you claiming "Hardship," as described in Section 308.G in lieu of meeting the requirements of this District?

☐ Yes ☐ No, Explain _____

_____

_____

b. If you are claiming "Hardship," has a Downstream Impacts Evaluation been prepared in accordance with Section 308.H?

☐ Yes ☐ No, Explain _____

_____

_____

_____

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 309 Calculation Methodology

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

☐ TR-20
☐ TR-55 ☐ Rational Method
☐ HEC-1 / HEC-HMS ☐ Other: _____

2. Was NOAA Atlas 14 utilized in rainfall determination?

☐ Yes ☐ No, Explain _____

_____

_____

3. Was Table F-1 (Runoff Curve Numbers) or Table F-2 (Rational Runoff Coefficients) in Appendix F utilized in calculations for runoff?

☐ Yes ☐ No, Explain _____

_____

_____

4. For any proposed stormwater detention facility, were the appropriate design storms routed through the facility using the Storage-Indication Method?

☐ Yes ☐ No, Explain _____

_____

_____

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 310 Other Requirements

1. Is this project subject to PENNDOT approval?

   ☐ Yes ☐ No

   a. If "YES," have these plans been forwarded to PENNDOT for review?

      ☐ Yes ☐ No, Explain _____

      _____

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

   ☐ Yes ☐ No ☐ Not Applicable

3. Are any proposed stormwater facilities subject to PADEP Chapter 105 permitting?

   ☐ Yes ☐ No

   a. If "YES," have these plans been forwarded to PADEP for review?

      ☐ Yes ☐ No, Explain _____

      _____

ARTICLE VII: MAINTENANCE RESPONSIBILITIES

Reference: Section 702 Responsibilities for Operations and Maintenance of Stormwater Controls/BMPs

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

   ☐ Yes ☐ No, Explain _____

   _____

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

   ☐ Municipality ☐ Homeowner Association

   ☐ Private Owner ☐ Other _____

Delaware County Conservation District
Rose Tree Park – Hunt Club
1521 N. Providence Rd.
Media, PA 19063
Phone: 610-892-9484
Fax: 610-892-9489
Email: Info@delcocd.org

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

ARTICLE I: GENERAL PROVISIONS

Reference: Section 105 Applicability/Regulated Activities

1. List all watersheds within which the proposed project is to take place:
   _____
2. Does the Proposed Project meet the definition of a "Regulated Activity" in any of the Stormwater Management Plans? ☐ Yes ☐ No

STOP – If you have checked NO for either of the above questions, you are not required to submit a SWM plan under the watershed's respective Stormwater Management Ordinance.

ARTICLE I: GENERAL PROVISIONS

Reference: Section 106 Exemptions

Note: Parent tract refers to the total parcel configuration on [*Insert date of ordinance adoption*], and includes any subdivision of lands which may have occurred after that date.

Parent Tract Area: _____ acres

Total Existing Impervious Area (as of [*Insert date of ordinance adoption*]): _____ acres
Total New Impervious Area (all Phases): _____ acres

Parcel IS Exempt ☐ Parcel IS NOT Exempt ☐

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 304 Nonstructural Project Design

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

   ☐ Yes ☐ No, Explain _____
   _____
   _____

ARTICLE III: STORMWATER MANAGEMENT (continued)

1. Are any of the following Environmentally Sensitive areas identified on site?

Steep Slopes	☐ Yes	☐ No	☐ Unknown
Ponds / Lakes / Vernal Pools	☐ Yes	☐ No	☐ Unknown
Streams	☐ Yes	☐ No	☐ Unknown
Wetlands	☐ Yes	☐ No	☐ Unknown
Hydric Soils	☐ Yes	☐ No	☐ Unknown
Floodplains	☐ Yes	☐ No	☐ Unknown
Stream Buffer Zones	☐ Yes	☐ No	☐ Unknown
Hydrologic Soil Groups A or B	☐ Yes	☐ No	☐ Unknown
Recharge Areas	☐ Yes	☐ No	☐ Unknown
Others: _____	☐ Yes	☐ No	☐ Unknown

2. Does the site layout plan avoid Environmentally Sensitive Areas identified on site?

   ☐ Yes ☐ No, Explain _____

   _____

   _____

3. Has a stream buffer been established per Section 306.C.?

   ☐ Yes ☐ No, Explain _____

   _____

   _____

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 305 Infiltration

1. Is the proposed activity considered a "Stormwater Hotspot"? (Refer to Section 301.T) ☐ Yes ☐ No

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

   ☐ Yes ☐ No, Explain _____

   _____

   _____

3. Total Recharge Volume Required:_____cubic feet (using: ☐ Modified CG-1; ☐ Modified CG-2)

4. How is the Required Recharge Volume being addressed?

   ☐ Infiltration Trench ☐ Dry Swales
   ☐ Infiltration Basin ☐ Other: _____
   ☐ Bioretention

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 306 Water Quality Requirements

1. Have provisions been installed to address stormwater runoff water quality on site?

   ☐ Yes ☐ No, Explain _____

   _____

   _____

2. Total Water Quality Volume Required: _____ acre feet

3. Is the site in a Special Protection watershed which includes Exceptional Value (EV) or High Quality (HQ) waters? ☐ Yes ☐ No

4. How is the Required Water Quality Volume being addressed?

   ☐ Wet Detention Basin
   ☐ Extended Dry Detention Basin
   ☐ Bioretention
   ☐ Sand Filter
   ☐ Constructed Wetlands
   ☐ Other: _____

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 307 Stream Bank Erosion Requirements

1. Has the 2- year proposed conditions flow been reduced to the 1- year existing conditions flow?

   ☐ Yes ☐ No, Explain _____

   _____

   _____

2. Does the proposed conditions 1- year storm drain over a minimum 24- hour period?

   ☐ Yes ☐ No, Explain _____

   _____

   _____

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 308 Stormwater Peak Rate Control and Management Districts

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

   ☐ A
   ☐ B
   ☐ Other _____

ARTICLE III: STORMWATER MANAGEMENT (continued)

2. Does the Proposed Conditions Runoff meet the Criteria established in [Table 308.1, 2,3, etc.]?

☐ Yes ☐ No If you answered Yes, proceed. If you answered No, consult with Municipality.

a. Are you claiming "Hardship," as described in Section 308.G in lieu of meeting the requirements of this District?

☐ Yes ☐ No, Explain _____

_____

_____

b. If you are claiming "Hardship," has a Downstream Impacts Evaluation been prepared in accordance with Section 308.H?

☐ Yes ☐ No, Explain _____

_____

_____

_____

ARTICLE III: STORMWATER MANAGEMENT

Reference: Section 309 Calculation Methodology

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

☐ TR-20
☐ TR-55 ☐ Rational Method
☐ HEC-1 / HEC-HMS ☐ Other: _____

2. Was NOAA Atlas 14 utilized in rainfall determination?

☐ Yes ☐ No, Explain _____

_____

_____

3. Was Table F-1 (Runoff Curve Numbers) or Table F-2 (Rational Runoff Coefficients) in Appendix F utilized in calculations for runoff?

☐ Yes ☐ No, Explain _____

_____

_____

4. For any proposed stormwater detention facility, were the appropriate design storms routed through the facility using the Storage-Indication Method?

☐ Yes ☐ No, Explain _____

_____

_____

ARTICLE III: STORMWATER MANAGEMENT (Continued)

Reference: Section 310 Other Requirements

1. Is this project subject to PENNDOT approval?

   ☐ Yes ☐ No

   a. If "YES," have these plans been forwarded to PENNDOT for review?

      ☐ Yes ☐ No, Explain _____

      _____

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

   ☐ Yes ☐ No ☐ Not Applicable

3. Are any proposed stormwater facilities subject to PADEP Chapter 105 permitting?

   ☐ Yes ☐ No

   a. If "YES," have these plans been forwarded to PADEP for review?

      ☐ Yes ☐ No, Explain _____

      _____

ARTICLE VII: MAINTENANCE RESPONSIBILITIES

Reference: Section 702 Responsibilities for Operations and Maintenance of Stormwater Controls/BMPs

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

   ☐ Yes ☐ No, Explain _____

   _____

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

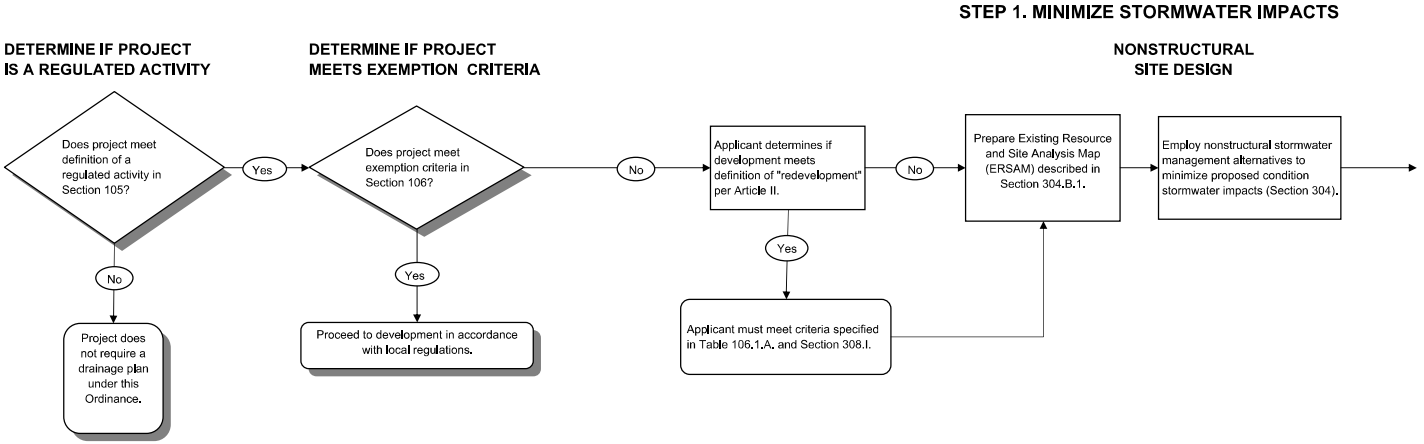
   ☐ Municipality ☐ Homeowner Association

   ☐ Private Owner ☐ Other _____

ORDINANCE APPENDIX D

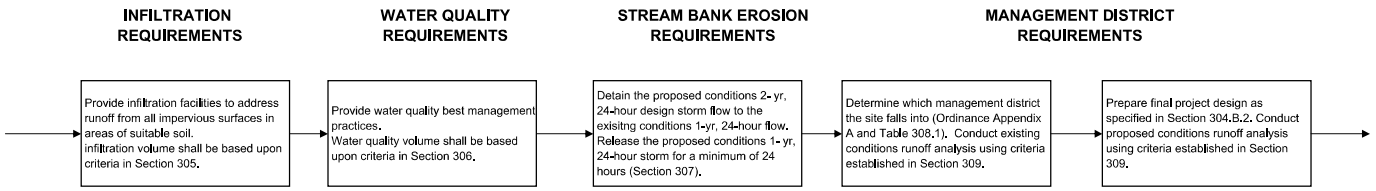
IMPLEMENTATION FLOW CHARTS

CRUM CREEK WATERSHED
STORMWATER MANAGEMENT
Water Quality and Quantity Control Drainage Plan
Applicant Plan Preparation Procedure

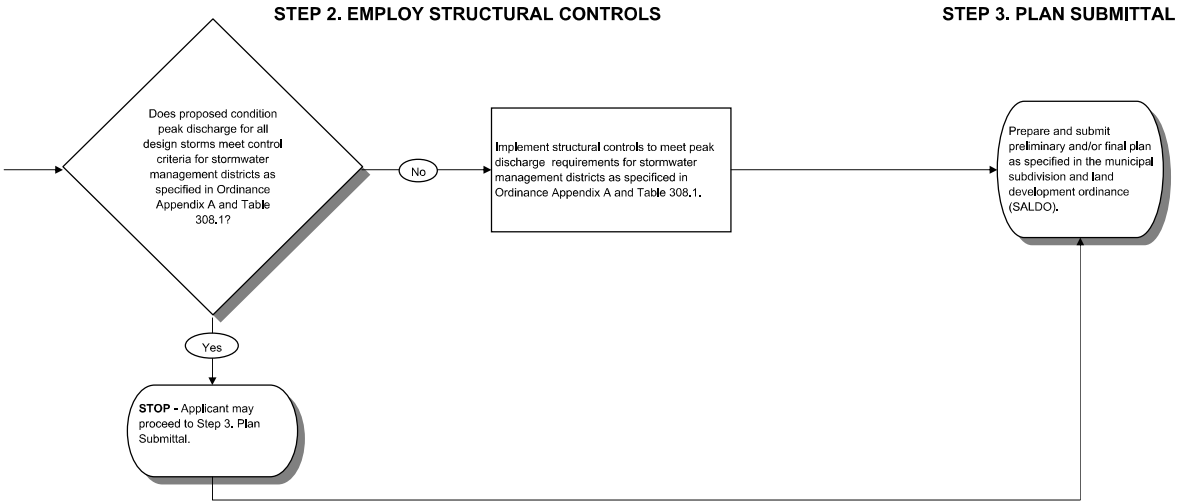


CRUM CREEK WATERSHED
STORMWATER MANAGEMENT
Water Quality and Quantity Control Drainage Plan
Applicant Plan Preparation Procedure

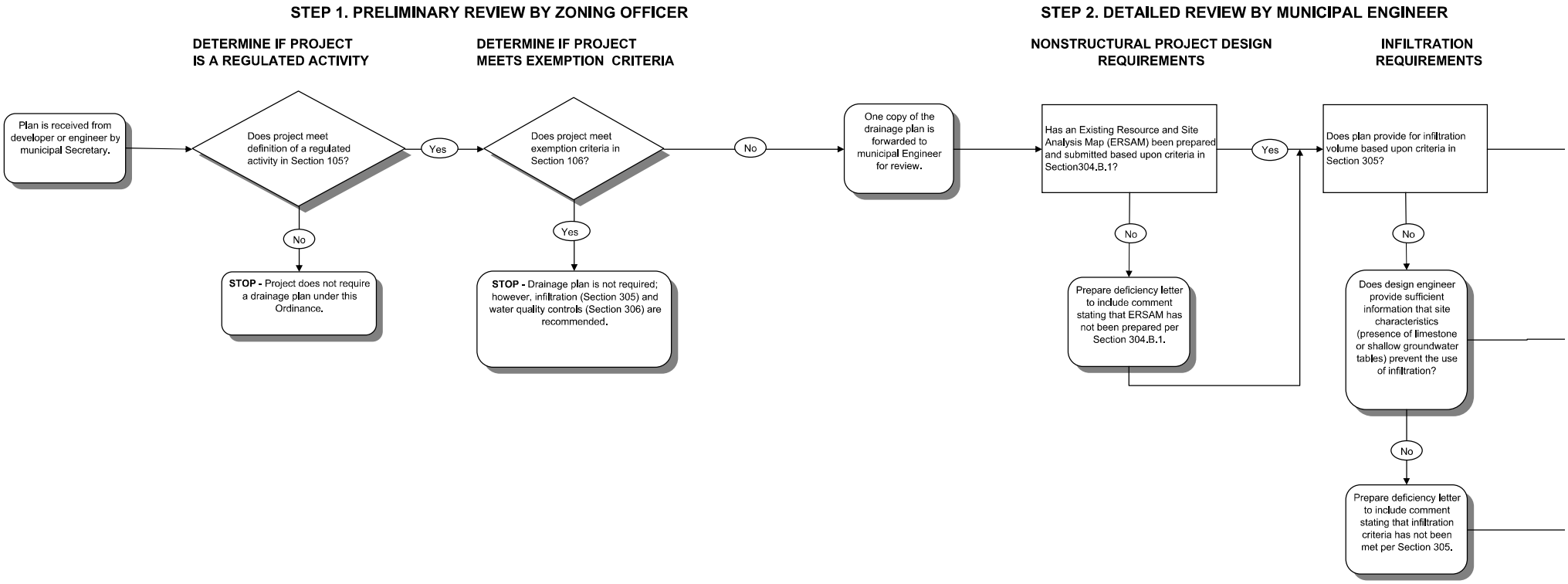
STEP 1. MINIMIZE STORMWATER IMPACTS (CONT.)



CRUM CREEK WATERSHED
STORMWATER MANAGEMENT
Water Quality and Quantity Control Drainage Plan
Applicant Plan Preparation Procedure

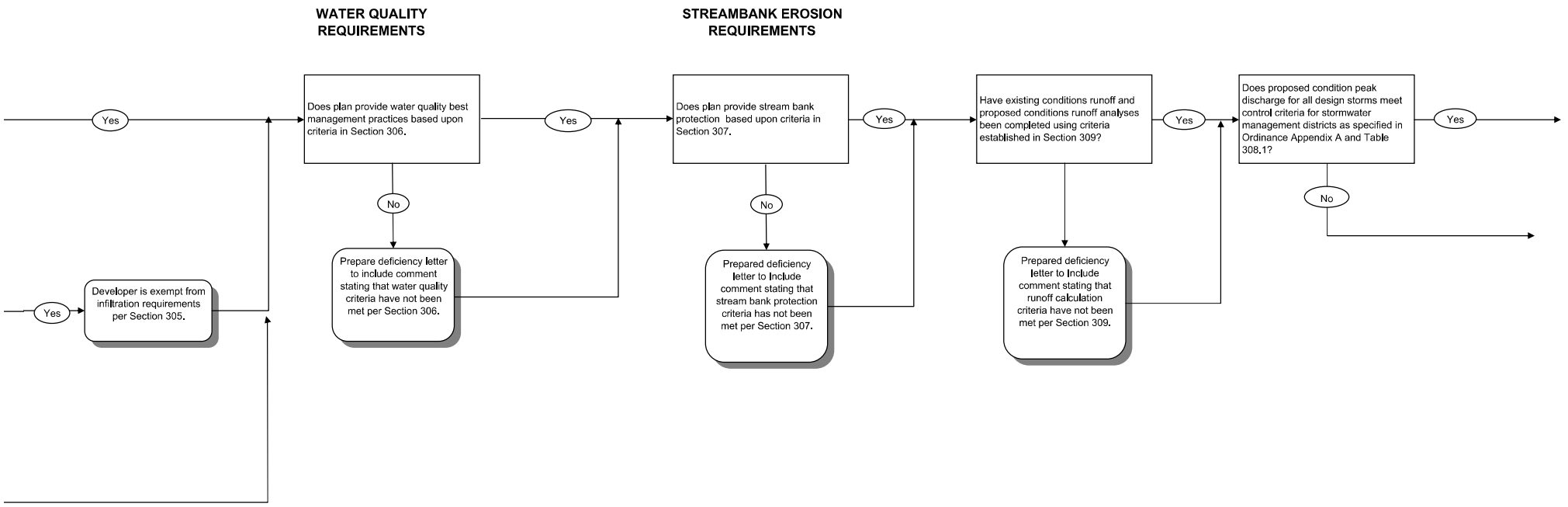


CRUM CREEK WATERSHED
STORMWATER MANAGEMENT
Water Quality and Quantity Control Drainage Plan
Municipal Review Procedure



CRUM CREEK WATERSHED
STORMWATER MANAGEMENT
Water Quality and Quantity Control Drainage Plan
Municipal Review Procedure

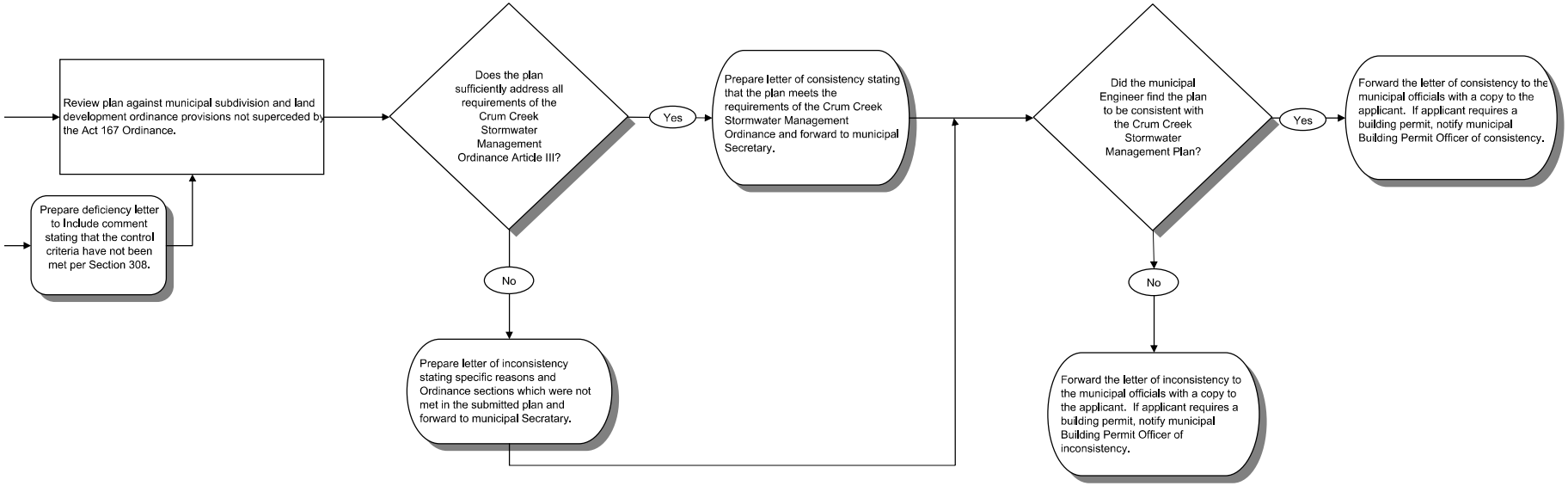
STEP 2. DETAILED REVIEW BY MUNICIPAL ENGINEER (CONT.)



CRUM CREEK WATERSHED
STORMWATER MANAGEMENT
Water Quality and Quantity Control Drainage Plan
Municipal Review Procedure

STEP 2. DETAILED REVIEW BY MUNICIPAL ENGINEER (CONT.)

STEP 3. MUNICIPAL ACTION



ORDINANCE APPENDIX E

LOW IMPACT DEVELOPMENT (LID) PRACTICES

LOW IMPACT DEVELOPMENT (LID) PRACTICES

ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

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

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

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

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

- **Protecting Natural Depression Storage Areas**. Depressional storage areas either have no surface outlet or drain very slowly following a storm event. They can be commonly seen as ponded areas in farm fields during the wet season or after large runoff events. Traditional development practices eliminate these depressions by filling or draining, thereby obliterating their ability to reduce surface runoff volumes and trap pollutants. The volume and release rate characteristics of depressions should be protected in the design of the development site. The depressions can be protected by simply avoiding the depression or by incorporating its storage as additional capacity in required detention facilities.

- **Avoiding Introduction of Impervious Areas**. Careful site planning should consider reducing impervious coverage to the maximum extent possible. Building footprints, sidewalks, driveways, and other features producing impervious surfaces should be evaluated to minimize impacts on runoff.

- **Reducing the Hydraulic Connectivity of Impervious Surfaces**. Impervious surfaces are significantly less of a problem if they are not directly connected to an impervious conveyance system (such as a storm sewer). Two basic ways to reduce hydraulic connectivity are routing of roof runoff over lawns and reducing the use of storm sewers. Site grading should promote increasing travel time of stormwater runoff and should help reduce concentration of runoff to a single point in the development.

- **Routing Roof Runoff Over Lawns**. Roof runoff can be easily routed over lawns in most site designs. The practice discourages direct connection of downspouts to storm sewers or parking lots. The practice also discourages sloping driveways and parking lots to the street. By routing roof drains and crowning the driveway to run off to the lawn, the lawn is essentially used as a filter strip.

- **Reducing the Use of Storm Sewers**. By reducing use of storm sewers for draining streets, parking lots, and back yards, the potential for accelerating runoff from the development can be greatly reduced. The practice requires greater use of swales and may not be practical for some development sites, especially if there are concerns for areas that do not drain in a "reasonable" time. The practice requires educating local citizens and public works officials who expect runoff to disappear shortly after a rainfall event.

- **Reducing Street Widths**. Street widths can be reduced by either eliminating on-street parking or by reducing roadway widths. Municipal planners and traffic designers should encourage narrower neighborhood streets which ultimately could lower maintenance.

- **Limiting Sidewalks to One Side of the Street**. A sidewalk on one side of the street may suffice in low-traffic neighborhoods. The lost sidewalk could be replaced with bicycle/recreational trails that follow back-of-lot lines. Where appropriate, backyard trails should be constructed using pervious materials.

- **Using Permeable Paving Materials**. These materials include permeable interlocking concrete paving blocks or porous bituminous concrete. Such materials should be considered as alternatives to conventional pavement surfaces, especially for low use surfaces such as driveways, overflow parking lots, and emergency access roads.

- **Reducing Building Setbacks**. Reducing building setbacks reduces impervious cover associated with driveway and entry walks and is most readily accomplished along low-traffic streets where traffic noise is not a problem.

- **Constructing Cluster Developments**. Cluster developments can also reduce the amount of impervious area for a given number of lots. The biggest savings occurs with street length, which also will reduce costs of the development. Cluster development groups the

construction activity in less-sensitive areas without substantially affecting the gross density of development.

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

ORDINANCE APPENDIX F

STORMWATER MANAGEMENT DESIGN CRITERIA

TABLE F-1
RUNOFF CURVE NUMBERS

TABLE F-2
RATIONAL RUNOFF COEFFICIENTS

TABLE F-3
MANNING ROUGHNESS COEFFICIENTS

TABLE F-1

RUNOFF CURVE NUMBERS

LAND USE DESCRIPTION	Hydrologic Condition	HYDROLOGIC SOIL GROUP A	B	C	D
Open Space					
Grass cover < 50%	Poor	68	79	86	89
Grass cover 50% to 75%	Fair	49	69	79	84
Grass cover > 75%	Good	39	61	74	80
Meadow		30	58	71	78
Agricultural					
Pasture, grassland, or range – Continuous forage for grazing	Poor	68	79	86	89
Pasture, grassland, or range – Continuous forage for grazing	Fair	49	69	79	84
Pasture, grassland, or range – Continuous forage for grazing	Good	39	61	74	80
Brush—brush-weed-grass mixture with brush the major element	Poor	48	67	77	83
Brush—brush-weed-grass mixture with brush the major element	Fair	35	56	70	77
Brush—brush-weed-grass mixture with brush the major element	Good	30	48	65	73
Fallow Bare soil	-------	77	86	91	94
Crop residue cover (CR)	Poor	76	85	90	93
	Good	74	83	88	90
Woods – grass combination (orchard or tree farm)	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30	55	70	77

Commercial	(85% impervious)	89	92	94	95
Industrial	(72% impervious)	81	88	91	93
Institutional	(50% impervious)	71	82	88	90

Residential districts by average lot size:

	% Impervious				
1/8 acre or less * (townhouses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Farmstead		59	74	82	86
Smooth surfaces (concrete, asphalt, gravel, or bare compacted soil)		98	98	98	98
Water		98	98	98	98
Mining/newly graded areas (pervious areas only)		77	86	91	94

* Includes multi-family housing unless justified lower density can be provided.

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

Source: NRCS (SCS) TR-55

TABLE F-2

RATIONAL RUNOFF COEFFICIENTS

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

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

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

TABLE F-3

MANNING'S ROUGHNESS COEFFICIENTS

Roughness Coefficients (Manning's "n") for Overland Flow

Surface Description	n		
Dense growth	0.4	-	0.5
Pasture	0.3	-	0.4
Lawns	0.2	-	0.3
Bluegrass sod	0.2	-	0.5
Short grass prairie	0.1	-	0.2
Sparse vegetation	0.05	-	0.13
Bare clay-loam soil (eroded)	0.01	-	0.03
Concrete/asphalt - very shallow depths (less than 1/4 inch)	0.10	-	0.15
- small depths (1/4 inch to several inches)	0.05	-	0.10

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

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

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

Source: U.S. Army Corps of Engineers, HEC-1 Users Manual

ORDINANCE APPENDIX G

REFERENCES

REFERENCES

BMP Manuals

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

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

Maryland
2000 Maryland Stormwater Design Manual – **http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/stormwater design/index.asp**

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

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

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

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

Pennsylvania

Pennsylvania Department of Environmental Protection ***Pennsylvania Stormwater Best Management Practices Manual*****,** Pub. No. 363-0300-002**,** December 30, 2006

Washington
Stormwater Management Manual for Western Washington (August 2001) – **http://www.ecy.wa.gov/programs/wq/stormwater/manual.html**

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

USEPA Infiltration Trench Fact Sheet (September 1999) – **http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm**

Riparian Buffer References

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

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

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

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

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

Rupprecht, R., Kilgore, C., and Gunther, R., "Riparian and Wetland Buffers for Water-Quality Protection." *Stormwater* Nov.-Dec. 2009, Vol 10, No. 8: 46-51. Print.

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

ORDINANCE APPENDIX H

WEST NILE VIRUS GUIDANCE

WEST NILE VIRUS GUIDANCE

(This source is from the Monroe County, PA Conservation District that researched the potential of West Nile Virus problems from BMPs due to a number of calls they were receiving)

Monroe County Conservation District Guidance: Stormwater Management and West Nile Virus

Source: Brodhead McMichaels Creeks Watershed Act 167 Stormwater Management Ordinance Final Draft 2/23/04

The Monroe County Conservation District recognizes the need to address the problem of nonpoint source pollution impacts caused by runoff from impervious surfaces. The new stormwater policy being integrated into Act 167 stormwater management regulations by the PA Department of Environmental Protection (PADEP) will make nonpoint pollution controls an important component of all future plans and updates to existing plans. In addition, to meet post-construction anti-degradation standards under the state National Pollutant Discharge Elimination System (NPDES) permitting program, applicants will be required to employ Best Management Practices (BMPs) to address nonpoint pollution concerns.

Studies conducted throughout the United States have shown that wet basins and in particular constructed wetlands are effective in traditional stormwater management areas such as channel stability and flood control and are one of the most effective ways to remove stormwater pollutants (United States Environmental Protection Agency 1991, Center for Watershed Protection 2000). From Maryland to Oregon, studies have shown that as urbanization and impervious surfaces increase in a watershed, the streams in those watersheds become degraded (CWP 2000). Although there is debate over the threshold of impervious cover when degradation becomes apparent (some studies show as little as 6% while others show closer to 20%), there is agreement that impervious surfaces cause nonpoint pollution in urban and urbanizing watersheds and that degradation is ensured if stormwater BMPs are not implemented.

Although constructed wetlands and ponds are desirable from a water quality perspective, there may be concerns about the possibility of these stormwater management structures becoming breeding grounds for mosquitoes. The Conservation District feels that although it may be a valid concern, **municipalities should not adopt ordinance provisions prohibiting wet basins for stormwater management.**

Mosquitoes

The questions surrounding mosquito production in wetlands and ponds have intensified in recent years by the outbreak of the mosquito-borne West Nile Virus. As is the case with all vector-borne maladies, the life cycle of West Nile Virus is complicated, traveling from mosquito to bird, back to mosquito, and then to other animals including humans. *Culex pipiens* was identified as the vector species in the first documented cases from New York in 1999. This species is still considered the primary transmitter of the disease across its range. Today there are some 60 species of mosquitoes that inhabit Pennsylvania. Along with *C. pipiens*, three other

species have been identified as vectors of West Nile Virus while four more have been identified as potential vectors.

The four known vectors in NE Pennsylvania are *Culex pipiens*, *C. restuans*, *C. salinarius*, and *Ochlerotatus japonicus*. All four of these species prefer, and almost exclusively use, artificial containers (old tires, rain gutters, birdbaths, etc.) as larval habitats. In the case of *C. pipiens*, the most notorious of the vector mosquitoes, the dirtier the water, the better they like it. The important factor is that these species do not thrive in functioning wetlands where competition for resources and predation by larger aquatic and terrestrial organisms is high.

The remaining four species, *Aedes vexans*, *Ochlerotatus Canadensis*, *O. triseriatus*, and *O. trivittatus*, are currently considered potential vectors due to laboratory tests (except the *O. trivittatus*, which did have one confirmed vector pool for West Nile Virus in PA during 2002). All four of these species prefer vernal habitats and ponded woodland areas following heavy summer rains. These species may be the greatest threat of disease transmission around stormwater basins that pond water for more than four days. This can be mitigated, however, by establishing ecologically functioning wetlands.

Stormwater Facilities

If a stormwater wetland or pond is constructed properly and a diverse ecological community develops, mosquitoes should not become a problem. Wet basins and wetlands constructed as stormwater management facilities should be designed to attract a diverse wildlife community. If a wetland is planned, proper hydrologic soil conditions and the establishment of hydrophytic vegetation will promote the population of the wetland by amphibians and other mosquito predators. In natural wetlands, predatory insects and amphibians are effective at keeping mosquito populations in check during the larval stage of development while birds and bats prey on adult mosquitoes.

The design of a stormwater wetland must include the selection of hydrophytic plant species for their pollutant uptake capabilities and for not contributing to the potential for vector mosquito breeding. In particular, species of emergent vegetation with little submerged growth are preferable. By limiting the vegetation growing below the water surface, larvae lose protective cover, and there is less chance of anaerobic conditions occurring in the water.

Stormwater ponds can be designed for multiple purposes. When incorporated into an open space design, a pond can serve as a stormwater management facility and a community amenity. Aeration fountains and stocked fish should be added to keep larval mosquito populations in check.

Publications from the PA Department of Health and the Penn State Cooperative Extension concerning West Nile Virus identify aggressive public education about the risks posed by standing water in artificial containers (tires, trash cans, rain gutters, bird baths) as the most effective method to control vector mosquitoes.

Conclusion

The Conservation District understands the pressure faced by municipalities when dealing with multifaceted issues such as stormwater management and encourages the incorporation of water quality management techniques into stormwater designs. As Monroe County continues to grow, conservation design, infiltration, and constructed wetlands and ponds should be among the preferred design options to reduce the impacts of increases in impervious surfaces. When designed and constructed appropriately, the runoff mitigation benefits to the community from these design options will far outweigh their potential to become breeding grounds for mosquitoes.

ORDINANCE APPENDIX J

RIPARIAN BUFFER TRAIL GUIDELINES

Riparian Buffer Trail Guidelines

[Note to Municipality: The following riparian buffer trail guidelines may be modified provided that the buffer meets all minimum width and vegetation requirements detailed in Section 306 of the ordinance as well as all federal, state and local, stormwater, floodplain, and other requirements and regulations.]

Introduction

Riparian buffers are used as non-structural best management practices (BMPs) for protecting and enhancing water quality. Depending on their size, location, and design, riparian buffers often supply additional environmental, economic, aesthetic, and recreational value. Passive recreational trails can be a compatible use within riparian buffers if the trails are sized and placed appropriately. The trail guidelines below are meant to supplement Section 306, Water Quality Requirements, and do not alter or modify the regulations set forth in Section 301 General Requirements. All other applicable rules and requirements should be followed, including all federal, state, permitting, and local stormwater and floodplain ordinances.

Installing a trail does not relieve a developer or municipality of the minimum buffer and vegetation requirements described in Section 306-C, or infiltration and peak rate controls in Sections 305 and 308. Effort shall be made to mitigate water quality and peak rate adjacent the trail structure to avoid collecting runoff in a large facility and creating a point discharge. This can be accomplished by trail-side stone filtration trenches, vegetative filter strips, small bio-retention facilities, and other mechanisms subject to site constraints and municipal engineer approval. See Figure J-1. In situations where site constraints negate the feasibility of trail-side mitigation methods, effort shall be made to collect runoff in multiple stormwater facilities for segmented portions of the trail, in place of detaining stormwater in one large facility. Level spreaders shall be constructed at facility outlets to decrease point-source discharges.

As with all trails, adequate land acquisition, easements, and/or landowner permission should be obtained in advance of any trail placement. Care should be given when designing and installing trails so as not to compromise the buffer's ability to protect water quality. Many factors such as slope, vegetation, and soil type will determine the type, size, and placement of the trail within the riparian buffer. Heavily used trails and trails with wide impervious surfaces should be set back farther from the stream edge to help mitigate the effects of any associated increase in runoff. Note: failure to comply with these guidelines (Installing a trail with inadequate setback from the stream bank) could result in increased stormwater runoff, decreased water quality, stream bank degradation, and damage to the buffer or trail.

Trail Recommendations

Location, Size, and Orientation

All trails should be a reasonable width appropriate for the site conditions. It is not recommended that the width of any paved trail exceed twenty five (25) percent of the total buffer width. All trail designs and specifications are subject to approval by the municipality.

Natural vegetation must be present throughout the buffer as described in Section 306 of the ordinance. Grassy areas should be managed as meadows or be reforested and should not be mowed as lawn in any part of the buffer. Where existing vegetation is insufficient to protect water quality, additional native species should be planted to enhance the buffer.

Paved trails, if appropriate to the site, are permitted and must be located at least twenty-five (25) feet from the top of the stream bank. In limited instances, paved trails be placed closer to a stream due to topography, or in order to accommodate passive educational and recreational activities, but must always be at least ten (10) feet from the top of the stream bank. Although this can be achieved by diverting the entire trail closer to the stream, more conservative methods should be considered, such as smaller spur trails or loop trails. These smaller trails provide access to the stream, but reduce the total traffic along the sensitive stream bank.

In rare instances where the buffer width is reduced due to zoning setback or geographical constraints, the municipality should strongly consider whether the benefits of a trail outweigh the benefits of a wider buffer.

Signage

The installation of interpretive and educational signage is strongly encouraged along the trail. Signs should point out local natural resources and educate the public on how riparian buffers protect the watershed. There should be minimum disturbance in the vegetated buffer between the trail and the stream. Therefore, all appurtenances (e.g. benches, educational signs, kiosks, fountains, etc.) should be installed on the landward side of the trail, if possible. All appurtenances shall be installed in compliance with federal, state, local, stormwater, floodplain, and other regulations and permitting requirements (e.g. anchoring, etc.)

Parking Areas

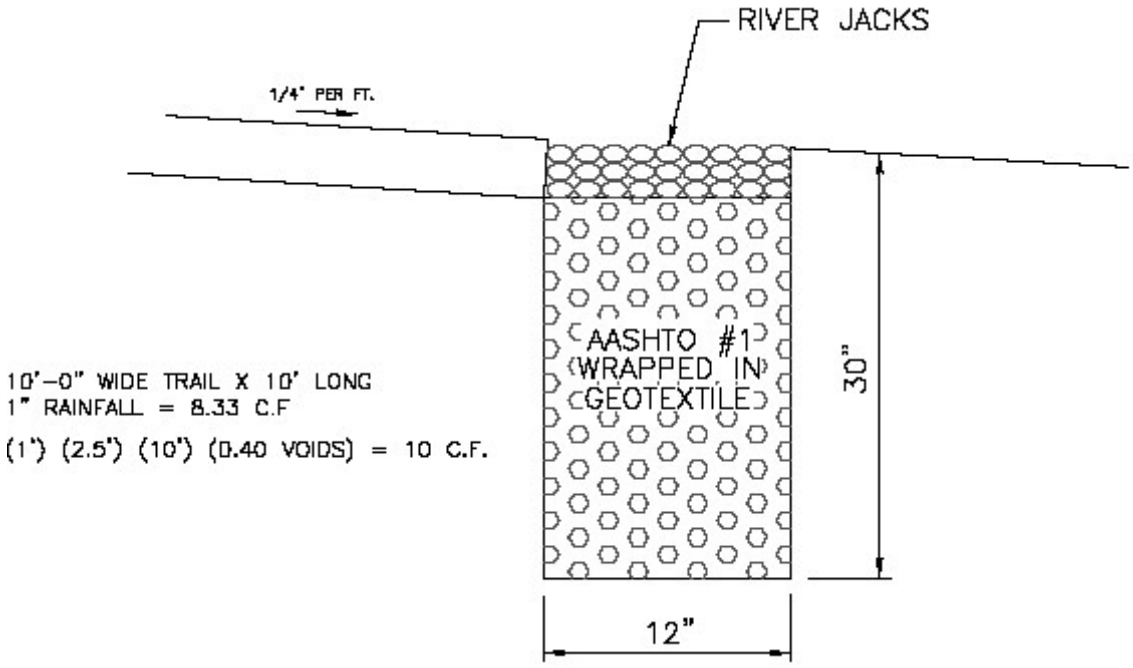
New trailheads and trail parking areas shall meet all the infiltration, rate control, and minimum setback requirements of this ordinance. Every effort should be made to coordinate trail access with existing parking areas. Any new parking areas and trailhead clearings should not encroach on the riparian buffer in any way.

Trail Maintenance

The installation and maintenance of all trails should be performed in a manner that minimizes site disturbance and prevents runoff and erosion. Soil disturbance should be avoided if possible. The removal of native trees and other native vegetation should also be kept to a minimum. If large or heavy equipment is required for trail installation, special care should be given not to damage existing trees and tree roots.

FIGURE J-1

EXAMPLE DESIGN OF A TRAIL-SIDE STONE FILTRATION TRENCH



Source:
James MacCombie, Herbert E. MacCombie Jr. P.E. Consulting Engineers & Surveyors Inc.