POLLUTANT REDUCTION PLAN

For:

BOROUGH OF BATH

Northampton County, Pennsylvania

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TABLE OF CONTENTS:

NARRATIVE 1

EXISTING SEDIMENT LOADING / METHODOLOGY 1

EXISTING BEST MANAGEMENT PRACTICES (BMPs) 2

PROPOSED SEDIMENT REDUCTION BEST MANAGEMENT PRACTICES (BMPs) 3

FUNDING MECHANISMS 8

ESTIMATE OF PROBABLE COSTS 8

RESPONSIBLE PARTIES FOR OPERATION AND MAINTENANCE (O&M) OF BMPs 8

SCHEDULE OF THE IMPLEMENTATION OF THE PROPOSED BMPs 10

SOILS MAP 11

EXISTING SEDIMENT LOAD CALCULATIONS

EXISTING SEDIMENT LOADING 70

EXISTING SEDIMENT LOADING AREA ANALYSIS 72

REQUIRED SEDIMENT LOAD REDUCTION CALCULATIONS 73

PROPOSED BMP REDUCTION CALCULATIONS SUMMARY 75

PROPOSED BMP REDUCTION CALCULATIONS FOR INDIVIDUAL PROPOSED BMPs 77

MS4 OUTFALL AND STORM SEWER MAP 88

PUBLIC NOTICE ADVERTISEMENT 90

PUBLIC COMMENTS AND RESPONSES 92

MCM #3 94

MCM #6 107

MOU (Northampton Area School District and Borough of Bath) 116

STREET SWEEPING POLICY 117

STORMWATER ORDINANCE 126

POLLUTANT REDUCTION PLAN

NARRATIVE:

The Borough of Bath is located centrally within Northampton County, Pennsylvania. The Borough is mostly developed including residential, commercial and industrial areas. The entire Borough is located within an urbanized area as defined by the 2010 U.S. Census Bureau. The Borough has a Municipal Separate Storm Sewer System (MS4) permit (NPDES No. PAI132215).

The Borough's urbanized areas and storm sewer outfalls drain to the Monocacy Creek and its tributaries, which are impaired, for 'Urban Runoff/Storm Sewer – Siltation'. Another cause of impairment to this watershed is Flow Alterations. The Monocacy Creek and its tributaries are also designated as Warm Water Fisheries (WWF) and Migratory Fishes (MF). The Monocacy Creek is located within the Delaware River Basin.

Due to the aforementioned impairments, the Borough is required to develop a Pollutant Reduction Plan (PRP) for sediment removal. The requirements set forth in the Pennsylvania Department of Environmental Protection's National Pollutant Discharge Elimination System (NPDES) Stormwater Discharges from Small Municipal Separate Storm Sewer Systems Pollutant Reduction Plan (PRP) Instructions require a minimum 10% sediment reduction from current sediment loading volumes.

This Plan outlines the existing loading within the Borough PRP areas, highlights proposed Best Management Practices (BMPs), and provides operation and maintenance schedules for short- and long-term maintenance of the proposed BMPs.

EXISTING SEDIMENT LOADING / METHODOLOGY:

The Borough's existing storm sewer infrastructure has been mapped using information obtained through a hand-held GPS unit. From the mapped storm sewer inlets, pipes, swales and outfalls, the storm sewer shed tributaries to each regulated outfall have been mapped using LIDAR two-foot (2') contours.

Existing sediment loading was then calculated using the online-based Wiki Watershed program, as developed by the Stroud Water Research Center. The PRP planning areas are the areas within each storm sewer shed that are tributary to all regulated outfalls.

The outputs from Model My Watershed provide the land cover areas from within each PRP area. The table included in this narrative was generated using the Watershed Multi-Year Worksheet Based on these areas, the following assumptions, in accordance with the 2011 National Land Cover Database (NLCD 2011), are made to calculate the amount of impervious and pervious areas within each study area:

Developed, Open Space: 19% Impervious
Developed, Low Intensity: 49% Impervious
Developed, Medium Intensity: 79% Impervious
Developed, High Intensity: 100% Impervious

For Northampton County, per Attachment B (Developed Land Loading Rates for PA Counties) in the Pennsylvania Department of Environmental Protection's PRP Instructions, the Total Sediment (TSS) loading is calculated by multiplying the Developed Impervious rate by 1,839 lbs./acre/yr.; by multiplying the Developed Pervious rate by 264.96 lbs./acre/yr.; and by multiplying the Undeveloped rate by 234.6 lbs./acre/yr.

A total sediment loading, in lbs. per year, was calculated for each storm sewer shed. These totals were then added together to generate the existing sediment loading for the Monocacy Creek watershed.

AREAS THAT HAVE BEEN PARSED (EXPLANATION FOR REMOVAL OF AREAS FROM PRP):

The following areas have been parsed out from the Borough of Bath's PRP plan.

- The areas in the northeast corner of the Borough were removed. The section of Spyglass Hill Road and all of Spyglass Court flows to the two inlets located in Spyglass Court. These inlets discharge into two underground infiltration beds. Their approximate location is shown on the plan. These infiltration areas were not included in the calculations due to their age and the lack of size information. The Borough does not have any problems with the system and it appears to be working as it should.
- The areas located in the northwest section of the Borough that are not shaded sheet flow into the creek. There are no direct discharge points.
- The areas along the creek, as it heads through the Borough, that are not shaded sheet flow into the waterway with no direct discharge points.
- The section of the Borough that is located in the western most part along the state road known as W Main Street was removed due to the fact that both sides of the road are privately owned. The storm sewer crossing is not owned by the Borough and the roadway is owned by PennDOT. The water flows from the top of the property on the north side of W Main Street and crosses under the highway and heads across land to the creek. This approximate discharge point is labeled on the plan with a green marker and noted in the legend as Private.
- The areas not shaded in the southwestern section of the Borough, which is on both sides of the creek, sheet flow into the waterway. There are no direct discharge points into the creek that are owned by the Borough. Some of the properties are owned by Keystone Cement Company and Norfolk Southern Railway Company.

EXISTING BEST MANAGEMENT PRACTICES (BMP'S):

No existing BMP's exist within the PRP planning area. Therefore, no credits have been taken to reduce the existing sediment loading.

PROPOSED SEDIMENT REDUCTION BEST MANAGEMENT PRACTICES (BMPs):

To reduce the required sediment loading, a series of proposed BMPs are recommended to be implemented. The requirements of the proposed BMPs and their anticipated operation and maintenance schedule are described as follows:

1. **BMP 6.6.3 Dry Extended Detention Basin:**

General design considerations:

1. **Storage Volume, Depth and Duration.**
   a. Extended detention basins should be designed to mitigate runoff peak flow .rates.
   b. An emergency outlet or spillway which is capable of conveying the spillway design flood (SDF) should be included in the design. The SDF is usually equal to the 100-year design flood.
   c. Extended detention basins should be designed to treat the runoff volume produced by the water quality design storm.
   d. Extended Detention Basins are designed to achieve a specified detention time. Details on the detention time are outlined in Chapter 3.
   e. The lowest elevation within an extended dry detention basin should be at least 2 fee above the seasonal high water table. If high water table conditions are anticipated, then the design of a wet pond, constructed wetland or bioretention facility should be considered.
2. **Dry Extended Detention Basin Location.**
   a. disturbed or developed areas on the site. The basin should collect as much site runoff as possible, especially from the site's impervious surfaces (roads, parking, buildings, etc.).
   b. Extended detention basins should not be constructed on steep slopes, nor should slopes be significantly altered or modified to reduce the steepness of the existing slope, for the purpose of installing a basin.
   c. Extended detention basins should not worsen the runoff potential of the existing site by removal of trees for the purpose of installing a basin.
   d. Extended detention basins should not be constructed in areas with high quality and/or well-draining soils, which are adequate for the installation of BMPs capable of achieving stormwater infiltration.
   e. Extended detention basins should not be constructed within jurisdictional waters, including wetlands.
3. **Basin Sizing and Configuration.**
   a. Basins should be shaped to maximize the length of stormwater flow pathways and minimize short-circuited inlet-outlet systems. Basins should have a minimum width of 10 feet. A minimum length-to-width ratio of 2:1 is recommended to maximize sedimentation.
   b. Irregularly shaped basins are encouraged and appear more natural.
   c. If site conditions inhibit construction of a long, narrow basin, baffles constructed from earthen berms or other materials can be incorporated into the pond design to "lengthen"

the stormwater flow path. Care should be taken to ensure the design storage capacity is provided after baffle installation.

d. Low flow channels, if required, should always be vegetated with a maximum slope of 3 percent to encourage sedimentation. Alternatively, other BMPs may be considered such as wet ponds, constructed wetlands or bioretention.

4. **Embankments**.

a. Embankments should be less than 15 feet in height and should have side slopes no steeper than 3:1 (H:V).

b. The basin should have a minimum freeboard of 1 foot above the SDF elevation.

5. **Inlet Structures.**

a. Inlet structures to basin should not be submerged at the normal pool depth.

b. Erosion protection measures should be utilized to stabilize inflow structures and channels.

6. **Outlet Design.**

a. In order to meet designs storm requirements, dry extended detention basins should have a multistage outlet structure. Three elements are typically included in this design:

1. A low-flow outlet that controls the extended detention and functions to slowly release the water quality design storm.

2. A primary outlet the functions to attenuate the peak of larger design storms.

3. An emergency overflow outlet/spillway.

b. The primary outlet structure should incorporate weirs, orifices, pipes or a combination of these to control runoff peak rates for required design storms. Water quality storage

should be provided below the invert of the primary outlet. When routing basins, the low flow outlet should be included in the depth-discharge relationship.

c. Energy dissipaters are to be placed at the end of the primary outlet to prevent er the basin discharges to a channel with dry weather flow, care should be taken to minimize tree clearing along the downstream channel and to reestablish a forested riparian zone between the outlet and natural channel. Where feasible, a multiple orifice outlet system is preferred to a single pipe.

d. The orifice should typically be no smaller than 2.5 inches in diameter. However, the orifice diameter may be reduced to 1 inch if adequate protection from clogging is provided.

e. The hydraulic design of all outlet structures should consider any tailwater effects of downstream waterways. The primary and low flow outlet should be protected from clogging by an external trash rack.

7. **Sediment Forebay.**

a. Forebays should be incorporated into the extended detention design. The forebay storage volume is indicated for the water quality volume requirements.

b. Forebays should be vegetated to improve filtering of runoff, to reduce runoff velocity, and to stabilize soils against erosion. Forebays are typically constructed as shallow marsh areas and should adhere to the following design criteria:

1. It is recommended that forebays have a minimum length of 10 feet.

2. Storage should be provided to trap the anticipated sediment volume produced over a period of 2 years.

3. Forebays should be protected from the erosive force of the inflow to prevent resuspension of previously collected sediment during large storms (typically constructed offline).

8. **Vegetation and Soils Protection.**
   a. Care should be taken to prevent compaction of in situ soils in the bottom of the extended detention basin in order to promote healthy plant growth and to encourage infiltration. If soils compaction is not prevented during construction, soils should be restored as discussed in BMP 6.7.3 - Soils Amendment & Restoration.
   b. It is recommended that basin bottoms be vegetated in a diverse native planting mix to reduce maintenance need, promote natural landscapes, and increase infiltration potential. Vegetation may include trees, woody shrubs and meadow/wetland herbaceous plants.
   c. Woody vegetation should not be planted on the embankments or within 25 feet of the emergency overflow spillway.
   d. Meadow grasses or other deeply rooted herbaceous vegetation is recommended on the interior slope of embankments.
   e. Fertilizers and pesticides should not be used.
9. **Special Design Considerations.**
   a. Ponds hat have embankments higher than 15 feet, have a drainage of more than 100 acres or will impound more than 50 acre-feet of runoff during the high-water condition will be regulated as dams by PADEP. The designer shall consult Pennsylvania Chapter 105 to determine which provisions may apply to the specific project in question.
   b. Extended detention ponds should not be utilized as recreation areas due to health and safety issues. Design features that discourage access are recommended.

Specific design considerations:

This PRP proposes the conversion of two existing detention basin into a dry extended detention basin within existing Borough-owned land.

The existing basins proposed for conversion were constructed in the Mid 90's and were designed and constructed for run off control as a Dry Detention/Retention Basin. The current design is providing no water quality treatment, as such no existing credit is being taken for these basins.

Dry Extended Basin #1. The existing basin located in the water shed area for Outfall #13, will be regraded, seeded and two fore bays will be installed in accordance with the recommendations outlined in the December 30, 2006 Pennsylvania Stormwater Best Management Practices manual.

Photograph taken April 9, 2018 (Existing site area for proposed Dry Extended Basin Conversion).

Dry Extended Basin #2. The existing basin located in the water shed area for Outfall #08, will be regraded, seeded and two fore bays will be installed in accordance with the recommendations outlined in the December 30, 2006 Pennsylvania Stormwater Best Management Practices manual.

Photograph taken from Google Earth (Existing site area for proposed Dry Extended Basin Conversion).

2. **Street Sweeping:**

   General design considerations:

   - Street sweeping must be conducted 25 times annually. Only the streets that have been conducted 25 times per year may be counted.

   Specific design considerations:

   - The Borough has slightly more than 9 miles of Borough-maintained roadways. Regenerative air street sweeping is proposed over these roadways to achieve credits for this BMP. Only the areas within regulated sewer shed areas have been included in the calculations.

3. BMP 6.4.5: Rain Garden/Bioretention = School Property

   Specific design considerations:

   This PRP proposes the construction of a Rain Garden, the proposed Rain Garden is to be located on the property of the Northampton Area School District property know as George Wolf Elementary School. A Memorandum of Understanding has been completed between the Borough of Bath and Northampton Area School District.

   The proposed Rain Garden will be constructed to meet all requirement set forth in the Pennsylvania Stormwater Best Managenment Practices Manual, Chapter 6 BMP 6.4.5: Rain Garden/Bioretention.

Photograph taken from Google Earth (Proposed location of Rain Garden located on NASD property).

FUNDING MECHANISMS:

BMPs will be funded by the Borough general fund. Additional resources that may be pursued include grant funding through sources such as Penn VEST or DEP Growing Greener.

ESTIMATE OF PROBABLE COSTS:

- Dry Extended Detention Basin #1: Based on an estimated cost of $60.00 per Square Yard for construction, design and permitting. The total construction cost for the basin conversion is approximately **$200,000.**
- Dry Extended Detention Basin #2: Based on an estimated cost of $60.00 per Square Yard for construction, design and permitting. The total construction cost for the basin conversion is approximately **$200,000.**
- Street Sweeping: The Borough currently owns a regenerative air sweeper, so no new additional start-up costs are anticipated for this BMP.
- Rain Garden: (School Property) Based on an estimated cost of $60.00 per Square Yard for construction, design and permitting. The total construction cost for the Construction of the Rain Garden is approximately **$80,000.**

RESPONSIBLE PARTIES FOR OPERATION AND MAINTENANCE (O&M) OF BMPs:
The Borough of Bath will be responsible for the operation and maintenance of the proposed BMPs in accordance with the following schedule:

Inspection Activity	Frequency	Maintenance Action
Dry Extended Basin and Rain Garden		
Inspect for erosion, damage to vegetation, and sediment and debris accumulation	Annually and after every major rainfall event (>2 inches in 24 hours)	Correct erosive conditions and re-stabilize. Remove debris and sediment and dispose of in accordance with all federal, state and local laws.
Inspect vegetation on side slopes for erosion and formation of rill and gullies	Annually and after every major rainfall event (>2 inches in 24 hours)	Correct erosive conditions and re-stabilize as needed.
Inspect for pools of standing water	Annually and after every major rainfall event (>2 inches in 24 hours)	Dewater and discharge to an approved location. Restore and re-stabilize to design grades.
Mow and trim vegetation to ensure safety, aesthetics, proper swale construction or to suppress weeds and invasive vegetation	Annually in early spring	Dispose of cutting in a local composting facility. Mow only when swale is dry to avoid rutting.

Inspect for litter	Annually and prior to mowing	Remove litter and dispose accordingly.
Inspect for uniformity in cross-section and longitudinal slope	Annually and after every major rainfall event (>2 inches in 24 hours)	Correct as needed. Immediately stabilize disturbed areas.
Inspect vegetation for uniform establishment	Annually	Plant alternative grass species as needed. Immediately stabilize disturbed areas.
Inspect basin for bare areas	Annually	Re-seed bare areas. Install appropriate erosion control measures when native soil is exposed or erosion channels are forming.
Inspect for areas of standing water that dewater in greater than 48 hours	Annually and after every major rainfall event (>2 inches in 24 hours)	Rototill and re-plant swale as needed. Restore to design grades.
Inspect basin vegetation	During extreme dry periods	Water, fertilize and/or apply pesticide only when absolutely necessary.
Inspect basin	Immediately after spring melt	Remove residuals (e.g. sand or cinders) and replace damaged vegetation without disturbed remaining vegetation.
Restore soil structure and moisture capacity of the basin	Immediately after spring melt	Mulching and/or soil aeration/manipulation may be required to restore soil structure and moisture capacity and to reduce impacts of deicing agents.
Inspect basin inlet and outlet for signs of erosion or blockage	Annually and after every major rainfall event (>2 inches in 24 hours)	Remove debris and sediment and dispose of in accordance with all federal, state, and local laws.

SCHEDULE OF THE IMPLEMENTATION OF THE PROPOSED BMPs:

The following schedule will outline the implementation the proposed BMPs:

- **During 2023 the Borough is planning to complete the following:**
  1. Start sweeping the streets twice a week from April to December
  2. Studies, design and obtaining required permits for Dry Extended Basin#1.
- **During 2024 the Borough is planning to complete the following:**
  1. Continue sweeping the streets twice a week from April to December.
  2. Studies, design and obtaining required permits for Dry Extended Basin#2
  3. Dry Extended Basin#1 Conversion: Start construction and complete before fall, weather permitting, and funding is available.
- **During 2025 the Borough is planning to complete the following:**
  1. Continue sweeping the streets twice a week from April to December
  2. Studies, design and obtaining required permits for Rain Garden.
  3. Dry Extended Basin#2 Conversion: Start construction and complete before fall, weather permitting, and funding is available.
- **During 2026 the Borough is planning to complete the following:**
  1. Continue sweeping the streets twice a week from April to December
  2. Construct Rain Garden.
- **During 2027 the Borough is planning to complete the following:**
  1. Continue sweeping the streets twice a week from April to December

SOILS MAP

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Northampton County, Pennsylvania

April 13, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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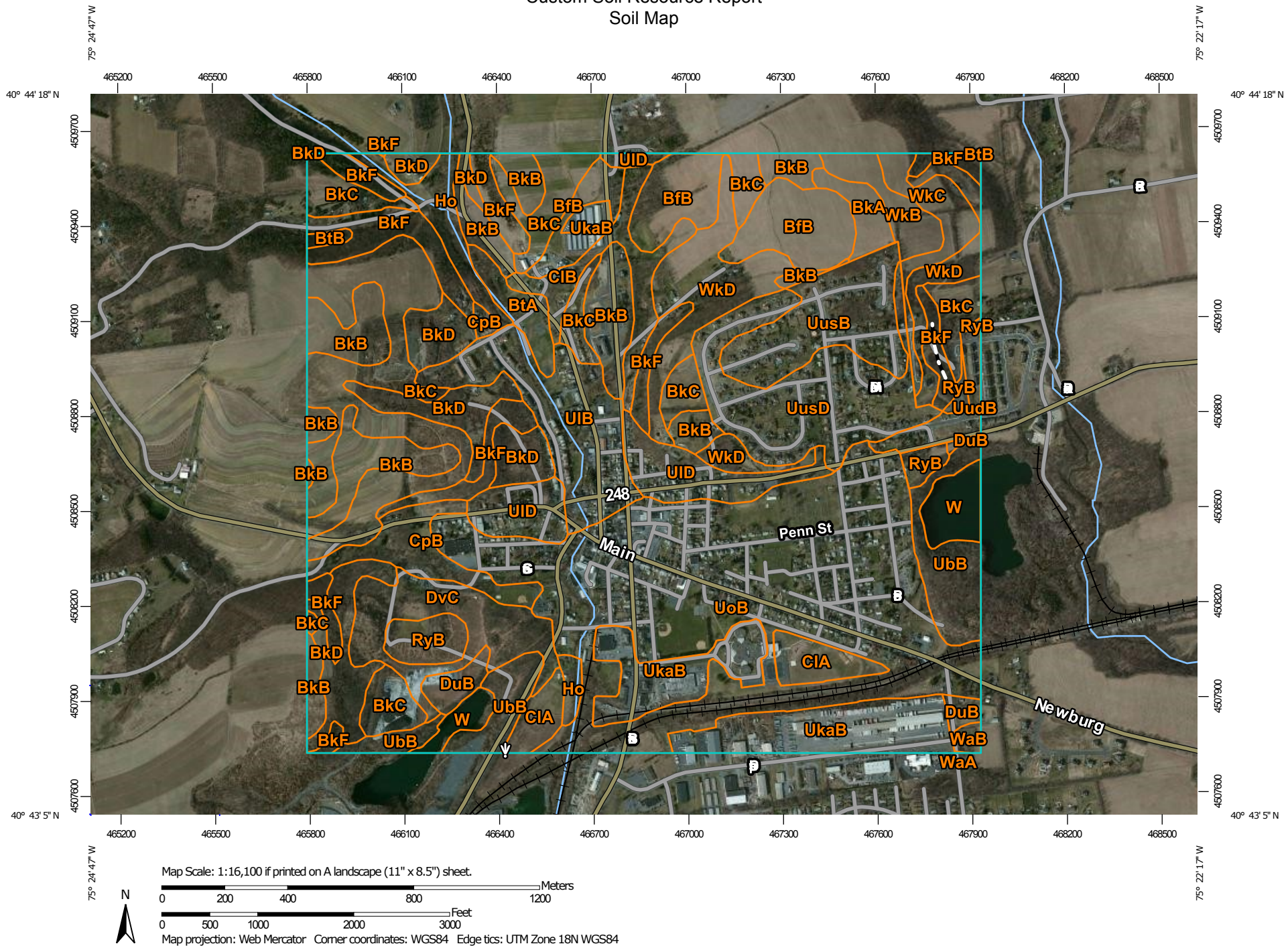
Contents

Preface..... 2
Soil Map..... 5
Soil Map.....6
Legend.....7
Map Unit Legend..... 8
Map Unit Descriptions..... 9
Northampton County, Pennsylvania.....11
BfB—Bedington-Berks complex, 3 to 8 percent slopes.....11
BkA—Berks-Weikert complex, 0 to 3 percent slopes.....13
BkB—Berks-Weikert complex, 3 to 8 percent slopes.....15
BkC—Berks-Weikert complex, 8 to 15 percent slopes.....17
BkD—Berks-Weikert complex, 15 to 25 percent slopes.....19
BkF—Berks-Weikert complex, 25 to 60 percent slopes.....21
BtA—Brinkerton-Comly silt loams, 0 to 3 percent slopes.....24
BtB—Brinkerton-Comly silt loams, 3 to 8 percent slopes.....25
ClA—Clarksburg silt loam, 0 to 3 percent slopes.....27
ClB—Clarksburg silt loam, 3 to 8 percent slopes.....28
CpB—Comly silt loam, 3 to 8 percent slopes.....29
DuB—Duffield silt loam, 3 to 8 percent slopes.....31
DvC—Duffield-Ryder silt loams, 8 to 15 percent slopes..... 32
Ho—Holly silt loam.....34
RyB—Ryder-Duffield silt loams, 3 to 8 percent slopes.....36
UbB—Udorthents, limestone, 0 to 8 percent slopes..... 37
UkaB—Urban land, 0 to 8 percent slopes.....38
UlB—Urban land-Berks complex, 0 to 8 percent slopes..... 39
UlD—Urban land-Berks complex, 8 to 25 percent slopes.....41
UoB—Urban land-Duffield complex, 0 to 8 percent slopes..... 42
UudB—Urban land-Udorthents, limestone complex, 0 to 8 percent slopes.....44
UusB—Urban land-Udorthents, shale and sandstone complex, 0 to 8 percent slopes.....46
UusD—Urban land-Udorthents, shale and sandstone complex, 8 to 25 percent slopes.....47
W—Water.....49
WaA—Washington silt loam, 0 to 3 percent slopes.....49
WaB—Washington silt loam, 3 to 8 percent slopes.....51
WkB—Weikert-Berks complex, 3 to 8 percent slopes.....53
WkC—Weikert-Berks complex, 8 to 15 percent slopes.....55
WkD—Weikert-Berks complex, 15 to 25 percent slopes.....56

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


75° 24' 47" W
75° 22' 17" W
40° 44' 18" N
40° 43' 5" N
465200
465500
465800
466100
466400
466700
467000
467300
467600
467900
468200
468500
4509700
4509400
4509100
4508800
4508500
4508200
4507900
4507600
BkD
BkF
BkC
Ho
BtB
BkB
BfB
UkaB
ClB
BtA
CpB
UlB
UlD
WkD
BkA
WkB
UusB
UusD
RyB
UudB
DuB
W
UbB
UoB
ClA
WaB
WaA
DvC
248
Main
Penn St
Newburg
Map Scale: 1:16,100 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0
200
400
800
1200
Feet
0
500
1000
2000
3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Northampton County, Pennsylvania
Survey Area Data: Version 9, Oct 4, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 20, 2011—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BfB	Bedington-Berks complex, 3 to 8 percent slopes	45.8	4.6%
BkA	Berks-Weikert complex, 0 to 3 percent slopes	7.4	0.7%
BkB	Berks-Weikert complex, 3 to 8 percent slopes	65.8	6.6%
BkC	Berks-Weikert complex, 8 to 15 percent slopes	104.6	10.4%
BkD	Berks-Weikert complex, 15 to 25 percent slopes	50.5	5.0%
BkF	Berks-Weikert complex, 25 to 60 percent slopes	49.1	4.9%
BtA	Brinkerton-Comly silt loams, 0 to 3 percent slopes	9.0	0.9%
BtB	Brinkerton-Comly silt loams, 3 to 8 percent slopes	1.5	0.1%
ClA	Clarksburg silt loam, 0 to 3 percent slopes	16.1	1.6%
ClB	Clarksburg silt loam, 3 to 8 percent slopes	19.6	2.0%
CpB	Comly silt loam, 3 to 8 percent slopes	19.8	2.0%
DuB	Duffield silt loam, 3 to 8 percent slopes	8.7	0.9%
DvC	Duffield-Ryder silt loams, 8 to 15 percent slopes	31.5	3.1%
Ho	Holly silt loam	15.9	1.6%
RyB	Ryder-Duffield silt loams, 3 to 8 percent slopes	13.8	1.4%
UbB	Udorthents, limestone, 0 to 8 percent slopes	32.8	3.3%
UkaB	Urban land, 0 to 8 percent slopes	55.5	5.5%
UlB	Urban land-Berks complex, 0 to 8 percent slopes	41.9	4.2%
UlD	Urban land-Berks complex, 8 to 25 percent slopes	32.8	3.3%
UoB	Urban land-Duffield complex, 0 to 8 percent slopes	199.1	19.8%
UudB	Urban land-Udorthents, limestone complex, 0 to 8 percent slopes	9.3	0.9%
UusB	Urban land-Udorthents, shale and sandstone complex, 0 to 8 percent slopes	34.6	3.4%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
UusD	Urban land-Udorthents, shale and sandstone complex, 8 to 25 percent slopes	52.5	5.2%
W	Water	14.6	1.5%
WaA	Washington silt loam, 0 to 3 percent slopes	0.0	0.0%
WaB	Washington silt loam, 3 to 8 percent slopes	1.9	0.2%
WkB	Weikert-Berks complex, 3 to 8 percent slopes	10.8	1.1%
WkC	Weikert-Berks complex, 8 to 15 percent slopes	13.4	1.3%
WkD	Weikert-Berks complex, 15 to 25 percent slopes	45.9	4.6%
Totals for Area of Interest		**1,004.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Northampton County, Pennsylvania

BfB—Bedington-Berks complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l78r
Elevation: 300 to 1,600 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 120 to 214 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Bedington and similar soils: 55 percent
Berks and similar soils: 35 percent
Minor components: 9 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bedington

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Acid brown residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 10 inches: channery silt loam
Bt - 10 to 43 inches: channery silt loam
C - 43 to 63 inches: extremely channery silt loam
R - 63 to 73 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 60 to 99 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Berks

Setting

Landform: Ridges, valleys

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Acid brown residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 10 inches: channery loam
Bw - 10 to 26 inches: very channery silt loam
C - 26 to 33 inches: extremely channery loam
R - 33 to 43 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Comly

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

Brinkerton

Percent of map unit: 3 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Weikert

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear

Hydric soil rating: No

BkA—Berks-Weikert complex, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2sgbf
Elevation: 310 to 960 feet
Mean annual precipitation: 37 to 50 inches
Mean annual air temperature: 47 to 56 degrees F
Frost-free period: 148 to 192 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Berks and similar soils: 70 percent
Weikert and similar soils: 20 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Berks

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Ap - 0 to 7 inches: channery loam
Bw1 - 7 to 14 inches: very channery loam
Bw2 - 14 to 21 inches: very channery silt loam
C - 21 to 30 inches: extremely channery loam
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: B
Other vegetative classification: Very Rocky, Acid Soils (RA2), Very Rocky, Acid Soils (RA3)
Hydric soil rating: No

Description of Weikert

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Gray and brown acid residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Ap - 0 to 8 inches: channery silt loam
Bw - 8 to 15 inches: very channery silt loam
C - 15 to 18 inches: extremely channery silt loam
R - 18 to 28 inches: bedrock

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: D
Other vegetative classification: Droughty Shales (SD2)
Hydric soil rating: No

Minor Components

Comly

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex

Hydric soil rating: No

Brinkerton

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

BkB—Berks-Weikert complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2sgbh
Elevation: 250 to 1,740 feet
Mean annual precipitation: 37 to 50 inches
Mean annual air temperature: 47 to 56 degrees F
Frost-free period: 148 to 192 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Berks and similar soils: 65 percent
Weikert and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Berks

Setting

Landform: Ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Ap - 0 to 7 inches: channery loam
Bw1 - 7 to 14 inches: channery silt loam
Bw2 - 14 to 21 inches: very channery silt loam
C - 21 to 30 inches: extremely channery loam
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Other vegetative classification: Very Rocky, Acid Soils (RA2), Very Rocky, Acid Soils (RA3)
Hydric soil rating: No

Description of Weikert

Setting

Landform: Ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Gray and brown acid residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Ap - 0 to 8 inches: channery silt loam
Bw - 8 to 15 inches: very channery silt loam
C - 15 to 18 inches: extremely channery silt loam
R - 18 to 28 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to very high (0.00 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Other vegetative classification: Droughty Shales (SD2)
Hydric soil rating: No

Minor Components

Comly

Percent of map unit: 6 percent
Landform: Ridges
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Brinkerton

Percent of map unit: 4 percent
Landform: Ridges
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: Yes

BkC—Berks-Weikert complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2sgbj
Elevation: 210 to 3,270 feet
Mean annual precipitation: 37 to 50 inches
Mean annual air temperature: 47 to 56 degrees F
Frost-free period: 148 to 192 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Berks and similar soils: 65 percent
Weikert and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Berks

Setting

Landform: Ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Ap - 0 to 7 inches: channery loam

Bw1 - 7 to 14 inches: channery loam
Bw2 - 14 to 21 inches: very channery silt loam
C - 21 to 30 inches: extremely channery loam
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Other vegetative classification: Very Rocky, Acid Soils (RA2), Very Rocky, Acid Soils (RA3)
Hydric soil rating: No

Description of Weikert

Setting

Landform: Ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Gray and brown acid residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Ap - 0 to 8 inches: channery silt loam
Bw - 8 to 15 inches: very channery silt loam
C - 15 to 18 inches: extremely channery silt loam
R - 18 to 28 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.28 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)

Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Other vegetative classification: Droughty Shales (SD2)
Hydric soil rating: No

Minor Components

Comly

Percent of map unit: 6 percent
Landform: Ridges
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Brinkerton

Percent of map unit: 4 percent
Landform: Ridges
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

BkD—Berks-Weikert complex, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2wkdr
Elevation: 230 to 1,240 feet
Mean annual precipitation: 37 to 50 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 155 to 177 days
Farmland classification: Not prime farmland

Map Unit Composition

Berks and similar soils: 65 percent
Weikert and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Berks

Setting

Landform: Ridges
Landform position (two-dimensional): Backslope, shoulder, summit

Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Parent material: Residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Ap - 0 to 7 inches: channery loam
Bw1 - 7 to 15 inches: very channery silt loam
Bw2 - 15 to 22 inches: very channery silt loam
C - 22 to 37 inches: extremely channery silt loam
R - 37 to 47 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Weikert

Setting

Landform: Ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Parent material: Gray and brown acid residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Ap - 0 to 7 inches: channery silt loam
Bw - 7 to 14 inches: very channery silt loam
C - 14 to 18 inches: extremely channery silt loam
R - 18 to 28 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Other vegetative classification: Droughty Shales (SD2)
Hydric soil rating: No

Minor Components

Comly
Percent of map unit: 6 percent
Landform: Ridges
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: No

Brinkerton
Percent of map unit: 4 percent
Landform: Ridges
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

BkF—Berks-Weikert complex, 25 to 60 percent slopes

Map Unit Setting
National map unit symbol: 2sgcr
Elevation: 220 to 1,300 feet
Mean annual precipitation: 29 to 50 inches
Mean annual air temperature: 47 to 56 degrees F
Frost-free period: 148 to 192 days
Farmland classification: Not prime farmland

Map Unit Composition
Berks and similar soils: 65 percent
Weikert and similar soils: 25 percent
Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Berks

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Acid brown residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 5 inches: channery loam
Bw1 - 5 to 15 inches: very channery silt loam
Bw2 - 15 to 22 inches: very channery silt loam
C - 22 to 37 inches: extremely channery silt loam
R - 37 to 47 inches: bedrock

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Other vegetative classification: Very Rocky, Acid Soils (RA3)
Hydric soil rating: No

Description of Weikert

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Acid brown residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

A - 1 to 5 inches: channery silt loam
Bw - 5 to 18 inches: very channery loam
R - 18 to 28 inches: bedrock

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: 8 to 19 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Other vegetative classification: Not Suited (NS)
Hydric soil rating: No

Minor Components

Bedington

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Comly

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Brinkerton

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

BtA—Brinkerton-Comly silt loams, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: l790
Elevation: 300 to 1,400 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Not prime farmland

Map Unit Composition

Brinkerton and similar soils: 75 percent
Comly and similar soils: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brinkerton

Setting

Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Parent material: Fine-silty colluvium derived from shale and siltstone

Typical profile

Ap - 0 to 9 inches: silt loam
Bt - 9 to 16 inches: silty clay loam
Bx - 16 to 42 inches: channery clay loam
C - 42 to 61 inches: channery loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 11 to 30 inches to fragipan; 60 to 99 inches to lithic bedrock
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Hydric soil rating: Yes

Description of Comly

Setting

Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Acid fine-loamy colluvium derived from shale and siltstone

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 25 inches: channery silty clay loam
Btx - 25 to 52 inches: channery loam
C - 52 to 61 inches: very channery silt loam
R - 61 to 72 inches: bedrock

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 20 to 35 inches to fragipan; 60 to 96 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Hydric soil rating: No

BtB—Brinkerton-Comly silt loams, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l791
Elevation: 300 to 1,400 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Not prime farmland

Map Unit Composition

Brinkerton and similar soils: 75 percent
Comly and similar soils: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brinkerton

Setting

Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Fine-silty colluvium derived from shale and siltstone

Typical profile

Ap - 0 to 9 inches: silt loam
Bt - 9 to 16 inches: silty clay loam
Bx - 16 to 42 inches: channery clay loam
C - 42 to 61 inches: channery loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 11 to 30 inches to fragipan; 60 to 99 inches to lithic bedrock
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Hydric soil rating: Yes

Description of Comly

Setting

Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Acid fine-loamy colluvium derived from shale and siltstone

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 25 inches: channery silty clay loam
Btx - 25 to 52 inches: channery loam
C - 52 to 61 inches: very channery silt loam
R - 61 to 72 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 36 inches to fragipan; 60 to 96 inches to lithic bedrock
Natural drainage class: Moderately well drained

Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

ClA—Clarksburg silt loam, 0 to 3 percent slopes

Map Unit Setting
National map unit symbol: 21xwj
Elevation: 200 to 1,500 feet
Mean annual precipitation: 32 to 48 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Clarksburg and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clarksburg

Setting
Landform: Valley flats
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Parent material: Residuum weathered from limestone

Typical profile
Ap - 0 to 8 inches: silt loam
Bt - 8 to 27 inches: silt loam
Btx - 27 to 51 inches: silt loam
C - 51 to 84 inches: silt loam

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: 20 to 36 inches to fragipan; 60 to 99 inches to
Natural drainage class: Moderately well drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Thorndale

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

ClB—Clarksburg silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 21xwk
Elevation: 200 to 1,500 feet
Mean annual precipitation: 32 to 48 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Clarksburg and similar soils: 90 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clarksburg

Setting

Landform: Valley flats
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Residuum weathered from limestone

Typical profile

Ap - 0 to 8 inches: silt loam

Bt - 8 to 27 inches: silt loam
Btx - 27 to 51 inches: silt loam
C - 51 to 84 inches: silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 36 inches to fragipan; 60 to 99 inches to
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Thorndale

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

CpB—Comly silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l79m
Elevation: 300 to 1,400 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 120 to 214 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Comly and similar soils: 90 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Comly

Setting

Landform: Valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Acid fine-loamy colluvium derived from shale and siltstone

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 25 inches: channery silty clay loam
Btx - 25 to 52 inches: channery loam
C - 52 to 61 inches: very channery silt loam
R - 61 to 80 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 35 inches to fragipan; 60 to 96 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Brinkerton

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

DuB—Duffield silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 21xx2
Elevation: 200 to 1,500 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Duffield and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Duffield

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from limestone and siltstone

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 53 inches: silty clay loam
C - 53 to 72 inches: silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 48 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clarksburg

Percent of map unit: 5 percent
Landform: Valley flats
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Ryder

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Thorndale

Percent of map unit: 2 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

DvC—Duffield-Ryder silt loams, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 23dvt
Elevation: 200 to 1,500 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Duffield and similar soils: 60 percent
Ryder and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Duffield

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Residuum weathered from limestone and siltstone

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 53 inches: silty clay loam
C - 53 to 72 inches: silt loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 48 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Ryder

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Residuum weathered from limestone

Typical profile

Ap - 0 to 8 inches: silt loam
Bt - 8 to 30 inches: silt loam
C - 30 to 38 inches: very channery silt loam
R - 38 to 48 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 24 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clarksburg
Percent of map unit: 4 percent
Landform: Valley flats
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Thorndale
Percent of map unit: 3 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Penlaw
Percent of map unit: 3 percent
Landform: Swales
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Ho—Holly silt loam

Map Unit Setting
National map unit symbol: l7bn
Elevation: 100 to 1,300 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Holly and similar soils: 94 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Holly

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 7 inches: silt loam
Bg - 7 to 26 inches: silty clay loam
Cg - 26 to 44 inches: silty clay loam
2Cg - 44 to 62 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: Occasional
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Linden

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Gibraltar

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Brinkerton

Percent of map unit: 2 percent

Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

RyB—Ryder-Duffield silt loams, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l7cl
Elevation: 300 to 1,000 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 140 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ryder and similar soils: 65 percent
Duffield and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ryder

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Residuum weathered from shaly limestone

Typical profile

Ap - 0 to 8 inches: silt loam
Bt - 8 to 34 inches: channery silt loam
C - 34 to 38 inches: very channery silt loam
R - 38 to 48 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 24 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Duffield

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy residuum weathered from impure limestone and calcareous siltstone

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 53 inches: silt loam
C - 53 to 72 inches: channery silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 48 to 99 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

UbB—Udorthents, limestone, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 23f03
Elevation: 300 to 900 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition
Udorthents, limestone, and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Limestone

Setting
Landform: Hills
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Graded areas of argillaceous limestone

Typical profile
A/B - 0 to 6 inches: silty clay loam
C - 6 to 60 inches: clay

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: 40 to 99 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 60 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.2 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

UkaB—Urban land, 0 to 8 percent slopes

Map Unit Setting
National map unit symbol: 23f0k
Elevation: 800 to 1,500 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Pavement, buildings and other artifically covered areas human transported material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Udorthents, unstable fill

Percent of map unit: 10 percent
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

UIB—Urban land-Berks complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: l7d7
Elevation: 300 to 1,500 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 44 to 57 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 65 percent
Berks and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Ridges, hills, valleys
Landform position (two-dimensional): Summit, footslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Pavement, buildings and other artifically covered areas

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 to 100 inches to lithic bedrock
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Berks

Setting

Landform: Ridges, valleys
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Acid brown residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 10 inches: channery loam
Bw - 10 to 26 inches: very channery silt loam
C - 26 to 33 inches: extremely channery loam
R - 33 to 43 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Comly

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

Brinkerton

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

UID—Urban land-Berks complex, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: l7d6
Elevation: 300 to 1,500 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 44 to 57 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 65 percent
Berks and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Ridges, hills, valleys
Landform position (two-dimensional): Summit, footslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Pavement, buildings and other artifically covered areas

Typical profile

C - 0 to 6 inches: variable

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 10 to 100 inches to lithic bedrock
Runoff class: Very high
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Berks

Setting

Landform: Ridges, valleys
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Acid brown residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 10 inches: channery loam
Bw - 10 to 26 inches: very channery silt loam
C - 26 to 33 inches: extremely channery loam
R - 33 to 43 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Comly

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

Brinkerton

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

UoB—Urban land-Duffield complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 23f21
Elevation: 200 to 1,500 feet

Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 44 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 65 percent
Duffield and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Pavement, buildings and other artifically covered areas

Typical profile

C - 0 to 6 inches: variable

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 to 100 inches to lithic bedrock
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Duffield

Setting

Landform: Valleys
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from limestone

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 53 inches: silty clay loam
C - 53 to 72 inches: silt loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 48 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clarksburg

Percent of map unit: 4 percent
Landform: Valley flats
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Penlaw

Percent of map unit: 4 percent
Landform: Swales
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Thorndale

Percent of map unit: 2 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

UudB—Urban land-Udorthents, limestone complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 227x6
Elevation: 300 to 1,000 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 80 percent

Udorthents, limestone, and similar soils: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting
Landform: Hills, valleys
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Interfluve, side slope, nose slope, head slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Pavement, buildings and other artifically covered areas

Typical profile
C - 0 to 6 inches: variable

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: 10 to 99 inches to lithic bedrock
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Udorthents, Limestone

Setting
Landform: Hills, valleys
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Interfluve, side slope, nose slope, head slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Graded areas of argillaceous limestone

Typical profile
A/B - 0 to 6 inches: clay loam
C - 6 to 60 inches: clay

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 99 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.2 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Duffield
Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

UusB—Urban land-Udorthents, shale and sandstone complex, 0 to 8 percent slopes

Map Unit Setting
National map unit symbol: 227xb
Elevation: 250 to 950 feet
Mean annual precipitation: 38 to 48 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 161 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 80 percent
Udorthents, shale and sandstone, and similar soils: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting
Landform: Hills
Parent material: Pavement, buildings and other artifically covered areas

Typical profile
C - 0 to 6 inches: variable

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: 10 to 99 inches to lithic bedrock
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Udorthents, Shale And Sandstone

Setting

Landform: Ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, nose slope, interfluve
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Graded areas of sandstone and shale

Typical profile

A - 0 to 6 inches: very channery loam
C - 6 to 60 inches: very channery silt loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 99 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Penn

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

UusD—Urban land-Udorthents, shale and sandstone complex, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: 227xc
Elevation: 250 to 950 feet

Mean annual precipitation: 38 to 48 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 80 percent
Udorthents, shale and sandstone, and similar soils: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Pavement, buildings and other artifically covered areas

Typical profile

C - 0 to 6 inches: variable

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 10 to 99 inches to lithic bedrock
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Udorthents, Shale And Sandstone

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Graded areas of sandstone and shale

Typical profile

Ap - 0 to 6 inches: very channery loam
C - 6 to 60 inches: very channery silty clay loam

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 20 to 99 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Penn

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

W—Water

Map Unit Setting

National map unit symbol: l7ds
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 59 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Setting

Parent material: Rivers streams ponds

Properties and qualities

Runoff class: Negligible
Frequency of ponding: Frequent

WaA—Washington silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: l7dt
Elevation: 200 to 1,500 feet

Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Washington and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Washington

Setting

Landform: Valleys
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from limestone and/or old glacial drift

Typical profile

Ap - 0 to 9 inches: silt loam
Bt - 9 to 42 inches: clay loam
C - 42 to 61 inches: gravelly loam
R - 61 to 71 inches: bedrock

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 60 to 99 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clarksburg

Percent of map unit: 5 percent
Landform: Valley flats
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Ryder

Percent of map unit: 3 percent

Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Thorndale

Percent of map unit: 1 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Penlaw

Percent of map unit: 1 percent
Landform: Swales
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

WaB—Washington silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l7dv
Elevation: 200 to 1,500 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Washington and similar soils: 90 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Washington

Setting

Landform: Valleys
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from limestone and/or old glacial drift

Typical profile

Ap - 0 to 9 inches: silt loam
Bt - 9 to 42 inches: clay loam
C - 42 to 61 inches: silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 60 to 99 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clarksburg

Percent of map unit: 2 percent
Landform: Valley flats
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Ryder

Percent of map unit: 1 percent
Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Thorndale

Percent of map unit: 1 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Loudonville

Percent of map unit: 1 percent
Landform: Till plains
Landform position (three-dimensional): Head slope
Down-slope shape: Convex

Across-slope shape: Convex
Hydric soil rating: No

WkB—Weikert-Berks complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2v4w4
Elevation: 230 to 980 feet
Mean annual precipitation: 37 to 50 inches
Mean annual air temperature: 47 to 56 degrees F
Frost-free period: 148 to 192 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Weikert and similar soils: 50 percent
Berks and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Weikert

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Gray and brown acid residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Ap - 0 to 8 inches: channery silt loam
Bw - 8 to 15 inches: very channery silt loam
C - 15 to 18 inches: extremely channery silt loam
R - 18 to 28 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.28 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Other vegetative classification: Droughty Shales (SD2)
Hydric soil rating: No

Description of Berks

Setting

Landform: Ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Ap - 0 to 7 inches: channery loam
Bw1 - 7 to 14 inches: very channery loam
Bw2 - 14 to 21 inches: very channery silt loam
C - 21 to 30 inches: extremely channery loam
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Other vegetative classification: Very Rocky, Acid Soils (RA2), Very Rocky, Acid Soils (RA3)
Hydric soil rating: No

Minor Components

Comly

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Brinkerton

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

WkC—Weikert-Berks complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 23f2j
Elevation: 500 to 1,600 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Not prime farmland

Map Unit Composition

Weikert and similar soils: 70 percent
Berks and similar soils: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Weikert

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 8 inches: channery silt loam
Bw - 8 to 15 inches: very channery silt loam
R - 15 to 25 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Berks

Setting

Landform: Ridges, valleys
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Acid brown residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 10 inches: channery loam
Bt - 10 to 26 inches: very channery loam
C - 26 to 33 inches: very channery loam
R - 33 to 43 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

WkD—Weikert-Berks complex, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2v4w3
Elevation: 210 to 1,090 feet
Mean annual precipitation: 37 to 50 inches
Mean annual air temperature: 47 to 56 degrees F
Frost-free period: 148 to 192 days
Farmland classification: Not prime farmland

Map Unit Composition

Weikert and similar soils: 50 percent
Berks and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Weikert

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Gray and brown acid residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Ap - 0 to 7 inches: channery silt loam
Bw - 7 to 12 inches: very channery silt loam
C - 12 to 15 inches: extremely channery silt loam
R - 15 to 25 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water storage in profile: Very low (about 1.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Other vegetative classification: Droughty Shales (SD3)
Hydric soil rating: No

Description of Berks

Setting

Landform: Ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from shale and siltstone and/or fine grained sandstone

Typical profile

Ap - 0 to 7 inches: channery loam

Bw1 - 7 to 14 inches: very channery loam
Bw2 - 14 to 21 inches: very channery silt loam
C - 21 to 30 inches: extremely channery loam
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.16 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Other vegetative classification: Very Rocky, Acid Soils (RA2), Very Rocky, Acid Soils (RA3)
Hydric soil rating: No

Minor Components

Comly

Percent of map unit: 5 percent
Landform: Ridges on hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, convex
Across-slope shape: Concave, linear
Hydric soil rating: No

Brinkerton

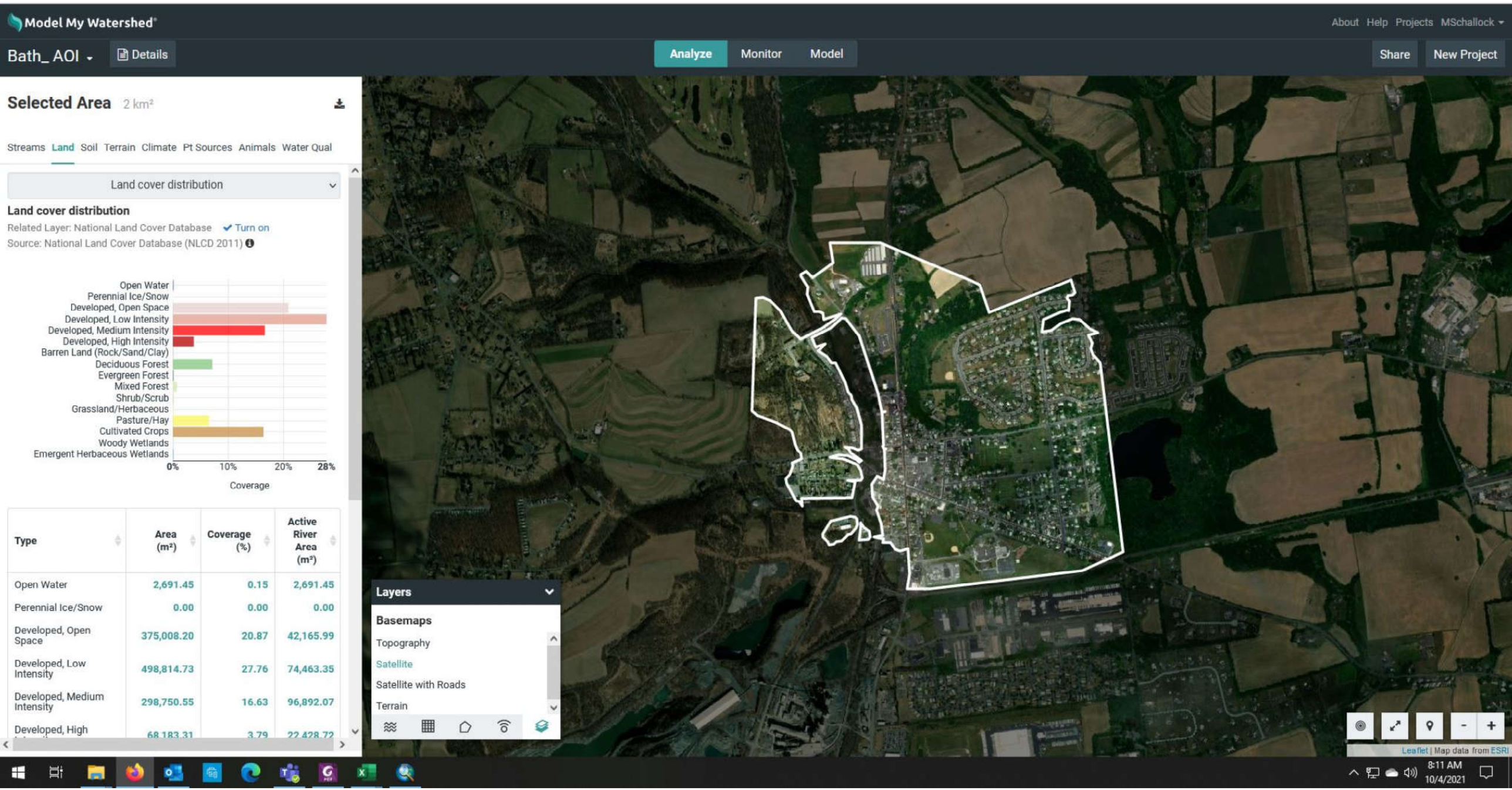
Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

EXISTING SEDIMENT LOAD CALCULATIONS

BOROUGH OF BATH - EXISTING SEDIMENT LOADING

STORM SEWER SHED NUMBER	DEVELOPED, OPEN SPACE (SQ. METERS)	DEVELOPED, OPEN SPACE (ACRES)	DEVELOPED, OPEN SPACE (IMPERVIOUS SURFACES) (19% OF TOTAL AREA) (A)	DEVELOPED, OPEN SPACE (PERVIOUS SURFACES) (81% OF TOTAL AREA) (B)	DEVELOPED, OPEN SPACE (IMPERVIOUS SURFACE - SEDIMENT LOADING)(A*1893 LBS/ACRE/YR) (LBS/YR)	DEVELOPED, OPEN SPACE (PERVIOUS SURFACE - SEDIMENT LOADING) (B*264.96 LBS/ACRE/YR) (LBS/YR)	DEVELOPED, LOW INTENSITY (SQ. METERS)	DEVELOPED, LOW INTENSITY (ACRES)	DEVELOPED, LOW INTENSITY (IMPERVIOUS SURFACES) (49% OF TOTAL AREA) (C)	DEVELOPED, LOW INTENSITY (PERVIOUS SURFACES) (51% OF TOTAL AREA) (D)	DEVELOPED, LOW INTENSITY (IMPERVIOUS SURFACE - SEDIMENT LOADING) (C*1893 LBS/ACRE/YR) (LBS/YR)	DEVELOPED, LOW INTENSITY (PERVIOUS SURFACE - SEDIMENT LOADING) (D*264.96 LBS/ACRE/YR) (LBS/YR)	DEVELOPED, MEDIUM INTENSITY (SQ. METERS)	DEVELOPED, MEDIUM INTENSITY (ACRES)	DEVELOPED, MEDIUM INTENSITY (IMPERVIOUS SURFACES) (79% OF TOTAL AREA) (E)	DEVELOPED, MEDIUM INTENSITY (PERVIOUS SURFACES) (21% OF TOTAL AREA) (F)	DEVELOPED, MEDIUM INTENSITY (IMPERVIOUS SURFACE - SEDIMENT LOADING) (E*1893 LBS/ACRE/YR) (LBS/YR)	DEVELOPED, MEDIUM INTENSITY (PERVIOUS SURFACE - SEDIMENT LOADING) (F*264.96 LBS/ACRE/YR) (LBS/YR)	DEVELOPED, HIGH INTENSITY (SQ. METERS)	DEVELOPED, HIGH INTENSITY (ACRES)	DEVELOPED, HIGH INTENSITY (IMPERVIOUS SURFACES) (100% OF TOTAL AREA) (G)	DEVELOPED, HIGH INTENSITY (IMPERVIOUS SURFACE - SEDIMENT LOADING) (G*1893 LBS/ACRE/YR) (LBS/YR)	UNDEVELOPED LANDS (SQ. METERS)	UNDEVELOPED LANDS (ACRES) (H)	UNDEVELOPED LANDS - SEDIMENT LOADING (H*234.6 LBS/ACRE/YR) (LBS/YR)	TOTAL SEDIMENT LOADING (LBS/YR)	TOTAL STORM SEWERSHED AREA (ACRES)
AOI	375007.88	92.67	17.61	75.06	32378.46	19887.77	498814.31	123.26	60.40	62.86	111070.10	16655.97	298750.30	73.82	58.32	15.50	107250.08	4107.60	68183.26	16.85	16.85	30984.18	553540.36	136.78	32089.12	**354423.29**	**443.38**
		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	**0.00**	**0.00**
		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	**0.00**	**0.00**
		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	**0.00**	**0.00**
		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	**0.00**	**0.00**
		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	**0.00**	**0.00**
		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	**0.00**	**0.00**
		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	**0.00**	**0.00**

TOTAL EXISTING SEDIMENT LOAD 354423.29


Model My Watershed
About Help Projects MSchallock
Bath_ AOI
Details
Analyze
Monitor
Model
Share
New Project
Selected Area 2 km²
Streams Land Soil Terrain Climate Pt Sources Animals Water Qual
Land cover distribution
Land cover distribution
Related Layer: National Land Cover Database
Turn on
Source: National Land Cover Database (NLCD 2011)
Open Water
Perennial Ice/Snow
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land (Rock/Sand/Clay)
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Grassland/Herbaceous
Pasture/Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetlands
0%
10%
20%
28%
Coverage
Type
Area (m²)
Coverage (%)
Active River Area (m²)
Open Water 2,691.45 0.15 2,691.45
Perennial Ice/Snow 0.00 0.00 0.00
Developed, Open Space 375,008.20 20.87 42,165.99
Developed, Low Intensity 498,814.73 27.76 74,463.35
Developed, Medium Intensity 298,750.55 16.63 96,892.07
Developed, High
68,183.31 3.79 22,428.72
Layers
Basemaps
Topography
Satellite
Satellite with Roads
Terrain
Leaflet | Map data from ESRI
8:11 AM
10/4/2021

REQUIRED SEDIMENT LOAD REDUCTION CALCULATIONS

BOROUGH OF BATH - REQUIRED SEDIMENT LOAD CALCULATIONS		
EXISTING SEDIMENT LOAD	**354423.29**	**LBS/YR**
EXISTING BEST MANAGEMENT PRACTICE (BMP) REDUCTIONS:		
EXISTING SEDIMENT LOAD WITH EXISTING BMP BENEFITS:	**354423.29**	**LBS/YR**
(EXISTING SEDIMENT LOAD - EXISTING BEST MANAGEMENT PRACTICE REDUCTIONS)		
REQUIRED SEDIMENT LOAD REDUCTION:	**35442.33**	**LBS/YR**
(10% OF EXISTING SEDIMENT LOAD WITH EXISTING BMP BENEFITS)		

PROPOSED BMP REDUCTION CALCULATIONS

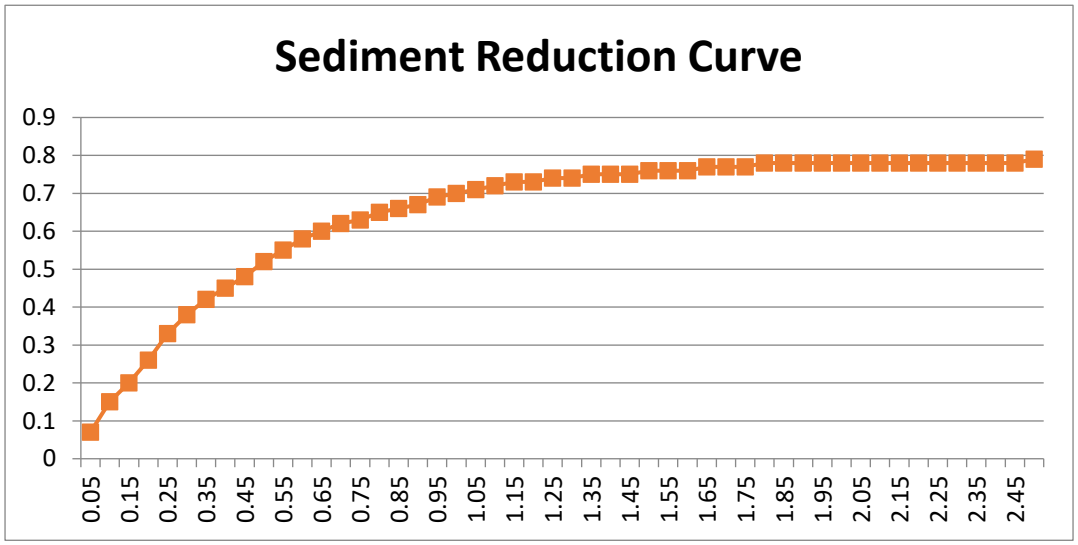
BOROUGH OF BATH - PROPOSED BMP REDUCTION CALCULATIONS						
STORM SEWER SHED NUMBER	EXISTING SEDIMENT LOADING (LBS/YR)	EXISTING BMP REDUCTION (LBS/YR)	EXISTING SEDIMENT LOADING WITH EXISTING BMP REDUCTION CREDIT (LBS/YR)	TOTAL SEDIMENT LOAD TREATED BY DRY EXTENDED DETENTION BASIN *	TOTAL SEDIMENT LOAD TREATED BY PROPOSED STREET SWEEPING (LBS/YR) **	PROPOSED SEDIMENT REDUCTION (A*B) (LBS/YR)
AOI	354423.29	0.00	354423.29	0.00	4912.33	4912.33
BMP #1= Basin #1 Conversion BMP 6.6.3 Dry Ext.	30820.18		30820.18	18492.11		18492.11
BMP #2= Basin #2 Conversion BMP 6.6.3 Dry Ext.	10951.32		10951.32	8213.49		8213.49
BMP #3 = Construct BMP 6.4.5: Rain Garden/Bioretention	27125.65		27125.65	4068.85		4068.85

TOTALS	**354423.29**	**0.00**	**354423.29**	**TOTAL PROPOSED SEDIMENT REDUCTION**	**35686.78**
			REQUIRED SEDIMENT REDUCTION	**35442.3286**	

* Note: Dry Exteneded Basin calculations are based on runoff calculations for the watershed area upstream of the Basin proposed to be converted. See Sediment Loading to Proposed BMP'S.

BOROUGH OF BATH - SEDIMENT LOADING TO PROPOSED BMP'S

BMP NAME: BMP #1 conversion to BMP 6.6.3 Dry Ext.



TOTAL DRAINAGE AREA (Acres):	**33.92**
TOTAL IMPERVIOUS AREA (Acres):	**13.54**

BMP SEDIMENT LOAD (lbs/yr):	**30,820.18**

EXISTING SEDIMENT REMOVAL REDUCTIONS

PROPOSED SEDIMENT REMOVAL REDUCTIONS	
Volume Treated (ac-ft.)	**0.765**
Inches of Impervious Area Treated:	**0.68**
Percent Reduction:	**60%**
Removed Sediment:	**18,492.11**

Type	Area (m2)	ACRES	IMP. AREA	PER. AREA
Open Water	0	**0.00**		
Perennial Ice/Snow	0	**0.00**		
Developed, Open Space	22428.69	**5.54**	**1.05**	**4.49**
Developed, Low Intensity	58314.6	**14.41**	**7.06**	**7.35**
Developed, Medium Intensity	27811.58	**6.87**	**5.43**	**1.44**
Developed, High Intensity	0	**0.00**	**0.00**	**0.00**
Barren Land (Rock/Sand/Clay)	0	**7.09**		**7.09**
Deciduous Forest	8971.48			
Evergreen Forest				
Mixed Forest	0			
Shrub/Scrub	0			
Grassland/Herbaceous	0			
Pasture/Hay	897.15			
Cultivated Crops	18840.1			
Woody Wetlands	0			
Emergent Herbaceous Wetlands	0			

CF
33333.33333

BMP Area	25000	ft2
Treated Depth (in.)	16	inches

19750

Dry Extended Basin#1 | Details | Analyze | Model | New Project

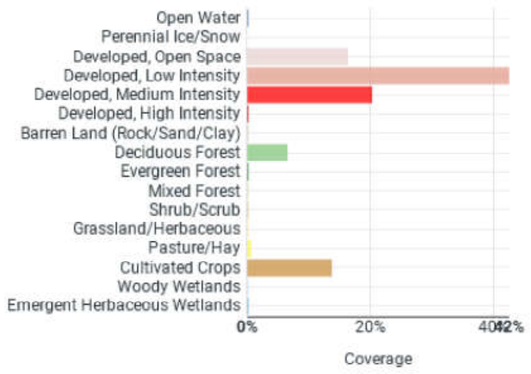
Selected Area 134,674 m²

Land | Soil | Animals | Point Sources | Water Quality

Land cover distribution

Related Layer: National Land Cover Database ✔ Turn on

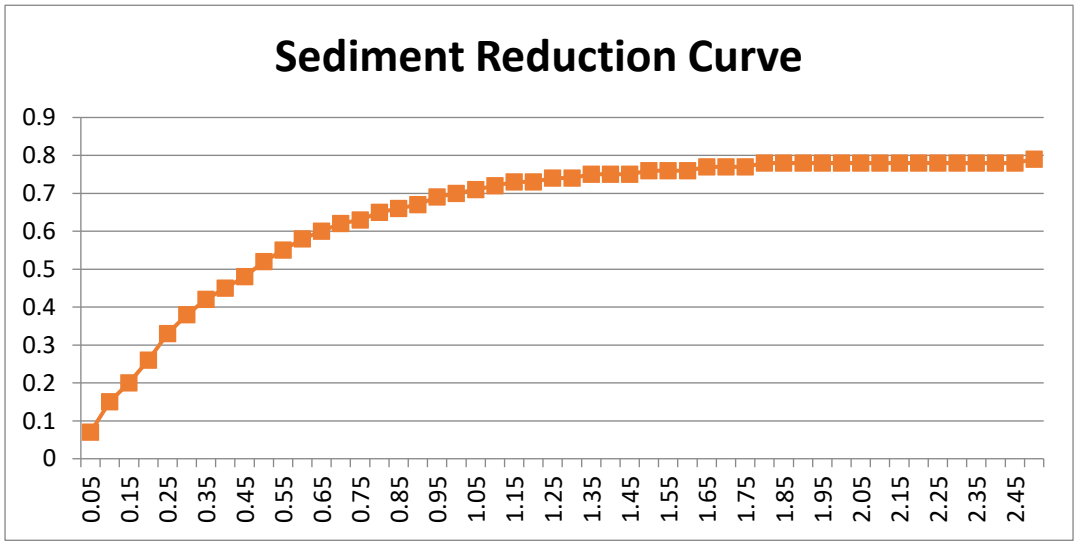
Source: National Land Cover Database (NLCD 2011)



Type	Area (m²)	Coverage (%)
Open Water	0.00	0.0
Perennial Ice/Snow	0.00	0.0
Developed, Open Space	22,428.69	16.3
Developed, Low Intensity	58,314.60	42.5
Developed, Medium Intensity	27,811.58	20.3
Developed, High Intensity	0.00	0.0
Barren Land (Rock/Sand/Clay)	0.00	0.0
Deciduous Forest	8,971.48	6.5
Evergreen Forest	0.00	0.0
Mixed Forest	0.00	0.0
Shrub/Scrub	0.00	0.0
Grassland/Herbaceous	0.00	0.0

BOROUGH OF BATH - SEDIMENT LOADING TO PROPOSED BMP'S

BMP NAME: BMP #2 conversion to BMP 6.6.3 Dry Ext.



TOTAL DRAINAGE AREA (Acres):	**11.53**
TOTAL IMPERVIOUS AREA (Acres):	**4.85**

BMP SEDIMENT LOAD (lbs/yr):	**10,951.32**

EXISTING SEDIMENT REMOVAL REDUCTIONS

PROPOSED SEDIMENT REMOVAL REDUCTIONS	
Volume Treated (ac-ft.)	**0.574**
Inches of Impervious Area Treated:	**1.42**
Percent Reduction:	**75%**
Removed Sediment:	**8,213.49**

Type	Area (m2)	ACRES	IMP. AREA	PER. AREA
Open Water	0	0.00		
Perennial Ice/Snow	0	0.00		
Developed, Open Space	15251.52	3.77	0.72	3.05
Developed, Low Intensity	26914.44	6.65	3.26	3.39
Developed, Medium Intensity	4485.74	1.11	0.88	0.23
Developed, High Intensity	0	0.00	0.00	0.00
Barren Land (Rock/Sand/Clay)	0	0.00		0.00
Deciduous Forest	0			
Evergreen Forest				
Mixed Forest	0			
Shrub/Scrub	0			
Grassland/Herbaceous	0			
Pasture/Hay	0			
Cultivated Crops	0			
Woody Wetlands	0			
Emergent Herbaceous Wetlands	0			

CF
25000

BMP Area	18750	ft2
Treated Depth (in.)	16	inches

Model My Watershed

About Help Projects MSchallock

Bath Dry Extended Basi... Details

Analyze Monitor Model

Share New Project

Selected Area 47,874 m²

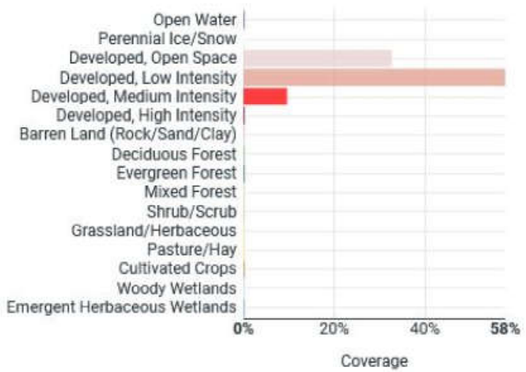
Streams Land Soil Terrain Climate Pt Sources Animals Water Qual

Land cover distribution

Land cover distribution

Related Layer: National Land Cover Database ✔ Turn on

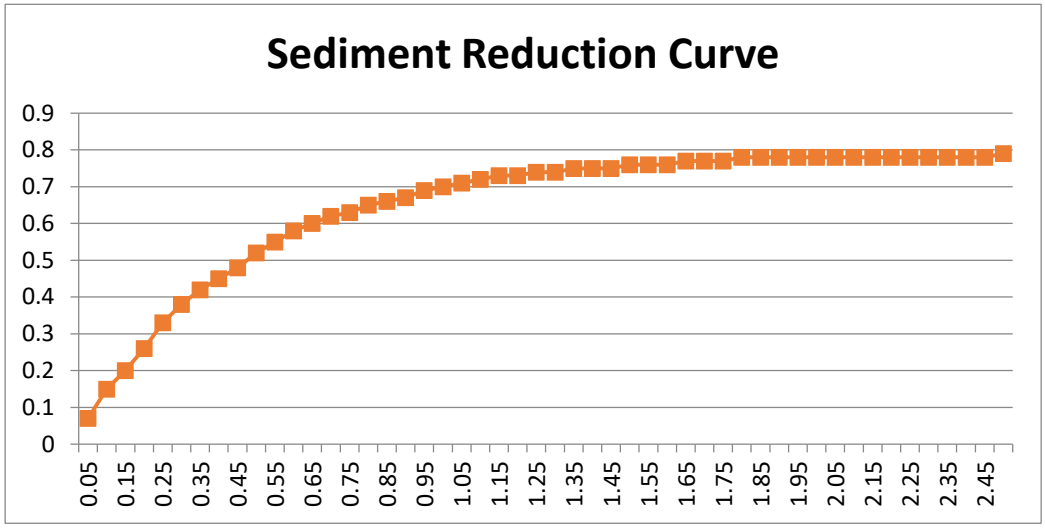
Source: National Land Cover Database (NLCD 2011)



Type	Area (m²)	Coverage (%)	Active River Area (m²)
Open Water	0.00	0.00	No Data
Perennial Ice/Snow	0.00	0.00	No Data
Developed, Open Space	15,251.52	32.69	No Data
Developed, Low Intensity	26,914.44	57.69	No Data
Developed, Medium Intensity	4,485.74	9.62	No Data
Developed, High Intensity	0.00	0.00	No Data

BOROUGH OF BATH - SEDIMENT LOADING TO PROPOSED BMP'S

BMP NAME: BMP 6.4.5: Rain Garden/Bioretention = School Property



TOTAL DRAINAGE AREA (Acres):	**29.71**
TOTAL IMPERVIOUS AREA (Acres):	**11.88**
BMP SEDIMENT LOAD (lbs/yr):	**27,125.65**

EXISTING SEDIMENT REMOVAL REDUCTIONS

PROPOSED SEDIMENT REMOVAL REDUCTIONS	
Volume Treated (ac-ft.)	**0.099**
Inches of Impervious Area Treated:	**0.10**
Percent Reduction:	**15%**
Removed Sediment:	**4,068.85**

Type	Area (m2)	ACRES	IMP. AREA	PER. AREA
Open Water	0	**0.00**		
Perennial Ice/Snow	0	**0.00**		
Developed, Open Space	36783.09	**9.09**	**1.73**	**7.36**
Developed, Low Intensity	50240.32	**12.41**	**6.08**	**6.33**
Developed, Medium Intensity	19737.27	**4.88**	**3.85**	**1.02**
Developed, High Intensity	897.15	**0.22**	**0.22**	**0.00**
Barren Land (Rock/Sand/Clay)	0	**3.10**		**3.10**
Deciduous Forest	0			
Evergreen Forest	0			
Mixed Forest	0			
Shrub/Scrub	0			
Grassland/Herbaceous	0			
Pasture/Hay	12560.08			
Cultivated Crops	0			
Woody Wetlands	0			
Emergent Herbaceous Wetlands	0			

BMP Area	8650	ft2
Treated Depth (in.)	6	inches

		cost/yd2	Total Cost
961.11111	yd2	**$ 60.00**	**$ 57,666.67**

Model My Watershed

About Help Projects MSchallock

BATH_Rain Garden#1 Details

Analyze Monitor Model Share New Project

Selected Area 118,976 m²

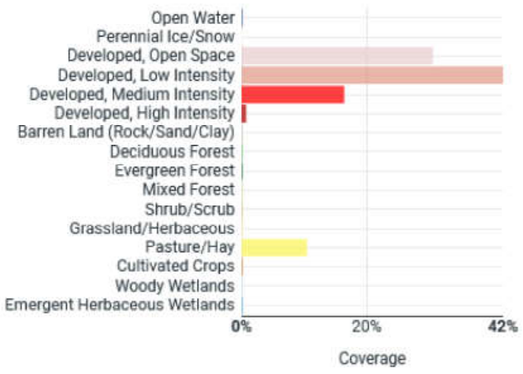
Streams Land Soil Terrain Climate Pt Sources Animals Water Qual

Land Use/Cover 2019 (NLCD19)

Land Use/Cover 2019 (NLCD19)

Related Layer: Land Use/Cover 2019 (NLCD19) Turn on

Source: National Land Cover Database (NLCD 2019)



Type	Area (m²)	Coverage (%)	Active River Area (m²)
Open Water	0.00	0.00	No Data
Perennial Ice/Snow	0.00	0.00	No Data
Developed, Open Space	36,783.09	30.60	No Data
Developed, Low Intensity	50,240.32	41.79	No Data
Developed, Medium Intensity	19,737.27	16.42	No Data
Developed, High Intensity	897.15	0.75	No Data

BOROUGH OF BATH - STREET SWEEPING SOLIDS REMOVAL CALCULATIONS					
STORM SEWER SHED NUMBER	EXISTING SEDIMENT LOADING (LBS/YR) (A)	TOTAL TRIBUTARY AREA	AREA OF SWEEPING IN TRIBUTARY AREA (ACRES)	REDUCTION FACTOR	TOTAL TREATMENT SEDIMENT LOAD [(C/A)*B]
AOI	354423.29	443.38	29.68	0.09	4912.33
				Total	4912.33

** Street Sweeping Calculations:

Nazareth Borough maintains slightly more than 9 miles of roadway in the borough. Based on the average road width of 26 feet, the area of impervious surfaces is 29.68 acres. Using the total sediment loading rate of 1,839 lbs./yr. per acre, the existing sediment loading with in the 9 miles of the Borough-maintained roadway is 4,912.33 lbs/yr. Roads must be swept 25 times a year.

BOROUGH OF BATH - SEDIMENT LOADING TO PROPOSED BMP'S

BMP	DEVELOPED, OPEN SPACE (SQ. METERS)	DEVELOPED, OPEN SPACE (ACRES)	DEVELOPED, OPEN SPACE (IMPERVIOUS SURFACES) (19% OF TOTAL AREA) (A)	DEVELOPED, OPEN SPACE (PERVIOUS SURFACES) (81% OF TOTAL AREA) (B)	DEVELOPED, OPEN SPACE (IMPERVIOUS SURFACE - SEDIMENT LOADING)(A*1893 LBS/ACRE/YR) (LBS/YR)	DEVELOPED, OPEN SPACE (PERVIOUS SURFACE - SEDIMENT LOADING) (B*264.96 LBS/ACRE/YR) (LBS/YR)	DEVELOPED, LOW INTENSITY (SQ. METERS)	DEVELOPED, LOW INTENSITY (ACRES)	DEVELOPED, LOW INTENSITY (IMPERVIOUS SURFACES) (49% OF TOTAL AREA) (C)	DEVELOPED, LOW INTENSITY (PERVIOUS SURFACES) (51% OF TOTAL AREA) (D)	DEVELOPED, LOW INTENSITY (IMPERVIOUS SURFACE - SEDIMENT LOADING) (C*1893 LBS/ACRE/YR) (LBS/YR)	DEVELOPED, LOW INTENSITY (PERVIOUS SURFACE - SEDIMENT LOADING) (D*264.96 LBS/ACRE/YR) (LBS/YR)	DEVELOPED, MEDIUM INTENSITY (SQ. METERS)	DEVELOPED, MEDIUM INTENSITY (ACRES)	DEVELOPED, MEDIUM INTENSITY (IMPERVIOUS SURFACES) (79% OF TOTAL AREA) (E)	DEVELOPED, MEDIUM INTENSITY (PERVIOUS SURFACES) (21% OF TOTAL AREA) (F)	DEVELOPED, MEDIUM INTENSITY (IMPERVIOUS SURFACE - SEDIMENT LOADING) (E*1893 LBS/ACRE/YR) (LBS/YR)	DEVELOPED, MEDIUM INTENSITY (PERVIOUS SURFACE - SEDIMENT LOADING) (F*264.96 LBS/ACRE/YR) (LBS/YR)	DEVELOPED, HIGH INTENSITY (SQ. METERS)	DEVELOPED, HIGH INTENSITY (ACRES)	DEVELOPED, HIGH INTENSITY (IMPERVIOUS SURFACES) (100% OF TOTAL AREA) (G)	DEVELOPED, HIGH INTENSITY (IMPERVIOUS SURFACE - SEDIMENT LOADING) (G*1893 LBS/ACRE/YR) (LBS/YR)	UNDEVELOPED LANDS (SQ. METERS)	UNDEVELOPED LANDS (ACRES) (H)	UNDEVELOPED LANDS - SEDIMENT LOADING (H*234.6 LBS/ACRE/YR) (LBS/YR)	TOTAL SEDIMENT LOADING (LBS/YR)	TOTAL TRIBUTARY AREA (ACRES)
BMP #1 Basin Conversion to BMP 6.6.3 Dry Ext.	22,428.69	5.54	1.05	4.49	1936.51	1189.46	58,314.60	14.41	7.06	7.35	12984.81	1947.19	27,811.58	6.87	5.43	1.44	9984.24	382.39	0.00	0.00	0.00	0.00	28708.73	7.09	1664.26	**30,088.86**	**33.92**
BMP #2 Basin Conversion to BMP 6.6.3 Dry Ext.	15251.52	3.77	0.72	3.05	1316.83	808.83	26914.44	6.65	3.26	3.39	5992.99	898.70	4485.74	1.11	0.88	0.23	1610.36	61.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**10,689.39**	**11.53**
BMP 6.4.5: Rain Garden/Bioretention	36783.09	9.09	1.73	7.36	3175.88	1950.72	50240.32	12.41	6.08	6.33	11186.92	1677.58	19737.27	4.88	3.85	1.02	7085.60	271.37	897.15	0.22	0.22	407.69	12560.08	3.10	728.12	**26,483.87**	**29.71**

MS4 OUTFALL AND STORM SEWER MAP

PUBLIC NOTICE ADVERTISEMENT

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NOTICE OF PUBLIC COMMENT PERIOD AND PUBLIC MEETING

NOTICE is hereby given that Borough of Bath, Northampton County, Pennsylvania, advertised on August 2, 2022 and August 10, 2022 in this newspaper that it is holding a public comment period beginning July 28, 2022, and ending September 5, 2022 for Bath's draft MS4 Pollutant Reduction Plan (PRP) for Bath's PAG-13 National Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Small Municipal Separate Storm Water Sewer Systems (MS4), however, said public comment period will now end on September 6, 2022, instead of September 5th because of the labor day holiday on September 5th. Also, a public meeting of Bath's Council regarding the PRP will be held at Bath's Municipal Building located at 121 South Walnut Street, Bath, PA 18014 on September 6, 2022, at 6 PM in the public meeting room instead of the previously advertised September 5th date. The intent of the PRP is to establish the existing loading of pollutants discharged from Bath's MS4 to the Monocacy Creek, and to present a plan to reduce these pollutants. The PRP public comment period is required under the terms of Bath's MS4 Permit. The draft PRP continues to be available for inspection at the Bath Municipal Building located at 121 S. Walnut Street, Bath, PA 18014, during the regular business hours of 9:00 a.m. to 4:00 p.m. during regular business days on Monday thru Friday (excepting legal holidays). If a paper copy of the PRP is requested, such copy will be provided upon payment of costs for copying. Written comments from the public regarding the PRP should be sent to Bradford T. Flynn, Manager, 121 South Walnut Street, Bath, PA 18014 by September 6, 2022. All comments made shall include the originator's name and address. Written and public comments on the PRP will also be accepted at the above referenced public meeting of Bath's Council that will be held on September 6, 2022, at 6 PM in the public meeting room at 121 South Walnut Street, Bath, PA 18014.

Bradford T. Flynn, Manager
Borough of Bath
(8/18 & 8/25)

State of Pennsylvania,
County of Northampton,

Paul Prass, Publisher of *The Home News*, being duly sworn, deposes and says that *The Home News* is a weekly periodical, of general circulation, headquartered in the Borough of Walnutport, PA, which periodical was established December 11, 1942, since which date said periodical has been regularly issued weekly; that a copy of the printed notice or publication is attached hereto exactly as the same was printed and published in the regular editions and issues of the said periodical on the following dates, viz August 18th & 25th, 2022 that the affiant is the associate publisher of *The Home News* and declares that he is not interested in the subject matter of the aforesaid advertisement, and that all allegations of the time, place and character of the publication are true.

Signed: Paul Prass

Sworn to and subscribed before me this 25th day of August, A.D. 2022.

Signed: Donna Jo Bachman
Donna Jo Bachman, Notary Public

Commonwealth of Pennsylvania - Notary Seal
DONNA JO BACHMAN - Notary Public
Northampton County
My Commission Expires October 20, 2024
Commission Number 1005025

Statement of Advertising Costs

Billed to Borough Of Bath
121 South Walnut St
Bath, PA 18014

To *The Home News*, Dr.

For publishing the notice or advertisement attached hereto on the above dates	$ 321.20
Probating same	$ 5.00
TOTAL	$ 326.20

Publisher's Receipt for Advertising Costs

The Home News, a weekly general circulation newspaper, hereby acknowledges receipt of the aforesaid advertising and publication costs and certifies that the same have been fully paid.

By Paul Prass

PUBLIC COMMENTS AND RESPONSES

Bath-12-010

Borough of Bath

POLLUTANT REDUCTION PLAN

RESPONSE TO COMMENTS

No public comments received.

MCM 3: Illicit Discharge Detection and Elimination

Importance of Illicit Discharge, Detection and Elimination (IDD&E)

Discharges into surface waters such as rivers, streams, lakes, and ponds from Municipal Separate Storm Sewer Systems (MS4s) often include wastes and wastewater from non-stormwater sources. A study conducted in 1987 in Sacramento, California, found that almost one-half of the water discharged from a local MS4 was not directly attributable to precipitation runoff. A significant portion of the dry weather flows were from illicit and/or inappropriate discharges and connections to the system. Pollutant levels from these illicit discharges have been shown in EPA studies to be high enough to significantly degrade receiving water quality and threaten aquatic, wildlife, and human health.

The objective of the illicit discharge detection and elimination minimum control measure is for the Borough to gain a thorough awareness of its storm sewer system. This awareness will allow the Borough to determine the types and sources of illicit discharges entering its system and establish the legal, technical, and educational means needed to eliminate these discharges.

Definition of "Illicit Discharge"

Federal regulations define an illicit discharge as "... any discharge to an MS4 that is not composed entirely of stormwater ...". Illicit discharges include the following non-stormwater wastes:

- Sanitary wastewater;
- Effluent from septic tanks;
- Carwash wastewater;
- Improper disposal of automobile and household toxins;
- Improper disposal of oil;
- Laundry wastewater; and
- Spills from roadway accidents.

The following non-stormwater wastes are <u>not</u> considered illicit discharges:

- Discharges from fire-fighting activities;
- Runoff from irrigation practices;
- Diverted stream flows;
- Uncontaminated ground water infiltration;
- Uncontaminated pumped ground water;
- Discharges from potable water sources;
- Foundation drains;
- Air conditioning condensate;
- Springs;
- Water from crawl space pumps; and
- Discharges from NPDES-permitted industrial sources.

Illicit discharges enter the system through either direct connections (e.g., wastewater piping either mistakenly or deliberately connected to the storm drains) or indirect connections (e.g., infiltration into the storm sewer system from cracked sanitary sewer systems, spills or toxins collected by or dumped directly into storm sewer inlets). The result is untreated discharges that contribute high levels of pollutants, including heavy metals, toxins, oil and grease, solvents, nutrients, viruses, and bacteria to receiving waterbodies.

Program Development Requirements

In order to reduce to the maximum extent practicable the adverse impacts of illicit discharges on surface water quality, the IDD&E Program must address the following minimum requirements.

- Establish written practices and procedures to identify and eliminate illicit discharges to surface waters and screen storm sewer outfalls;
- Prepare a storm sewer system map showing the location of all outfalls and the names and locations of all waters of the United States that receive discharges from those outfalls;
- Prohibit, through ordinance or other regulatory mechanism to the extent allowable under State or local law, non-stormwater discharges into the MS4 and enact appropriate enforcement procedures and penalties;
- Devise a plan to detect and address non-stormwater discharges, including illegal dumping, into the MS4; and
- Educate Borough employees, businesses, and the general public about the hazards associated with illegal discharges and improper disposal of waste.

<u>BMP 3-1: Develop, Implement, and Maintain a Written Program for the Detection, Elimination, and Prevention of Illicit Discharges (Including Illegal Dumping)</u>

A. Implementation

1. Detection and Reporting of Illicit Discharges

a. Public

i. The Borough should educate the public about the hazards of illicit discharges (including illegal dumping), how to identify a suspected illicit discharge, and what to do if one identifies a suspected illicit discharge using best practices contained in BMP 1-4 and BMP 3-6 herein.

ii. The Borough should implement the following procedures to facilitate the public reporting of suspected illicit discharges.

- Include as a part of the forthcoming Borough MS4 website prominently displayed information regarding illicit discharges including a telephone number and an email address for public reporting purposes.

- Designate one or more Borough employees (e.g. Borough secretary, Borough Zoning Officer, etc.) to receive, document, process, and manage public reports of suspected illicit discharges (the Manager).
- Provide initial and ongoing education and training as needed to ensure that the Manager is familiar with established policies and procedures and is able to properly perform tasks related to the receipt and management of public reports of suspected illicit discharges.
- The Manager should complete Section 1 of the Suspected Illicit Discharge – Report Form contained in Appendix A1 of this Manual for each report received.
- The Manager should make a copy of the partially completed Report Form, maintain the original in a designated location, and forward the copy to the Investigator described below.
- Following the investigation, the Manager should obtain the completed Report Form from the Investigator along with any photographs, test results, or other documentation related to the investigation of the suspected illicit discharge.
- The Manager should contact the complainant by telephone and provide the complainant with a summary of the investigation into the suspected illicit discharge, actions taken, if any, to resolve the issue, and planned future action, if any, on the part of the Borough (unless pending or possible future litigation involving the source of the suspected illicit discharge prevents such follow-up with complainant).
- The Manager should complete the 'Follow-Up with Complainant' section of the Report Form.
- The Manager should file the completed Report Form along with any photographs, test results, or other documentation related to the investigation of the suspected illicit discharge in the designated location.
- At the end of each permit year (September 30), the Manager should make copies of all completed Report Forms and furnish same to the Borough Engineer for inclusion in the MS4 Annual Report.

b. Borough Employees

   i. The Borough should educate its employees about the hazards of illicit discharges (including illegal dumping), how to identify a suspected illicit discharge, and what to do if one identifies a suspected illicit discharge.

   ii. The Borough should reinforce in its employees their responsibility to look out for suspected illicit discharges while performing their primary job responsibilities.

iii. The Borough should implement the following procedures for the reporting of suspected illicit discharges by its employees.

- Employees should verbally report suspected illicit discharges to their department head who will then convey the information to the Manager described above or advise the employee to convey the information to the Manger directly.
- The Manager will process the suspected illicit discharge according to the procedure outlined above.

c. Outfall Screening

i. The Borough should regularly screen identified outfalls in Urbanized Areas.

ii. Refer to BMP 3-4 herein for guidance related to outfall screening practices.

2. Investigation and Elimination of Illicit Discharges

a. Designate one or more qualified person or persons (e.g. Borough Engineer, Sewage Enforcement Officer, Zoning Officer, etc.) to investigate reports of suspected illicit discharges (the Investigator).

b. Provide initial and ongoing education and training as needed to ensure that the Investigator is familiar with established policies and procedures and is able to properly perform tasks related to the investigation of suspected illicit discharges.

c. The Investigator should assess the reported suspected illicit discharge in accordance with the procedures described in "Illicit Discharge Detection and Elimination, A Guidance Manual for Program Development and Technical Assessment" (the IDD&E Guidance Manual) which is included as an attachment to this Manual.

d. If deemed illicit, the Investigator should attempt to identify the source of the discharge in accordance with the procedures described in the IDD&E Guidance Manual.

e. If the source is able to be identified, the Borough should take any and all reasonable and legal actions it deems appropriate to correct or eliminate the illicit discharge.

f. The Investigator should document the findings of the investigation, actions taken, if any, to resolve the issue, and planned future action, if any, on the part of the Borough in Sections 2 and 3 of the Suspected Illicit Discharge – Report Form contained in Appendix A1 of this Manual.

g. Following the investigation, the Investigator should return the completed Report Form to the Manager along with any photographs or other documentation related to the investigation of the suspected illicit discharge.

3. Gaining Access to Private Property

a. The Investigator should not enter private property to investigate a suspected illicit discharge without prior authorization from the department head.

b. The Investigator should conduct any authorized investigations or other activities on private property in a respectful and un-intrusive manner to the extent practicable.

c. The Borough, with assistance from the Borough Solicitor and Borough Engineer, should review the suitability of existing Borough ordinances to permit access by the Borough to private property for the purposes of investigating and correcting illicit discharges and enact new or amended ordinances as necessary.

d. Upon adoption of any new or amended ordinances to permit access to private property as described above, the Borough should amend this section of the Program to include any specific policies or protocol from the ordinance.

B. Measurable Goals

1. Develop the IDD&E Program during the first year of permit coverage.

2. Establish a dedicated telephone number and email address to accept public reports of suspected illicit discharges (To be completed).

3. Maintain records of all reports of suspected illicit discharges including the report form, any photographs or other documentation, the findings of the investigation, actions taken, if any, to resolve the issue, and planned future action, if any, on the part of the Borough.

4. Review the suitability of existing Borough ordinances to permit access by the Borough to private property for the purposes of investigating and correcting illicit discharges and enact new or amended ordinances as necessary.

5. Document any new or amended ordinances related to the IDD&E Program adopted during each reporting period.

6. Review and update the IDD&E Program annually and implement improvements as appropriate.

<u>BMP 3-2: Develop and Maintain a Map of the Regulated MS4 Watershed Area</u>

A. Implementation

1. The Borough Engineer should locate by field survey using a hand-held GPS device or other appropriate equipment and document any new or altered outfalls within Urbanized Areas of the Borough. (Completed during storm sewer inspection and survey during 2017)

2. Location information should include both horizontal and vertical positioning data reflecting the North American Datum of 1983 (NAD83) State Plane Coordinate System, Pennsylvania South Zone and North American Vertical Datum of 1988 (NAVD88), respectively.

B. Measurable Goals

1. Review the MS4 Watershed Map annually and update as necessary.

BMP 3-3: Develop and Maintain a Map of the Storm Sewer Collection System within the Regulated MS4 Watershed Area

A. Implementation

1. The Borough Engineer should locate by field survey using a hand-held GPS device or other appropriate equipment all Borough-owned storm sewer system components, including inlets and catch basins, oil-debris separators, piping, culverts, open channels, basins, infiltration practices, and outfalls within Urbanized Areas of the Borough. (Completed in Se[tember of 2017)
2. Location information should include both horizontal and vertical positioning data reflecting the North American Datum of 1983 (NAD83) State Plane Coordinate System, Pennsylvania South Zone and North American Vertical Datum of 1988 (NAVD88), respectively.
3. The Borough should consider documenting additional parameters for storm sewer system components including the following:
    a. Inlet size, type, and grate elevation; (Completed in September of 2017)
    b. Endwall size and type; (Completed in September of 2017)
    c. Pipe size, type, and invert elevations; (Completed in September of 2017)
    d. Approximate volume, geometry, and type of basins and infiltration practices; and
    e. Approximate geometry and longitudinal slopes for open channels.
4. The Borough should consider authorizing the Borough Engineer or other qualified professional to compile location information and additional parameters for storm sewer system components using ESRI ArcMap Graphical Information System (GIS) software which can serve as a valuable reference tool to assist the Borough in the operation and maintenance of its storm sewer system.

B. Measurable Goals

1. Review the MS4 Watershed Map annually and update as necessary.

BMP 3-4: Conduct Outfall Field Screenings

A. Intent: Develop and implement a program to systematically screen identified outfalls within Urbanized Areas of the Borough for the purposes of detecting and eliminating illicit discharges.

B. Implementation

1. Perform outfall field screenings according to the following general schedule.

   a. Screen each identified outfall during dry weather conditions at least once during each five-year permit coverage term;

   b. Screen outfalls annually in areas where past problems have been detected or known sources of dry weather flows occur on a regular basis; and

   c. Screen outfalls in high impact areas such as those with high ratios of impervious cover or high levels of industrial activity more frequently and during varying seasonal and meteorological conditions.

2. The Investigator defined in BMP 3-1 above or other designated, qualified person should screen outfalls to ensure accuracy and consistency.

3. Document the findings of each outfall field screening using the Outfall Inventory and Screening Field Sheet contained in Appendix A1 of this Manual.

4. Maintain copies of records of all outfall field screenings including the completed field sheet, photographs, other documentation, and test results, as applicable, in a designated location.

5. Furnish original records of all outfall field screenings to the Manager defined in BMP 3-1 herein.

6. At the end of each permit year (September 30), the Manager should make copies of records of all outfall field screenings performed during the past permit year and furnish same to the Borough Engineer for inclusion in the MS4 Annual Report.

7. Investigate suspected illicit discharges detected during field screenings in accordance with the procedures described in "Illicit Discharge Detection and Elimination, A Guidance Manual for Program Development and Technical Assessment" (the IDD&E Guidance Manual) which is included as an attachment to this Manual.

8. Refer to the IDD&E Program in BMP 3-1 herein for guidance related to the investigation of suspected illicit discharges.

C. Measurable Goals

1. Develop and implement an outfall field screening program during the first year of permit coverage.

2. Develop a written outfall screening schedule.

3. Review the screening program annually and update as necessary.
4. Maintain records of all outfall field screenings including the completed field sheet, photographs, other documentation, and test results, as applicable.

BMP 3-5: Enact a Stormwater Management Ordinance (SWMO) that Includes a Prohibition of Non-Stormwater Discharges

A. Implementation

1. The Borough, with assistance from the Borough Solicitor and Borough Engineer, should review the suitability of its current SWMO to prohibit non-stormwater discharges into its storm sewer system and take enforcement action (including imposing sanctions and penalties) against property owners in the event that a non-stormwater discharge is discovered.
2. Enact amendments to the SWMO as necessary.
3. Advertise any proposed amendments to the SWMO in accordance with Pennsylvania Municipalities Planning Code minimum requirements.
4. Provide opportunities for and actively solicit public involvement in the process of developing amendments to the SWMO.
5. Refer to BMP 2-2 herein for guidance related to advertising proposed amendments to the SWMO and soliciting public involvement in the process of developing those amendments.

B. Measurable Goals

1. Review the SWMO annually and update as necessary.
2. Properly advertise any proposed amendments to the SWMO using at least one alternate advertising channel in addition to the local newspaper.
3. Document any amendments to the SWMO adopted during each reporting period.

BMP 3-6: Provide Educational Outreach related to the IDD&E Program

A. Implementation

1. The Borough should engage in educational outreach efforts to generate public awareness of and interest in its IDD&E Program and inform the public of the following:
    a. What is an illicit discharge;
    b. The hazards of illicit discharges, including illegal dumping;
    c. How to identify a suspected illicit discharge;
    d. What to do and how to report a suspected illicit discharge; and

e. How to participate in programs and activities designed to identify and eliminate illicit discharges.

Refer to BMP 1-4 herein for suggested communication channels and best practices for devising effective public education and outreach initiatives.

2. The Borough should organize or sponsor the following programs or other similar activities to involve the public in the implementation of its IDD&E Program.

   a. Label outfalls and other storm drainage features to facilitate identification and public reporting of illicit discharges;

   b. Volunteer efforts for locating, labeling, and visually inspecting outfalls and storm drains;

   c. Recycling programs for commonly dumped wastes such as motor oil, antifreeze, paint, and pesticides; and

   d. Specific initiatives to reach high-impact segments of the target audience such as commercial, industrial, and institutional entities that are likely to have a significant impact on stormwater (e.g. carpet cleaning businesses, gas stations, etc.).

   Refer to BMP 2-3 herein for suggested methods to promote public involvement and participation.

3. Upon request by the Borough, the Borough Engineer will furnish educational materials and guidance resources and provide consulting services to assist with the administration of the IDD&E Program.

B. Measurable Goals

1. Upon establishing protocol for public reporting of suspected illicit discharges, publish promotional and educational information related to the IDD&E Program on the forthcoming Borough MS4 website and in the Borough newsletter.

2. Conduct at least one of the above or similar public outreach initiatives, activities, or programs related to the IDD&E Program annually.

Outfall Inventory and Screening Field Sheet

Section 1: Background Data

Watershed Name:		Outfall ID:	
Date:		Time (Military):	
Investigator Name:		Rainfall (In.) in Last 24 Hrs.:	
Air Temperature:		Rainfall (In.) in Last 48 Hrs.:	
Latitude:	Longitude:	GPS Unit:	GPS LMK:
Camera:		Photo #s:	

Land Use(s) in Drainage Area

- ☐ Industrial
- ☐ Urban Residential
- ☐ Suburban Residential
- ☐ Commercial
- ☐ Open Space
- ☐ Institutional
- ☐ Other: _____
- ☐ Other: _____

Known Businesses/Industries:

_____

_____

_____

Notes: (e.g. Origin of outfall, if known)

Section 2: Outfall Description

Type	Material	Geometry		Dimensions	Submerged
☐ Pipe	☐ RCP ☐ HDPE ☐ PVC ☐ CMP ☐ Steel ☐ Other: _____	☐ Circular ☐ Eliptical ☐ Box ☐ Other: _____	☐ Single ☐ Double ☐ Triple ☐ Other: _____	Dia./Dims. _____	Water: ☐ Yes ☐ No ☐ Part Sedmnt.: ☐ Yes ☐ No ☐ Part
☐ Channel	☐ Concrete ☐ Earthen ☐ Rip-rap ☐ Other: _____	☐ Trapazoidal ☐ Parabolic ☐ Other: _____		Depth: _____ Top Width: _____ Bot. Width: _____	
☐ In Stream	(Applicable when collecting samples)				
Flow Present	☐ Yes ☐ No (If no, skip to Section 5)				
Flow Description	☐ Trickle ☐ Moderate ☐ Substantial				

Section 3: Quantitative Characterization

Field Data for Flowing Outfalls				
Parameter		**Result**	**Unit**	**Equipment**
☐ Flow #1	Volume		Liter	Bottle
	Time to Fill		Second	Stop Watch
☐ Flow #2	Flow Depth		Inches	Tape Measure
	Flow Width	_____ ' - _____ "	Ft.-In.	Tape Measure
	Traveled Length	_____ ' - _____ "	Ft.-In.	Tape Measure
	Travel Time		Seconds	Stop Watch
Water Temperature			F°	Thermometer
pH			pH	Test Strip/Probe
Ammonia			Miligrams/Liter	Test Strip

Outfall Inventory and Screening Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only

Are any physical indicators present in the flow? □ Yes □ No (If no, skip to Section 5)

Type	Description	Relative Severity Index		
□ Odor	□ Sewage □ Petrol./Gas □ Sulfide □ Other: _____ □ Rancid/Sour	□ 1 Faint	□ 2 Easily Detectible	□ 3 Noticeable from Distance
□ Color	□ Clear □ Grey □ Green □ Red □ Brown □ Yellow □ Orange □ Other: _____	□ 1 Faint color in bottle	□ 2 Clearly visible in bottle	□ 3 Clearly visible in flow
□ Turbidity	See Severity	□ 1 Slight Cloudy	□ 2 Cloudy	□ 3 Opaque
□ Floatables (Excludes Trash)	□ Sewage (Toilet paper, etc.) □ Petrolium (Oil sheen) □ Sewage □ Other: _____	□ 1 Few/Slight Origin not Obvious	□ 2 Some Indications of Origin	□ 3 Some Origin Obvious

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are any physical indicators present that are not related to flow? □ Yes □ No (If no, skip to Section 6)

Indicator	Description	Comments
□ Outfall Damage	□ Peeling Paint □ Spalling or Cracking □ Corrosion	
□ Deposits/ Stains	□ Oily □ Flow Line □ Paint □ Other: _____	
□ Abnormal Vegetation	□ Excessive □ Inhibited	
□ Poor Pool Quality	□ Odors □ Suds □ Colors □ Excess Algae □ Floatables □ Other: _____ □ Oil Sheen	
□ Pipe Benthic Growth	□ Brown □ Green □ Orange □ Other: _____	

Section 6: Overall Outfall Characterization

□ Unlikely	□ Potential (presence of 2 or more indicators)	□ Suspect (1 or more indicators severity >3)	□ Obvious

Section 7: Data Collection

Sample for Lab Analysis	□ Yes □ No	
If Yes, Collected from	□ Flow □ Pool	
Intermittent Flow Trap Set	□ Yes □ No	If yes, type? □ OBM □ Caulk Dam

Section 8: Any Non-Illicit Discharge Concerns (trash or needed infrastructure repairs)

Description:

Suspected Illicit Discharge - Report Form

Section 1: General Information

Responder Information	
Call Received by:	Call Date:
Precipitation Depth (In.) in Past 24-48 Hrs.:	Call Time (Military):
Reporter Information	
Name:	Incident Date:
Address:	Incident Time (Military):
Telephone Number:	Email Adress:

Section 2: Incident Location

Latitude/Longitude:	Outfall Number:
Location of Discharge (nearest street intersection, address, nearby landmarks, etc.): _____	
Description	□ Stream Corridor (In or Adjacent to Stream)
	□ Outfall □ In-Stream □ Along Banks
	□ Upland Area (Land not Adjacent to Stream)
	□ Near Inlet □ Near Other Water Source (Detention Basin, Wetland, etc.)

Section 3: Upland Problem Indicator Description

□ Dumping	□ Soap Suds	□ Oil, Solvents, Chemicals	□ Other: _____

Section 4: Stream Corridor Problem Indicator Description

Flow Present	□ Yes	□ No			
Flow Description	□ Trickle	□ Moderate	□ Substantial	□ Intermittant	
Photo Provided	□ Yes	□ No	(If yes, attach to form)		
Odor	□ None	□ Musty	□ Sewage	□ Rotten Eggs	□ Sour Milk
	□ Petrolium	□ Other: _____			
Color	□ None	□ Red	□ Yellow	□ Brown	□ Green
	□ Grey	□ Other: _____			
Clarity	□ Clear	□ Cloudy	□ Opaque		
Floatables	□ None	□ Garbage	□ Algae	□ Dead Fish	□ Oily Sheen
	□ Sewage (Toilet Paper, etc.)		□ Other: _____		

Additional Information: _____

Suspected Violator or Source (Name, Address, Personal or Vehicle Description, License Plate Number, etc.:

Section 5: Follow-Up Investigation

Investigator Name:	Date:
	Time (Military):
Date of Last Rainfall:	Approx. Rainfall Depth (In.):
□ No Investigation Made	Reason:
□ Referred to Oustide Agency	Agency Name:
□ Investigated: No Action Necessary	Reason:
□ Investigated: Required Action	Reason:
Description of Action(s) Taken: _____ _____ _____ _____	
Hours between Call and Investigation:	Date Inclident Closed:
Additional Information: _____ _____ _____ _____	

MCM 6: Pollution Prevention/Good Housekeeping for Municipal Operations

Importance of Pollution Prevention and Good Housekeeping for Municipal Operations

The Pollution Prevention/Good Housekeeping Program for municipal operations is a key element of the Small MS4 Stormwater Program (the Program). Due to the broad scope and extensive scale of its operational and maintenance responsibilities, the Borough and its employees possess significant potential to impact stormwater runoff quality. For example, the Borough routinely conducts activities such as lawn and landscaping maintenance, building and facilities maintenance, regular and winter road maintenance and repair work, and automobile and equipment fleet maintenance that can pose a threat to water quality. Additionally, the Borough performs work intended to reduce the amount of pollutants that reach the storm sewer system such as parking lot and street sweeping and storm drain system cleaning. Finally, the Borough is responsible to contain spills, manage trash and yard waste, and regulate non-stormwater discharges. Through thoughtful evaluation of these and other similar activities and the development and implementation of sound practices and procedures the Borough can ensure it limits the amount of pollutants introduced into its storm sewer systems thereby improving stormwater runoff quality to the maximum extent practicable.

Program Development Considerations

The Borough should consider the following general guidelines as it continues to implement and further develop its Pollution Prevention / Good Housekeeping Program for municipal operations:

- Practices and procedures to ensure the proper regular and long-term inspection and maintenance of structural and non-structural stormwater best management practices (BMPs) to reduce floatables and other pollutants that are discharged from storm sewer systems;
- Practices and procedures that will reduce or eliminate the discharge of pollutants from areas such as public roads and parking lots, Borough maintenance and storage yards (including salt storage and snow disposal areas), and other Borough facilities;
- Practices and procedures for the proper disposal of waste such as dredge spoil, accumulated sediments, floatables, and other debris removed from storm sewer systems and areas listed above; and
- Policies and regulations to require the evaluation of existing flood management projects for possible incorporation of additional water quality protection devices and to ensure that new flood management projects are assessed relative to their potential to impact water quality.

BMP 6-1: Identify and Document all Facilities and Activities Owned and/or Operated by the Borough that have the Potential to Generate or Impact Stormwater Runoff

A. The Borough identified the following Borough facilities and activities with the potential to generate or impact stormwater runoff:

1. Maintenance of storm sewer system components such as inlets and catch basins, oil-debris separators, piping, culverts, open channels, basins, and outfalls including inspection and cleaning of storm drains and piping, controlling illicit discharges and connections, and controlling illegal dumping;
2. Maintenance of roads, parking areas, and loading areas including sweeping and cleaning, repair and maintenance, striping, application of salt or other deicing agents, and bridge and structure maintenance;
3. Maintenance and repair of buildings including Administrative offices, public works buildings, police and fire departments, garages and storage buildings, and others;
4. Maintenance of grounds and landscaping including mowing, trimming, planting, application of fertilizers or pesticide, erosion control, and managing landscape wastes;
5. Maintenance, repair, fueling, and washing of vehicles and equipment;
6. Handling and disposal of waste including debris removed from stormwater management BMPs, solid waste collection, waste reduction and recycling, household hazardous waste collection; landscaping wastes from municipal operations, and controlling litter and illegal dumping;
7. Material handling and storage including liquid containers and raw (e.g. salt, soil, etc.), and hazardous materials; and
8. Spill prevention and response.

B. Measurable Goals

1. Develop an inventory of Borough facilities and activities with the potential to generate or impact stormwater runoff (completed 2-1-18).
2. Review and update the inventory of Borough facilities and activities on an annual basis.

<u>BMP 6-2: Develop, Implement, and Maintain a Written Operation and Maintenance (O&M) Program for all Facilities and Activities Owned and/or Operated by the Borough that have the Potential to Generate or Impact Stormwater Runoff</u>

A. The Borough should follow the practices and procedures outlined below when performing each of the following operation and maintenance activities.

1. Storm Sewer System Components

a. Inspect system components including inlets and catch basins, oil-debris separators, piping, culverts, open channels, basins, and outfalls at least once per year. For the sake of efficiency, this could be done in conjunction with the annual street sweeping program.

b. Remove and collect debris.

c. Flush pipes to remove clogs or accumulated sediment and debris as necessary.

d. Repair or replace damaged structures as necessary.

e. Repair and re-stabilize eroded and bare areas in vegetated channels.

f. Follow all Federal and state regulations related to the proper storage and disposal of waste removed from the storm sewer system.

g. Prior to disposal store waste in a contained covered location outside of 100-year flood plains.

2. Road and Parking Area Maintenance

   a. Resurfacing
      - Perform paving operations involving concrete asphalt or other sealers only during dry weather conditions.
      - Employ proper staging techniques such as covering storm drain inlets and manholes during paving operations, using erosion and sediment controls to decrease runoff from repair sites, and using drip pans, absorbent materials and other pollution prevention materials to limit leaks of paving materials and fluids from paving machines.

   b. Salt Application and Storage
      - Store salt or alternative deicing materials in a contained covered location outside of 100-year flood plains.
      - Avoid over-application of deicing materials.
      - Calibrate equipment to apply deicing materials at a rate and spread width as appropriate based on site specific characteristics (e.g. road width, traffic volume, proximity to surface waters, etc.).
      - Use gravel rather than chemical deicers in environmentally sensitive areas when practicable.

   c. Roadside Vegetation
      - Apply chemical fertilizers and pesticides sparingly.
      - Use natural fertilizers and pesticides as opposed to chemical equivalents whenever practicable.
      - Apply chemical fertilizers and pesticides during ideal weather conditions (e.g. low wind, no rain in near forecast).
      - When establishing roadside vegetation, select a type of grass that is both salt and drought-tolerant.

   d. Cleaning
      - Sweep and vacuum Borough streets and parking areas at Borough facilities on a weekly basis from May 1st until December 1st to remove pollutants such as trash, sediment buildup, and debris from curb gutters and storm sewer inlets.

- Maintain accurate logs of the number of curb-miles swept and the amount of waste collected.
- Evaluate the above logs and devise a sweeping schedule that will maximize pollutant removal.
- Follow all Federal and state regulations related to the proper storage, disposal, and reuse of sweepings.
- Prior to disposal or reuse, store sweepings in a contained covered location outside of 100-year flood plains.

3. Grounds Maintenance

   a. Plant locally or regionally native species whenever practicable.

   b. Plant non-turf grass areas wherever practicable. Alternative ground cover such as meadow grass, wild flowers, and shrubs require less water and maintenance than turf grass.

   c. Where turf is used, select a type of grass that can withstand drought and become dormant during prolonged hot, dry weather.

   d. Water plants and lawns sparingly. Use low-volume water application approaches such as drip or sprinkler irrigation systems wherever practicable.

   e. Cut grass to a minimum height of three to four inches.

   f. Leave mulched clipping on the lawn as a natural fertilizer.

   g. Apply mulch to planting beds to prevent weeds and retain soil moisture.

   h. Apply chemical fertilizers and pesticides sparingly.

   i. Use natural fertilizers and pesticides as opposed to chemical equivalents whenever practicable.

   j. Apply chemical fertilizers and pesticides during ideal weather conditions (e.g. low wind, no rain in near forecast).

   k. Follow application and safety instructions on the label when using chemical pesticides. Wear the appropriate protective equipment when working with organophosphate insecticides or concentrated sprays or dusts. Read and follow all safety precautions listed on pesticide labels and wash hands and face before smoking or eating.

   l. Rinse tools or equipment that were used to apply or incorporate pesticides in a bucket and apply the rinse water as if it were full-strength pesticide.

   m. Safely store for later use or dispose of any unused pesticides at a hazardous waste collection location.

4. Vehicle and Equipment Maintenance

a. Waste Reduction
   - Minimize the number of solvents used. This makes recycling easier and it reduces hazardous waste management cost.
   - Perform all liquid cleaning at a centralized station to ensure that solvents and residues stay in one area.
   - Locate drip pans and draining boards to direct solvents back into a solvent sink or holding tank for reuse.

b. Use of Safer Alternative Chemical Products
   - Use non-hazardous cleaners whenever practicable.
   - Replace chlorinated organic solvents with non-chlorinated ones such as kerosene or mineral spirits.
   - Purchase recycled products, such as engines, oil, transmission fluid, antifreeze, and hydraulic fluid, to help support the recycled products market.

c. Spill Containment and Cleanup
   - Perform all maintenance activities inside or under cover to contain spills and prevent work surface runoff from entering storm drains.
   - Clean up spills immediately without water whenever possible and properly dispose of clean up materials. Where necessary, use water sparingly.
   - Seal floor drains.
   - Consider hiring a service to collect spent solvents and other hazardous substances.
   - Implement a spill prevention plan and maintain necessary spill kits nearby maintenance areas.

d. Good Housekeeping
   - Update facility schematics to accurately reflect all plumbing connections.
   - Closely monitor parked vehicles for leaks and place pans under any leaks to collect the fluids for proper disposal or recycling.
   - Promptly transfer used fluids to recycling drums or hazardous waste containers.
   - Dispose of liquid waste properly.
   - In the event of a spill, cover drains with drain mats.
   - Store cracked batteries in leak-proof secondary containers.

e. Parts Cleaning
   - Use detergent-based or water-based cleaning systems instead of organic solvent degreasers.
   - Steam clean or pressure wash parts instead of using solvents. Water discharged into the sanitary sewer may require treatment prior to release. Wastewater

generated from steam cleaning can be discharged to an on-site oil/water separator.

5. Vehicle and Equipment Fueling

   a. Ensure vehicle fueling areas are properly paved with cement, concrete, or an equivalent impervious surface, with a two to four percent slope to prevent ponding, and separated from the rest of the site by a grade break or berm to prevent run-on of stormwater.

   b. Ensure vehicle fueling areas are properly covered. The cover should have minimum dimensions equal to or greater than the area within the grade break and should not drain onto the fuel dispensing area. Install a perimeter drain or slope the pavement inward so that runoff drains to a blind sump. It might be necessary to install and maintain an oil control device in catch basins that might receive runoff from the fueling area.

   c. Implement a spill prevention plan and maintain necessary spill kits nearby fueling areas.

   d. Inspect vehicle fueling areas and equipment regularly.
      - Check for external corrosion and structural failure in aboveground tanks.
      - Check for evidence of spills and overfills due to operator error.
      - Check for failure of any piping systems.
      - Inspect tank foundations, connections, coatings, tank walls, and piping systems.
      - Test above-ground tanks periodically for integrity using a qualified professional.

   e. Maintain vehicle fueling areas and equipment in good working condition.

6. Vehicle and Equipment Washing

   a. Use a commercial car wash whenever practicable.

   b. Avoid the use of detergents whenever possible. If detergents are necessary, use a phosphate-free, non-toxic, biodegradable soap. Using a commercial car wash.

   c. Wash vehicles and equipment in an area designed to collect and hold the wash water effluent generated. Recycle the wash water effluent or pump effluent onto grass or landscaped areas to provide filtration.

   d. If installation of a containment area is not feasible, wash vehicles and equipment on gravel, grass, or other permeable surfaces.

   e. Select location for wash area that does not drain to storm inlets to avoid discharges to the storm sewer system.

f. Avoid on-site pressure cleaning and steam cleaning whenever possible. If done on-site, do not pressure or steam clean in an area designated as a wellhead protection area of a public water supply.

g. Immediately contain and clean up spills.

7. Materials Handling and Storage

   a. General

      - Maintain an accurate inventory of materials to reduce the occurrence of overstocking hazardous materials.
      - Identify all hazardous and nonhazardous substances present at a facility.
      - Obtain a Material Safety Data Sheet (MSDS) for each material.

   b. Hazardous Materials Storage

      - Note on the inventory of materials described above any special handling, storage, and/or disposal requirements for hazardous chemicals.
      - Label all containers with the name of the chemical, unit number, expiration date, handling instructions, and health or environmental hazards. Ensuring sufficient aisle space to provide access for inspections and to improve the ease of material transport.
      - Store materials in a contained covered location outside of 100-year flood plains.
      - Store materials away from high-traffic areas to reduce the likelihood of accidents that might cause spills or damage to drums, bags, or containers.
      - Stack containers in accordance with the manufacturers' directions to avoid damaging the container or the product itself.
      - Store containers on pallets or equivalent structures to facilitate inspection for leaks and prevent the containers from coming into contact with wet floors, which can cause corrosion. This consideration also reduces the incidence of damage by pests (insects, rodents, etc.).
      - Delegate the responsibility for management of hazardous materials to personnel trained and experienced in hazardous substance management.
      - Implement a spill prevention plan and maintain necessary spill kits nearby materials storage areas.

8. Spill Prevention and Response

   a. Identify the individual(s) responsible for implementing the Spill Prevention and Response Plan.

   b. Define safety measures associated with each potential type of waste (e.g. gasoline, fuel oil or other petroleum products; residential or industrial waste; etc.).

c. Define the protocol for notification of appropriate authorities, such as police and fire departments, hospitals, or publicly-owned treatment works for assistance.

d. Define procedures for containing, diverting, isolating, and cleaning up spills.

e. Describe spill response equipment to be used, including safety and cleanup equipment.

B. Measurable Goals

1. Develop, implement, and maintain a written Operation and Maintenance (O&M) Program for all facilities and activities owned and/or operated by the Borough that have the potential to generate or impact stormwater runoff (completed 2-1-18).

2. Review and update the O&M Program on an annual basis.

BMP #6-3: Develop and Implement an Employee Training Program Designed to Further the Goal of Reducing or Preventing the Discharge of Pollutants from Municipal Operations

A. Applicability

1. All municipal employees, regardless of job description, should receive training designed to educate staff about potential sources of stormwater contamination and methods to minimize the impact of municipal operations on stormwater runoff quality.

2. Municipal employees who are directly involved in activities that have the potential to cause or prevent pollution should receive training tailored to their specific activities in addition to general training.

B. Approved Topics

1. General stormwater awareness

2. Detection, reporting, and elimination of illicit discharges

3. Operation and maintenance of stormwater management BMPs

4. Pollution prevention through good housekeeping procedures

5. Spill prevention and response

C. Instructional Methods and Resources

1. In-house classroom format

2. In-house “tailgate” meetings

3. On-the-job reinforcement

4. Workshops and conferences

5. Display or distribution of educational materials

D. Cost Savings Considerations

1. Incorporate initiatives into existing employee training programs.
2. Utilize free educational materials and training tools available through various online resources.
3. Select free or low-cost workshops or conferences presented by government agencies, outside organizations, and companies.

E. Implementation

1. The Borough should provide at least four formal training sessions annually (one per quarter) to each employee.
2. At the beginning of each permit year, the borough superintendent should select general and job-specific training topics, select appropriate training methods, and set training schedules for the year.
3. The Borough should cover a variety of topics from year to year from the categories outlined above.
4. Department heads should strive to provide additional in-field training whenever possible to reinforce lessons taught during formal training sessions.
5. Department heads should post informational resources such as placards, posters, and stickers at appropriate locations around the work place to raise awareness of stormwater pollution prevention and remind employees of proper procedures.
6. Department heads should maintain records of training sessions using the Municipal Employee Training – Annual Report Form contained in Appendix A2 of this Manual.
7. At the end of each permit year (September 30), department heads should make copies of all completed Report Forms and furnish same to the Borough Engineer for inclusion in the MS4 Annual Report.
8. Upon request by the Borough, the Borough Engineer will furnish educational materials and guidance resources and provide consulting services to assist with the administration of the municipal employee training program.

F. Measurable Goals

1. Develop a municipal employee training program during the first year of permit coverage (completed 2-1-18).
2. Provide at least four formal training sessions annually (one per quarter) to each employee.
3. Maintain records of training sessions using the form contained in Appendix A2 of this Manual.
4. Implement and review the training program annually and update as necessary.

Borough of Bath

121 South Walnut Street, Bath, PA 18014
Phone: 610-837-6525 Fax: 610-837-8989

MEMORANDUM OF UNDERSTANDING

Between: Borough of Bath
Northampton County, PA
and
Northampton Area School District

Date: June 24, 2022

RE: Proposed MS4 Rain Garden BMP
George Wolf Elementary School
Borough of Bath Pollution Reduction Plan

The Borough of Bath, Northampton County, Pennsylvania has obtained a Municipal Separate Stormwater Sewer Systems (MS4) National Pollution Discharge Elimination System (NPDES) Permit through the Pennsylvania Department of Environmental Protection (PADEP). The Borough has also retained their stormwater consultant to prepare the MS4 require Pollution Reduction Plan (PRP).

As part of the PRP, the Borough proposed to construct a rain garden at the current stormwater discharge location on the George Wolf Elementary School property owned by the Northampton Area School District (NASD). This proposed rain garden best management practice (BMP) facility is depicted in the enclosed exhibit, and was discussed with the NASD representatives during a site meeting with Borough representatives on May 19, 2022.

NASD understands that the proposed rain garden BMP is a benefit, provides protection of the Monacacy Creek Watershed, and is required by the Borough's MS4 PRP. NASD agrees to enter into a stormwater easement agreement with the Borough upon PADEP approval of the Borough's MS4 PRP. The proposed easement agreement will allow the Borough to construct the proposed rain garden BMP on the George Wolf Elementary School property and maintain its operations.

Bradford T. Flynn
Borough of Bath Manager
121 South Walnut Street
Bath, PA 18014

Joseph Kovalchik
Superintendent of Schools
Northampton Area School District
2014 Laubach Avenue
Northampton, PA 18067

"Bath, History Nestled With Friendship"

BOROUGH POLICY

Policy Number: PW-2016-02

Reference:	Adopted By:
Borough Manager Policy 09-08-2012 Bath Borough Council 07/05/2016	Bath Borough Council

Prepared By:	Borough Manager	Date: May 27, 2016
Title:	**Municipal Separate Storm Water System (MS4)**	

Policy

Policy Statement: The Borough of Bath is required to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage annually. This permit is obtained via the Pennsylvania Department of Environmental Protection (DEP). In addition, practices must be utilized by the Borough of Bath Public Works Department in order to comply with the small Municipal Separate Storm Sewer System (MS4) permit, which is an over-arching regulation by the federal Environmental Protection Agency (EPA).

Purpose: The purpose of this policy is to provide the Borough of Bath Public Works Department with general information on how to maintain the Borough's MS4 and NPDES permits in the field. In addition to this policy, it is recommended the Public Works crew become familiar with the Borough's MS4 Progress Report associated with Permit #PAI132215. The progress report contains governing information of this policy, in accordance with Borough of Bath Ordinance No. 2007-595 and Appendix A "Monocacy Creek Watershed Act 167 Storm water Management Ordinance regulations located in the Borough Manager's conference room.

Procedure:

The types of stormwater Best Management Practices (BMP) that the Borough of Bath is responsible for maintaining on public and private land (**this includes PennDOT-maintained state roads and facilities**) is as follows:

- Roadside Swales and Ditches

BOROUGH POLICY

- Piped Conveyances Systems and Inlets
- Stormwater Management Facilities: Natural Areas and Vegetative Filter Strips; Detention/Retention Facilities; Infiltration Basins and Trenches; Bio retention facilities (Raingardens, Water Quality Swales, etc.); Constructed Wetlands; Water Quality Filters (constructed and manufactured)

The following is a list of general stormwater maintenance requirements that should be performed by the Borough of Bath Public Works crew, for both existing structures and applicable future development:

A. Roadside Swales and Ditches, Piped Conveyance Systems and Inlets, and Stormwater Management Facilities

1. Inspect after **ALL** significant rain events (a significant rain event is defined as rainfall accumulation greater than two inches (2") in a twenty-four hour (24) period). Please refer to the "Existing Storm Sewer Facilities" map created by Keller Consulting Engineers on July 5, 2000. This map is with the Borough's progress report located in the Borough Manager's conference room. (see Attachment A for an MS4 "Existing Storm Sewer Facilities Zoning Map) Remove any accumulated sediment/debris and check for:

    i. Sediment/Debris accumulation;
    ii. Erosion;
    iii. Established Vegetative Covers;
    iv. Structural Integrity; and
    v. Note MS4 inspections, problems, remediation actions on Borough of Bath Catch Basin Inspection Form (see Attachment B, C, & D)

2. Inspect on a **weekly** basis regardless of rain conditions. Remove any accumulated sediment/debris and check for:

    i. Sediment/Debris accumulation;
    ii. Erosion;
    iii. Established Vegetative Covers;
    iv. Structural Integrity; and
    v. Note MS4 inspections, problems, remediation actions on Borough of Bath Catch Basin Inspection Form (see Attachment B, C, & D)

BOROUGH POLICY

3. The Borough of Bath has an equipment sharing agreement for the use of the Bath Water Authority PipeHunter blow-out/washing trailer. The equipment is towed with the use of a pick-up truck. The equipment uses water pressure to clean out the pipe conveyance systems and inlets. The Borough of Bath has purchased a "Petee" nozzle specifically used for clearing out thirty six inch (36") and forty eight inch (48") in diameter pipe conveyance systems. The nozzle uses up to sixty five gallons (65) per minute at two thousand pounds per square inch (2,000 PSI) to clean pipe conveyance systems. The nozzle penetrates silt, sediment, and debris that may accumulate along these systems from time-to-time. Proper training, handling, and use of the equipment will be provided by personnel of the Bath Water Authority.

B. Vegetated Areas

1. Ensure that there is no surface compaction (i.e. parking, drive-over) of vegetative areas around MS4 facilities, inlets, catch basins, etc.

C. Infiltration Facilities (Surface and Subsurface Infiltration Basins)

1. Check for infiltration function (they must drain within seventy two hours (72) from a rainstorm event. If the area(s) are not draining properly the water conveyance system may be clogged or inoperable and need of necessary repairs.

D. Bio-Retention Facilities

1. Prune and weed while vegetation is being established;
2. Cut perennial plantings each year and remove leaves and other dead plant material;
3. Replace mulch as needed once every two to three years (2-3); assess mulch on an annual and/or seasonal basis;
4. Water during drought conditions; and
5. Inspect health of shrubs, trees, and other vegetation two (2) times a year.

E. Water Quality Filters (constructed)

1. Remove trash and debris as necessary;
2. Scape silt and rake;
3. Till and aerate filter area; and
4. Replace filtering medium if depth reduced by maintenance or other condition(s)

F. Water Quality Filters and Hydrodynamic Devices (Manufactured)

BOROUGH POLICY

1. Follow all manufacturer's recommendations with such systems.

G. Existing Stormsewer Facilities Map (July 5, 2000)

1. The Borough of Bath has an Existing Stormsewer Facilities Map located in the Borough Manager's conference room, *see the Borough Manager for more information.*

2. The map contains the following information:

   i. Existing Storm Sewer Inlet(s);
   ii. Outlet Structures;
   iii. Existing Storm Sewer Manhole Covers;
   iv. Storm Sewer Flow and Direction;
   v. Rigid Concrete Pipe;
   vi. Smooth Wall Metal Pipe;
   vii. Concrete Box Culvert;
   viii. Corrugated Plastic Pipe;
   ix. Smooth Wall Plastic Pipe;
   x. Storm Sewer with Undetermined Data;
   xi. Flood Plain information;
   xii. Existing Water Course; and
   xiii. Location of Water Outfalls to Monocacy Creek

3. At a minimum, the map has been generally (and unofficially) re-drawn dividing the Borough into three (3) distinct zones; "A", "B", and "C" (see Attachment A). Each zone has the locations of existing catch basins that need to be inspected and reported on the Borough of Bath Catch Basin Reports as outlined under Section A of this policy. The catch basins are located as; "1, 2, 3, 4, 5, and so on . . ." in each respective zone for identification purposes. For example, catch basin A-1, B-1, and C-1 are three (3) separate basins throughout the Borough, depending on which zone; A, B, or C it is located. This method should assist the Public Works crew, and ultimately the Borough Manager, in locating trouble areas of the MS4 program that may need further adjustments.

4. Any questions or concerns with the Existing Stormsewer Facilities Map and MS4 Zoning Map should be directed to the Borough Manager.

BOROUGH POLICY

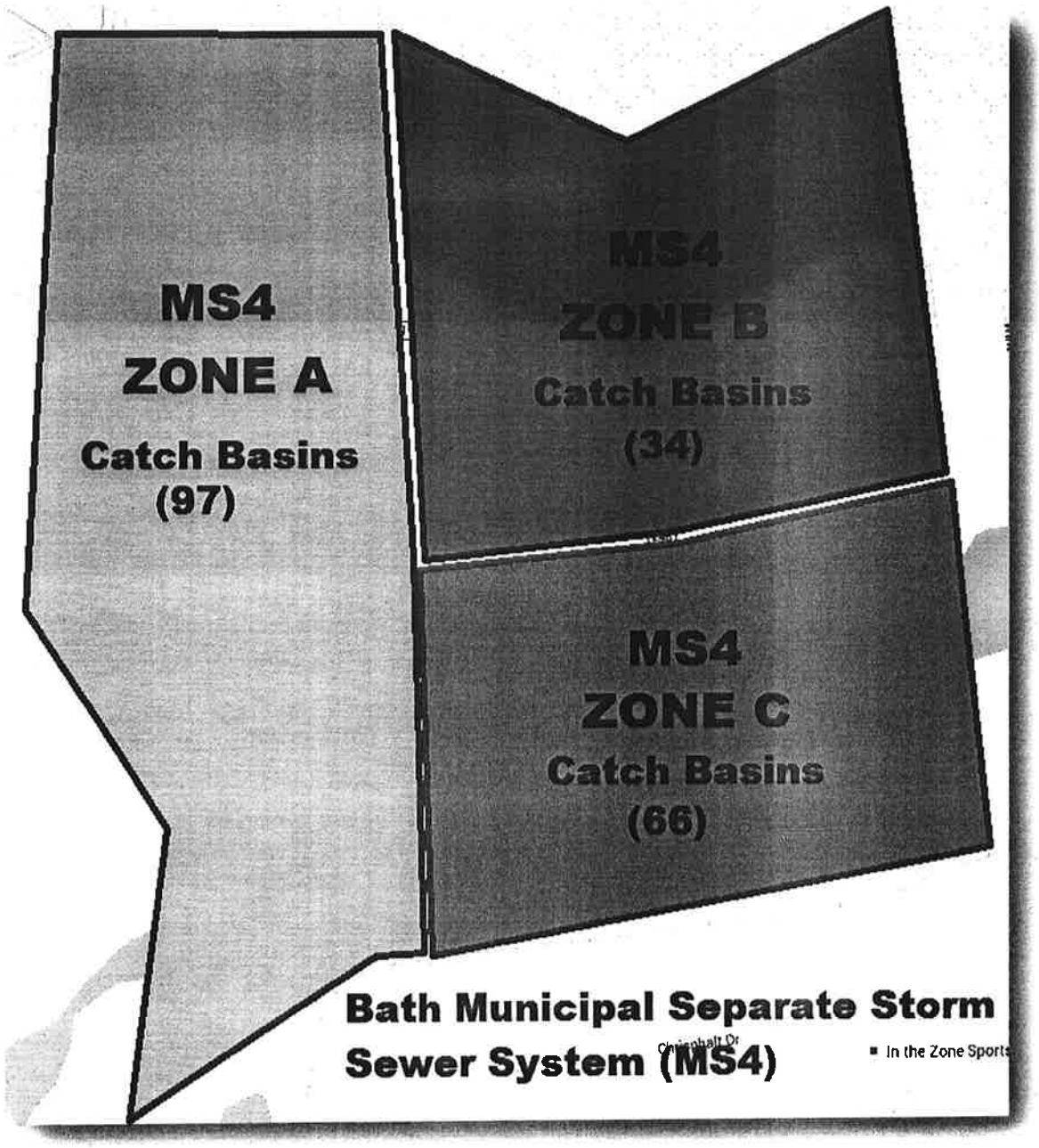
APPROVED:

Bradford T. Flynn
Borough Manager

Mark A. Saginario
Bath Council President

BOROUGH POLICY

ATTACHMENT A



BOROUGH POLICY

ATTACHMENT B

Borough of Bath
Catch Basin Inspection Form

Date: _____

Location (ZONE A – *97 Catch Basins/5 Drains & 17 Outfalls*): _____

Time: _____

Employee: _____

Weather (please circle one):

1. Sunny
2. Partly cloudy
3. Overcast
4. Raining

Last Rainfall (please circle one):

1. Today
2. Yesterday
3. 2-5 days ago
4. >5 days ago

Intensity of Last Rainfall (please circle one):

1. Light
2. Moderate
3. Heavy

Type of Maintenance Performed (please circle all that apply):

1. Inspection
2. Vegetation Control
3. Sediment Removal
4. Debris Removal
5. Trash Removal

Notes:

General Observation

Trash or Debris Blocks More than 10% of Inlet:	□Yes	□No
Trash or Debris Exceeds 60% of Sump Depth:	□Yes	□No
Trash or Debris Blocks 1/3 of Inlet or Outlet Pipe:	□Yes	□No
Sediment to 60% or More of Sump Depth:	□Yes	□No
Frame is Not Securely Attached to Top Slab:	□Yes	□No
Fractures or Cracks in Basin Walls or Bottom:	□Yes	□No
Vegetation Grows and Blocks 10% or More of Opening: □Yes	□No	
Catch Basin Cover Missing or Out of Place:	□Yes	□No
Ladder Rungs Unsafe, Missing, Corroded or Not Secure: □Yes	□No	
Metal Grate Opening Broken, Unsafe or Blocked with Debris:	□Yes	□No

Illicit Discharge Detected:

□Yes* □No

If yes, notify Borough Manager immediately.

BOROUGH POLICY

ATTACHMENT C

Borough of Bath
Catch Basin Inspection Form

Date: _____

Location (ZONE B – *34 Catch Basins/9 Drains*): _____

Time: _____

Employee: _____

Weather (please circle one):

1. Sunny
2. Partly cloudy
3. Overcast
4. Raining

Last Rainfall (please circle one):

1. Today
2. Yesterday
3. 2-5 days ago
4. >5 days ago

Intensity of Last Rainfall (please circle one):

1. Light
2. Moderate
3. Heavy

Type of Maintenance Performed (please circle all that apply):

1. Inspection
2. Vegetation Control
3. Sediment Removal
4. Debris Removal
5. Trash Removal

Notes:

General Observation

Trash or Debris Blocks More than 10% of Inlet:	□Yes	□No
Trash or Debris Exceeds 60% of Sump Depth:	□Yes	□No
Trash or Debris Blocks 1/3 of Inlet or Outlet Pipe:	□Yes	□No
Sediment to 60% or More of Sump Depth:	□Yes	□No
Frame is Not Securely Attached to Top Slab:	□Yes	□No
Fractures or Cracks in Basin Walls or Bottom:	□Yes	□No
Vegetation Grows and Blocks 10% or More of Opening: □Yes	□No	
Catch Basin Cover Missing or Out of Place:	□Yes	□No
Ladder Rungs Unsafe, Missing, Corroded or Not Secure: □Yes	□No	
Metal Grate Opening Broken, Unsafe or Blocked with Debris:	□Yes	□No

Illicit Discharge Detected:

□Yes* □No

If yes, notify Borough Manager immediately.

BOROUGH POLICY

ATTACHMENT D

Borough of Bath
Catch Basin Inspection Form

Date: _____

Location (ZONE C – *66 Catch Basins/12 Drains*): _____

Time: _____

Employee: _____

Weather (please circle one):

1. Sunny
2. Partly cloudy
3. Overcast
4. Raining

Last Rainfall (please circle one):

1. Today
2. Yesterday
3. 2-5 days ago
4. >5 days ago

Intensity of Last Rainfall (please circle one):

1. Light
2. Moderate
3. Heavy

Type of Maintenance Performed (please circle all that apply):

1. Inspection
2. Vegetation Control
3. Sediment Removal
4. Debris Removal
5. Trash Removal

Notes:

General Observation

Trash or Debris Blocks More than 10% of Inlet:	□Yes	□No
Trash or Debris Exceeds 60% of Sump Depth:	□Yes	□No
Trash or Debris Blocks 1/3 of Inlet or Outlet Pipe:	□Yes	□No
Sediment to 60% or More of Sump Depth:	□Yes	□No
Frame is Not Securely Attached to Top Slab:	□Yes	□No
Fractures or Cracks in Basin Walls or Bottom:	□Yes	□No
Vegetation Grows and Blocks 10% or More of Opening: □Yes	□No	
Catch Basin Cover Missing or Out of Place:	□Yes	□No
Ladder Rungs Unsafe, Missing, Corroded or Not Secure: □Yes	□No	
Metal Grate Opening Broken, Unsafe or Blocked with Debris:	□Yes	□No

Illicit Discharge Detected:

□Yes* □No

If yes, notify Borough Manager immediately.

BOROUGH OF BATH
NORTHAMPTON COUNTY, PENNSYLVANIA

ORDINANCE NO. 2007- 595
(Duly Adopted April 2, 2007)

AN ORDINANCE AMENDING, RESTATING, SUBSTANTIALLY REWRITING AND SUPERCEDING THE EXISTING MONOCACY CREEK WATERSHED ACT 167 – STORMWATER MANAGEMENT ORDINANCE OF 2005 (ORDINANCE NO. 577, DULY ADOPTED APRIL 4, 2005) TO INCORPORATE THE GLOBAL ACT 167 WATER QUALITY UPDATE AND THE REQUIREMENTS UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) FOR COMMUNITIES COVERED BY THE PHASE II PERMIT PROCESS FOR THE MONOCACY CREEK WATERSHED AND TO CREATE THE BOROUGH OF BATH MONOCACY CREEK WATERSHED ACT 167 – STORMWATER MANAGEMENT ORDINANCE OF 2007.

WHEREAS, Act 167, Pennsylvania's Storm Water Management Act, adopted by the General Assembly on October 4, 1978, as amended by Act 63 of May 24, 1984, imposed upon the County of Northampton (the "County") a responsibility for promulgating watershed management plans for the Monocacy Creek and the County's other watersheds; and

WHEREAS, Borough Council of the Borough of Bath (the "Borough Council") adopted Ordinance No. 429 on May 7, 1990, to create and implement the Monocacy Creek Watershed Plan (the "Monocacy Creek Watershed Act 167 – Stormwater Management Ordinance of 1990") which also implemented and adopted updates from the Little Lehigh Creek Watershed Stormwater Management Plan and coordinated those updates with the Monocacy Creek Watershed Plan; and

WHEREAS, Borough Council adopted Ordinance No. 577 on April 4, 2005, to create and implement the Monocacy Creek Watershed Plan (known as the "Monocacy Creek Watershed Act 167 – Stormwater Management Ordinance of 2005") which also implemented and adopted updates from the Little Lehigh Creek Watershed Stormwater Management Plan and coordinated those updates with the Monocacy Creek Watershed Plan; and

WHEREAS, pursuant to Pennsylvania's Storm Water Management Act, 32 P.S. §§ 680.1 *et seq.*, Borough of Bath is required to adopt the April 2006 Global Act 167 Stormwater Management Plan Water Quality Update, adopted by the County on June 15, 2006, and approved by the Pennsylvania Department of Environmental Protection on October 4, 2006, to the Monocacy Creek Watershed Stormwater Management Plan; and

WHEREAS, Borough of Bath is required to adopt the April 2006 Global Act 167 Stormwater Management Plan Water Quality Update requirements under the National Pollutant Discharge Elimination System (NPDES) program for communities covered by the Phase II permit process; and

WHEREAS, on October 4, 2006, the Pennsylvania Department of Environmental Protection approved a model ordinance drafted by the Lehigh Valley Planning Commission and certified that it met state water quality requirements; and

WHEREAS, pursuant to Pennsylvania's Storm Water Management Act, 32 P.S. §§ 680.1 *et seq.*, and the Borough Code, 53 P.S. §§ 45101 *et seq.*, Borough of Bath desires to adopt a version of the model ordinance certified by the Pennsylvania Department of Environmental Protection to meet state and federal requirements for water quality and the NPDES program.

NOW, THEREFORE, in order to comply with the state and federal requirements for water quality and the NPDES program, Borough Council does hereby **ORDAIN** the following to supercede the 2005 Monocacy Creek Watershed Act 167 – Stormwater Management Ordinance:

1. Borough of Bath hereby adopts the Monocacy Creek Watershed Act 167 Stormwater Management Ordinance of 2007 (the "Ordinance") attached hereto, marked Exhibit "A" and made a part hereof; and

2. This Ordinance substantially rewrites and supersedes Ordinance No. 577 known as the Bath Borough Monocacy Creek Watershed Act 167 – Stormwater Management Ordinance of 2005 together with and including all subsequent amendments thereto.

3. This Ordinance shall become effective immediately.

DULY ORDAINED AND ENACTED this 2nd day of April, 2007 by a majority vote of the members of the Borough Council of the Borough of Bath in lawful session duly assembled.

BOROUGH OF BATH
BOROUGH COUNCIL

By: _____
Paul Haldaman, Vice-President

Attest:

_____
Judith A. Danko, Borough Manager
Secretary-Treasurer

APPROVED this 2nd day of April, 2007.

_____
William Heckman, Acting Mayor

SL1 700689v1/050122.00032

CERTIFICATE

I, the undersigned, Secretary of the Borough of Bath, Northampton County, Pennsylvania (the "Borough") certify that the foregoing is a true and correct copy of an Ordinance of the Borough of Bath which was duly enacted by affirmative vote of the majority of the members of the Bath Borough Council at a meeting duly held on April 2, 2007, and that said Ordinance remains in effect, unaltered and unamended, as of the date of this certificate.

I further certify that the Council of the Borough of Bath met the advance notice requirements of Act No. 175 of the General Assembly of the Commonwealth of Pennsylvania, approved July 19, 1974, by advertising the date of said meeting and posting a notice of said meeting on the bulletin board at the Municipal Building, 215 East Main Street, Bath, Pennsylvania, the place of the meeting.

IN WITNESS WHEREOF, I set my hand and affix the official seal of the Borough this 2nd day of April, 2007.

Judith A. Danko, Borough Manager
Secretary-Treasurer

MONOCACY CREEK WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE

ARTICLE 1
GENERAL PROVISIONS

SECTION 101. SHORT TITLE

This Ordinance shall be known and may be cited as the "Monocacy Creek Watershed Act 167 Stormwater Management Ordinance of 2007".

SECTION 102. STATEMENT OF FINDINGS

The governing body of the municipality finds that:

A. Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases flood flows and velocities, contributes to erosion and sedimentation, changes the natural hydrologic patterns, destroys aquatic habitat, elevates aquatic pollutant concentrations and loadings, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines floodplain management and flood control efforts in downstream communities, reduces groundwater recharge, and threatens public health and safety.

B. A comprehensive program of stormwater management, including reasonable regulation of development and activities causing accelerated erosion and loss of natural infiltration, is fundamental to the public health, safety and welfare and the protection of the people of the municipality and all of the people of the Commonwealth, their resources and the environment.

C. Stormwater can be an important resource by providing groundwater recharge for water supplies and baseflow of streams, which also protects and maintains surface water quality.

D. Public education on the control of pollution from stormwater is an essential component in successfully addressing stormwater.

E. *Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES).

F. Non-stormwater discharges to municipal separate storm sewer systems can contribute to pollution of waters of the Commonwealth by the municipality.

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* Throughout the Ordinance, these provisions are from the DEP Guidance on MS4 Ordinance Provisions and are not required for municipalities not subject to the NPDES Phase II regulations.

SECTION 103. PURPOSE

The purpose of this Ordinance is to promote the public health, safety and welfare within the Monocacy Creek Watershed by minimizing the damages and maximizing the benefits described in Section 102 of this Ordinance by provisions designed to:

A. Manage stormwater runoff impacts at their source by regulating activities which cause such problems.

B. Utilize and preserve the desirable existing natural drainage systems.

C. Encourage infiltration of stormwater, where appropriate, to maintain groundwater recharge, to prevent degradation of surface and groundwater quality and to otherwise protect water resources.

D. Maintain the existing flows and quality of streams and watercourses in the municipality and the Commonwealth.

E. Preserve and restore the flood carrying capacity of streams.

F. Provide for proper maintenance of all permanent stormwater management BMPs that are implemented in the municipality.

G. Provide review procedures and performance standards for stormwater planning, design and management.

H. Manage stormwater impacts close to the runoff source which requires a minimum of structures and relies on natural processes.

I. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code Chapter 93.4a to protect and maintain "existing uses" and maintain the level of water quality to support those uses in all streams and to protect and maintain water quality in "special protection" streams.

J. Prevent scour and erosion of streambanks and streambeds.

K. * Provide standards to meet the NPDES permit requirements.

SECTION 104. STATUTORY AUTHORITY

The municipality is empowered to regulate these activities by the authority of the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, the "Stormwater Management Act" and the Act of February 1, 1966, P.L. 1656 (Act 581), 53 P.S. Section 45101, et seq., as amended, "The Borough Code."

SECTION 105. APPLICABILITY

This Ordinance shall only apply to those areas of the municipality which are located within the Monocacy Creek Watershed as delineated on an official map available for

inspection at the municipal office. A map of the Monocacy Creek Watershed at a reduced scale is included in Appendix A for general reference. Municipalities subject to the NPDES Phase II regulations must ensure that all of the ordinance provisions required to meet the MS4 NPDES requirements apply across the entire municipality.

The following activities are defined as Regulated Activities and shall be governed by this Ordinance:

A. Land development.

B. Subdivision.

C. Construction of new or additional impervious surfaces (driveways, parking lots, etc.).

D. Construction of new buildings or additions to existing buildings.

E. Diversion or piping of any natural or man-made stream channel.

F. Installation of stormwater systems or appurtenances thereto.

G. * Regulated Earth Disturbance Activities.

SECTION 106. EXEMPTIONS

A. Impervious Cover - Any proposed Regulated Activity, except those defined in Section 105.E. and 105.F., which would create 10,000 square feet or less of additional impervious cover is exempt from the Drainage Plan preparation provisions of this Ordinance. All of the impervious cover added incrementally to a site above the initial 10,000 square feet shall be subject to the Drainage Plan preparation provisions of this Ordinance. If a site has previously received an exemption and is proposing additional development such that the total impervious cover on the site exceeds 10,000 square feet, the total impervious cover on the site proposed since the original ordinance date must meet the provisions of this Ordinance.

1. The date of the municipal Ordinance adoption of the original Monocacy Creek Act 167 Stormwater Management Ordinance, Ordinance No. 429, dated May 7, 1990, shall be the starting point from which to consider tracts as "parent tracts" in which future subdivisions and respective impervious area computations shall be cumulatively considered.

2. For development taking place in stages, the entire development plan must be used in determining conformance with these criteria.

3. Additional impervious cover shall include, but not be limited to, additional indoor living spaces, decks, patios, garages, driveways, storage sheds and

similar structures, any roof, parking or driveway areas and any new streets and sidewalks constructed as part of or for the proposed Regulated Activity.

4. Any additional areas proposed to initially be gravel, crushed stone, porous pavement, etc. shall be assumed to be impervious for the purposes of comparison to the exemption criteria. Any existing gravel, crushed stone or hard packed soil areas on a site shall be considered as pervious cover for the purpose of exemption evaluation.

B. Prior Drainage Plan Approval - Any Regulated Activity for which a Drainage Plan was previously prepared as part of a subdivision or land development proposal that received preliminary plan approval from the municipality prior to the effective date of this Ordinance is exempt from the Drainage Plan preparation provisions of this Ordinance, except as cited in Section 106.C., provided that the approved Drainage Plan included design of stormwater facilities to control runoff from the site currently proposed for Regulated Activities consistent with ordinance provisions in effect at the time of approval and the approval has not lapsed under the Municipalities Planning Code. If significant revisions are made to the Drainage Plan after both the preliminary plan approval and the effective date of this Ordinance, preparation of a new Drainage Plan, subject to the provisions of this Ordinance, shall be required. Significant revisions would include a change in control methods or techniques, relocation or redesign of control measures or changes necessary because soil or other conditions are not as stated on the original Drainage Plan.

C. These exemptions shall not relieve the applicant from implementing such measures as are necessary to protect health, safety, property, and State Water Quality Requirements. These measures include adequate and safe conveyance of stormwater on the site and as it leaves the site. These exemptions do not relieve the applicant from the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act or ordinance.

D. No exemptions shall be provided for Regulated Activities as defined in Sections 105.E. and 105.F.

SECTION 107. REPEALER

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

SECTION 108. SEVERABILITY

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

SECTION 109. COMPATIBILITY WITH OTHER ORDINANCE REQUIREMENTS

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

SECTION 110. DUTY OF PERSONS ENGAGED IN THE DEVELOPMENT OF LAND

Notwithstanding any provisions of this Ordinance, including exemption and waiver provisions, any landowner and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics shall implement such measures as are reasonably necessary to prevent injury to health, safety or other property. Such measures shall include such actions as are required to manage the rate, volume, direction and quality of resulting stormwater runoff in a manner which otherwise adequately protects health and property from possible injury.

ARTICLE 2
DEFINITIONS

For the purposes of this Ordinance, certain terms and words used herein shall be interpreted as follows:

A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.

B. The word "includes" or "including" shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.

C. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.

Accelerated Erosion – The removal of the surface of the land through the combined action of human activities and natural processes, at a rate greater than would occur because of the natural processes alone.

Best Management Practice (BMP) – Activities, facilities, measures or procedures used to manage stormwater quantity and quality impacts from the Regulated Activities listed in Section 105, to meet State Water Quality Requirements, to promote groundwater recharge and to otherwise meet the purposes of this Ordinance.

Best Management Practice Operations and Maintenance Plan – Documentation, included as part of a Drainage Plan, detailing the proposed BMPs, how they will be operated and maintained and who will be responsible

Bioretention - Densely vegetated, depressed features that store stormwater and filter it through vegetation, mulch, planting soil, etc. Ultimately stormwater is evapotranspirated, infiltrated, or discharged. Optimal bioretention areas mimic natural forest ecosystems in terms of species diversity, density, distribution, use of native plants, etc.

Buffer –

1. Streamside Buffer - A zone of variable width located along a stream that is vegetated and is designed to filter pollutants from runoff.

2. Special Geologic Feature Buffer – A required isolation distance from a special geologic feature to a proposed BMP needed to reduce the risk of sinkhole formation due to stormwater management activities.

Capture/Reuse - Stormwater management techniques such as cisterns and rain barrels which direct runoff into storage devices, surface or sub-surface, for later re-use, such as for irrigation of gardens and other planted areas. Because this stormwater is utilized and no pollutant discharge results, water quality performance is superior to other non-infiltration BMPs.

Carbonate Bedrock - Rock consisting chiefly of carbonate minerals, such as limestone and dolomite; specifically a sedimentary rock composed of more than 50% by weight of carbonate minerals that underlies soil or other unconsolidated, superficial material.

Cistern - An underground reservoir or tank for storing rainwater.

Closed Depression - A distinctive bowl-shaped depression in the land surface. It is characterized by internal drainage, varying magnitude, and an unbroken ground surface.

Conservation District - The Northampton County Conservation District, as applicable.

Constructed Wetlands - Constructed wetlands are similar to wet ponds (see below) and consist of a basin which provides for necessary stormwater storage as well as a permanent pool or water level, planted with wetland vegetation. To be successful, constructed wetlands must have adequate natural hydrology (both runoff inputs as well as soils and water table which allow for maintenance of a permanent pool of water). In these cases, the permanent pool must be designed carefully, usually with shallow edge benches, so that water levels are appropriate to support carefully selected wetland vegetation.

Culvert - A pipe, conduit or similar structure including appurtenant works which carries surface water.

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

DEP - The Pennsylvania Department of Environmental Protection.

Design Storm - The depth and time distribution of precipitation from a storm event measured in probability of occurrence (e.g., 100-yr. storm) and duration (e.g. 24-hour) and used in computing stormwater management control systems.

Detention Basin - A basin designed to retard stormwater runoff by temporarily storing the runoff and releasing it at the appropriate Release Rate.

Developer - A person, partnership, association, corporation or other entity, or any responsible person therein or agent thereof, that undertakes any Regulated Activity of this Ordinance.

Development Site (Site) - The specific tract of land for which a Regulated Activity is proposed.

Diffused Drainage - See Sheet Flow.

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

Drainage Plan - The documentation of the proposed stormwater quantity and quality management controls to be used for a given development site, including a BMP Operations and Maintenance Plan, the contents of which are established in Section 403.

Earth Disturbance Activity - A construction or other human activity which disturbs the surface of the land, including, but not limited to, clearing and grubbing, grading, excavations, embankments, road maintenance, building construction and the moving, depositing, stockpiling or storing of soil, rock or earth materials.

Erosion - The removal of soil particles by the action of water, wind, ice, or other geological agents.

Existing Uses - Those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards. (25 Pa. Code Chapter 93.1)

Fill - Man-made deposits of natural soils or rock products and waste materials. **Filter Strips** – See Vegetated Buffers.

Freeboard - The incremental depth in a stormwater management structure, provided as a safety factor of design, above that required to convey the design runoff event.

Groundwater Recharge - Replenishment of existing natural underground water supplies.

Hardship Waiver Request - A written request for a waiver alleging that the provisions of this Ordinance inflict unnecessary hardship upon the applicant. A hardship waiver does not apply to and is not available from the water quality provisions of this Ordinance and should not be granted.

Hydrologic Soil Group (HSG) - Soils are classified into four HSGs (A, B, C and D) to indicate the minimum infiltration rates, which are obtained for bare soil after prolonged wetting. The Natural Resources Conservation Service (NRCS) of the US Department of Agriculture defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of the development site may be identified from a soil survey report that can be obtained from local NRCS offices or conservation district offices. Soils become less permeable as the HSG varies from A to D.

Hot Spot Land Uses - A land use or activity that generates higher concentrations of hydrocarbons, trace metals or other toxic substances than typically found in stormwater runoff. These land uses are listed in Section 304.P.

Impervious Surface (Impervious Cover) - A surface which prevents the percolation of water into the ground.

Infiltration Practice - A practice designed to direct runoff into the ground, e.g. French drain, seepage pit, seepage trench or bioretention area.

Karst - A type of topography or landscape characterized by depressions, sinkholes, limestone towers and steep-sided hills, underground drainage and caves. Karst is usually formed on carbonate rocks, such as limestones or dolomites and sometimes gypsum.

Land Development - Any of the following activities:

1. The improvement of one lot or two or more contiguous lots, tracts or parcels of land for any purpose involving (i) a group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure; or (ii) the division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups or other features.

2. A subdivision of land.

3. Development in accordance with Section 503 (1.1) of the Pennsylvania Municipalities Planning Code.

Loading Rate - The ratio of the land area draining to the system, as modified by the weighting factors in Section 307.B., compared to the base area of the infiltration system.

Low Impact Development - A development approach that promotes practices that will minimize post-development runoff rates and volumes thereby minimizing needs for artificial conveyance and storage facilities. Site design practices include preserving natural drainage features, minimizing impervious surface area, reducing the hydraulic connectivity of impervious surfaces and protecting natural depression storage.

"Local" Runoff Conveyance Facilities - Any natural channel or man-made conveyance system which has the purpose of transporting runoff from the site to the Mainstem.

Mainstem (Main Channel) - Any stream segment or other conveyance used as a reach in the Monocacy Creek hydrologic model.

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

Maryland Stormwater Design Manual - A stormwater design manual written by the Maryland Department of the Environment and the Center for Watershed Protection. As of January 2004, the Manual can be obtained through the following web site: www.mde.state.md.us.

Minimum Disturbance/Minimum Maintenance Practices (MD/MM) - Site design practices in which careful limits are placed on site clearance prior to development allowing for maximum retention of existing vegetation (woodlands and other), minimum disturbance and compaction of existing soil mantle and minimum site application of chemicals post-development. Typically, MD/MM includes disturbance setback criteria from buildings as well as related site improvements such as walkways, driveways, roadways, and any other improvements. These criteria may vary by community context as well as by type of development being proposed. Additionally, MD/MM also shall include provisions (e.g., deed restrictions, conservation easements) to protect these areas from future disturbance and from application of fertilizers, pesticides, and herbicides.

Municipality - Borough of Bath, Northampton County, Pennsylvania.

No Harm Option - The option of using a less restrictive runoff quantity control if it can be shown that adequate and safe runoff conveyance exists and that the less restrictive control would not adversely affect health, safety and property.

NPDES - National Pollutant Discharge Elimination System.

NRCS – Natural Resources Conservation Service - U.S. Department of Agriculture. (Formerly the Soil Conservation Service.)

Oil/Water Separator - A structural mechanism designed to remove free oil and grease (and possibly solids) from stormwater runoff.

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

Owner - One with an interest in and often dominion over a property.

Peak Discharge - The maximum rate of flow of stormwater runoff at a given location and time resulting from a specified storm event.

Penn State Runoff Model (PSRM) - The computer-based hydrologic modeling technique adapted to each watershed for the Act 167 Plans. The model was "calibrated" to reflect actual flow values by adjusting key model input parameters.

Person - An individual, partnership, public or private association or corporation, firm, trust, estate, municipality, governmental unit, public utility or any other legal entity whatsoever which is recognized by law as the subject of rights and duties.

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

Preliminary Site Investigation - The determination of the depth to bedrock, the depth to the seasonal high water table and the soil permeability for a possible infiltration location on a site through the use of published data and on-site surveys. In carbonate bedrock areas, the location of special geologic features must also be determined along with the associated buffer distance to the possible infiltration area. See Appendix G.

Public Water Supplier - A person who owns or operates a Public Water System.

Public Water System - A system which provides water to the public for human consumption which has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. (See 25 Pa. Code Chapter 109)

Qualified Geotechnical Professional - A licensed professional geologist or a licensed professional engineer who has a background or expertise in geology or hydrogeology.

Rational Method - A method of peak runoff calculation using a standardized runoff coefficient (rational 'c'), acreage of tract and rainfall intensity determined by return period and by the time necessary for the entire tract to contribute runoff. The rational method formula is stated as follows: $Q = ciA$, where "Q" is the calculated peak flow rate in cubic feet per second, "c" is the dimensionless runoff coefficient (see Appendix C), "i" is the rainfall intensity in inches per hour, and "A" is the area of the tract in acres.

Reach - Any of the natural or man-made runoff conveyance channels used for watershed runoff modeling purposes to connect the subareas and transport flows downstream.

Recharge Volume (REv) - The portion of the water quality volume (WQv) used to maintain groundwater recharge rates at development sites. (see Section 304.J.)

Regulated Activities - Actions or proposed actions which impact upon proper management of stormwater runoff and which are governed by this Ordinance as specified in Section 105.

Regulated Earth Disturbance Activities - Earth disturbance activity other than agricultural plowing or tilling of one acre or more with a point source discharge to surface waters or to the municipality's storm sewer system or earth disturbance activity of five acres or more regardless of the planned runoff. This includes earth disturbance on any portion of, part or during any stage of a larger common plan of development.

Release Rate - The percentage of the pre-development peak rate of runoff for a development site to which the post-development peak rate of runoff must be controlled to avoid peak flow increases throughout the watershed.

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

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

Runoff - That part of precipitation which flows over the land.

Sediment Traps/Catch Basin Sumps - Chambers which provide storage below the outlet in a storm inlet to collect sediment, debris and associated pollutants, typically requiring periodic clean out.

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

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

Sheet Flow - Stormwater runoff flowing in a thin layer over the ground surface.

Soil-Cover-Complex Method - A method of runoff computation developed by NRCS which is based upon relating soil type and land use/cover to a runoff parameter called a Curve Number.

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

Spill Prevention and Response Program - A program that identifies procedures for preventing and, as needed, cleaning up potential spills and makes such procedures known and the necessary equipment available to appropriate personnel.

State Water Quality Requirements - As defined under State regulations -- protection of designated and existing uses (See 25 Pa. Code Chapters 93 and 96)--including:

A. Each stream segment in Pennsylvania has a "designated use," such as "cold water fishes" or "potable water supply," which is listed in Chapter 93. These uses must be protected and maintained, under State regulations.

B. "Existing uses" are those attained as of November 1975, regardless whether they have been designated in Chapter 93. Regulated Earth Disturbance activities must be designed to protect and maintain existing uses and maintain the level of water quality necessary to protect those uses in all streams, and to protect and maintain water quality in special protection streams.

C. Water quality involves the chemical, biological and physical characteristics of surface water bodies. After Regulated Earth Disturbance activities are complete, these characteristics can be impacted by addition of pollutants such as sediment, and changes in habitat through increased flow volumes and/or rates as a result of changes in land surface area from those activities. Therefore, permanent discharges to surface waters must be managed to protect the stream bank, streambed and structural integrity of the waterway, to prevent these impacts.

Storage Indication Method - A method of routing or moving an inflow hydrograph through a reservoir or detention structure. The method solves the mass conservation equation to determine an outflow hydrograph as it leaves the storage facility.

Storm Drainage Problem Areas - Areas which lack adequate stormwater collection and/or conveyance facilities and which present a hazard to persons or property. These areas are either documented in Appendix B of this Ordinance or identified by the municipality or municipal engineer.

Storm Sewer - A system of pipes or other conduits which carries intercepted surface runoff, street water and other wash waters, or drainage, but excludes domestic sewage and industrial wastes.

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

Stormwater Filters - Any number of structural mechanisms such as multi-chamber catch basins, sand/peat filters, sand filters, and so forth which are installed to intercept stormwater flow and remove pollutants prior to discharge. Typically, these systems require periodic maintenance and clean out.

Stormwater Management Plan - The plan for managing stormwater runoff adopted by Northampton County for the Monocacy Creek Watershed as required by the Act of October 4, 1978, P.L. 864, (Act 167), as amended, and known as the "Stormwater Management Act".

Stream - A Watercourse.

Subarea - The smallest unit of watershed breakdown for hydrologic modeling purposes for which the runoff control criteria have been established in the Stormwater Management Plan.

Subdivision - The division or redivision of a lot, tract or parcel of land by any means into two or more lots, tracts, parcels or other divisions of land including changes in existing lot lines for the purpose, whether immediate or future, of lease, partition by the court for distribution to heirs or devisees, transfer of ownership or building or lot development:

Provided, however, that the subdivision by lease of land for agricultural purposes into parcels of more than ten acres, not involving any new street or easement of access or any residential dwelling, shall be exempted.

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

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

Technical Best Management Practice Manual & Infiltration Feasibility Report, November 2002 - The report written by Cahill Associates that addresses the feasibility of infiltration in carbonate bedrock areas in the Monocacy Creek Watershed. The report is available at the Lehigh Valley Planning Commission offices.

Trash/Debris Collectors - Racks, screens or other similar devices installed in a storm drainage system to capture coarse pollutants (trash, leaves, etc.).

Vegetated Buffers - Gently sloping areas that convey stormwater as sheet flow over a broad, densely vegetated earthen area, possibly coupled with the use of level spreading devices. Vegetated buffers should be situated on minimally disturbed soils, have low-flow velocities and extended residence times.

Vegetated Roofs - Vegetated systems installed on roofs that generally consist of a waterproof layer, a root-barrier, drainage layer (optional), growth media, and suitable vegetation. Vegetated roofs store and eventually evapotranspirate the collected rooftop rainfall; overflows may be provided for larger storms.

Vegetated Swales -

1. Vegetated earthen channels designed to convey stormwater. These swales are not considered to be water quality BMPs.

2. Broad, shallow, densely vegetated, earthen channels designed to treat stormwater while slowly infiltrating, evapotranspirating, and conveying it. Swales should be gently sloping with low flow velocities to prevent erosion. Check dams may be added to enhance performance.

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

Water Quality Inserts - Any number of commercially available devices that are inserted into storm inlets to capture sediment, oil, grease, metals, trash, debris, etc.

Water Quality Volume (WQv) - The volume needed to capture and treat 90% of the average annual rainfall volume. (see Section 304.B.)

Watershed - The entire region or area drained by a river or other body of water, whether natural or artificial.

Wet Detention Ponds - Basins that provide for necessary stormwater storage as well as a permanent pool of water. To be successful, wet ponds must have adequate natural hydrology (both runoff inputs as well as soils and water table which allow for maintenance of a permanent pool of water) and must be able to support a healthy aquatic community so as to avoid creation of mosquito and other health and nuisance problems.

ARTICLE 3
STORMWATER MANAGEMENT REQUIREMENTS

SECTION 301. GENERAL REQUIREMENTS

A. All Regulated Activities in the municipality shall be subject to the stormwater management requirements of this Ordinance.

B. Storm drainage systems shall be provided to permit unobstructed flow in natural watercourses except as modified by stormwater detention facilities, recharge facilities, water quality facilities, pipe systems or open channels consistent with this Ordinance.

C. The existing locations of concentrated drainage discharge onto adjacent property shall not be altered without written approval of the affected property owner(s).

D. Areas of existing diffused drainage discharge onto adjacent property shall be managed such that, at minimum, the peak diffused flow does not increase in the general direction of discharge, except as otherwise provided in this Ordinance. If diffused flow is proposed to be concentrated and discharged onto adjacent property, the developer must document that there are adequate downstream conveyance facilities to safely transport the concentrated discharge to the point of pre-development flow concentration, to the stream reach or otherwise prove that no harm will result from the concentrated discharge. Areas of existing diffused drainage discharge shall be subject to any applicable release rate criteria in the general direction of existing discharge whether they are proposed to be concentrated or maintained as diffused drainage areas.

E. Where a site is traversed by watercourses other than those for which a 100-year floodplain is defined by the municipality, there shall be provided drainage easements conforming substantially with the line of such watercourses. The width of any easement shall be adequate to provide for unobstructed flow of storm runoff based on calculations made in conformance with Section 307 for the 100-year return period runoff and to provide a freeboard allowance of one-half (0.5) foot above the design water surface level. The terms of the easement shall prohibit excavation, the placing of fill or structures, and any alterations which may adversely affect the flow of stormwater within any portion of the easement. Also, periodic maintenance of the easement to ensure proper runoff conveyance

shall be required. Watercourses for which the 100-year floodplain is formally defined are subject to the applicable municipal floodplain regulations.

F. When it can be shown that, due to topographic conditions, natural drainage swales on the site cannot adequately provide for drainage, open channels may be constructed conforming substantially to the line and grade of such natural drainage swales. Capacities of open channels shall be calculated using the Manning Equation.

G. Post construction BMPs shall be designed, installed, operated and maintained to meet the requirements of the Clean Streams Law and implementing regulations, including the established practices in 25 Pa. Code Chapter 102 and the specifications of this Ordinance as to prevent accelerated erosion in watercourse channels and at all points of discharge.

H. No Earth Disturbance Activities associated with any Regulated Activities shall commence until approval by the municipality of a plan which demonstrates compliance with the requirements of this Ordinance.

I. Techniques described in Appendix F (Low Impact Development) of this Ordinance are encouraged because they reduce the costs of complying with the requirements of this Ordinance and the State Water Quality Requirements.

J. Infiltration for stormwater management is encouraged where soils and geology permit, consistent with the provisions of this Ordinance and, where appropriate, the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Appendix D.

SECTION 302. PERMIT REQUIREMENTS BY OTHER GOVERNMENT ENTITIES

A. The following permit requirements apply to certain Regulated and Earth Disturbance Activities and must be met prior to commencement of Regulated and Earth Disturbance activities, as applicable:

1. All Regulated and Earth Disturbance activities subject to permit requirements by DEP under regulations at 25 Pa. Code Chapter 102.

2. Work within natural drainageways subject to permit by DEP under 25 Pa. Code Chapter 102 and Chapter 105.

3. Any stormwater management facility that would be located in or adjacent to surface waters of the Commonwealth, including wetlands, subject to permit by DEP under 25 Pa. Code Chapter 105.

4. Any stormwater management facility that would be located on a State highway right-of-way or require access from a State highway shall be subject to approval by the Pennsylvania Department of Transportation (PENNDOT).

5. Culverts, bridges, storm sewers or any other facilities which must pass or convey flows from the tributary area and any facility which may constitute a dam subject to permit by DEP under 25 Pa. Code Chapter 105.

SECTION 303. EROSION AND SEDIMENT CONTROL DURING REGULATED EARTH DISTURBANCE ACTIVITIES

A. No Regulated Earth Disturbance Activities within the municipality shall commence until approval by the municipality of an Erosion and Sediment Control Plan for construction activities. Written approval by DEP or a delegated County Conservation District shall satisfy this requirement.

B. An Erosion and Sediment Control Plan is required by DEP regulations for any Earth Disturbance Activity of 5,000 square feet or more under Pa. Code § 102.4(b).

C. DEP NPDES Stormwater Discharges Associated with Construction Activities Permit is required for Regulated Earth Disturbance Activities under Pa. Code Chapter 92.

D. Evidence of any necessary permit(s) for Regulated Earth Disturbance Activities from the appropriate DEP regional office or County Conservation District must be provided to the municipality before the commencement of an Earth Disturbance Activity.

E. A copy of the Erosion and Sediment Control Plan and any permit, as required by DEP regulations, shall be available at the project site at all times.

SECTION 304. POST CONSTRUCTION WATER QUALITY CRITERIA

A. No Regulated Earth Disturbance Activities within the municipality shall commence until approval by the municipality of a Drainage Plan which demonstrates compliance with this Ordinance. This Ordinance provides standards to meet NPDES Permit requirements associated with construction activities and MS4 permit requirements.

B. The Water Quality Volume (WQv) shall be captured and treated. The WQv shall be calculated two ways. First, WQv shall be calculated using the following formula:

$$WQv = \frac{(c)(P)(A)}{12}$$

Where WQv = water quality volume in acre-feet
c = Rational Method post-development runoff coefficient for the 2 year storm
P = 1.25 inches

A = Area in acres of proposed Regulated Activity

Second, the WQv shall be calculated as the difference in runoff volume from pre-development to post-development for the 2-year return period storm. The effect of closed depressions on the site shall be considered in this calculation. The larger of these two calculated volumes shall be used as the WQv to be captured and treated, except that in no case shall the WQv be permitted to exceed 1.25-inches of runoff over the site area. This standard does not limit the volume of infiltration an applicant may propose for purposes of water quantity/peak rate control.

C. The WQv shall be calculated for each post-development drainage direction on a site for sizing BMPs. Site areas having no impervious cover and no proposed disturbance during development may be excluded from the WQv calculations and do not require treatment.

D. If an applicant is proposing to use a dry extended detention basin, wet pond, constructed wetland or other BMP that ponds water on the land surface and may receive direct sunlight, the discharge from that BMP must be treated by infiltration, a vegetated buffer, filter strip, bioretention, vegetated swale or other BMP that provides a thermal benefit to protect the High Quality waters of the Monocacy Creek from thermal impacts.

E. The WQv for a site as a result of the Regulated Activities must either be treated with infiltration or two acceptable BMPs such as those listed in Section 304.O., except for minor areas on the periphery of the site that cannot reasonably be drained to an infiltration facility or other BMP.

F. Infiltration BMPs shall not be constructed on fill unless the applicant demonstrates that the fill is stable and otherwise meets the infiltration BMP standards of this Ordinance.

G. The applicant shall document the bedrock type(s) present on the site from published sources. Any apparent boundaries between carbonate and non-carbonate bedrock shall be verified through more detailed site evaluations by a qualified geotechnical professional.

H. For each proposed Regulated Activity in the watershed where an applicant intends to use infiltration BMP's, the applicant shall conduct a Preliminary Site Investigation, including gathering data from published sources, a field inspection of the site, a minimum of one test pit and a minimum of two percolation tests, as outlined in Appendix G. This investigation will determine depth to bedrock, depth to the seasonal high water table, soil permeability and location of special geologic features, if applicable. This investigation may be done by a certified Sewage Enforcement Officer (SEO) except that the location(s) of special geologic features shall be verified by a qualified geotechnical professional.

I. Sites where applicants intend to use infiltration BMPs must meet the following criteria:

- Depth to bedrock below the invert of the BMP greater than or equal to 2 feet
- Depth to seasonal high water table below the invert of the BMP greater than or equal to 3 feet; except for infiltration of residential roof runoff where the seasonal high water table must be below the invert of the BMP. (If the depth to bedrock is between 2 and 3 feet and the evidence of the seasonal high water table is not found in the soil, no further testing to locate the depth to seasonal high water table is required.)
- Soil permeability (as measured by the adapted 25 PA Code § 73.15. percolation test in Appendix G) greater than or equal to 0.5 inches/hour and less than or equal to 12 inches per hour
- Setback distances or buffers as follows:
  - 100 feet from water supply wells
  - 15 feet downgradient or 100 feet upgradient from building foundations; except for residential development where the required set back is 15 feet downgradient or 40 feet upgradient from building foundations.
  - 50 feet from septic system drainfields; except for residential development where the required setback is 25 feet from septic system drainfields.
  - 50 feet from a geologic contact with carbonate bedrock unless a
  - Preliminary Site Investigation is done in the carbonate bedrock to show the absence of special geologic features within 50 feet of the proposed infiltration area.
  - 100 feet from the property line unless documentation is provided to show that all setbacks from existing or potential future wells, foundations and drainfields on neighboring properties will be met; except for one and two family residential dwellings where the required setback is 40 feet unless documentation is provided to show that all setbacks from existing or potential future wells, foundations and drainfields on neighboring properties will be met.

J. For entirely non-carbonate sites, the Recharge Volume (REv) shall be infiltrated unless the applicant demonstrates that it is infeasible to infiltrate the REv for

reasons of seasonal high water table, permeability rate, soil depth or setback distances; or except as provided in Section 304.U.

1. The REv shall be calculated as follows:

$$REv = (0.25)*(I)/12$$

Where Rev = Recharge Volume in acre-feet
I = impervious area in acres

2. The Preliminary Site Investigation described in Section 304.H. is required and shall continue on different areas of the site until a potentially suitable infiltration location is found or the entire site is determined to be infeasible for infiltration. For infiltration areas that appear to be feasible based on the preliminary site investigation, the Additional Site Investigation and Testing as outlined in Appendix G shall be completed.

3. If an Applicant proposes infiltration, the municipality may determine infiltration to be infeasible if there are known existing conditions or problems that may be worsened by the use of infiltration.

4. The site must meet the conditions listed in Section 304.I.

5. If it is not feasible to infiltrate the full REv, the applicant shall infiltrate that portion of the REv that is feasible based on the site characteristics. If none of the REv can be infiltrated, REv shall be considered as part of the WQv and shall be captured and treated as described in Section 304.O.

6. If REv is infiltrated, it may be subtracted from the WQv required to be captured and treated.

K. In entirely carbonate areas, where the applicant intends to use infiltration BMPs, the Preliminary Site Investigation described in Section 304.H. shall be conducted. For infiltration areas that appear feasible based on the Preliminary Site Investigation, the applicant shall conduct the Additional Site Investigation and Testing as outlined in Appendix G. The soil depth, percolation rate and proposed loading rate, each weighted as described in Section 307, along with the buffer from special geologic features shall be compared to the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Appendix D to determine if the site is recommended for infiltration. In addition to the recommendation from Appendix D, the conditions listed in Section 304.I. are required for infiltration in carbonate areas.

Applicants are encouraged to infiltrate the REv, as calculated in Section 304.J., but are not required to use infiltration BMPs on a carbonate site even if the site falls in the "Recommended" range on the chart in Appendix D. Any amount of volume infiltrated can be subtracted from the WQv to be treated by non-

infiltration BMPs. If infiltration is not proposed, the full WQv shall be treated by two acceptable BMPs, as specified in Section 304.O.

L. If a site has both carbonate and non-carbonate areas, the applicant shall investigate the ability of the non-carbonate portion of the site to fully meet this Ordinance to meet the requirements for REv for the whole site through infiltration. If that proves infeasible, infiltration in the carbonate area as described in Section 304.K. or 2 other non-infiltration BMPs as described in Section 304.O. must be used. No infiltration structure in the non-carbonate area shall be located within 50 feet of a boundary with carbonate bedrock, except when a Preliminary Site Investigation has been done showing the absence of special geologic features within 50 feet of the proposed infiltration area.

M. If infiltration BMPs are proposed in carbonate areas, the post-development 2-year runoff volume leaving the site shall be 80% or more of the pre-development runoff volume for the carbonate portion of the site to prevent infiltration of volumes far in excess of the pre-development infiltration volume.

N. Site areas proposed for infiltration shall be protected from disturbance and compaction except as necessary for construction of infiltration BMPs.

O. If infiltration of the entire WQv is not proposed, the remainder of the WQv shall be treated by two acceptable BMPs in series for each discharge location. Sheet flow draining across a pervious area can be considered as one BMP. Sheet flow across impervious areas and concentrated flow shall flow through two BMPs. If sheet flow from an impervious area is to be drained across a pervious area as one BMP, the length of the pervious area must be equal to or greater than the length of impervious area. In no case may the same BMP be employed consecutively to meet the requirement of this section. Acceptable BMPs are listed below along with the recommended reference for design.

Best Management Practice	**Design Reference Number**[C]
Bioretention[A]	4, 5, 11, 16
Capture/Reuse[B]	4, 14
Constructed Wetlands	4, 5, 8, 10, 16
Dry Extended Detention Ponds	4, 5, 8, 12, 18
Minimum Disturbance/ Minimum Maintenance Practices	1, 9
Significant Reduction of Existing Impervious Cover	N/A
Stormwater Filters[A] (Sand, Peat, Compost, etc.)	4, 5, 10, 16
Vegetated Buffers/Filter Strips	2, 3, 5, 11, 16, 17
Vegetated Roofs	4, 13
Vegetated Swales[A]	2, 3, 5, 11, 16, 17
Water Quality Inlets[D]	4, 7, 15, 16, 19
Wet Detention Ponds	4, 5, 6, 8

[A] This BMP could be designed with or without an infiltration component. If infiltration is proposed,

the site and BMP will be subject to the testing and other infiltration requirements in this Ordinance.

B If this BMP is used to treat the entire WQv then it is the only BMP required because of this BMPs superior water quality performance.

C See table below.

D Water Quality Inlets include such BMPs as Oil/Water Separators, Sediment Traps/Catch Basin Sumps, and Trash/Debris Collectors in Catch Basins.

Number	Design Reference Title
1	"Conservation Design For Stormwater Management – A Design Approach to Reduce Stormwater Impacts From Land Development and Achieve Multiple Objectives Related to Land Use", Delaware Department of Natural Resources and Environmental Control, The Environmental Management Center of the Brandywine Conservancy, September 1997
2	"A Current Assessment of Urban Best Management Practices: Techniques for Reducing Nonpoint Source Pollution in the Coastal Zone", Schueler, T. R., Kumble, P. and Heraty, M., Metropolitan Washington Council of Governments, 1992.
3	"Design of Roadside Channels with Flexible Linings", Federal Highway Administration, Chen, Y. H. and Cotton, G. K., Hydraulic Engineering Circular 15, FHWA-IP-87-7, McLean Virginia, 1988.
4	"Draft Stormwater Best Management Practices Manual", Pennsylvania Department of Environmental Protection, January 2005.
5	"Evaluation and Management of Highway Runoff Water Quality", Federal Highway Administration, FHWA-PD-96-032, Washington, D.C., 1996.
6	"Evaporation Maps of the United States", U.S. Weather Bureau (now NOAA/National Weather Service) Technical Paper 37, Published by Department of Commerce, Washington D.C., 1959.
7	"Georgia Stormwater Manual", AMEC Earth and Environmental, Center for Watershed Protection, Debo and Associates, Jordan Jones and Goulding, Atlanta Regional Commission, Atlanta, Georgia, 2001.
8	"Hydraulic Design of Highway Culverts", Federal Highway Administration, FHWA HDS 5, Washington, D.C., 1985 (revised May 2005).
9	"Low Impact Development Design Strategies *An Integrated Design Approach*, Prince Georges County, Maryland Department of Environmental Resources, June 1999.
10	"Maryland Stormwater Design Manual", Maryland Department of the Environment, Baltimore, Maryland , 2000.
11	"Pennsylvania Handbook of Best Management Practices for Developing Areas", Pennsylvania Department of Environmental Protection, 1998.
12	"Recommended Procedures for Act 167 Drainage Plan Design", LVPC, Revised 1997.
13	"Roof Gardens History, Design, and Construction", Osmundson, Theodore. New York: W.W. Norton & Company, 1999.
14	"The Texas Manual on Rainwater Harvesting", Texas Water Development Board, Austin, Texas, Third Edition, 2005.
15	"VDOT Manual of Practice for Stormwater Management", Virginia Transportation Research Council, Charlottesville, Virginia, 2004.
16	"Virginia Stormwater Management Handbook", Virginia Department of Conservation and Recreation, Richmond, Virginia, 1999.
17	"Water Resources Engineering", Mays, L. W., John Wiley & Sons, Inc., 2005.
18	"Urban Hydrology for Small Watersheds", Technical Report 55, US Department

Number	Design Reference Title
	of Agriculture, Natural Resources Conservation Service, 1986.
19	US EPA, Region 1 New England web site (as of August 2005) http://www.epa.gov/NE/assistance/ceitts/stormwater/techs/html.

P. Stormwater runoff from Hot Spot land uses shall be pre-treated. In no case, may the same BMP be employed consecutively to meet this requirement and the requirement in Section 304.O. Acceptable methods of pre-treatment are listed below.

Hot Spot Land Use	Pre-treatment Method(s)
Vehicle Maintenance and Repair Facilities including Auto Parts Stores	- Water Quality Inlets - Use of Drip Pans and/or Dry Sweep Material Under Vehicles/Equipment - Use of Absorbent Devices to Reduce Liquid Releases - Spill Prevention and Response Program
Vehicle Fueling Stations	- Water Quality Inlets - Spill Prevention and Response Program
Storage Areas for Public Works	- Water Quality Inlets - Use of Drip Pans and/or Dry Sweep Material Under Vehicles/Equipment - Use of Absorbent Devices to Reduce Liquid Releases - Spill Prevention and Response Program - Diversion of Stormwater away from Potential Contamination Areas
Outdoor Storage of Liquids	- Spill Prevention and Response Program
Commercial Nursery Operations	- Vegetated Swales/Filter Strips -Constructed Wetlands - Stormwater Collection and Reuse
Salvage Yards and Recycling Facilities*	- BMPs that are a part of a Stormwater Pollution Prevention Plan under an NPDES Permit
Fleet Storage Yards and Vehicle Cleaning Facilities*	- BMPs that are a part of a Stormwater Pollution Prevention Plan under an NPDES Permit
Facilities that Store or Generate Regulated Substances*	- BMPs that are a part of a Stormwater Pollution Prevention Plan under an NPDES Permit
Marinas*	- BMPs that are a part of a Stormwater Pollution Prevention Plan under an NPDES Permit
Certain Industrial Uses (listed under NPDES)*	- BMPs that are a part of a Stormwater Pollution Prevention Plan under an NPDES Permit

*Regulated under the NPDES Stormwater Program

Design references for the pre-treatment methods, as necessary, are listed below. If the applicant can demonstrate to the satisfaction of the municipality that the proposed land use is not a Hot Spot, then the pre-treatment requirement would not apply.

Pre-treatment Method	Design Reference[A]
Constructed Wetlands	4, 5, 8, 10, 16
Diversion of Stormwater Away from Potential Contamination Areas	4, 11
Stormwater Collection and Reuse (especially for	4, 14

irrigation)	
Stormwater Filters (Sand, Peat, Compost, etc.)	4, 5, 10, 16
Vegetated Swales	2, 3, 5, 11, 16, 17
Water Quality Inlets	4, 7, 15, 16, 19

[A]These numbers refer to the Design Reference Title Chart in Section 304.O. above.

Q. The use of infiltration BMPs is prohibited on Hot Spot land use areas.

R. Stormwater infiltration BMPs shall not be placed in or on a special geologic feature(s). Additionally, stormwater runoff shall not be discharged into existing on-site sinkholes.

S. Applicants shall request, in writing, Public Water Suppliers to provide the Zone I Wellhead Protection radius, as calculated by the method outlined in the Pennsylvania Department of Environmental Protection Wellhead Protection regulations, for any public water supply well within 400 feet of the site. In addition to the setback distances specified in Section 304.I., infiltration is prohibited in the Zone I radius as defined and substantiated by the Public Water Supplier in writing. If the applicant does not receive a response from the Public Water Supplier, the Zone I radius is assumed to be 100 feet.

T. The volume and rate of the net increase in stormwater runoff from the Regulated Activities must be managed to prevent the physical degradation of receiving waters from such effects as scour and streambank destabilization, to satisfy State Water Quality Requirements, by controlling the 2-year post-development runoff to a 30% Release Rate.

U. The municipality may, after consultation with DEP, approve alternative methods for meeting the State Water Quality Requirements other than those in this Section, provided that they meet the minimum requirements of and do not conflict with State law including but not limited to the Clean Streams Law.

SECTION 305. STORMWATER MANAGEMENT DISTRICTS

A. Mapping of Stormwater Management Districts - To implement the provisions of the Monocacy Creek Watershed Stormwater Management Plan, the municipality is hereby divided into Stormwater Management Districts consistent with the Monocacy Creek Release Rate Map presented in the Plan Update. The boundaries of the Stormwater Management Districts are shown on an official map which is available for inspection at the municipal office. A copy of the official map at a reduced scale is included in Appendix A for general reference.

B. Description of Stormwater Management Districts - Two types of Stormwater Management Districts may be applicable to the municipality, namely Conditional/Provisional No Detention Districts and Dual Release Rate Districts as described below.

1. Conditional/Provisional No Detention Districts - Within these districts, the capacity of the "local" runoff conveyance facilities (as defined in Article 2) must be calculated to determine if adequate capacity exists. For this determination, the developer must calculate peak flows assuming that the site is developed as proposed and that the remainder of the local watershed is in the existing condition. The developer must also calculate peak flows assuming that the entire local watershed is developed per current zoning and that all new development would use the runoff controls specified by this Ordinance. The larger of the two peak flows calculated will be used in determining if adequate capacity exists. If adequate capacity exists to safely transport runoff from the site to the main channel (as defined in Article 2), these watershed areas may discharge post-development peak runoff without detention facilities. If the capacity calculations show that the "local" runoff conveyance facilities lack adequate capacity, the developer shall either use a 100% release rate control or provide increased capacity of downstream elements to convey increased peak flows consistent with Section 306.P. Any capacity improvements must be designed to convey runoff from development of all areas tributary to the improvement consistent with the capacity criteria specified in Section 306.D. By definition, a storm drainage problem area associated with the "local" runoff conveyance facilities indicates that adequate capacity does not exist. Sites in these districts are still required to meet all of the water quality requirements in Section 304.

2. Dual Release Rate Districts - Within these districts, the 2-year post-development peak discharge must be controlled to 30% of the pre-development 2-year runoff peak. Further, the 10-year, 25-year and 100-year post-development peak runoff must be controlled to the stated percentage of the pre-development peak. Release Rates associated with the 10- through 100-year events vary from 50% to 100% depending upon location in the watershed. [For the Monocacy Creek and Nancy Run Watersheds, the original Single Release Rate Districts become Dual Release Rate Districts due to the channel protection standard requiring developments to meet a 2-year 30% Release Rate.]

SECTION 306. STORMWATER MANAGEMENT DISTRICT IMPLEMENTATION PROVISIONS

A. Applicants shall provide a comparative pre- and post construction stormwater management hydrograph analysis for each direction of discharge and for the site overall to demonstrate compliance with the provisions of this Ordinance.

B. Any stormwater management controls required by this Ordinance and subject to a dual release rate criteria shall meet the applicable release rate criteria for each of the 2-, 10-, 25- and 100-year return period runoff events consistent with the calculation methodology specified in Section 307.

C. The exact location of the Stormwater Management District boundaries as they apply to a given development site shall be determined by mapping the boundaries using the two-foot topographic contours provided as part of the Drainage Plan. The District boundaries as originally drawn coincide with topographic divides or, in certain instances, are drawn from the interSection of the watercourse and a physical feature such as the confluence with another watercourse or a potential flow obstruction (e.g. road, culvert, bridge, etc.). The physical feature is the downstream limit of the subarea and the subarea boundary is drawn from that point up slope to each topographic divide along the path perpendicular to the contour lines.

D. Any downstream capacity analysis conducted in accordance with this Ordinance shall use the following criteria for determining adequacy for accepting increased peak flow rates:

1. Natural or man-made channels or swales must be able to convey the increased runoff associated with a 2-year return period event within their banks at velocities consistent with protection of the channels from erosion.

2. Natural or man-made channels or swales must be able to convey the increased 25-year return period runoff without creating any hazard to persons or property.

3. Culverts, bridges, storm sewers or any other facilities which must pass or convey flows from the tributary area must be designed in accordance with DEP Chapter 105 regulations (if applicable) and, at minimum, pass the increased 25- year return period runoff.

E. For a proposed development site located within one release rate category subarea, the total runoff from the site shall meet the applicable release rate criteria. For development sites with multiple directions of runoff discharge, individual drainage directions may be designed for up to a 100% release rate so long as the total runoff from the site is controlled to the applicable release rate.

F. For a proposed development site located within two or more release category subareas, the peak discharge rate from any subarea shall be the pre-development peak discharge for that subarea multiplied by the applicable release rate. The calculated peak discharges shall apply regardless of whether the grading plan changes the drainage area by subarea. An exception to the above may be granted if discharges from multiple subareas re-combine in proximity to the site. In this case, peak discharge in any direction may be a 100% release rate provided that the overall site discharge meets the weighted average release rate.

G. For a proposed development site located partially within a release rate category subarea and partially within a Conditional/Provisional No Detention subarea, the size of the pre-development drainage area on a site may not be changed post-

development to create potentially adverse conditions on downstream properties except as part of a "No Harm" or Hardship waiver procedure.

H. No portion of a site may be regraded between the Monocacy Creek Watershed and any adjacent watershed except as part of a "No Harm" or Hardship Waiver procedure.

I. Within a release rate category area, for a proposed development site which has areas which drain to a closed depression(s), the design release from the site will be the lesser of (a) the applicable release rate flow assuming no closed depression(s) or (b) the existing peak flow actually leaving the site. In cases where (b) would result in an unreasonably small design release, the design discharge of less than or equal to the release rate will be determined by the available downstream conveyance capacity to the main channel calculated using Section 306.D. and the minimum orifice criteria.

J. Off-site areas which drain through a proposed development site are not subject to release rate criteria when determining allowable peak runoff rates. However, on-site drainage facilities shall be designed to safely convey off-site flows through the development site using the capacity criteria in Section 306.D. and the detention criteria in Section 307.

K. For development sites proposed to take place in phases, all detention ponds shall be designed to meet the applicable release rate(s) applied to all site areas tributary to the proposed pond discharge direction. All site tributary areas will be assumed as developed, regardless of whether all site tributary acres are proposed for development at that time. An exception shall be sites with multiple detention ponds in series where only the downstream pond must be designed to the stated release rate.

L. Where the site area to be impacted by a proposed development activity differs significantly from the total site area, only the proposed impact area shall be subject to the release rate criteria. The impact area includes any proposed cover or grading changes.

M. Development proposals which, through groundwater recharge or other means, do not increase either the rate or volume of runoff discharged from the site compared to pre-development are not subject to the release rate provisions of this Ordinance.

N. "No Harm" Water Quantity Option - For any proposed development site not located in a Conditional/Provisional No Detention district, the developer has the option of using a less restrictive runoff control (including no detention) if the developer can prove that special circumstances exist for the proposed development site and that "no harm" would be caused by discharging at a higher runoff rate than that specified by the Plan. Special circumstances are defined as any hydrologic or hydraulic aspects of the development itself not specifically

considered in the development of the Plan runoff control strategy. Proof of "no harm" would have to be shown from the development site through the remainder of the downstream drainage network to the confluence of the creek with the Delaware or Lehigh River. Proof of "no harm" must be shown using the capacity criteria specified in Section 306.D. if downstream capacity analysis is a part of the "no harm" justification.

Attempts to prove "no harm" based upon downstream peak flow versus capacity analysis shall be governed by the following provisions:

1. The peak flow values to be used for downstream areas for the design return period storms (2-, 10-, 25- and 100-year) shall be the values from the calibrated PSRM Model for the Monocacy Creek or as calculated by an applicant using an alternate method acceptable to the municipality. The flow values from the PSRM Model would be supplied to the developer by the municipality upon request.

2. Any available capacity in the downstream conveyance system as documented by a developer may be used by the developer only in proportion to his development site acreage relative to the total upstream undeveloped acreage from the identified capacity (i.e. if his site is 10% of the upstream undeveloped acreage, he may use up to 10% of the documented downstream available capacity).

3. Developer-proposed runoff controls which would generate increased peak flow rates at storm drainage problem areas would, by definition, be precluded from successful attempts to prove "no harm", except in conjunction with proposed capacity improvements for the problem areas consistent with Section 306.P.

Any "no harm" justifications shall be submitted by the developer as part of the Drainage Plan submission per Article 4. Developers submitting "no harm" justifications must still meet all of the water quality requirements in Section 304.

O. Regional Detention Alternatives - For certain areas within the study area, it may be more cost-effective to provide one control facility for more than one development site than to provide an individual control facility for each development site. The initiative and funding for any regional runoff control alternatives are the responsibility of prospective developers. The design of any regional control basins must incorporate reasonable development of the entire upstream watershed. The peak outflow of a regional basin would be determined based on the required release rate at the point of discharge.

P. Capacity Improvements - In certain instances, primarily within the Conditional/Provisional No Detention areas, local drainage conditions may dictate more stringent levels of runoff control than those based upon protection of the entire watershed. In these instances, if the developer could prove that it

would be feasible to provide capacity improvements to relieve the capacity deficiency in the local drainage network, then the capacity improvements could be provided by the developer in lieu of runoff controls on the development site. Peak flow calculations shall be done assuming that the local watershed is in the existing condition and then assuming that the local watershed is developed per current zoning and using the specified runoff controls. Any capacity improvements would be designed using the larger of the above peak flows and the capacity criteria specified in Section 306.D. All new development in the entire subarea(s) within which the proposed development site is located shall be assumed to implement the developer's proposed discharge control, if any.

Capacity improvements may also be provided as necessary to implement any regional detention alternatives or to implement a modified "no harm" option which proposes specific capacity improvements to provide that a less stringent discharge control would not create any harm downstream.

SECTION 307. CALCULATION METHODOLOGY

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

B. Infiltration BMP loading rate percentages in the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Appendix D shall be calculated as follows:

$$\left[\frac{\text{Area Tributary to infiltration BMP}}{\text{Base Area of Infiltration BMP}}\right] * 100\%$$

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

All disturbed areas to be made impervious:	weight at 100%
All disturbed areas to be made pervious:	weight at 50%
All undisturbed pervious areas:	weight at 0%
All existing impervious areas:	weight at 100%

C. Soil thickness is to be measured from the bottom of any proposed infiltration system. The effective soil thickness in the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Appendix D is the measured soil thickness multiplied by the thickness factor based on soil permeability (as measured by the adapted 25 PA Code § 73.15. percolation test in Appendix G), as follows:

PERMEABILITY RANGE*	THICKNESS FACTOR
6.0 to 12.0 inches/hour	0.8
2.0 to 6.0 inches/hour	1.0
1.0 to 2.0 inches/hour	1.4

0.75 to 1.0 inches/hour	1.2
0.5 to 0.75 inches/hour	1.0

*If the permeability rate (as measured by the adapted 25 PA Code § 73.15. percolation test in Appendix G) falls on a break between two thickness factors, the smaller thickness factor shall be used.

Sites with soil permeability greater than 12.0 in/hr or less than 0.5 in/hr, as measured by the adapted 25 PA Code § 73.15. percolation test in Appendix G, are not recommended for infiltration.

D. The design of any detention basin intended to meet the requirements of this Ordinance shall be verified by routing the design storm hydrograph through the proposed basin using the storage indication method or other methodology demonstrated to be more appropriate. For basins designed using the Rational Method technique, the design hydrograph for routing shall be either the Universal Rational Hydrograph or the Modified Rational Method trapezoidal hydrograph which maximizes detention volume. Use of the Modified Rational hydrograph shall be consistent with the procedure described in Section "PIPE.RAT" of the Users' Manual for the Penn State Urban Hydrology Model (1987).

E. BMPs designed to store or infiltrate runoff and discharge to surface runoff or pipe flow shall be routed using the storage indication method.

F. BMPs designed to store or infiltrate runoff and discharge to surface runoff or pipe flow shall provide storage volume for the full WQv below the lowest outlet invert.

G. Wet Detention Ponds designed to have a permanent pool for the WQv shall assume that the permanent pool volume below the primary outlet is full at the beginning of design event routing for the purposes of evaluating peak outflows.

H. All stormwater detention facilities shall provide a minimum 1.0 foot freeboard above the maximum pool elevation associated with the 2- through 25-year runoff events. A 0.5 foot freeboard shall be provided above the maximum pool elevation of the 100- year runoff event. The freeboard shall be measured from the maximum pool elevation to the invert of the emergency spillway. The 2- through 100-year storm events shall be controlled by the primary outlet structure. An emergency spillway for each basin shall be designed to pass the 100-year return frequency storm peak basin inflow rate with a minimum 0.5 foot freeboard measured to the top of basin. The freeboard criteria shall be met considering any offsite areas tributary to the basin as developed, as applicable. If this detention facility is considered to be a dam as per DEP Chapter 105, the design of the facility must be consistent with the Chapter 105 regulations, and may be required to pass a storm greater than the 100-year event.

I. The minimum circular orifice diameter for controlling discharge rates from detention facilities shall be three (3) inches. Designs where a lesser size orifice would be required to fully meet release rates shall be acceptable with a 3-inch orifice provided that as much of the site runoff as practical is directed to the detention facilities. The minimum 3 inch diameter does not apply to the control of the WQv.

J. Runoff calculations using the soil-cover-complex method shall use the Natural Resources Conservation Service Type II 24-hour rainfall distribution. The 24-hour rainfall depths for the various return periods to be used consistent with this Ordinance may be taken from NOAA Atlas 14, Volume 2 Version 2.1, 2004 or the PennDOT Intensity - Duration - Frequency Field Manual ("PDT-IDF") (May 1986) for Region 4. The following values are taken from the PDT-IDF Field Manual:

Return Period	24-Hour Rainfall Depth
1-year	2.40 inches
2-year	3.00 inches
5-year	3.60 inches
10-year	4.56 inches
25-year	5.52 inches
50-year	6.48 inches
100-year	7.44 inches

A graphical and tabular presentation of the Type II-24 hour distribution is included in Appendix C.

K. Runoff calculations using the Rational Method shall use rainfall intensities consistent with appropriate times of concentration and return periods and NOAA Atlas 14, Volume 2 Version 2.1, 2004 or the Intensity-Duration-Frequency Curves as presented in Appendix C.

L. Runoff Curve Numbers (CN's) to be used in the soil-cover-complex method shall be based upon the matrix presented in Appendix C.

M. Runoff coefficients for use in the Rational Method shall be based upon the table presented in Appendix C.

N. All time of concentration calculations shall use a segmental approach which may include one or all of the flow types below:

1. Sheet Flow (overland flow) calculations shall use either the NRCS average velocity chart (Figure 3-1, Technical Release-55, 1975) or the modified kinematic wave travel time equation (equation 3-3, NRCS TR-55, June 1986). If using the modified kinematic wave travel time equation, the sheet flow length shall be limited to 50 feet for designs using the Rational

Method and limited to 150 feet for designs using the Soil-Cover-Complex method.

2. Shallow Concentrated Flow travel times shall be determined from the watercourse slope, type of surface and the velocity from Figure 3-1 of TR-55, June 1986.

3. Open Channel Flow travel times shall be determined from velocities calculated by the Manning Equation. Bankfull flows shall be used for determining velocities. Manning 'n' values shall be based on the table presented in Appendix C.

4. Pipe Flow travel times shall be determined from velocities calculated using the Manning Equation assuming full flow and the Manning 'n' values from Appendix C.

O. If using the Rational Method, all pre-development calculations for a given discharge direction shall be based on a common time of concentration considering both on-site and any off-site drainage areas. If using the Rational Method, all post-development calculations for a given discharge direction shall be based on a common time of concentration considering both on-site and any off-site drainage areas.

P. The Manning Equation shall be used to calculate the capacity of watercourses. Manning 'n' values used in the calculations shall be consistent with the table presented in Appendix C or other appropriate standard engineering 'n' value resources. Pipe capacities shall be determined by methods acceptable to the municipality.

Q. The Pennsylvania DEP, Chapter 105, Rules and Regulations, apply to the construction, modification, operation or maintenance of both existing and proposed dams, water obstructions and encroachments throughout the watershed. Criteria for design and construction of stormwater management facilities according to this Ordinance may differ from the criteria that are used in the permitting of dams under the Dam Safety Program.

ARTICLE 4
DRAINAGE PLAN REQUIREMENTS

SECTION 401. GENERAL REQUIREMENTS

For any of the Regulated Activities of this Ordinance, prior to the final approval of subdivision and/or land development plans, or the issuance of any permit, or the commencement of any Regulated Earth Disturbance Activity, the owner, subdivider, developer or his agent shall submit a Drainage Plan and receive municipal approval of the Plan.

SECTION 402. EXEMPTIONS

Exemptions from the Drainage Plan Requirements are as specified in Section 106.

SECTION 403. DRAINAGE PLAN CONTENTS

The following items shall be included in the Drainage Plan:

A. General

1. General description of project.
2. General description of proposed permanent stormwater controls.
3. The name and address of the project site, the name and address of the owner of the property and the name of the individual or firm preparing the Drainage Plan.

B. Map(s) of the Project Area Showing:

1. The location of the project relative to highways, municipalities or other identifiable landmarks.
2. Existing contours at intervals of two (2) feet. In areas of steep slopes (greater than 15%), five-foot contour intervals may be used. Off-site drainage areas impacting the project including topographic detail.
3. Streams, lakes, ponds or other bodies of water within the project area.
4. Other features including flood hazard boundaries, existing drainage swales, wetlands, closed depressions, sinkholes and areas of natural vegetation to be preserved.
5. Locations of proposed underground utilities, sewers and water lines. The locations of all existing and proposed utilities, sanitary sewers and water lines within 50 feet of property lines of the project site.
6. An overlay showing soil types and boundaries based on the Lehigh or Northampton County Soil Survey, as applicable, latest edition. Any hydric soils present on the site should be identified as such.
7. An overlay showing geologic types, boundaries and any special geologic features present on the site.
8. Proposed changes to land surface and vegetative cover.
9. Proposed structures, roads, paved areas and buildings.

10. Final contours at intervals of two (2) feet. In areas of steep slopes (greater than 15%), five-foot contour intervals may be used.

11. Stormwater Management District boundaries applicable to the site.

12. Clear identification of the location and nature of permanent stormwater BMPs.

13. An adequate access easement around all stormwater BMPs that would provide
municipal ingress to and egress from a public right-of-way.

14. A schematic showing all tributaries contributing flow to the site and all existing man-made features beyond the property boundary that would be affected by the project.

15. The location of all public water supply wells within 400 feet of the project and all private water supply wells within 100 feet of the project.

C. Stormwater Management Controls and BMPs

1. All stormwater management controls and BMPs shall be shown on a map and described, including:

   a. Groundwater recharge methods such as seepage pits, beds or trenches. When these structures are used, the locations of septic tank infiltration areas and wells shall be shown.

   b. Other control devices or methods such as roof-top storage, semi-pervious paving materials, grass swales, parking lot ponding, vegetated strips, detention or retention ponds, storm sewers, etc.

2. All calculations, assumptions and criteria used in the design of the BMPs shall be shown.

3. All site testing data used to determine the feasibility of infiltration on a site.

4. All details and specifications for the construction of the stormwater management controls and BMPs.

D. The BMP Operations and Management Plan, as required in Article 7, describing how each permanent stormwater BMP will be operated and maintained and the identity of the person(s) responsible for operations and maintenance. A statement must be included, signed by the landowner, acknowledging that the stormwater BMPs are fixtures that cannot be altered or removed without approval by the municipality.

E. An Environmental Resources Site Design Assessment that describes the following:

1. The extent to which the proposed grading and impervious cover avoid disturbance of significant environmental resources and preserve existing site hydrology.

2. An assessment of whether alternative grading and impervious cover site design could lessen the disturbance of significant environmental resources and/or make better use of the site hydrologic resources.

3. A description of how the proposed stormwater management controls and BMPs serve to mitigate any adverse impacts on environmental resources on the site.

Significant environmental resources considered in the site design assessment include, but are not limited to, steep slopes, ponds, lakes, streams, wetlands, hydric soils, floodplains, riparian vegetation, native vegetation and special geologic features.

SECTION 404. PLAN SUBMISSION

A. For Regulated Activities specified in Sections 105.A. and 105.B.:

1. The Drainage Plan shall be submitted by the developer to the municipal secretary (or other appropriate person) as part of the Preliminary Plan submission for the subdivision or land development.

2. Four (4) copies of the Drainage Plan shall be submitted.

3. Distribution of the Drainage Plan will be as follows:

   a. One (1) copy to the municipal governing body.

   b. One (1) copy to the municipal engineer.

   c. Two (2) copies to the Lehigh Valley Planning Commission, except for Drainage Plans involving less than 10,000 square feet of additional impervious cover.

4. Drainage Plans involving more than 10,000 square feet of additional impervious cover shall be submitted by the developer (possibly through the municipality) to the Lehigh Valley Planning Commission as part of the Preliminary Plan submission. The Lehigh Valley Planning Commission will conduct an advisory review of the Drainage Plan for consistency with the Monocacy Creek Watershed Stormwater Management Plan. The LVPC will not review details of the Erosion and Sedimentation Plan or the BMP Operations and Maintenance Plan.

a. Two (2) copies of the Drainage Plan shall be submitted.

b. The LVPC will provide written comments to the developer and the municipality, within a time frame consistent with established procedures under the Municipalities Planning Code, as to whether the Drainage Plan has been found to be consistent with the Stormwater Management Plan.

B. For Regulated Activities specified in Sections 105.C. and 105.D., the Drainage Plan shall be submitted by the developer to the municipal building permit officer as part of the building permit application.

C. For Regulated Activities specified in Sections 105.E., 105.F. and 105.G.:

1. The Drainage Plan shall be submitted by the developer to the Lehigh Valley Planning Commission for coordination with the DEP permit application process under Chapter 105 (Dam Safety and Waterway Management), Chapter 106 (Flood Plain Management) of DEP's Rules and Regulations and the NPDES regulations.

2. One (1) copy of the Drainage Plan shall be submitted.

D. Earthmoving for all regulated activities under Section 105 shall be conducted in accordance with the current federal and State regulations relative to the NPDES and DEP Chapter 102 regulations.

SECTION 405. DRAINAGE PLAN REVIEW

A. The municipality shall review the Drainage Plan, including the BMP Operations and Maintenance Plan, for consistency with the adopted Monocacy Creek Watershed Stormwater Management Plan as embodied by this Ordinance and with any permits issued by DEP. The municipality shall also review the Drainage Plan against any additional storm drainage provisions contained in the municipal subdivision and land development or zoning ordinance, as applicable.

B. The municipality shall notify the applicant in writing whether the Drainage Plan, including the BMP Operations and Maintenance Plan, is approved.

C. The municipality shall not approve any subdivision or land development (Regulated Activities 105.A. and 105.B.) or building permit application (Regulated Activities 105.C. and 105.D.) if the Drainage Plan has been found to be inconsistent with the Stormwater Management Plan.

D. The municipality may require an "As-Built Survey" of all stormwater BMPs and an explanation of any discrepancies with the Drainage Plan.

SECTION 406. MODIFICATION OF PLANS

A modification to a submitted Drainage Plan for a proposed development site which involves a change in control methods or techniques, or which involves the relocation or redesign of control measures, or which is necessary because soil or other conditions are not as stated on the Drainage Plan (as determined by the municipality) shall require a resubmission of the modified Drainage Plan consistent with Section 404 subject to review per Section 405 of this Ordinance.

SECTION 407. HARDSHIP WAIVER PROCEDURE

The municipality may hear requests for waivers where it is alleged that the provisions of this Ordinance inflict unnecessary hardship upon the applicant. The waiver request shall be in writing and accompanied by the requisite fee based upon a fee schedule adopted by the municipality. A copy of the waiver request shall be provided to each of the following: municipality, municipal engineer, municipal solicitor and Lehigh Valley Planning Commission. The request shall fully document the nature of the alleged hardship.

The municipality may grant a waiver provided that all of the following findings are made in a given case:

1. That there are unique physical circumstances or conditions, including irregularity of lot size or shape, or exceptional topographical or other physical conditions peculiar to the particular property, and that the unnecessary hardship is due to such conditions, and not the circumstances or conditions generally created by the provisions of this Ordinance in the Stormwater Management District in which the property is located;

2. That because of such physical circumstances or conditions, there is no possibility that the property can be developed in strict conformity with the provisions of this Ordinance, including the "no harm" provisions, and that the authorization of a waiver is therefore necessary to enable the reasonable use of the property;

3. That such unnecessary hardship has not been created by the applicant;

4. That the waiver, if authorized, will represent the minimum waiver that will afford relief and will represent the least modification possible of the regulation in issue; and

5. That financial hardship is not the criteria for granting of a hardship waiver.

In granting any waiver, the municipality may attach such conditions and safeguards as it may deem necessary to implement the purposes of this Ordinance. If a Hardship Waiver is granted, the applicant must still manage the quantity, velocity, direction and quality of resulting storm runoff as is necessary to prevent injury to health, safety or other property.

A. For regulated activities described in Section 105.A. and B., Bath Borough Council shall hear requests for and decide on hardship waiver requests on behalf of the municipality.

B. For regulated activities in Section 105.C., D., E., F. and G. the Bath Zoning Hearing Board shall hear requests for and decide on hardship waiver requests on behalf of the municipality.

C. The municipality shall not waive the water quality provisions of this Ordinance.

ARTICLE 5
INSPECTIONS

SECTION 501. SCHEDULE OF INSPECTIONS

A. DEP or its designees (e.g. County Conservation District) normally ensure compliance with any permits issued, including those for stormwater management. In addition to DEP compliance programs, the municipality or its designee may inspect all phases of the construction, operations, maintenance and any other implementation of stormwater BMPs.

B. During any stage of the Regulated Earth Disturbance Activities, if the municipality or its designee determines that any BMPs are not being implemented in accordance with this Ordinance, the municipality may suspend or revoke any existing permits issued by the municipality or other approvals issued by the municipality until the deficiencies are corrected.

ARTICLE 6
FEES AND EXPENSES

SECTION 601. GENERAL

The municipality may charge a reasonable fee for review of the Drainage Plan, including the BMP Operations and Maintenance Plan, to defray review costs incurred by the municipality. The applicant shall pay all such fees.

SECTION 602. EXPENSES COVERED BY FEES

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

A. The review of the Drainage Plan, including the BMP Operations and Maintenance Plan, by the municipality.

B. The site inspection.

C. The inspection of required controls and improvements during construction.

D. The final inspection upon completion of the controls and improvements required in the plan.

E. Any additional work required to monitor and enforce any permit provisions, regulated by this Ordinance, correct violations, and assure the completion of stipulated remedial actions.

F. Administrative and clerical costs.

ARTICLE 7
STORMWATER BMP OPERATIONS AND MAINTENANCE PLAN REQUIREMENTS

SECTION 701. GENERAL REQUIREMENTS

A. No Regulated Earth Disturbance Activities within the municipality shall commence until approval by the municipality of the BMP Operations and Maintenance Plan which describes how the permanent (e.g. post construction) stormwater BMPs will be properly operated and maintained.

SECTION 702. RESPONSIBILITIES FOR OPERATIONS AND MAINTENANCE OF BMPS

A. The BMP Operations and Maintenance Plan for the project site shall establish responsibilities for the continuing operation and maintenance of all permanent stormwater BMPs, as follows:

1. If a Plan includes structures or lots which are to be separately owned and in which streets, sewers and other public improvements are to be dedicated to the municipality, stormwater BMPs may also be dedicated to and maintained by the municipality;

2. If a Plan includes operations and maintenance by a single owner or if sewers and other public improvements are to be privately owned and maintained, then the operation and maintenance of stormwater BMPs shall be the responsibility of the owner or private management entity.

B. The municipality shall make the final determination on the continuing operations and maintenance responsibilities. The municipality reserves the right to accept or reject the operations and maintenance responsibility for any or all of the stormwater BMPs.

SECTION 703. ADHERENCE TO APPROVED BMP OPERATIONS AND MAINTENANCE PLAN

It shall be unlawful to alter or remove any permanent stormwater BMP required by an approved BMP Operations and Maintenance Plan or to allow the property to remain in a

condition which does not conform to an approved BMP Operations and Maintenance Plan unless an exception is granted in writing by the municipality.

SECTION 704. OPERATIONS AND MAINTENANCE AGREEMENT FOR PRIVATELY OWNED STORMWATER BMPS

A. The property owner shall sign an operations and maintenance agreement with the municipality covering all stormwater BMPs that are to be privately owned. The agreement shall be substantially the same as the agreement in Appendix E of this Ordinance.

B. Other items may be included in the agreement where determined by the municipality to be reasonable or necessary to guarantee the satisfactory operation and maintenance of all permanent stormwater BMPs. The agreement shall be subject to the review and approval of the municipality.

SECTION 705. STORMWATER MANAGEMENT EASEMENTS

Stormwater management easements shall be provided by the property owner if necessary for access for inspections and maintenance or for preservation of stormwater conveyance, infiltration, detention areas and other BMPs by persons other than the property owner. The purpose of the easement shall be specified in any agreement under Section 704.

SECTION 706. RECORDING OF APPROVED BMP OPERATIONS AND MAINTENANCE PLAN AND RELATED AGREEMENTS

A. The owner of any land upon which permanent BMPs will be placed, constructed or implemented, as described in the BMP Operations and Maintenance Plan, shall record the following documents in the Office of the Recorder of Deeds for Northampton County, within 90 days of approval of the BMP Operations and Maintenance Plan by the municipality:

1. The Operations and Maintenance Plan or a summary thereof

2. Operations and Maintenance Agreements under Section 704

3. Easements under Section 705

B. The municipality may suspend or revoke any approvals granted for the project site upon discovery of the failure of the owner to comply with this Section.

SECTION 707. MUNICIPAL STORMWATER BMP OPERATIONS AND MAINTENANCE FUND

A. If stormwater BMPs are accepted by the municipality for dedication, the municipality may require the applicant to pay a specified amount to the Municipal Stormwater BMP Operations and Maintenance Fund to help defray

costs of operations and maintenance activities. The amount may be determined as follows:

1. If the BMP is to be owned and maintained by the municipality, the amount shall cover the estimated costs for operation and maintenance in perpetuity, as determined by the municipality.

2. The amount shall then be converted to present worth of the annual series values.

B. If a BMP is proposed that also serves as a recreation facility (e.g. ball field, lake), the municipality may adjust the amount due accordingly.

ARTICLE 8
PROHIBITIONS

SECTION 801. PROHIBITED DISCHARGES

A. No person in the municipality shall allow or cause to allow stormwater discharges into the municipality's separate storm sewer system which are not composed entirely of stormwater except as provided in subsection B below or as allowed under a State or Federal permit.

B. Discharges that may be allowed based on the municipality finding that the discharge(s) do not significantly contribute pollution to surface waters of the Commonwealth are listed below.

1. Discharges from fire fighting activities

2. Potable water sources including dechlorinated water line and fire hydrant flushings

3. Irrigation drainage

4. Routine external building washdown which does not use detergents or other compounds

5. Air conditioning condensate

6. Water from individual residential car washing

7. Springs

8. Water from crawl space pumps

9. Uncontaminated water from foundation or footing drains

10. Flows from riparian habitats and wetlands

11. Lawn watering

12. Pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used

13. Dechlorinated swimming pool discharges

14. Uncontaminated groundwater

C. In the event that the municipality determines that any of the discharges identified in Section 801 .B. significantly contribute to pollution of waters of the Commonwealth or is so notified by DEP, the municipality will notify the responsible person to cease the discharge.

D. Upon notice provided by the municipality under Section 801 .C., the discharger will have a reasonable time, as determined by the municipality, to cease the discharge consistent with the degree of pollution caused by the discharge.

E. Nothing in this Section shall affect a discharger's responsibilities under state law.

SECTION 802. PROHIBITED CONNECTIONS

A. The following connections are prohibited, except as provided in Section 801.B. above:

1. Any drain or conveyance, whether on the surface or subsurface, which allows any non-stormwater discharge including sewage, process wastewater and wash water to enter the separate storm sewer system and any connections to the storm drain system from indoor drains and sinks

2. Any drain or conveyance connected from a commercial or industrial land use to the separate storm sewer system which has not been documented in plans, maps or equivalent records and approved by the municipality.

SECTION 803. ROOF DRAINS

A. Roof drains shall not be connected to streets, sanitary or storm sewers or roadside ditches, except as provided in Section 803.B.

B. When it is more advantageous to connect directly to streets or storm sewers, connections of roof drains to streets or roadside ditches may be permitted by the municipality.

C. Roof drains shall discharge to infiltration areas or vegetative BMPs to the maximum extent practicable.

SECTION 804. ALTERATION OF BMPS

A. No person shall modify, remove, fill, landscape or alter any existing stormwater BMP without the written approval of the municipality unless it is part of an approved maintenance program.

B. No person shall place any structure, fill, landscaping or vegetation into a stormwater BMP or within a drainage easement, which would limit or alter the functioning of the BMP, without the written approval of the municipality.

ARTICLE 9
RIGHT OF ENTRY, NOTIFICATION AND ENFORCEMENT

SECTION 901. RIGHT OF ENTRY

A. Upon presentation of proper credentials and with the consent of the land owner, duly authorized representatives of the municipality may enter at reasonable times upon any property within the municipality to inspect the implementation, condition or operation and maintenance of the stormwater BMPs or to investigate or ascertain the condition of the subject property in regard to any aspect regulated by this Ordinance.

B. In the event that the land owner refuses admission to the property, duly authorized representatives of the municipality may seek an administrative search warrant issued by a district justice to gain access to the property.

SECTION 902. SECTION 902. NOTIFICATION

A. Whenever the municipality finds that a person has violated a prohibition or failed to meet a requirement of this Ordinance, the municipality may order compliance by written notice to the responsible person. Such notice may require without limitation:

1. The name of the owner of record and any other person against whom the municipality intends to take action
2. The location of the property in violation
3. The performance of monitoring, analyses and reporting
4. The elimination of prohibited connections or discharges
5. Cessation of any violating discharges, practices or operations
6. The abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property
7. Payment of a fine to cover administrative and remediation costs

8. The implementation of stormwater BMPs

9. Operation and maintenance of stormwater BMPs

B. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of the violation(s). Said notice may further advise that should the violator fail to take the required action within the established deadline, the work will be done by the municipality or designee and the expense thereof, together with all related lien and enforcement fees, charges and expenses, shall be charged to the violator.

C. Failure to comply within the time specified shall also subject such person to the penalty provisions of this Ordinance. All such penalties shall be deemed cumulative and shall not prevent the municipality from pursuing any and all other remedies available in law or equity.

SECTION 903. PUBLIC NUISANCE

A. The violation of any provision of this Ordinance is hereby deemed a Public Nuisance.

B. Each day that an offense continues shall constitute a separate violation.

SECTION 904. SUSPENSION AND REVOCATION OF PERMITS AND APPROVALS

A. Any building, land development or other permit or approval issued by the municipality may be suspended or revoked by the municipality for:

1. Non-compliance with or failure to implement any provision of the permit

2. A violation of any provision of this Ordinance

3. The creation of any condition or the commission of any act during construction or development which constitutes or creates a hazard or nuisance, pollution or which endangers the life or property of others.

B. A suspended permit or approval shall be reinstated by the municipality when:

1. The municipality or designee has inspected and approved the corrections to the stormwater BMPs or the elimination of the hazard or nuisance.

2. The municipality is satisfied that the violation of the ordinance, law or rule and regulation has been corrected.

3. Payment of all municipal fees, costs and expenses related to or arising from the violation has been made.

C. A permit or approval which has been revoked by the municipality cannot be reinstated. The applicant may apply for a new permit under the procedures outlined in this Ordinance.

SECTION 905. PENALTIES

A. Any person, partnership or corporation who or which has violated the provisions of this Ordinance shall, upon being found liable therefor in a civil enforcement proceeding commenced by the municipality, pay a judgment of not more than Five Hundred ($500.00) Dollars plus all court costs, including reasonable attorney's fees incurred by the municipality as a result thereof. No judgment shall commence or be imposed, levied or payable until the date of the determination of a violation by the district justice. If the defendant neither pays nor timely appeals the judgment, the municipality may enforce the judgment pursuant to a separate violation, unless the district justice, determining that there has been a violation, further determines that there was a good faith basis for the person, partnership, or corporation violating this Chapter to have believed that there was no such violation, in which event there shall be deemed to have been only one such violation until the fifth (5^{th}) day following the date of the determination of a violation by the district justice and thereafter each day that a violation continues shall constitute a separate violation.

B. The court of common pleas, upon petition, may grant an order of stay upon cause shown, tolling the per diem judgment pending a final adjudication of the violation and judgment.

C. Nothing contained in this Section shall be construed or interpreted to grant to any person or entity other than the municipality the right to commence any action for enforcement pursuant to this Section.

D. District justices shall have initial jurisdiction in proceedings brought under this Section.

E. In addition, the municipality, through its solicitor, may institute injunctive, mandamus or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus or other appropriate forms of remedy or relief.

SECTION 906. APPEALS

Any person aggrieved by any action of the municipality or its designee relevant to the provisions of this Ordinance may appeal using the appeal procedures established in the Pennsylvania Municipalities Planning Code.

APPENDIX A

A-1 Map of Monocacy Creek Watershed (full size map available for inspection at the Borough of Bath Borough Building during normal business hours)

A-2 Municipal Map of Stormwater Management Districts (full size map available for inspection at the Borough of Bath Borough Building during normal business hours)

APPENDIX B

B-1 Map of Storm Drainage Problem Areas (n/a)

B-2 Description of Storm Drainage Problem Areas (n/a)

APPENDIX C

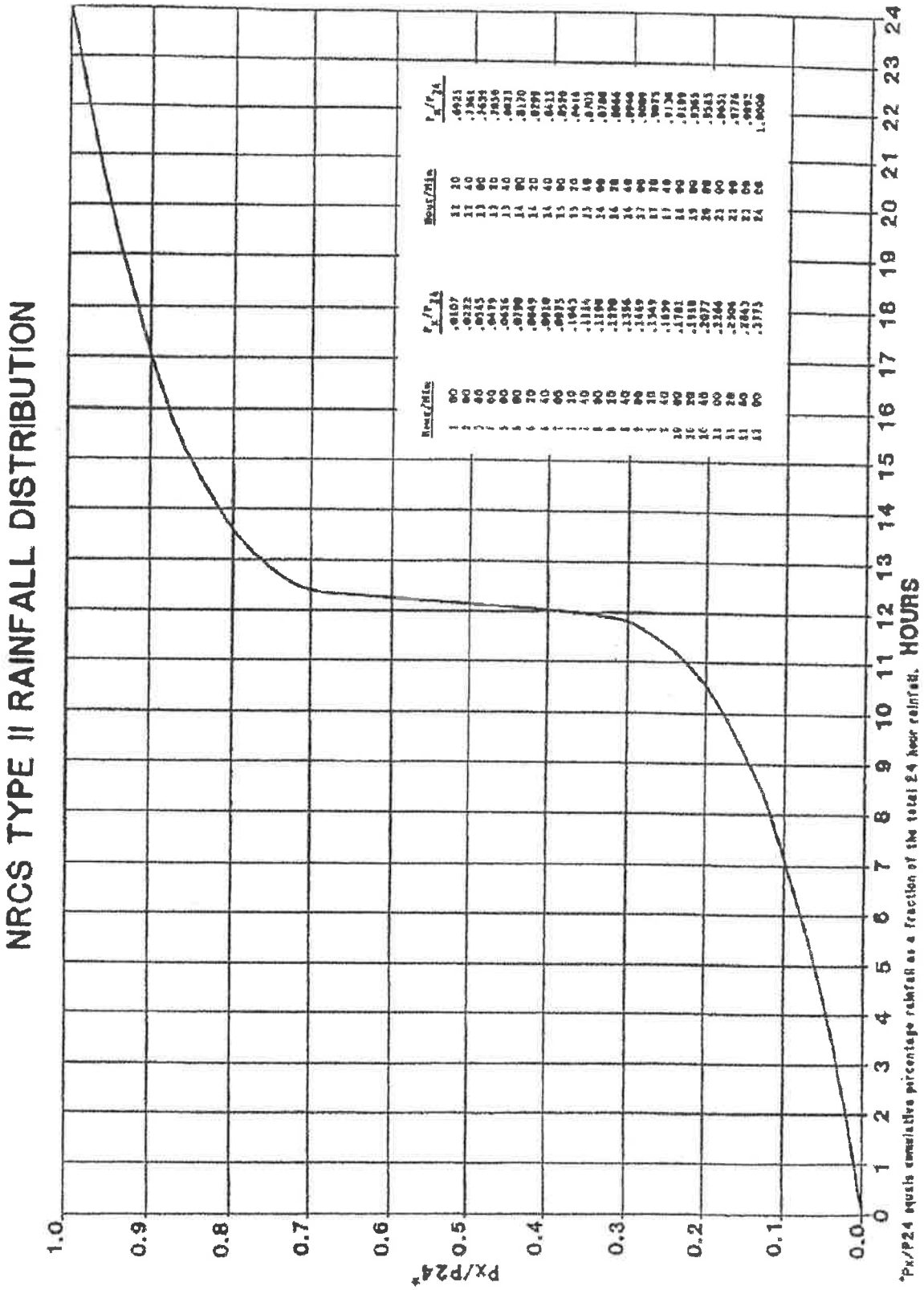
C-1 NRCS Type II 24-Hour Rainfall Distribution (Graphic & Tabular)

C-2 Intensity-Duration-Frequency Curves

C-3 Runoff Curve Numbers and Percent Imperviousness Values

C-4 Runoff Coefficients for the Rational Method

C-5 Manning 'n' Values



C-1

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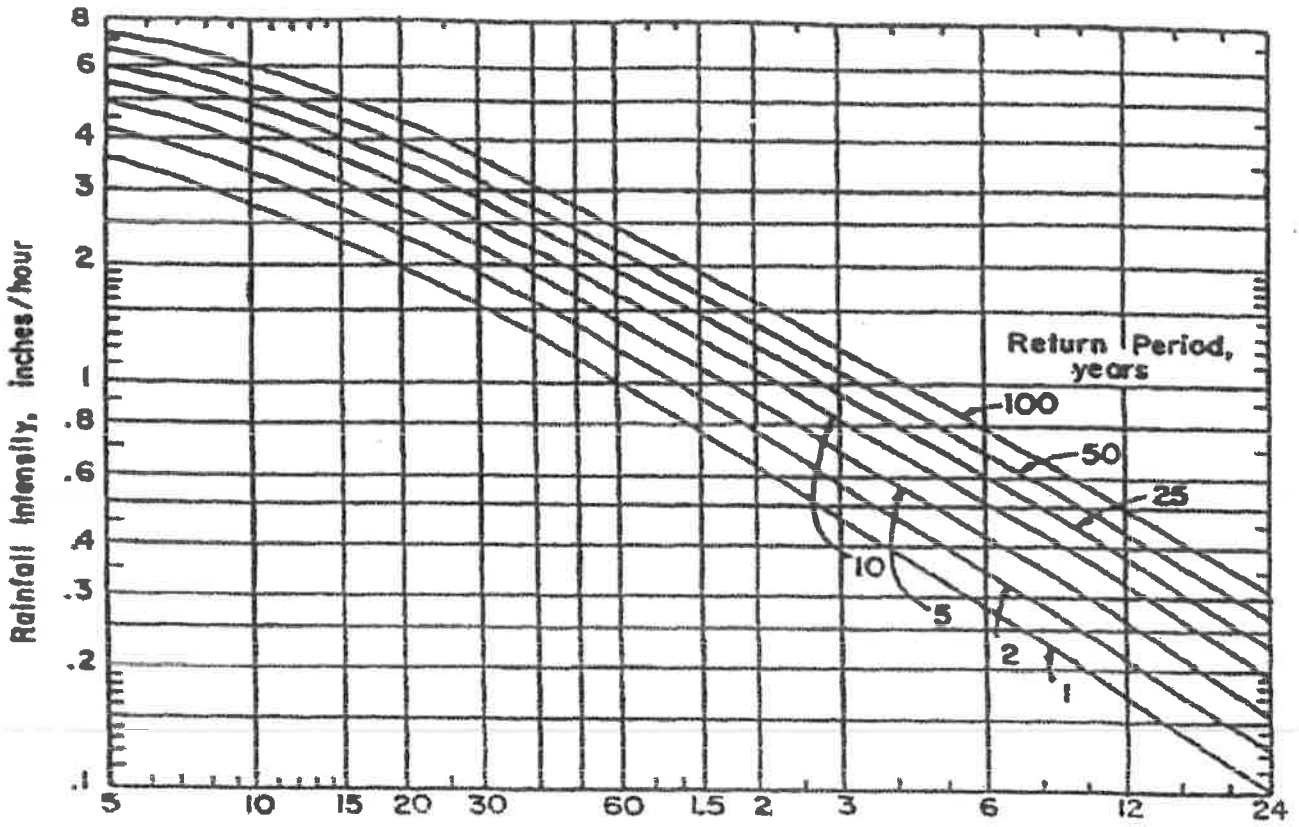
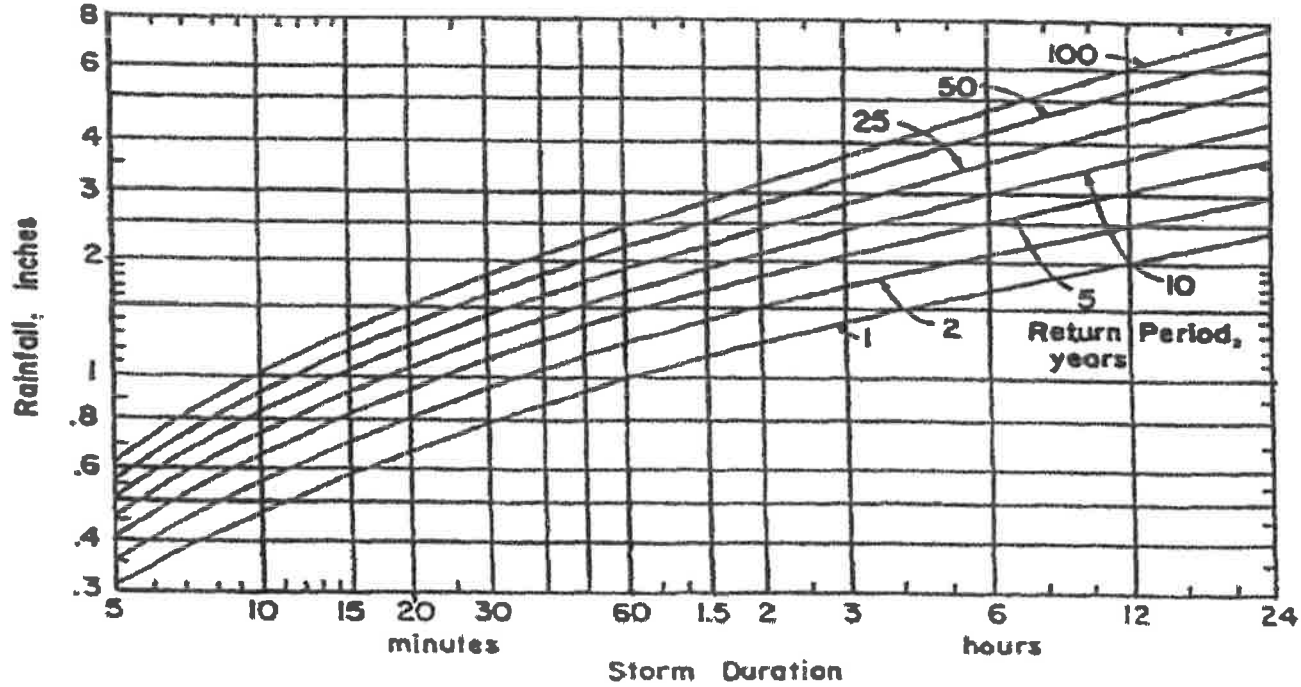
INTENSITY–DURATION–FREQUENCY CURVES*





*Source: Pennsylvania Dept. of Transp. Design Rainfall Curves (1986).

C-2

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RUNOFF CURVE NUMBERS AND PERCENT IMPERVIOUSNESS VALUES*

Cover Description		Curve numbers for hydrologic soil group**			
Land Use/Cover Type	Average percent impervious area	A	B	C	D
Open space (lawns, parks, golf courses, cemeteries, etc.):					
Good condition (grass cover greater than 75%).....		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way).....		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way).....		98	98	98	98
Paved; open ditches (including right-of-way).....		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
⅛ acre or less (townhouses)	65	77	85	90	92
¼ acre.....	38	61	75	83	87
⅓ acre	30	57	72	81	86
½ acre.....	25	54	70	80	85
1 acre.....	20	51	68	79	84
2 acres	12	46	65	77	82
Woods		30	55	70	77
Agriculture		Refer to Table 2-2b in source document (TR55) by crop type and treatment.			

*Source: Natural Resources Conservation Service Technical Release No. 55, Second Edition, June 1986.

**Hydrologic Soil Group based on the County Soil Survey latest edition.

C-3

SLI 697407v1/050122.00032

RUNOFF COEFFICIENTS FOR THE RATIONAL METHOD* HYDROLOGIC SOIL GROUP AND SLOPE RANGE**												
	A			B			C			D		
LAND USE	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
Cultivated[A]	[a]0.18	0.23	0.28	0.24	0.29	0.33	0.30	0.34	0.38	0.33	0.37	0.41
	[b]0.23	0.29	0.34	0.30	0.36	0.40	0.36	0.41	0.45	0.39	0.44	0.48
Pasture[B]	0.09	0.13	0.17	0.19	0.24	0.29	0.27	0.31	0.36	0.31	0.35	0.39
	0.12	0.17	0.23	0.24	0.30	0.36	0.33	0.38	0.43	0.37	0.42	0.46
Meadow, Lawn[C]	0.05	0.08	0.12	0.15	0.20	0.24	0.23	0.28	0.32	0.28	0.32	0.36
	0.07	0.12	0.17	0.19	0.25	0.30	0.28	0.34	0.39	0.33	0.39	0.43
Forest, Woods	0.03	0.05	0.08	0.11	0.16	0.20	0.20	0.25	0.29	0.25	0.30	0.34
	0.04	0.08	0.12	0.15	0.21	0.26	0.25	0.31	0.36	0.31	0.37	0.41
Gravel	0.24	0.29	0.33	0.32	0.36	0.40	0.35	0.39	0.43	0.37	0.41	0.44
	0.30	0.36	0.40	0.38	0.43	0.47	0.42	0.46	0.50	0.44	0.48	0.51
Parking, Other Impervious	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97
Residential, Commercial, Industrial and Other "Developed"	Runoff coefficients should be calculated based upon weighted average of impervious area coefficients and pervious area coefficients from above based upon soil type, slope and the particular development proposal.											

*Coefficients for all land uses except parking and other impervious cover are based on the Rossmiller Equation for translating NRCS curve numbers into Rational Method 'c' values. The source for the parking and other impervious cover coefficients is RAWLS, W.J., S.L. WONG and R.H. McCUEN, 1981. Comparison of urban flood frequency procedures. Preliminary draft report prepared for the Soil Conservation Service, Beltsville, MD.

**Hydrologic Soil Group based on the county soil survey latest edition.

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

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

[A]Represents average of cultivated land with and without conservation treatment from TR-55, January 1975. These values are consistent with several categories of cultivated lands from TR-55, June 1986.

[B]Represents grasslands in fair condition with 50% to 75% grass cover.

[C]Represents grasslands in good condition with greater than 75% grass cover.

MANNING 'n' VALUES BY TYPICAL REACH DESCRIPTION

Reach Description	Manning 'n'
Natural stream, clean, straight, no riffs Or pools	0.030
Natural stream, clean, winding, some pools And shoals	0.040
Natural stream, winding, pools, shoals. Stony with some weeds	0.050
Natural stream, sluggish with deep pools And weeds	0.070
Natural stream or swale, very weedy or With timber under brush	0.100
Concrete pipe, culvert or channel	0.012
Corrugated metal pipe	0.012-0.027*

*Depending upon type and diameter.

ROUGHNESS COEFFICIENTS (MANNING 'n') FOR SHEET FLOW

Surface Description	Manning 'n'[1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.050
Cultivated soils:	
Residue cover <= 20%	0.060
Residue cover > 20%	0.170
Grass:	
Short grass prairie	0.150
Dense grasses[2]	0.240
Bermuda grass	0.410
Range (natural)	0.130
Woods:[3]	
Light underbrush	0.400
Dense underbrush	0.800

[1]The n values are a composite of information compiled by Engman (1986).
[2]Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass and native grass mixtures.
[3]When selecting n, consider cover to a height of about 0.1 ft. this is the only part of the plant cover that will obstruct sheet flow.

APPENDIX D

Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock*

SITE RISK FACTORS																										
	Geology Type	CARBONATE BEDROCK																								
	Effective Soil Thickness	Less than 2 Feet	2 to 4 Feet									Over 4 Feet to 8 Feet									Over 8 Feet					
	Special Geologic Features**	Low/Med/High Buffer	Low Buffer			Medium Buffer			High Buffer			Low Buffer			Medium Buffer			High Buffer			Low Buffer			Medium Buffer			High Buffer		
SITE INVESTIGATION RECOMMENDED		(Unacceptable)	Preliminary			Preliminary			Preliminary			Preliminary			Preliminary			Preliminary			Preliminary			Preliminary			Preliminary		
DESIGN FACTORS	Infiltration Loading Rates (% increase) ***	(Unacceptable)	0-100%	100-300%	300-600%	0-100%	100-300%	300-600%	0-100%	100-300%	300-600%	0-100%	100-300%	300-600%	0-100%	100-300%	300-600%	0-100%	100-300%	300-600%	0-100%	100-300%	300-600%	0-100%	100-300%	300-600%	0-100%	100-300%	300-600%
PROGRAM SUMMARY GUIDANCE ****																													

RECOMMENDED

NOT RECOMMENDED

* Source: Developed by CahN Associates based on information in "Technical Best Management Practice Manual & Infiltration Feasibility Report", November 2002 and input from the LVPC, 2003.

** Special Geologic Feature Buffer widths are as follows:

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

*** Rates greater than 600% not recommended.

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

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

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

APPENDIX E

STORMWATER BEST MANAGEMENT PRACTICES OPERATIONS AND MAINTENANCE AGREEMENT

THIS AGREEMENT, made and entered into this ___ day of _____, 200__, by and between _____, (hereinafter the "Landowner"), and the Borough of Bath, Northampton County, Pennsylvania, (hereinafter "municipality");

WITNESSETH

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

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

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

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

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

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

- Infiltration Trench - A BMP surface structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer,

- Seepage Pit - An underground BMP structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer,

- Rain Garden - A BMP overlain with appropriate mulch and suitable vegetation designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or underground aquifer, and

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

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

1. The BMPs shall be constructed by the Landowner in accordance with the plans and specifications identified in the Plan.

2. The Landowner shall operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the municipality and in accordance with the specific maintenance requirements noted on the Plan.

3. The Landowner hereby grants permission to the municipality, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper identification, to inspect the BMP(s) whenever it deems necessary. Whenever possible, the municipality shall notify the Landowner prior to entering the property.

4. In the event the Landowner fails to operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the municipality, the municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). This provision shall not be construed to allow the municipality to erect any permanent structure on the land of the Landowner. It is expressly understood and agreed that the municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the municipality.

5. In the event the municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the municipality for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the municipality *and if not timely paid, a municipal lien shall be placed upon the premises for 110% of the invoice amount, plus statutorily allowed fees, expenses and costs.*

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMP(s) by the Landowner; provided, however, that this

Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests, *hereby* release *and hold harmless* the municipality's employees and designated representatives from all damages, accidents, casualties, occurrences or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or municipality. In the event that a claim is asserted against the municipality, its designated representatives or employees, the municipality shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgment or claims against the municipality's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.

8. The municipality shall inspect the BMP(s) *as necessary* to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of Northampton 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.

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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 _____, 200_, do hereby certify that _____whose name(s) is/are signed to the foregoing Agreement bearing date of the _____day of _____, 200_, has acknowledged the same before me in my said County and State.

GIVEN UNDER MY HAND THIS _____ day of _____, 200_.

_____ _____
NOTARY PUBLIC (SEAL)

APPENDIX F

LOW IMPACT DEVELOPMENT PRACTICES

ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

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

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

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

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

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

design of the development site. The depressions can be protected by simply avoiding the depression or by incorporating its storage as additional capacity in required detention facilities.

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

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

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

- **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 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 is in street length, which also will reduce costs of the development. Cluster development clusters the construction activity onto less-sensitive areas without substantially affecting the gross density of development.

APPENDIX G

PRELIMINARY SITE INVESTIGATION AND TESTING REQUIREMENTS

Required Data and Site Information: The following data shall be gathered utilizing standard testing procedures as part of a Preliminary Site Investigation:

- Bedrock composition - Any apparent boundaries between carbonate and non-carbonate bedrock must be verified by a qualified geotechnical professional.
- Bedrock structural geology - This includes the possible presence of faults and mapping of conspicuous fracture traces or lineaments.
- Overburden and soil mantle composition and thickness
- Permeability of the soil
- Depth to the seasonal high water table
- Presence of special geologic features - This includes sinkholes, closed depressions, fracture traces, lineaments, joints, faults, caves , pinnacles and geologic contacts between carbonate and non-carbonate bedrock

Preliminary Site Investigation Required for Sites Intending to Use Infiltration

Review of Available Data, Maps and Reports: Some of the required information, as listed above, can be found in existing published data. Suggested resources include the following:

- Geologic maps and references for the development area
- The Monocacy Creek Basin Carbonate Prototype Area Closed Depression Map - available at the LVPC
- USGS topographic maps
- Lehigh and Northampton County soil survey maps
- Aerial photographs from the LVPC or other sources
- Relevant Pennsylvania Geologic Survey Open File Reports that provide maps of sinkholes and Karst features for Lehigh County (OF 87-0 1) and Northampton County (OF 87-02)
- Kochanov and Reese (2003). Density of Mapped Karst Feature in South-Central and Southeastern Pennsylvania (Map 68)
- DCNR Online Sinkhole Inventory - (http://www.dcnr.state.pa.us/topogeo/hazards/sinkhole/default.asp)

Field Inspections: In addition to gathering data from published sources, a field inspection of the proposed site is required. A field inspection can provide additional information relating to site features such as carbonate bedrock features, indicators of seasonal high stream-level or water table levels, streams, springs, etc.

Soil Test Pit and Percolation Test Requirements: A minimum of one test pit and a minimum of 2 percolation tests are required for every site. A test pit is a 2-3 foot wide, 8 foot deep trench excavated with a backhoe for observing subsurface conditions. The test pits will be used to describe soil depth and quality, including soil horizons, and testing of permeability or percolation rates and can be conducted by a certified Sewage Enforcement Officer.

Percolation tests are to be conducted as follows (adapted from § 73.15. "Percolation Tests" of the Pennsylvania Code)

1. The percolation tests shall be made in separate holes uniformly spaced over the possible infiltration area.

2. An "Initial Presoak" should not be performed.

3. Percolation holes located within the possible infiltration area shall be used in the calculation of the average percolation rate.

4. Holes having a uniform diameter of 6 to 10-inches shall be bored or dug as follows:

    a. To the depth of the bottom of the possible infiltration BMP

    b. Alternate depths if the test pits/auger holes indicate that the soils are more suitable at a different depth (i.e., if a clay horizon is identified and more suitable soils are located beneath the horizon, and infiltration test should be performed in the suitable horizon).

5. The bottom and sides of the hole shall be scarified with a knife blade or sharp-pointed instrument to completely remove any smeared soil surfaces and to provide a natural soil interface into which water may percolate. Loose material shall be removed from the hole. Two inches of coarse sand or fine gravel shall be placed in the bottom of the hole to protect the soil from scouring and clogging of the pores.

6. Immediately before the percolation test, as a final presoak, water shall be placed in the hole to a minimum depth of 6-inches over the gravel and readjusted every 30 minutes for 1 hour.

7. The drop in the water level during the last 30 minutes of the final presoaking period shall be applied to the following standard to determine the time interval between readings for each percolation hole:

   a. If water remains in the hole, the interval for readings during the percolation test shall be 30 minutes.

   b. If no water remains in the hole, the interval for readings during the percolation test may be reduced to 10 minutes.

8. After the final presoaking period, water in the hole shall again be adjusted to approximately 6-inches over the gravel and readjusted when necessary after each reading.

   a. Measurement to the water level in the individual percolation holes shall be made from a fixed reference point and shall continue at the interval determined from step No. 7 (above) for each individual percolation hole until a minimum of eight readings are completed or until a stabilized rate of drop is obtained, whichever occurs first. A stabilized rate of drop means a difference of 1/4-inch or less of drop between the highest and lowest readings of four consecutive readings.

   b. The drop that occurs in the final period in percolation test holes, expressed as inches per hour, shall be used to calculate the average percolation rate.

   c. When the rate of drop in a percolation test is too slow to obtain a measurable rate, the rate of 0.25 inches per hour shall be assigned to that hole for use in calculating the average percolation rate. The infiltration area may be placed over holes with no measurable rate when the average percolation rate for the possible infiltration area is within the acceptable range.

When a percolation test hole yields a percolation rate of greater than 12-inches per hour, the proposed infiltration area may not be designed or installed within 25-feet of this hole unless the municipality determines that a testing anomaly caused the fast percolation rate and a retest of the area yields acceptable percolation rates. This percolation rate limit is established to protect groundwater quality and to minimize the risk of subsidence.

Additional Site Investigation and Testing Required if Infiltration is Proposed

Soil Test Pit Requirements: The required number of test pits varies with Effective Soil Thickness. As risk factors increase, the number of test pits increases. A minimum of 2 test pits, uniformly spaced within the proposed infiltration area (e.g. the 2 pits should be centered on each half of the proposed infiltration area), are required for any site proposing infiltration unless the applicant can demonstrate that one test pit is adequately representative of the area proposed for infiltration. For larger infiltration areas, multiple test pits shall be developed at the densities as listed below:

Effective Soil Thickness (ft.)	Test Pit Density (per acre of proposed infiltration area)*	Percolation Tests (per acre of proposed infiltration area)**	Auger Grid Spacing (Feet On-Center)***
8	4	8	50
4 to 8	6	12	35
2 to 4	8	16	25

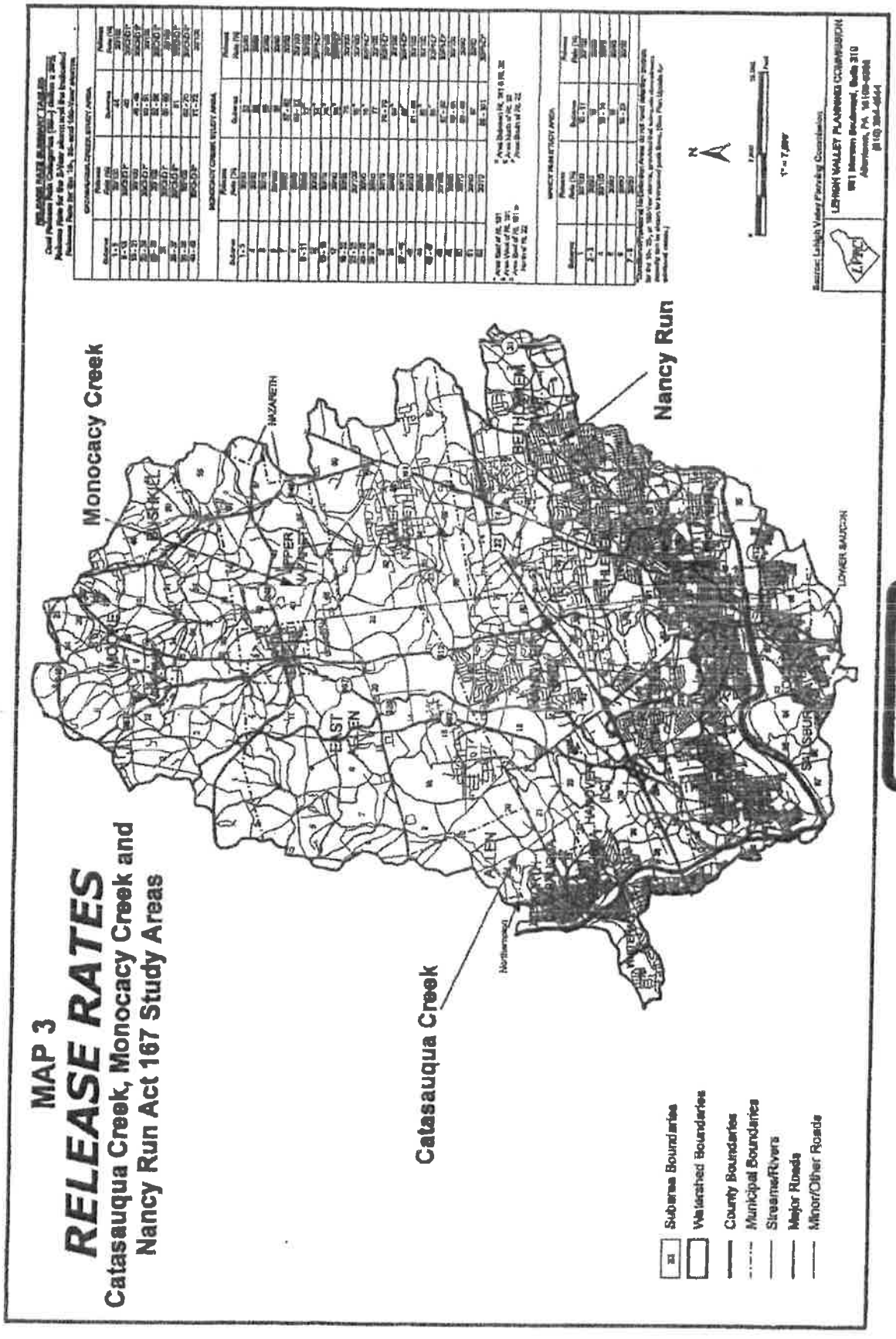
*No. of Test Pits required = Infiltration sq. ft./43,560 sq. ft. x test pit density from chart rounded up to the nearest whole number

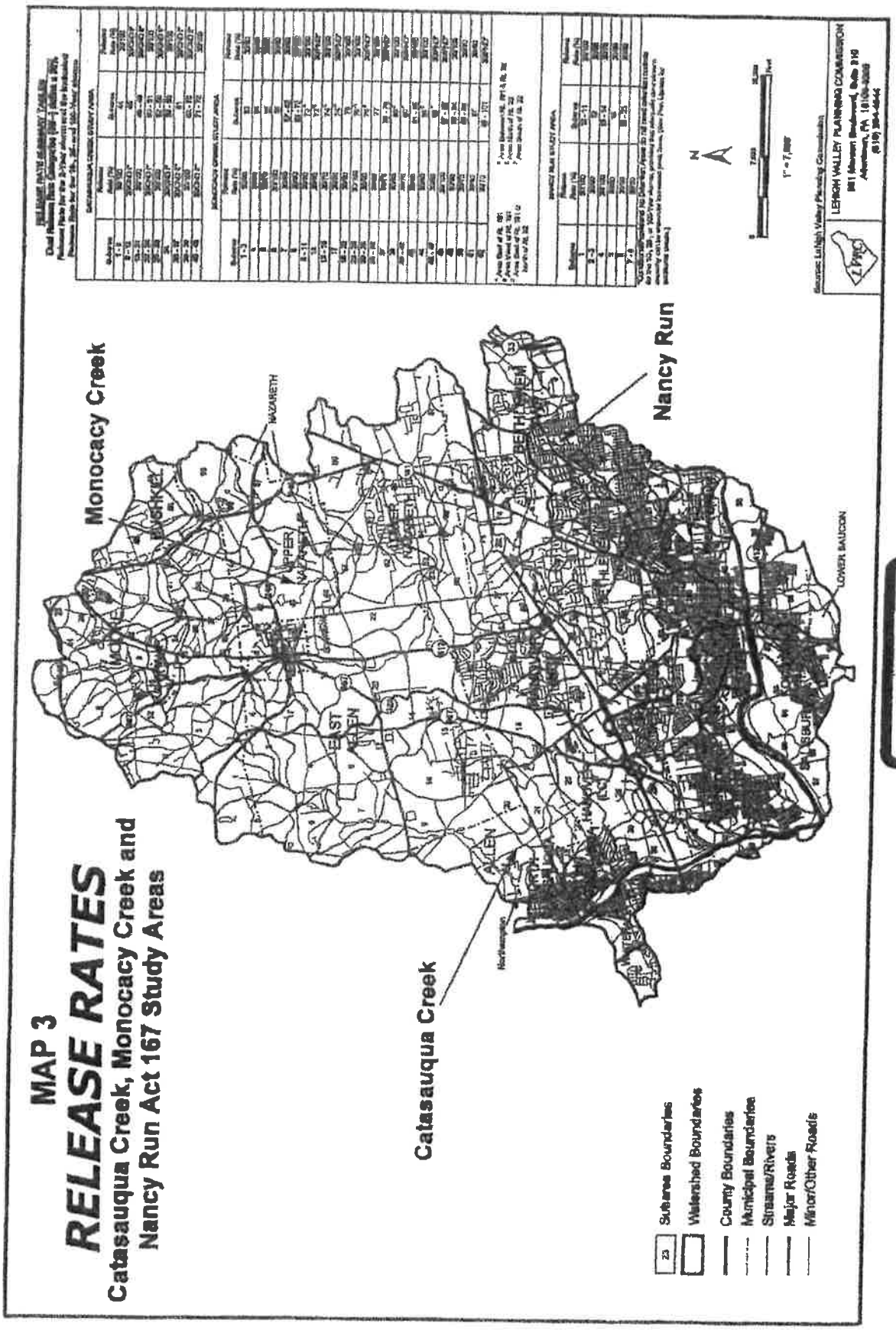
** No. of Percolation Tests required = Infiltration sq. ft./43,560 sq. ft. x percolation tests from chart rounded up to the nearest whole number

***Auger testing is only required on Carbonate sites.

Soil Auger Testing Requirements for Carbonate Areas: Because soil depth is not uniform in many carbonate areas, test pits will not be sufficient to accurately determine the depth to bedrock. Augering provides this essential data as inexpensively as possible. Track-rig rotary soil auger test drilling allows relatively inexpensive, qualitative determination of the presence of overburden voids and will generally penetrate to the top-of-bedrock. Augers typically extend to depths of 20 feet. Special augers extend to as much as 50 feet. Augers do not extend into the bedrock. Auger testing should be performed in a grid pattern across the proposed infiltration area, spaced as indicated in the above table.

Percolation Testing Requirements: For each proposed infiltration area, a minimum of six percolation tests shall be conducted with a vertical component permeability test unless the applicant can demonstrate that fewer tests accurately represent the percolation rate of the proposed infiltration area. Additional testing shall be required if the initial test results show significant variability in the vertical component percolation rate. For larger infiltration areas, percolation tests shall be conducted at the densities listed in the table above.


MAP 3
RELEASE RATES
Catasauqua Creek, Monocacy Creek and
Nancy Run Act 167 Study Areas
Monocacy Creek
Nancy Run
Catasauqua Creek
Subarea Boundaries
Watershed Boundaries
County Boundaries
Municipal Boundaries
Streams/Rivers
Major Roads
Minor/Other Roads
LEHIGH VALLEY PLANNING COMMISSION
EXHIBIT
A-1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LEHIGH VALLEY PLANNING COMMISSION
EXHIBIT
A-2