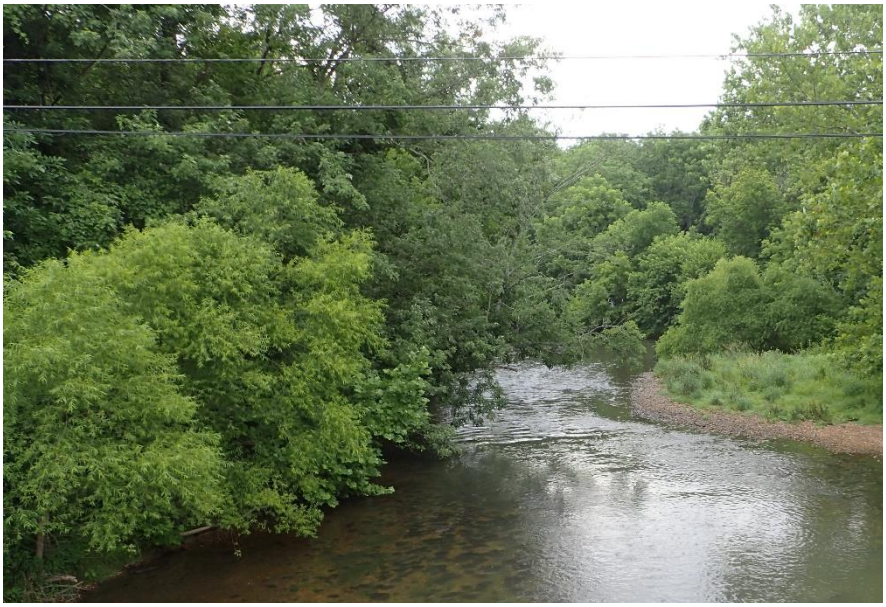
POLLUTION REDUCTION PLAN
TRINDLE SPRING RUN, DOGWOOD RUN AND CHESAPEAKE BAY WATERSHED

Monroe Township
Cumberland County, PA



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Project Number MNTP 1705

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EXECUTIVE SUMMARY

The 2010 United States Census identified several areas located within Monroe Township as Urbanized Area (UA). Because the Township includes areas designated as urbanized areas, it must apply for permit coverage for a National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from its Small Municipal Separate Storm Sewer Systems (MS4s). The NPDES Permit Notice of Intent (NOI) requires that all municipalities seeking coverage under the General Permit develop Pollution Reduction Plans (PRPs) to address discharges to impaired surface waters including the Chesapeake Bay Watershed.

The urbanized areas of Monroe Township are generally located along its eastern border. These areas discharge stormwater to portions of Trindle Spring Run, Dogwood Run and the Yellow Breeches Creek. Trindle Spring Run is tributary to the Conodoguinet Creek and Dogwood Run is tributary to the Yellow Breeches Creek. These surface waters are all tributary to the Chesapeake Bay Watershed. Trindle Spring Run and Dogwood Run are identified by the Pennsylvania Department of Environmental Protection (PADEP) as being impaired by siltation (total suspended solids (TSS)) and nutrients (i.e., phosphorus and nitrogen). The Chesapeake Bay Watershed is also impaired by siltation and nutrients.

Permittees with stormwater discharges to surface waters considered impaired for nutrients (nitrogen and phosphorus) and/or siltation (TSS) must develop a PRP to reduce pollutant loads to those waters including the Chesapeake Bay Watershed. The minimum reductions in loading for the pollutants of concern for the Chesapeake Bay Watershed are 10% sediment, 5% phosphorus and 3% nitrogen. Overall within the Chesapeake Bay Watershed it is assumed the phosphorus and nitrogen goals are achieved when a 10% reduction of sediment is achieved. The pollutant load reductions must be achieved within five (5) years following PADEP's approval of coverage under the General Permit. Progress with achieving the required pollutant load reductions must be reported to PADEP in an Annual MS4 Status Report.

This combined PRP addresses Trindle Spring Run, Dogwood Run and the Chesapeake Bay Watershed. The Plan has been developed to satisfy the requirements of Appendix D (Pollutant Reduction Plan Requirements for Discharges to the Chesapeake Bay Watershed) and Appendix E (Pollutant Reduction Plan Requirements for Discharges to Water Impaired for Nutrients and/or Sediment) for submission with the Notice of Intent (NOI) for Coverage under the NPDES General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems.

A. PUBLIC PARTICIPATION

The Monroe Township Pollution Reduction Plan was advertised for public review in the Patriot-News on July 18, 2017. The public notice and proof of publication are included in Appendix A. The PRP was available for review at the Township office located at 1220 Boiling Springs Road, Mechanicsburg, Pennsylvania.

The Township accepted public comment for the minimum 30-day period from the date of public notice on July 18, 2017 through August 16, 2017. Refer to Appendix A for the record of public comment.

A public meeting for the PRP was held on August 10, 2017 during the regularly scheduled Board of Supervisors meeting. Refer to Appendix A for a record of the meeting minutes.

The record of consideration of public comments received is included in Appendix A.

B. MAP

Mapping identifying land uses and storm sewershed boundaries associated with MS4 outfalls discharging to impaired surface waters and/or surface waters draining to the Chesapeake Bay is included in Appendix B.

Locations of structural Best Management Practices (BMP(s)) proposed to be implemented to achieve required pollutant load reductions are depicted on the map located in Appendix B.

PADEP defines BMPs as schedules of activities, prohibitions of practices, maintenance procedures and other management practices to prevent or reduce pollutant loading to surface waters of the Commonwealth. The term includes treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. The term includes activities, facilities, measures, planning or procedures used to minimize accelerated erosion and sedimentation and manage stormwater to protect, maintain, reclaim and restore the quality of waters and the existing and designated uses of waters within the Commonwealth before, during and after earth disturbance activities.

The term BMP as used in this document generally refers to structural BMP practices such as infiltration basins, bioretention / raingardens, vegetated open channels, storm sewer system solids removal, and forest buffers. These facilities will be used to manage stormwater runoff to minimize pollutant loading, including nutrients and sediments, thereby improving water quality.

C. POLLUTANTS OF CONCERN

STORM SEWERSHEDS

There are three storm sewersheds delineated within the Township including Trindle Spring Run, Dogwood Run and the Yellow Breeches Creek; all are tributary to the Chesapeake Bay Watershed. These storm sewersheds are identified on the map located in Appendix B.

The following table summarizes the pollutants of concern for Trindle Spring Run, Dogwood Run and the Chesapeake Bay Watershed. The Yellow Breeches Creek is not identified by PADEP as being impaired. Refer to Appendix C for an excerpt from PADEPs MS4 Aggregation Table last revised May 9, 2017.

IMPAIRMENTS

DESCRIPTION	IMPAIRMENT	REQUIREMENT
Trindle Spring Run	Nutrients, Siltation	Appendix E
Dogwood Run	Nutrients, Siltation	Appendix E
Chesapeake Bay Watershed	Nutrients, Siltation	Appendix D

D. EXISTING LOADING FOR POLLUTANTS OF CONCERN

EXISTING LOADING SUMMARY

Existing loading for pollutants of concern was calculated using DEP's simplified method. Attachment B - Developed Land Loading Rates for PA Counties, Cumberland County was used in the simplified method calculation to estimate the existing loading in each of the three storm sewersheds. The existing loading estimates were established during 2017 in the months leading up to the MS4 NPDES Permit application due date of September 16, 2017. Please refer to Appendix D for detailed base load calculations. Following is a summary of the existing base loads and required 10% TSS load reduction required for each storm sewershed. The base loadings presented in the following table represent the final loads after considering parsed acreage and existing BMPs.

BASE LOAD SUMMARY

DESCRIPTION	TN (LBS/YEAR)	TP (LBS/YEAR)	TSS (LBS/YEAR)	10% TSS REDUCTION (LBS/YEAR)
Trindle Spring Run	8,136.89	172.33	236,436.06	23,643.61
Dogwood Run	249.57	5.31	7,381.62	738.16
Yellow Breeches Creek	11,711.67	246.63	342,345.40	34,234.54

The following table summarizes the parsed acreage in each storm sewershed. Please refer to Appendix D for parsed acreage detail.

PARSED ACREAGE

DESCRIPTION	PARSED ACREAGE
Trindle Spring Run	5.03
Dogwood Run	53.44
Yellow Breeches Creek	9.51

EXISTING BMPS

Structural BMPs implemented prior to development of the PRP were credited to reduce existing loading estimates. Please refer to Appendix D for a detailed listing of existing BMPs. The list includes the following information:

- Detailed description of the BMP;
- Latitude and longitude coordinates for the BMP;
- Permit number, when available, that authorized installation of the BMP;
- Calculations demonstrating the pollutant reductions achieved by the BMP;
- Date BMP was installed and a statement that the BMP continues to serve the function(s) it was designed for; and
- Operation and maintenance activities and frequencies associated with the BMP.

Following is a summary of the base load reductions resulting from existing BMPs located in the Trindle Spring Run and Yellow Breeches Creek storm sewersheds. No reductions for existing BMPs were taken within the Dogwood Run storm sewershed.

EXISTING BMP REDUCTIONS

DESCRIPTION	TN (LBS/YEAR)	TP (LBS/YEAR)	TSS (LBS/YEAR)
Trindle Spring Run	358.98	8.60	14,853.83
Dogwood Run	N/A	N/A	N/A
Yellow Breeches Creek	121.55	5.37	7,656.53

E. PROPOSED BMPS TO MEET REQUIRED LOAD REDUCTIONS

The minimum required reductions in pollutant loading for each storm sewershed is identified in the following table. The table also summarizes the projected load reductions anticipated to result from structural BMP implementation. BMP efficiencies used to derive the load reductions were taken from the PADEP BMP Effectiveness Values table. The projected load reductions slightly exceed the required load reductions allowing for some flexibility should final design result in less than projected load reductions.

PROPOSED BMP REDUCTIONS

DESCRIPTION	REQUIRED TSS REDUCTION (LBS/YEAR)	PROJECTED TSS REDUCTON (LBS/YEAR)
Trindle Spring Run	23,643.61	27,951.44
Dogwood Run	738.16	2,078.15
Yellow Breeches	34,234.54	47,829.37

A variety of structural BMPs are proposed throughout the Trindle Spring Run, Dogwood Run and Yellow Breeches storm sewersheds to meet required pollutant load reductions for each impaired water. The proposed facilities include storm sewer system solids removal; retrofits of existing detention basins for infiltration; retrofit of existing vegetated open channels to include water quality measures; a forest buffer and construction of a new bioretention basin / raingarden. In accordance with PADEP stipulations, less than 50% of the total pollutant reduction requirements are proposed to be met using solids removal systems.

A detailed listing of the proposed BMPs and load reduction calculations are included in Appendix E. BMP locations are depicted on the map in Appendix B.

F. FUNDING MECHANISMS

The following table summarizes planning level cost estimate for implementation of the proposed BMPs within each storm sewershed. Detailed planning level costs are included in Appendix F.

PROJECTED COST

DESCRIPTION	TOTAL CAPITAL COST
Trindle Spring Run	$112,500.00
Dogwood Run	$ 3,965.37
Yellow Breeches	$318,606.20
Total	$435.071.57

The Township proposes to use its General Fund to pay for implementation of the proposed BMPs to achieve the required pollutant load reductions within 5 years following PADEP's approval of coverage under the General Permit. The Township also anticipates, but will not be dependent upon, supplementing the costs of implementation through applying for grant funding, should opportunities become available.

The Township is investigating the feasibility of having its Authority collect stormwater management fees to augment Township resources necessary to operate its Stormwater Management Program (SWMP) and construct the proposed BMPs.

G. BMP OPERATION AND MAINTENANCE

The following facilities will be operated and maintained by Township Department of Public Works staff:

- All Storm Sewer System Solids Removal Systems;
- Spring Circle Vegetated Open Channels;
- Monroe Acres Park Bioretention Basin / Raingarden;

The following facilities will be operated and maintained by the property owner(s):

- West Shore Evangelical Free Church Detention Basin 1 Retrofit;
- Crossroads Bible Church Detention Basin Retrofit; and
- Wertz Forest Buffer.

All new and retrofitted facilities will be operated and maintained in accordance with acceptable practices as outlined in the Pennsylvania Stormwater Best Management Practices Manual. Guidelines for operation and maintenance of the proposed BMPs are included in Appendix G.

H. PLAN IMPLEMENTATION SCHEDULE

Monroe Township plans to implement the proposed BMPs over the 5-year permit term by spreading out the total cost over the 5-year period. Factors with the potential to affect any schedule include land acquisition, stakeholder buy-in, and permitting. Proposed facilities requiring working with private property owners are expected to have longer lead times; therefore, full implementation of these BMPs is not anticipated until later in the permit term.

IMPLEMENTATION SCHEDULE

DESCRIPTION	FISCAL YEAR
Begin Basin Retrofits	2018 - 2019
Begin Miller Road Inlet Inserts & Endwall Work	
Begin Implementing Speedway Storm Sewer System Solids Removal	
Begin Implementing Park Bioretention / Raingarden	2019 - 2020
Continue Basin Retrofits	
Complete Miller Road Inlet Inserts & Endwall Work	
Complete Speedway Storm Sewer System Solids Removal	
Begin Implementing Vegetated Channel Retrofits	
Begin Implementing Forest Buffer Installation	
Continue Park Bioretention / Raingarden	2020 - 2021
Continue Basin Retrofits	
Continue Vegetated Channel Retrofits	
Continue Forest Buffer	
Complete Bioretention / Raingarden	2021 - 2022
Complete Basin Retrofits	
Complete Vegetated Channel Retrofits	
Continue Forest Buffer	
Complete Forest Buffer	2022 - 2023

APPENDICES

APPENDIX A

Public Participation

NOTICE OF PUBLIC COMMENT AND PUBLIC MEETING FOR NPDES STORMWATER DISCHARGE POLLUTANT REDUCTION PLAN

Monroe Township is hereby giving notice of the 30-day public comment period for its National Pollutant Discharge Elimination (NPDES) Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) Pollutant Reduction Plan (PRP). The Plan proposes best management practices (BMPs) to satisfy the PRP requirements for the following impaired waterways: Chesapeake Bay (Appendix D – Siltation/Nutrients); Trindle Spring Run (Appendix E – Siltation/Nutrients); and Dogwood Run – (Appendix E – Siltation/Nutrients).

The plan is available for public examination as noted below. The public is invited to review this document and provide written comments to the individual listed below:

Pollutant Reduction Plan:
Monroe Township
1220 Boiling Springs Road
Mechanicsburg, PA 17055
Phone (717) 258-6642
Comments to Holly Wood

Visit times are Monday through Friday, between 8:00 am and 4:30 pm or visit the Township's website at http://monroetwp.net/ .

The minimum 30-day public comment period will begin Tuesday, July 18, 2017 and end Wednesday, August 16, 2017.

A public meeting for the Plan will be held on August 10, 2017 during the regularly scheduled Township Supervisors meeting. The meeting is held at 1220 Boiling Springs Road, Mechanicsburg, PA 17055, beginning at 7:00 pm.

MONROE TOWNSHIP

APPENDIX B

Map

Wertz Forest Buffer

Spring Circle Vegetated Open Channel 1

Spring Circle Vegetated Open Channel 2

Trindle Spring Run

West Shore Evangelical Free Church Detention Basin 1

Monroe Acres Park Bioretention / Raingarden

Williams Grove Speedway Storm Sewer System Solids Removal

Inlet Insert MR-1 - MR-6 (Typ.)

Crossroads Bible Church Detention Basin

Yellow Breeches Creek

Dogwood Run

Trindle Spring Run

Parsed Areas

AgriculturalEasements

AgriculturalSecurityAreas

Parcels

Agricultural

Commercial

Industrial

Residential

Utility

Vacant

0 650 1,300 2,600 3,900 5,200 Feet

0 330 660 990 1,320 Feet

N

Legend

MS4 Outfall

Proposed BMPs

Roads

Streams

Storm Sewershed

Dogwood Run

Trindle Spring Run

Yellow Breeches Creek

Parsed Areas

AgriculturalEasements

AgriculturalSecurityAreas

Parcels

Agricultural

Commercial

Industrial

Residential

Utility

Vacant

Date: 7/13/2017 Time: 9:19:52 AM Document Path: M:\Projects\MNTP\MNTP1705-MS4\DESIGN_GIS\MAPS\Draft Final PRP Map - 2017-07-11.mxd

FIGURE NO.	MONROE TOWNSHIP, CUMBERLAND COUNTY, PA		
Figure 1 of 1	MNTP1705	Pennoni	BASE LAYERS PROVIDED BY CUMBERLAND COUNTY GIS DEPARTMENT
1	POLLUTION REDUCTION PLAN MONROE TOWNSHIP, CUMBERLAND COUNTY, PA	1215 Manor Drive Suite 100 Mechanicsburg, PA 17055	

APPENDIX C

Pollutants of Concern

MS4 Name	Permit Number	HUC 12 Name	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)
Cumberland County				
CAMP HILL BORO	PAG133549	Conodoguinet Creek-Susquehanna River	Chesapeake Bay Nutrients\Sediment	Appendix D-Siltation/Nutrients
		Laurel Run-Susquehanna River	Chesapeake Bay Nutrients\Sediment, Susquehanna River, Susquehanna River	Appendix C-PCB, Appendix D-Siltation/Nutrients
		Lower Yellow Breeches Creek	Cedar Run, Chesapeake Bay Nutrients\Sediment, Yellow Breeches Creek, Cedar Run, Yellow Breeches Creek	Appendix B-Pathogens, Appendix D-Siltation/Nutrients
CARLISLE BORO	PAI133517	Letort Spring Run, Simmons Creek-Conodoguinet Creek	Chesapeake Bay Nutrients\Sediment	Appendix D-Siltation/Nutrients
EAST PENNSBORO TWP	PAG133680	Cove Creek-Susquehanna River, Laurel Run-Susquehanna River	Chesapeake Bay Nutrients\Sediment, Susquehanna River, Unnamed Tributaries to Susquehanna River, Susquehanna River	Appendix C-PCB, Appendix D-Siltation/Nutrients, Appendix E-Siltation
		Conodoguinet Creek-Susquehanna River	Chesapeake Bay Nutrients\Sediment, Holtz Run, Holtz Run	Appendix B-Pathogens, Appendix D-Siltation/Nutrients
HAMPDEN TWP	PAI133513	Trindle Spring Run	Trindle Spring Run	Appendix C-PCB, Priority Organics
		Conodoguinet Creek-Susquehanna River, Trindle Spring Run	Chesapeake Bay Nutrients\Sediment, Holtz Run, Pine Run, Sears Run, Trindle Spring Run	Appendix D-Siltation/Nutrients, Appendix E-Siltation
		Conodoguinet Creek-Susquehanna River	Holtz Run, Pine Run	Appendix B-Pathogens
		Lower Yellow Breeches Creek	Cedar Run, Chesapeake Bay Nutrients\Sediment, Yellow Breeches Creek, Cedar Run, Yellow Breeches Creek	Appendix B-Pathogens, Appendix D-Siltation/Nutrients
		Laurel Run-Susquehanna River	Chesapeake Bay Nutrients\Sediment, Susquehanna River, Susquehanna River	Appendix C-PCB, Priority Organics, Appendix D-Siltation/Nutrients
LEMOYNE BORO	PAG133552	Laurel Run-Susquehanna River	Chesapeake Bay Nutrients\Sediment, Susquehanna River, Unnamed Tributaries to Susquehanna River, Susquehanna River	Appendix C-PCB, Appendix D-Siltation/Nutrients, Appendix E-Siltation
LOWER ALLEN TWP	PAG133711	Laurel Run-Susquehanna River	Chesapeake Bay Nutrients\Sediment, Susquehanna River, Susquehanna River	Appendix C-PCB, Appendix D-Siltation/Nutrients
		Lower Yellow Breeches Creek	Cedar Run, Chesapeake Bay Nutrients\Sediment, Unnamed Tributaries to Yellow Breeches Creek, Yellow Breeches Creek, Cedar Run, Yellow Breeches Creek	Appendix B-Pathogens, Appendix D-Siltation/Nutrients, Appendix E-Nutrients, Organic Enrichment/Low D.O., Siltation
MECHANICSBURG BORO	PAG133553	Trindle Spring Run	Trindle Spring Run	Appendix C-PCB, Priority Organics
		Lower Yellow Breeches Creek	Cedar Run, Cedar Run, Chesapeake Bay Nutrients\Sediment	Appendix B-Pathogens, Appendix D-Siltation/Nutrients, Appendix E-Nutrients, Siltation
		Conodoguinet Creek-Susquehanna River, Trindle Spring Run	Chesapeake Bay Nutrients\Sediment, Trindle Spring Run	Appendix D-Siltation/Nutrients, Appendix E-Nutrients, Siltation
MIDDLESEX TWP		Letort Spring Run, Simmons Creek-Conodoguinet Creek, Wertz Run-Conodoguinet Creek	Chesapeake Bay Nutrients\Sediment, Wertz Run	Appendix D-Siltation/Nutrients, Appendix E-Siltation
MONROE TWP	PAG133573	Conodoguinet Creek-Susquehanna River, Trindle Spring Run	Chesapeake Bay Nutrients\Sediment, Trindle Spring Run	Appendix D-Siltation/Nutrients, Appendix E-Organic Enrichment/Low D.O., Siltation, Suspended Solids
		Middle Yellow Breeches Creek	Dogwood Run	Appendix B-Pathogens
		Lower Yellow Breeches Creek, Middle Yellow Breeches Creek	Chesapeake Bay Nutrients\Sediment, Dogwood Run	Appendix D-Siltation/Nutrients, Appendix E-Organic Enrichment/Low D.O., Siltation, Suspended Solids
		Trindle Spring Run	Trindle Spring Run	Appendix C-PCB, Priority Organics

APPENDIX D

Existing Loading for Pollutants of Concern

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
TRINDLE SPRING RUN STORM SEWERSHED EXISTING LOADING FOR POLLUTANTS OF CONCERN
JUNE 2017

TRINDLE SPRING RUN	DEVELOPED LAND LOADING RATES FOR CUMBERLAND COUNTY						Total		
	Impervious			Pervious					
	TN lbs/acre/yr	TP lbs/acre/yr	TSS lbs/acre/yr	TN lbs/acre/yr	TP lbs/acre/yr	TSS lbs/acre/yr	TN lbs/acre/yr	TP lbs/acre/yr	TSS lbs/acre/yr
	28.93	1.11	2,065.10	23.29	0.34	306.95	52.22	1.45	2,372.05

Trindle Spring Run Sewershed

Trindle Spring Run Total Sewershed Area (square feet)	Trindle Spring Run Sewershed Area Outside UA Area (square feet)	Trindle Spring Run Sewershed Area Outside UA Area (acres)	Trindle Spring Run Sewershed Area Within UA Area (square feet)	Trindle Spring Run Sewershed Area (acres)	UA Impervious Percent	UA Pervious Percent	Outside of UA Impervious Percent	Outside of UA Pervious Percent
15,236,544.5413	0.00	0.0000	15,017,283.1004	344.75	0.24	0.76	0.06	0.94

Trindle Spring Run Parsed Area (square feet)
219,261.44

Trindle Spring Run Total Sewershed Area Less Parsed Area (square feet)
15,017,283.10

Calculating Impervious and pervious area within sewershed based upon Statewide MS4 Land Cover Estimates.

Trindle Spring Run Impervious (acres)	Trindle Spring Run Pervious (acres)
82.74	262.01

Trindle Spring Run Impervious Loads			Trindle Spring Run Pervious Loads		
TN lbs/yr	TP lbs/yr	TSS lb/yr	TN lbs/yr	TP lbs/yr	TSS lbs/yr
2,393.66	91.84	170,866.07	6,102.20	89.08	80,423.83

Trindle Spring Run Loads

	TN lbs/yr	TP lbs/yr	TSS lbs/yr
Existing BMPs	8,495.87	180.92	251,289.89
Trindle Station Infiltration Basin	253.53	5.62	8,997.24
Sinclair Road SD Detention Basin	21.35	1.14	1,822.18
Sinclair Road SD Vegetated Channels	84.10	1.83	4,034.41
	8,136.89	172.33	236,436.06

10% TSS Reduction Required (lbs/yr)
23,643.61

Proposed BMPs		
Spring Circle Vegetated Open Channel 1	1,101.56	
Spring Circle Vegetated Open Channel 2	14,323.94	
Wertz Forest Buffer	12,525.94	
Balance	**-4,307.84**	**(lbs/yr)**

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
DOGWOOD RUN STORM SEWERSHED EXISTING LOADING FOR POLLUTANTS OF CONCERN
JUNE 2017

Dogwood Run	DEVELOPED LAND LOADING RATES FOR CUMBERLAND COUNTY						Total		
	Impervious			Pervious					
	TN lbs/acre/yr	TP lbs/acre/yr	TSS lbs/acre/yr	TN lbs/acre/yr	TP lbs/acre/yr	TSS lbs/acre/yr	TN lbs/acre/yr	TP lbs/acre/yr	TSS lbs/acre/yr
	28.93	1.11	2,065.10	23.29	0.34	306.95	52.22	1.45	2,372.05

Dogwood Run Sewershed

Dogwood Run Total Sewershed Area (square feet)	Dogwood Run Sewershed Area Outside UA Area (square feet)	Dogwood Run Sewershed Area Outside UA Area (acres)	Dogwood Run Sewershed Area Within UA Area (square feet)	Dogwood Run Sewershed Area (acres)	UA Impervious Percent	UA Pervious Percent	Outside of UA Impervious Percent	Outside of UA Pervious Percent
2,769,088.1252	0.00	0.0000	441,131.2458	10.13	0.24	0.76	0.06	0.94

Dogwood Run Parsed Area (square feet)
2,327,956.88

Dogwood Run Total Sewershed Area Less Parsed Area (square feet)
441,131.25

Calculating Impervious and pervious area within sewershed based upon Statewide MS4 Land Cover Estimates.

Dogwood Run Impervious (acres)	Dogwood Run Pervious (acres)
2.43	7.70

Dogwood Run Impervious Loads			Dogwood Run Pervious Loads		
TN lbs/yr	TP lbs/yr	TSS lb/yr	TN lbs/yr	TP lbs/yr	TSS lbs/yr
70.31	2.70	5,019.17	179.25	2.62	2,362.44

Dogwood Run Loads		
TN lbs/yr	TP lbs/yr	TSS lbs/yr
249.57	5.31	7,381.62

10% TSS Reduction Required (lbs/yr)
738.16

Proposed BMPs

Crossroads Bible Church Detention Basin	2,078.15	
Balance	**-1,339.99**	**(lbs/yr)**

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
YELLOW BREECHES CREEK STORM SEWERSHED EXISTING LOADING FOR POLLUTANTS OF CONCERN
JUNE 2017

Yellow Breeches

DEVELOPED LAND LOADING RATES FOR CUMBERLAND COUNTY						Total		
Impervious			Pervious					
TN lbs/acre/yr	TP lbs/acre/yr	TSS lbs/acre/yr	TN lbs/acre/yr	TP lbs/acre/yr	TSS lbs/acre/yr	TN lbs/acre/yr	TP lbs/acre/yr	TSS lbs/acre/yr
28.93	1.11	2,065.10	23.29	0.34	306.95	52.22	1.45	2,372.05

Yellow Breeches Sewershed

Yellow Breeches Total Sewershed Area (square feet)	Yellow Breeches Sewershed Area Outside UA Area (square feet)	Yellow Breeches Sewershed Area Outside UA Area (acres)	Yellow Breeches Sewershed Area Within UA Area (square feet)	Yellow Breeches Sewershed Area (acres)	UA Impervious Percent	UA Pervious Percent	Outside of UA Impervious Percent	Outside of UA Pervious Percent
21,330,446.8485	0.00	0.0000	20,916,392.6485	480.17	0.24	0.76	0.06	0.94

Yellow Breeches Parsed Area (square feet)
414,054.20

Yellow Breeches Total Sewershed Area Less Parsed Area (square feet)
20,916,392.65

Calculating Impervious and pervious area within sewershed based upon Statewide MS4 Land Cover Estimates.	Yellow Breeches Impervious (acres)	Yellow Breeches Pervious (acres)
	115.24	364.93

Yellow Breeches Impervious Loads			Yellow Breeches Pervious Loads		
TN lbs/yr	TP lbs/yr	TSS lb/yr	TN lbs/yr	TP lbs/yr	TSS lbs/yr
3,333.95	127.92	237,985.91	8,499.28	124.08	112,016.02

Yellow Breeches Loads

	TN lbs/yr	TP lbs/yr	TSS lbs/yr
Existing BMPs	11,833.22	252.00	350,001.93
West Shore Evangelical Free Church Detention Basin 1	57.93	2.75	4,129.94
West Shore Evangelical Free Church Detention Basin 2	9.05	0.44	667.89
West Shore Evangelical Free Church Detention Basin 3	42.58	1.66	2,149.48
West Shore Evangelical Free Church Detention Basin 4	7.04	0.30	416.21
West Shore Evangelical Free Church Detention Basin 5	4.95	0.21	293.02
	11,711.67	246.63	342,345.40

10% TSS Reduction Required (lbs/yr)
34,234.54

Proposed BMPs			
West Shore Evangelical Free Church Detention Basin 1		35,104.49	
Monroe Acres Park Bioretention / Raingarden		6,320.45	
Williams Grove Speedway Storm Sewer System Solids Removal		6,404.43	
	Balance	**-13,594.83**	**(lbs/yr)**

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
EXISTING BMPs

MS4 Outfall #	Name	NPDES Permit No.	Latitude	Longitude	Receiving Watershed	Stream Classification	Watershed	BMP	Description	Operation & Maintenance Frequency/Summary	Party Responsible for O&M	Date Installed	Last Inspection Date	Is BMP Serving Design Function (Yes or No)
004	Sinclair Road	PAG-02-0021-10-001R	40.19811	-77.02420	Trindle Spring Run	CWF, MF	Conodoguinet	Detention Basin	Detention Basin	Bi-annually inspect outlet structure for blocked orifices, damage to the orifice plate, grate, and outflow pipe. Repair and clean as needed. Inspect emergency spillways for erosion and repair per plan details. Mulch and seed eroded areas immediately.	Developer / HOA	2012/2013	May-17	Yes
004	Sinclair Road	PAG-02-0021-10-001R	40.19803	-77.02312	Trindle Spring Run	CWF, MF	Conodoguinet	Swale A	Vegetated Open Channel A/B Soils	Maintain annually & within 48 hours after every major storm event (> 1" rainfall depth).	Developer / HOA	2012/2013	May-17	Yes
004	Sinclair Road	PAG-02-0021-10-001R	40.19878	-77.02338	Trindle Spring Run	CWF, MF	Conodoguinet	Swale B	Vegetated Open Channel A/B Soils	Inspect & correct erosion problems; damage to vegetation; & sediment & debris accumulation (address when > 3" at any spot or covering vegetation). Inspect vegetation on side slopes for erosion & formation of rills or gullies; correct as needed.	Developer / HOA	2012/2013	May-17	Yes
004	Sinclair Road	PAG-02-0021-10-001R	40.19815	-77.02100	Trindle Spring Run	CWF, MF	Conodoguinet	Swale C	Vegetated Open Channel A/B Soils	Inspect for pools of standing water; dewater & discharge to approved location : restore to design grade.	Developer / HOA	2012/2013	May-17	Yes
004	Sinclair Road	PAG-02-0021-10-001R	40.19671	-77.02149	Trindle Spring Run	CWF, MF	Conodoguinet	Swale D	Vegetated Open Channel A/B Soils	Mow & trim vegetation as needed; mow only when swale is dry. Remove litter prior to mowing. Inspect for uniformity in cross-section & longitudinal slope; correct as needed.	Developer / HOA	2012/2013	May-17	Yes
004	Sinclair Road	PAG-02-0021-10-001R	40.19689	-77.02268	Trindle Spring Run	CWF, MF	Conodoguinet	Swale E	Vegetated Open Channel A/B Soils	Inspect for signs of erosion or blockage; correct as needed. Rototill & replant if draw down time is more than 48 hours.	Developer / HOA	2012/2013	May-17	Yes
004	Trindle Station	PAG-02-0021-04-024R(1)	40.19972	-77.02564	Trindle Spring Run	CWF, MF	Conodoguinet	Infiltration Basin 2	Infiltration Basin	Inspect and clean catch basins and inlets (upgradient of infiltration basin) at least two times per year and after runoff events. Maintain vegetation along the surface of the infiltration basin in good condition and revegetate any bare spots as soon as possible. Do not park or drive vehicles on infiltration basin and take care to avoid excessive compaction by mowers. Inspect the basin after runoff events and make sure that runoff drains down within 72 hours, Mosquito's should not be a problem if the water drains within 72 hours. Inspect for accumulation of sediment, damage to outlet control structures, erosion control measures, signs of water contamination/spills, and slope stability in berms. Mow only as appropriate for vegetative cover species. Remove accumulated sediment from basin as required. Restore original cross section and infiltration rate. Properly dispose of sediment.	Developer / HOA	2016		Yes
005	West Shore Evangelical Free Church Detention Basin 1	PAG-02-021-03-014R	Trout Run		CWF, MF	Yellow Breeches	Detention Basin #1	Dry Detention Basin	Conduct following inspections 3 times annually: Inspect for sediment build-up & embankment condition Remove sediment & repair & stabilize eroded areas. Inspect outlet structures & remove any blockages of orifice or grate. Inspect outlet box for debris. Inspect pipes for blockages & remove immediately. Inspect swales for blockages & to ensure stabilization material is in satisfactory condition.	West Shore Evangelical Free Church	2004		Yes
005	West Shore Evangelical Free Church Detention Basin 2	PAG-02-021-03-014R	Trout Run		CWF, MF	Yellow Breeches	Detention Basin #2	Dry Detention Basin		West Shore Evangelical Free Church	2004		Yes
005	West Shore Evangelical Free Church Detention Basin 3	PAG-02-021-03-014R	Trout Run		CWF, MF	Yellow Breeches	Detention Basin #3	Dry Detention Basin		West Shore Evangelical Free Church	2004		Yes
005	West Shore Evangelical Free Church Detention Basin 4	PAG-02-021-03-014R	Trout Run		CWF, MF	Yellow Breeches	Detention Basin #4	Dry Detention Basin		West Shore Evangelical Free Church	2004		Yes
005	West Shore Evangelical Free Church Detention Basin 5	PAG-02-021-03-014R	Trout Run		CWF, MF	Yellow Breeches	Detention Basin #5	Dry Detention Basin		West Shore Evangelical Free Church	2004		Yes

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
EXISTING BMPs

MS4 Outfall #	Name	NPDES Permit No.	Notes	Drainage Areas	Pollutant Reduction Calculation (lbs/yr) TN	TP	TSS	Impervious (Ac)	Developed Land Loading Rates for Cumberland County Loading from Impervious (lbs/acre/yr) TN	TP	TSS	Pervious (Ac)	Developed Land Loading Rates for Cumberland County Loading from Pervious (lbs/acre/yr) TN	TP	TSS	Total Loading (lbs/yr) TN	TP	TSS
									28.93	**1.11**	**2,065.10**		**23.29**	**0.34**	**306.95**	**52.22**	**1.45**	**2,372.05**
			Dry Detention Basin	**% Removal**	0.05	0.10	0.10											
004	Sinclair Road	PAG-02-0021-10-001R	Basin still in E&S mode.	17	21.35	1.14	1,822.18	7.48	216.40	8.30	15,446.95	9.04	210.54	3.07	2,774.83	426.94	11.38	18,221.78
			Vegetated Open Channels (A/B Soils)	**% Removal**	0.45	0.45	0.70											
004	Sinclair Road	PAG-02-0021-10-001R	Vegetated Channel Site in E&S mode.	2.37	26.56	0.60	1,346.11	0.68	19.67	0.75	1,404.27	1.69	39.36	0.57	518.75	59.03	1.33	1,923.01
004	Sinclair Road	PAG-02-0021-10-001R	Vegetated Channel Site in E&S mode.	2.15	23.35	0.44	855.79	0.32	9.26	0.36	660.83	1.83	42.62	0.62	561.72	51.88	0.98	1,222.55
004	Sinclair Road	PAG-02-0021-10-001R	Vegetated Channel Site in E&S mode.	0.74	8.26	0.18	405.14	0.20	5.79	0.22	413.02	0.54	12.58	0.18	165.75	18.36	0.41	578.77
004	Sinclair Road	PAG-02-0021-10-001R	Vegetated Channel Site in E&S mode.	1.39	15.43	0.33	717.10	0.34	9.84	0.38	702.13	1.05	24.45	0.36	322.30	34.29	0.73	1,024.43
004	Sinclair Road	PAG-02-0021-10-001R	Vegetated Channel Site in E&S mode.	0.90	10.50	0.28	710.27	0.42	12.15	0.47	867.34	0.48	11.18	0.16	147.34	23.33	0.63	1,014.68
			Total		**84.10**	**1.83**	**4,034.41**											
			Infiltration Practices	**% Removal**	0.85	0.85	0.95											
004	Trindle Station	PAG-02-0021-04-024R(1)	Infiltration Basin Site in E&S mode.	12.01	253.53	5.62	8,997.24	3.29	95.18	3.65	6,794.18	8.72	203.09	2.96	2,676.60	298.27	6.62	9,470.78
			Dry Detention Basin	**% Removal**	0.05	0.10	0.10											
005	West Shore Evangelical Free Church Detention Basin 1	PAG-02-021-03-014R	Detention Basin 1	46.00	57.93	2.75	4,129.94	15.46	447.23	17.16	31,924.43	30.54	711.33	10.38	9,374.98	1,158.56	27.54	41,299.40
005	West Shore Evangelical Free Church Detention Basin 2	PAG-02-021-03-014R	Detention Basin 2	7.15	9.05	0.44	667.89	2.55	73.77	2.83	5,265.63	4.60	107.23	1.57	1,413.23	181.00	4.40	6,678.86
005	West Shore Evangelical Free Church Detention Basin 3	PAG-02-021-03-014R	Detention Basin 3	35.09	42.58	1.66	2,149.48	6.10	176.46	6.77	12,596.35	28.99	675.17	9.86	8,898.45	851.64	16.63	21,494.80
005	West Shore Evangelical Free Church Detention Basin 4	PAG-02-021-03-014R	Detention Basin 4	5.71	7.04	0.30	416.21	1.37	39.65	1.52	2,830.01	4.34	101.07	1.48	1,332.04	140.71	3.00	4,162.05
005	West Shore Evangelical Free Church Detention Basin 5	PAG-02-021-03-014R	Detention Basin 5	4.02	4.95	0.21	293.02	0.96	27.91	1.07	1,992.41	3.06	71.16	1.04	937.79	99.07	2.11	2,930.20

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
PARSED AREA DETAIL

Watershed	Location	Square Feet	Acres
Trindle Spring Run	Turnpike (see below)	35,918.72	0.82
Trindle Spring Run	Turnpike (see below)	183,342.72	4.21
		219,261.44	5.03
Yellow Breeches	PennDOT (see below)	414,054.20	9.51
		414,054.20	9.51
Dogwood Run	PennDOT York Road	28,338.18	0.65
Dogwood Run	Williams Grove Inc.	1,163,052.00	26.70
Dogwood Run	Bordelon / Williams Grove Property	470,098.70	10.79
Dogwood Run	TKSM LLC	666,468.00	15.30
Subtotal		2,327,956.88	53.44

Parse PennDOT	Route No.	ROW (FT)	Length (LF)	Area (SF)	Area (Acres)	Watershed
Park Place Road	SR 2008	22	4,235.02	93,170.44	2.14	Yellow Breeches
Williams Grove Road	SR 2011	32	8,421.52	269,488.64	6.19	Yellow Breeches
Lisburn Road	SR 2004	28	419.61	11,749.08	0.27	Yellow Breeches
West Grantham Road	SR 2026	28	1,415.93	39,646.04	0.91	Yellow Breeches
			14,492.08	**414,054.20**	**9.51**	

Parse PennDOT	Route No.	ROW (FT)	Length (LF)	Area (SF)	Area (Acres)	Watershed
York Road	SR 0074	30	944.61	28,338.18	0.65	Dogwood Run

Parse Turnpike	Route No.	ROW (FT)	Length (LF)	Area (SF)	Area (Acres)	Watershed
PA Turnpike				35,918.72	0.82	Trindle Spring Run
PA Turnpike				183,342.72	4.21	Trindle Spring Run
				219,261.44	**5.03**	

APPENDIX E

Proposed BMPs to Meet Required Load Reductions

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
PROPOSED BMPs

Name	Latitude	Longitude	Receiving Watershed	Stream Classification	Watershed	BMP	Operation & Maintenance Frequency/Summary	Party Responsible for O&M
Spring Circle Vegetated Open Channel 1	40.20552	-77.02701	Trindle Spring Run	CWF, MF	Conodoguinet	Vegetated Open Channel	Maintain annually & within 48 hours after every major storm event (> 1" rainfall depth). Inspect & correct erosion problems; damage to vegetation; & sediment & debris accumulation (address when > 3" at any spot or covering vegetation). Inspect vegetation on side slopes for erosion & formation of rills or gullies; correct as needed. Inspect for pools of standing water; dewater & discharge to approved location : restore to design grade. Mow & trim vegetation as needed; mow only when swale is dry. Remove litter prior to mowing. Inspect for uniformity in cross-section & longitudinal slope; correct as needed. Inspect for signs of erosion or blockage; correct as needed. Rototill & replant if draw down time is more than 48 hours.	Monroe Township
Spring Circle Vegetated Open Channel 2	40.20425	-77.02655	Trindle Spring Run	CWF, MF	Conodoguinet	Vegetated Open Channel		Monroe Township
Wertz Forest Buffer	40.20611	-77.02791	Trindle Spring Run	CWF, MF	Conodoguinet	Forest Buffer	Prepare site specific maintenance and monitoring plan. First 3 to 5 years is the most critical period during buffer establishment; ongoing maintenance is required during this period. Watering, mulching and weed control should be performed regularly. Monitor 4 times annually (February, May, August, and November) during first 4 years and after any severe storm.	Property Owner

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
PROPOSED BMPs

Name	Latitude	Longitude	Receiving Watershed	Stream Classification	Watershed	BMP	Operation & Maintenance Frequency/Summary	Party Responsible for O&M
West Shore Evangelical Free Church Detention Basin 1	40.17044	77.01933	Trout Run/Yellow Breeches	CWF, MF	Yellow Breeches	Infiltration Practice w/sand., veg.	Inspect and clean catch basins and inlets (upgradient of infiltration basin) at least two times per year and after runoff events. Maintain vegetation along the surface of the infiltration basin in good condition and revegetate any bare spots as soon as possible. Do not park or drive vehicles on infiltration basin and take care to avoid excessive compaction by mowers. Inspect the basin after runoff events and make sure that runoff drains down within 72 hours, Mosquito's should not be a problem if the water drains within 72 hours. Inspect for accumulation of sediment, damage to outlet control structures, erosion control measures, signs of water contamination/spills, and slope stability in berms. Mow only as appropriate for vegetative cover species. Remove accumulated sediment from basin as required. Restore original cross section and infiltration rate. Properly dispose of sediment.	Property Owner
Williams Grove Speedway Storm Sewer System Solids Removal	40.15281	-77.03452	Yellow Breeches	CWF, MF	Yellow Breeches	Storm Sewer System Solids Removal	In accordance with manufacturer's recommended operation and maintenance.	Property Owner
Monroe Acres Park Bioretention / Raingarden	40.16361	-77.02632	Yellow Breeches	CWF, MF	Yellow Breeches	Bioretention / Raingarden (C/D soils w/underdrain)	While vegetation is being established, pruning and weeding may be required. Detritus may also need to be removed every year. Perennial plantings may be cut down at end of the growing season. Re-spread mulch when erosion is evident and replenish as needed. Once every 2 to 3 years the entire area may require mulch replacement. Inspect bioretention areas at least two times per year for sediment buildup, erosion, vegetative conditions, etc. Bioretention areas may require watering during periods of extended drought. Inspect trees and shrubs twice per year to evaluate health.	Monroe Township

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
PROPOSED BMPs

Name	Latitude	Longitude	Receiving Watershed	Stream Classification	Watershed	BMP	Operation & Maintenance Frequency/Summary	Party Responsible for O&M
Crossroads Bible Church Detention Basin	40.13827	-77.04439	Dogwood Run	CWF, MF	Yellow Breeches	Infiltration Practice w/sand., veg.	Inspect and clean catch basins and inlets (upgradient of infiltration basin) at least two times per year and after runoff events. Maintain vegetation along the surface of the infiltration basin in good condition and revegetate any bare spots as soon as possible. Do not park or drive vehicles on infiltration basin and take care to avoid excessive compaction by mowers. Inspect the basin after runoff events and make sure that runoff drains down within 72 hours, Mosquito's should not be a problem if the water drains within 72 hours. Inspect for accumulation of sediment, damage to outlet control structures, erosion control measures, signs of water contamination/spills, and slope stability in berms. Mow only as appropriate for vegetative cover species. Remove accumulated sediment from basin as required. Restore original cross section and infiltration rate. Properly dispose of sediment.	Property Owner

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
PROPOSED BMPs

			Pollutant Reduction Calculation (lbs/yr)				Developed Land Loading Rates for Cumberland County Loading from Impervious (lbs/acre/yr)				Developed Land Loading Rates for Cumberland County Loading from Pervious (lbs/acre/yr)				Total Loading (lbs/acre/yr)		
Name	**Notes**	**Drainage Areas**	**TN**	**TP**	**TSS**	**Impervious (Ac)**	**TN**	**TP**	**TSS**	**Pervious (Ac)**	**TN**	**TP**	**TSS**		**TN**	**TP**	**TSS**
							28.93	**1.11**	**2,065.10**		**23.29**	**0.34**	**306.95**		**52.22**	**1.45**	**2,372.05**
	Vegetated Open Channel A/B Soils	**% Removal**	**0.45**	**0.45**	**0.70**												
Spring Circle Vegetated Open Channel 1		2.16	23.94	0.51	1,101.56	0.52	14.99	0.58	1,070.02	1.64	38.21	0.56	503.64		53.20	1.13	1,573.66
Spring Circle Vegetated Open Channel 2		28.07	311.32	6.63	14,323.94	6.74	194.92	7.48	13,913.79	21.34	496.91	7.25	6,548.99		691.83	14.73	20,462.78
	Forest Buffer	**% Removal**	**0.25**	**0.25**	**0.50**												
Wertz Forest Buffer		34.37	211.74	4.51	12,525.94	8.25	238.63	9.16	17,034.18	26.12	608.35	8.88	8,017.70		846.98	18.04	25,051.88
	Trindle Spring Run Total		**547.01**	**11.65**	**27,951.44**												

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
PROPOSED BMPs

			Pollutant Reduction Calculation (lbs/yr)				Developed Land Loading Rates for Cumberland County Loading from Impervious (lbs/acre/yr)				Developed Land Loading Rates for Cumberland County Loading from Pervious (lbs/acre/yr)				Total Loading (lbs/acre/yr)		
Name	**Notes**	**Drainage Areas**	**TN**	**TP**	**TSS**	**Impervious (Ac)**	**TN**	**TP**	**TSS**	**Pervious (Ac)**	**TN**	**TP**	**TSS**		**TN**	**TP**	**TSS**
	Infiltration Practices Retrofit Existing Detention Basin	**% Removal**	**0.80**	**0.75**	**0.85**												
West Shore Evangelical Free Church Detention Basin 1		46.00	926.85	20.66	35,104.49	15.46	447.23	17.16	31,924.43	30.54	711.33	10.38	9,374.98		1,158.56	27.54	41,299.40
	Storm Sewer System Solids Removal	**% Removal**	**Refer To Solids Removal Calculation on next spreadsheet.**														
Williams Grove Speedway Storm Sewer System Solids Removal		25.82			6,404.43	6.20	179.28	6.88	12,797.18	19.62	457.03	6.67	6,023.42		636.31	13.55	18,820.60
	Bioretention / Raingarden (C/D soils w/underdrain)	**% Removal**	**0.25**	**0.45**	**0.55**												
Monroe Acres Park Bioretention / Raingarden		15.77	97.13	3.72	6,320.45	3.78	109.46	4.20	7,813.87	11.98	279.06	4.07	3,677.86		388.52	8.27	11,491.72
	Yellow Breeches Creek Total		**1,023.98**	**24.38**	**47,829.37**												

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
PROPOSED BMPs

			Pollutant Reduction Calculation (lbs/yr)				Developed Land Loading Rates for Cumberland County Loading from Impervious (lbs/acre/yr)				Developed Land Loading Rates for Cumberland County Loading from Pervious (lbs/acre/yr)				Total Loading (lbs/acre/yr)		
Name	**Notes**	**Drainage Areas**	**TN**	**TP**	**TSS**	**Impervious (Ac)**	**TN**	**TP**	**TSS**	**Pervious (Ac)**	**TN**	**TP**	**TSS**		**TN**	**TP**	**TSS**
Crossroads Bible Church Detention Basin		3.35	66.13	1.32	2,078.15	0.81	23.29	0.89	1,662.41	2.55	59.37	0.87	782.47		82.66	1.76	2,444.88
	Dogwood Run Total		**66.13**	**1.32**	**2,078.15**												

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
STORM SEWER SYSTEM SOLIDS REMOVAL CALCULATIONS

Name	Description	Notes	Drainage Areas	Pollutant Reduction Calculation (lbs/yr) TN	TP	TSS	Impervious (Ac)	Developed Land Loading Rates for Cumberland County Loading from Impervious (lbs/acre/yr) TN	TP	TSS	Pervious (Ac)	Developed Land Loading Rates for Cumberland County Loading from Pervious (lbs/acre/yr) TN	TP	TSS	Total Loading (lbs/acre/yr) TN	TP	TSS
								28.93	**1.11**	**2,065.10**		**23.29**	**0.34**	**306.95**	**52.22**	**1.45**	**2,372.05**
		Storm Sewer System Solids Removal	**% Removal**			**0.80**											
Williams Grove Speedway	Storm Sewer System Solids Removal		25.82			15,056.48	6.20	179.28	6.88	12,797.18	19.62	457.03	6.67	6,023.42	636.31	13.55	18,820.60

TSS Loading lbs/Year	Stormceptor® Removal Efficiency 80%	TSS Load Removed lbs/Year	10% Debris/Refuse	Remaining TSS Loading Wet Weight	Inorganic Sediment 55% (x 0.55 x 0.7) x 0.7	Organic Material 45% (x 0.45 x 0.2) x 0.2	TN 0.0027	TN 0.0111	TP 0.0006	TP 0.0012	Total Sediment Loading Reduction
18,820.60	0.80	15,056.48	1,505.65	13,550.83	5,217.07	1,219.57	14.09	13.54	3.13	1.46	**6,404.43**

APPENDIX F

Planning Level Cost Estimate

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
PLANNING LEVEL COST ESTIMATE

Name	Receiving Watershed	Proposed BMP	Description	$ / Acre Treated	Acres Treated	Subtotal Cost	Contingency 10%	Engineering 15%	Total Cost
Spring Circle Vegetated Open Channel 1	Trindle Spring Run	Vegetated Channel	Retrofit	N/A	2.16	$ 35,000.00	$ 3,500.00	$ 5,250.00	$ 43,750.00
Spring Circle Vegetated Open Channel 2	Trindle Spring Run	Vegetated Channel	Retrofit	N/A	28.07	$ 35,000.00	$ 3,500.00	$ 5,250.00	$ 43,750.00
Williams Grove Speedway Storm Sewer System Solids Removal	Yellow Breeches	Storm Sewer System Solids Removal	End of Pipe (Structural) Treatment	N/A	25.82	$ 114,250.00	$ 11,425.00	$ 17,137.50	$ 142,812.50
Millers Road Inlet Insert (MR #1) and Endwall Work	Yellow Breeches	Storm Sewer System Solids Removal	End of Pipe (Structural) Treatment	N/A		$ 2,500.00	$ 250.00	$ 375.00	$ 3,125.00
Millers Road Inlet Insert (MR #2) and Endwall Work	Yellow Breeches	Storm Sewer System Solids Removal	End of Pipe (Structural) Treatment	N/A		$ 2,500.00	$ 250.00	$ 375.00	$ 3,125.00
Millers Road Inlet Insert (MR #3) and Endwall Work	Yellow Breeches	Storm Sewer System Solids Removal	End of Pipe (Structural) Treatment	N/A		$ 2,500.00	$ 250.00	$ 375.00	$ 3,125.00
Millers Road Inlet Insert (MR #4) and Endwall Work	Yellow Breeches	Storm Sewer System Solids Removal	End of Pipe (Structural) Treatment	N/A		$ 2,500.00	$ 250.00	$ 375.00	$ 3,125.00
Millers Road Inlet Insert (MR #6) and Endwall Work	Yellow Breeches	Storm Sewer System Solids Removal	End of Pipe (Structural) Treatment	N/A		$ 2,500.00	$ 250.00	$ 375.00	$ 3,125.00
						$ 196,750.00	$ 19,675.00	$ 29,512.50	$ 245,937.50
Name	**Receiving Watershed**	**Proposed BMP**	**Description**	**$ / Acre**	**Acres**	**Subtotal Cost**	**Contingency 10%**	**Engineering 15%**	**Total Cost**
Wertz Forest Buffer	Trindle Spring Run	Forest Buffer	New Construction	N/A	0.67	$ 20,000.00	$ 2,000.00	$ 3,000.00	$ 25,000.00
West Shore Evangelical Free Church Detention Basin 1	Yellow Breeches	Infiltration Practice w/sand, veg	Retrofit	$ 25,000.00	4.30	$ 107,409.46	$ 10,740.95	$ 16,111.42	$ 134,261.82
Crossroads Bible Church Detention Basin	Dogwood Run	Infiltration Practice w/sand, veg	Retrofit	$ 25,000.00	0.13	$ 3,172.30	$ 317.23	$ 475.84	$ 3,965.37
Monroe Acres Park Bioretention / Raingarden	Yellow Breeches	Bioretention / Raingarden	New Construction	$ 16,850.00	1.23	$ 20,725.50	$ 2,072.55	$ 3,108.83	$ 25,906.88
						$ 151,307.26	$ 15,130.73	$ 22,696.09	$ 189,134.07
					Subtotal	**$ 348,057.26**	**$ 34,805.73**	**$ 52,208.59**	**$ 435,071.57**
								Annual for 5-Years	**$ 87,014.31**
NOTE: COSTS DO NOT INCLUDE LEGAL OR LAND ACQUISITION COSTS								**Annual for 7-Years**	**$ 62,153.08**
								Annual for 10-Years	**$ 43,507.16**

Cost References:

BayFAST Website - PA Default Cost - Cost Profile

BayFAST Website - Unit Cost Spreadsheets for BMPs in Phase II WIPs prepared for EPA using existing data.

Planning Level Unit Cost Development for Stormwater Best Management Practices (BMPs) - Part 1: Initial Costs Per Impervious Acre Treated

Storm Sewer System Solids Removal Budgetary Cost Estimate Provided by CONTECH Engineered Solutions LLC.

APPENDIX G

Proposed Operation and Maintenance Plan

MONROE TOWNSHIP, CUMBERLAND COUNTY, PA
PROPOSED OPERATION AND MAINTENANCE PLAN

Name	Receiving Watershed	Proposed BMP	Description	Responsible Party	Operation and Maintenance
					Vegetated Open Channels
Spring Circle Vegetated Open Channel 1	Trindle Spring Run	Vegetated Open Channel	Retrofit	Monroe Township	Maintain annually & within 48 hours after every major storm event (> 1" rainfall depth). Inspect & correct erosion problems; damage to vegetation; & sediment & debris accumulation (address when > 3" at any spot or covering vegetation). Inspect vegetation on side slopes for erosion & formation of rills or gullies; correct as needed. Inspect for pools of standing water; dewater & discharge to approved location : restore to design grade. Mow & trim vegetation as needed; mow only when swale is dry. Remove litter prior to mowing. Inspect for uniformity in cross-section & longitudinal slope; correct as needed. Inspect for signs of erosion or blockage; correct as needed. Rototill & replant if draw down time is more than 48 hours.
Spring Circle Vegetated Open Channel 2	Trindle Spring Run	Vegetated Open Channel	Retrofit	Monroe Township	
					Forest Buffer
Wertz Forest Buffer	Trindle Spring Run	Forest Buffer	New Construction	Property Owner	Prepare site specific maintenance and monitoring plan. First 3 to 5 years is the most critical period during buffer establishment; ongoing maintenance is required during this period. Watering, mulching and weed control should be performed regularly. Monitor 4 times annually (February, May, August, and November) during first 4 years and after any severe storm.
					Infiltration Basins
West Shore Evangelical Free Church Detention Basin 1	Yellow Breeches	Infiltration Practice w/sand., veg.	Retrofit	Property Owner	Inspect and clean catch basins and inlets (upgradient of infiltration basin) at least two times per year and after runoff events. Maintain vegetation along the surface of the infiltration basin in good condition and revegetate any bare spots as soon as possible. Do not park or drive vehicles on infiltration basin and take care to avoid excessive compaction by mowers. Inspect the basin after runoff events and make sure that runoff drains down within 72 hours, Mosquito's should not be a problem if the water drains within 72 hours. Inspect for accumulation of sediment, damage to outlet control structures, erosion control measures, signs of water contamination/spills, and slope stability in berms. Mow only as appropriate for vegetative cover species. Remove accumulated sediment from basin as required. Restore original cross section and infiltration rate. Properly dispose of sediment.
Crossroads Bible Church Detention Basin	Dogwood Run	Infiltration Practice w/sand., veg.	Retrofit	Property Owner	
					Bioretention / Raingarden
Monroe Acres Park Bioretention / Raingarden	Yellow Breeches	Bioretention / Raingarden	New Construction	Monroe Township	While vegetation is being established, pruning and weeding may be required. Detritus may also need to be removed every year. Perennial plantings may be cut down at end of the growing season. Re-spread mulch when erosion is evident and replenish as needed. Once every 2 to 3 years the entire area may require mulch replacement. Inspect bioretention areas at least two times per year for sediment buildup, erosion, vegetative conditions, etc. Bioretention areas may require watering during periods of extended drought. Inspect trees and shrubs twice per year to evaluate health.
					Storm Sewer System Solids Removal
Williams Grove Speedway Storm Sewer System Solids Removal	Yellow Breeches	Storm Sewer System Solids Removal	New Construction	Property Owner	In accordance with manufacturer's recommended operation and maintenance.
Inlet Insert MR No. 1	Yellow Breeches	Storm Sewer System Solids Removal	New Construction	Monroe Township	
Inlet Insert MR No. 2	Yellow Breeches	Storm Sewer System Solids Removal	New Construction	Monroe Township	
Inlet Insert MR No. 3	Yellow Breeches	Storm Sewer System Solids Removal	New Construction	Monroe Township	
Inlet Insert MR No. 4	Yellow Breeches	Storm Sewer System Solids Removal	New Construction	Monroe Township	
Inlet Insert MR No. 6	Yellow Breeches	Storm Sewer System Solids Removal	New Construction	Monroe Township	