Tulpehocken Creek
DRAFT Pollution Reduction Plan

FOR

WYOMISSING BOROUGH

BERKS COUNTY, PENNSYLVANIA

MCCARTHY PROJECT NO. 170004

JULY 2017

PREPARED BY:

McCarthy Engineering

Tulpehocken Creek
Pollution Reduction Plan

WYOMISSING BOROUGH
BERKS COUNTY, PENNSYLVANIA

TABLE OF CONTENTS

1 Introduction

This Pollution Reduction Plan (PRP) was developed as a strategy for Wyomissing Borough to comply with the requirements of the Municipal Separate Storm Sewer System (MS4) program as permitted by the National Pollutant Discharge Elimination System (NPDES) and administered by the Pennsylvania Department of Environmental Protection. This plan will address the impairments of the Tulpehocken Creek where the creek receives stormwater discharge from the municipally owned storm sewers of Wyomissing Borough.

The Tulpehocken Creek in Berks County was listed as impaired by nutrients due to Agriculture as part of the 2008 Pennsylvania Integrated Report. As such, the MS4 program dictates that the Borough must address the cause of the impairment through a 5% reduction in the annual loading of Total Phosphorus (TP) discharged to the Tulpehocken Creek from the Borough owned MS4 outfalls. Constituent pollutants of nutrient impairments are generally considered to be total Phosphorus and total Nitrogen; however, the MS4 program and this report, consider Total Phosphorus to be representative of the entire impairment.

To quantify the pollutant load reduction the Borough was required to completely map its storm sewer collections system and delineate the storm-sewersheds associated with each outfall. Existing Best Management Practices (BMPs) were located, and their nutrient removal potential was considered to determine the

The 5% reduction in TP must be achieved through the construction of structural stormwater BMPs upstream of MS4 outfalls. These BMPs are required to be in place and operational by the end of NPDES permit coverage, through the 2018 permit cycle, in 2023.

1.1 - Permittee Information

Permittee Name: Wyomissing Borough
Mailing Address: 22 Reading Blvd, Wyomissing, PA 19610
MS4 Contact Person: Jim Babb
NPDES Permit Number: PAI133522
Municipality: Wyomissing Borough
County: Berks
Consultant Name: McCarthy Engineering

1.2 - Data Sources

The development of this Pollutant Reduction Plan used publicly available data sources to compile base mapping.

Data Type	Data Source
Aerial Imaging	http://www.pasda.psu.edu/
Urbanized Area	Census Bureau, 2010
Topographical Contours	http://www.pasda.psu.edu/
Municipal Boundaries	http://www.co.berks.pa.us
Roadway & Parcel Information	http://www.co.berks.pa.us

2 Public Involvement and Participation - RESERVED

2.1 – Copy of Public Notice

2.2 – Comments received

2.3 – Address of Comments

3 Baseline Loading Determination & Mapping

The Tulpehocken Creek creates the northern border of the Borough with the City of Reading, and generally flows from east to west. The Tulpehocken Creek flows for approximately 1.1 miles along the border of Wyomissing Borough before joining with the Schuylkill River. The Tulpehocken Creek is in the Hydrologic Unit Code (HUC) 02040203.

The total watershed area consists of approximately 220 square miles in Eastern & Northern Berks County and Western Lebanon County. The watershed area within the Borough accounts for less than one half of one percent of that total watershed area. The total stream length within the watershed is 287 miles, with the entirety of the watershed being classified as impaired with a cause of siltation or nutrients in the Pennsylvania Integrated Report.

Table 1 provides a summation of the classifications and impairments of the creek where it receives stormsewer discharge from the Borough of Wyomissing, as found in the 2008 Integrated Report and the PA DEP Draft MS4 Requirements Table.

Table 1: Tulpehocken Creek Impairments at Wyomissing Borough, Berks Co.

Impaired Use	Source	Cause	Date	Requirements
Aquatic Life	Agriculture	Nutrients	2008	Appendix E-Nutrients, (5)

The entirety of the Borough is within the Urbanized Area as determined by the 2010 census. However, the Tulpehocken watershed area within the Borough consists of up to 27% forest, based on land cover approximations from the National Land Cover Database (NLCD). These forested areas are generally found only near the borders of the Tulpehocken Creek.

The defined Planning Area for the Borough's PRP for the Tulpehocken Creek was determined through extensive mapping and GPS location of existing storm sewer features throughout the Borough and the consideration of the urbanized boundary in relation to those features. The MS4 Pollution Reduction Plan "Planning Area", or those municipal storm sewers which drained urbanized areas, either directly or transiently, was found to be approximately 302 acres. Table 2 provides the land use classification per the definitions of the National Land Cover Database (NLCD). Figure 1 shows the extents of Wyomissing Borough's planning area.

Table 2: NLCD Classifications

Land Use Classification	Area (Ac.)	Percentage of Total Area
Developed, Open Space[1]	11.54	3.82
Developed, Low Intensity[2]	19.18	6.34
Developed, Medium Intensity[3]	271.16	89.84
Developed, High Intensity[4]	0	0

1. Impervious surfaces account for less than 20% of total cover.
2. Impervious surfaces account for 20% to 49% of total cover.
3. Impervious surfaces account for 50% to 79% of total cover.
4. Impervious surfaces account for 80% to 100% of total cover.


TOTAL ACRES = 302.3
TOTAL IMPERVIOUS AREA = 185.7
TOTAL PHOSPHORUS LOADING = 481.56 LBS/YEAR
TOTAL NITROGEN LOADING = 9,879.82 LBS/YEAR
REQUIRED PHOSPHORUS REDUCTION = 24.08 LBS/YEAR
SITE
VICINITY MAP
DA TO CLOSED DEPRESSION
DRAINAGE TO WYOMISSING CREEK
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WYOMISSING BOROUGH
" TULPEHOCKEN CREEK "
FIGURE 1

As is shown in Table 2, the majority land use in the individual sewersheds of the planning area is Developed, medium, with the exception of several portions along the borders of the planning area and the Tulpehocken Creek which are a mix of Open and Low Intensity Developed space. There are no high intensity drainage areas within the planning area.

This developed, medium intensity land use is well established throughout the planning area and is primarily accounted for by commercial development including large shopping malls and plazas, as well as office buildings.

3.1 -Tulpehocken Creek Existing Loading

Wyomissing Borough had existing BMP and base mapping completed, additional GPS surveying was performed to identify all storm sewer features including outfalls, piping, catch basins, etc. This information was used in conjunction with publicly available aerial imaging data (obtained through PASDA), 2-foot lidar surface contours, and Berks County Tax and Parcel information to develop a working base-plan for the Tulpehocken Creek MS4 planning area using AutoCAD.

This base-map was then used to empirically derive the individual storm sewershed drainage areas and the impervious areas within each sewershed in the planning area. Table 3 below provides a breakdown of the overall land-cover as it was delineated within the planning area.

Table 3: Tulpehockn Creek Planning Area Land Cover Types and Areas

Land Cover Type	Area (Ac.)[5]
Total Sewershed Area (Planning Area)	302.5
Impervious Area	185.6
Pervious Area	116.3

[5.] Areas derived from base-map takeoff unless otherwise noted

Appendix A provides a planning area wide map showing the delineated storm sewershed areas, and adjacent drainage areas. There are a total of 12 mapped sewersheds and MS4 outfalls in the Tulpehocken Creek planning area. From Table 3, throughout the MS4 planning area, approximately 61% of the land cover is impervious area. The entire planning area is within the Urbanized Area, with the exception of small portions of sewersheds on the eastern end of the planning area.

The PA DEP simplified method for determining pollutant loading rates was used to calculate the total phosphorus load in pounds per year based on the land use determined from the mapping of each sewershed. Table 5 shows the land use values provided by the PA DEP as part of the PRP Instructions for use in the simplified method.

Table 5: PA DEP Simplified Method – Land Use Loading Rates

County	Category	Acres	Total Phosphorus (lbs/acre/yr)	Total Nitrogen (lbs/ac/yr)
Berks[6]	Impervious	1,292.4	2.26	36.81
	Pervious	5,178.8	0.98	34.02

[6] Note that the Berks Co. values provided are for the Chesapeake Bay Watershed. These values were used in favor of the aggregate county value for those areas outside of the Chesapeake Bay Watershed.

Table 5 states that the impervious land uses in Berks County have a total phosphorus discharge at 2.26 lbs/ac/yr and that the pervious land uses have a total phosphorus discharge rate of 0.98 lbs/ac/yr. The total nitrogen loading estimate is also provided in Table 5.

These discharge rates were applied to the delineated storm sewersheds and impervious cover to calculate the pollutant loading rates for each. These total phosphors and nitrogen loadings for each storm sewershed can be found on each sewershed delineation sheet in Appendix A, and listed in Appendix B.

Table 6: Tulpehocken Creek Planning Area Pollutant Loading

Land Cover	Phosphorus Loading (lbs/yr)	Nitrogen Loading (lbs/yr)
185.6 impervious acres	419.52	6,833.04
116.3 pervious acres	113.93	3,954.83
302.5 total acres	**533.45 lbs/yr total**	**10,787.87 lbs/yr total**

As stated in the introduction, Total Phosphorus is the required reporting and demonstrated reduction pollutant per the PRP. Throughout the Tulpehocken Creek planning area the total Phosphorus loading is approximately 533.45 lbs/yr total.

3.2 – Accounting for Existing BMPs

Existing structural Best Management Practices (BMPs) were identified through both GPS survey and land development plan file searches, though in most cases original plan documentation for BMPs was not available. The existing BMPs that were identified throughout the planning area were accounted for in the pollutant loading calculations using the PA DEP's BMP effectiveness values. A complete list of this table is included in Appendix C.

Where applicable the most conservative BMP effectiveness values were applied, and if insufficient data to determine the original classification of the BMP was not available, conservative assumptions were made to complete the calculation.

Each structural BMP identified was individually analyzed to determine its drainage area, and the associated impervious to pervious ratio. These values were than used to define what the phosphorus loading to each BMP was in pounds per year. The appropriate BMP effectiveness value, or pollutant treatment and reduction value, was then applied to the phosphorus loading to the BMP, and the resulting phosphorus loading discharge from the BMP to the remaining sewershed area were then added back into the total sewershed phosphorus loading.

Table 7 provides a comparison of the existing phosphorus loading from the MS4 planning area to the Tulpehocken Creek with and without existing structural BMPs accounted for.

Table 7: Resultant Pollutant Loading

Existing Phosphorus Load (lbs/yr)	Existing Phosphorus Load with BMPs (lbs/yr)	Required Phosphorus Reduction (lbs/yr)
533.45	481.56	24.08

From Table 7, by estimating the pollution reduction potential of the existing BMPs within the Tulpehocken Creek MS4 planning area, the existing phosphorus load can be reduced by approximately 10%.

The Appendix E requirements discussed in Section 1.0 and Table 1, require the Borough to meet a 5% reduction of the existing total phosphorus load being discharged to the Tulpehocken Creek from the MS4 planning area with the installation of structural BMPs. From Table 7, the 5% reduction in total phosphorus loading to meet NPDES permit requirements will be ***24.08 pounds per year***.

4 Meeting Pollution Reduction Goals

To meet the required ***24.08 pounds per year*** annual reduction requirement, the Borough is required to install structural BMPs upstream of discharge points within the identified MS4 planning area of the Tulpehocken Creek. An overview of the selected BMPs required to meet this reduction are outlined in the table below.

Table 8: Proposed BMP

Sewershed No.	Existing Phosphorus Load (lbs./yr.)	BMP	Estimated Phosphorus Load Reduction (lbs./yr.)
394A	154.19	Retrofit concrete swale	69.39

4.1 – BMP 1, Retrofit of Existing Concrete Swale

Sewershed 394A is shown on Sheet No. 1 in Appendix A. The sewereshed is 107 acres, approximately 65% of which is impervious area. Primary land use in the area is commercial. The estimated phosphorus loading engendered by the drainage area is 171.32 lbs/yr, after accounting for existing BMPs.

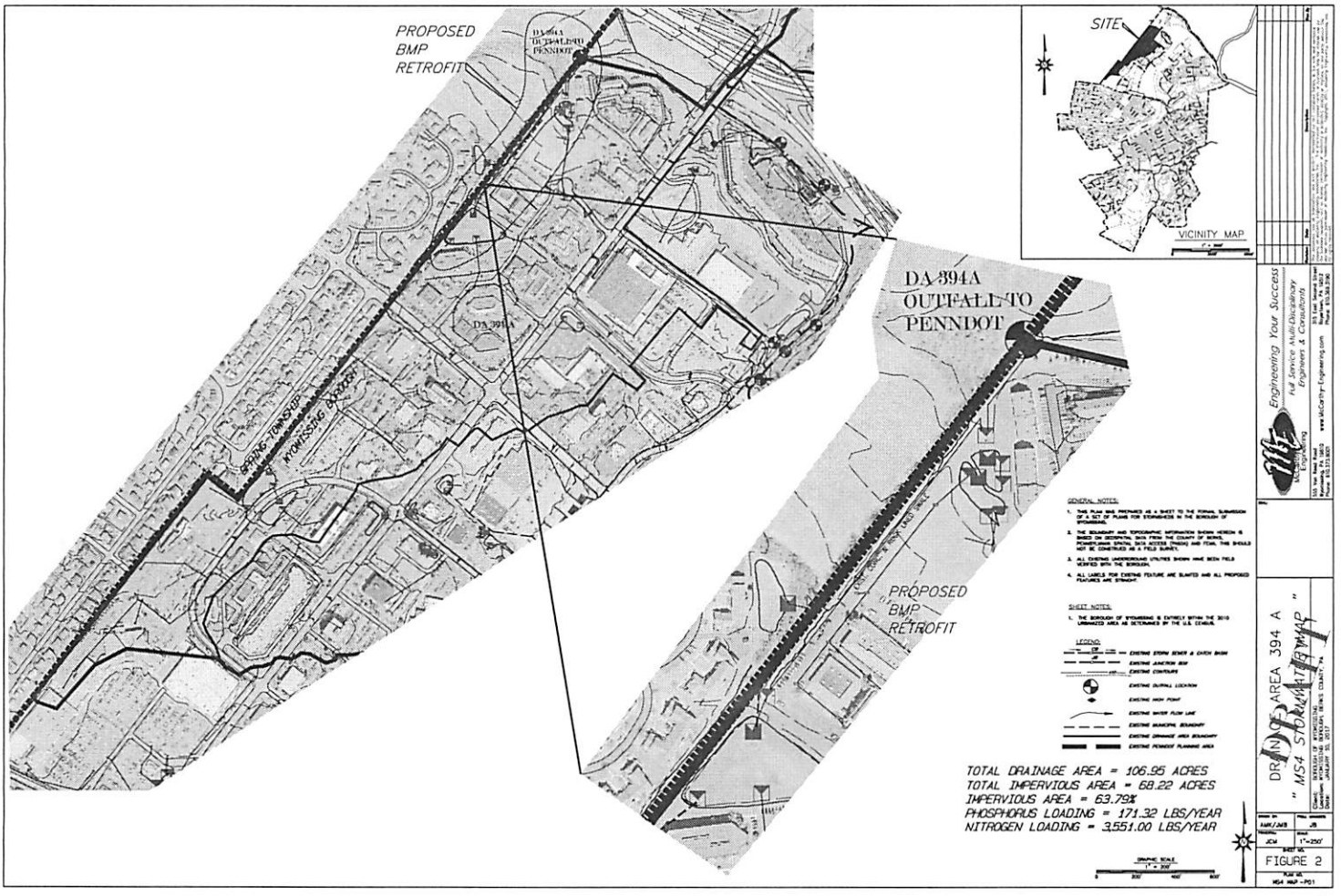
The area generally drains west from the border of sewershed 394B, and north towards the PennDOT MS4 boundary. The outfall of the sewershed is at the PennDOT planning area boundary, where the concrete/rock line swale transitions to PennDOT's concrete drainage swales for Rts. 222 & 422. The ultimate discharge to the Tulpehocken Creek is through a 12' x 8' culvert under Rt. 422 (W. Shore Bypass) & Rt. 12 (Warren Street Bypass)

This project proposes the removal of the 380 LF of existing concrete swale, and the installation of a vegetated swale. The proposed swale would require flow attenuation structures to reduce scouring velocity. The existing rip-rap apron would also be removed to extents possible upstream of the outlet to the PennDOT MS4 planning area. This could provide up to approximately 800 LF of vegetated swale area. The soils in the area of this proposed project are Urban land of the Duffield complex and are in hydrologic soil group B (See Appendix C for soil map and description). Figure 2 shows the location of the proposed BMP.

Using the PA DEP BMP Effectiveness Values Table, included in Appendix C, the proposed project would reduce the total phosphorus discharged by sewershed 394A by an estimated 45%. Considering the total phosphorus loading and the upstream BMPS in the sewershed, the estimated possible phosphorus reduction of this BMP is ***69.39 lbs/year***.

The proposed BMP would meet the 24.08 lbs/yr reduction required by the MS4 permit, and provide an estimated additional 45.31 lbs/yr of phosphorus removal. The estimated phosphorus removal rate basin wide provided by this BMP would be 14.4%.

The Borough has existing easements along this property for sanitary sewer which runs along the western side of the swale. This project would provide additional access for Borough vehicles to perform maintenance on the sanitary sewer. The Borough does not own the tract of land associated with the swale and would need to either reach an agreement with the land owner for the proposed project.


PROPOSED
BMP
RETROFIT
DA-394A
OUTFALL TO
PENNDOT
DA 394A
SPRING-TOWNSHIP
WYOMISSING BOULEVARD
PROPOSED
BMP
RETROFIT
SITE
VICINITY MAP
TOTAL DRAINAGE AREA = 106.95 ACRES
TOTAL IMPERVIOUS AREA = 68.22 ACRES
IMPERVIOUS AREA = 63.79%
PHOSPHORUS LOADING = 171.32 LBS/YEAR
NITROGEN LOADING = 3,551.00 LBS/YEAR
DRAINAGE AREA 394 A
" MS4 STORMWATER MAP "
FIGURE 2

4.5 - Summary of BMP Selection to Meet Requirements

The planning area was defined based on the GPS location of MS4 outfalls. The sewersheds associated with these outfalls were delineated, and a detailed quantity takeoff was performed to estimate the total existing total phosphorus load to the Tulpehocken Creek was 481.56 pounds of TP per year. Due to the impairments identified for the Tulpehocken Creek, the MS4 permit requires that Wyomissing Borough reduce the amount of total phosphorus it discharges within the planning area by 5% or 24.08 pounds per year. This required reduction will be met through the retrofit of an existing concrete swale in sewershed 392A. Table 9 provides an overall summary of the proposed BMP and its estimated TP reduction as well as a summation of the total estimated reduction achieved through implementation of the BMP.

Table 9: Proposed BMP and Total Estimated Phosphorus Reduction vs. Required Phosphorus Reduction

BMP No.	Sewershed	Existing TP Load (lbs/yr)	BMP	Estimated TP Load Reduction (lbs/yr)
1	392A	171.32	Concrete Swale Retrofit	69.39

Total Estimated Phosphorus Reduction Achieved through BMP 1	**69.39 lbs/yr**
Total PA DEP Required Phosphorus Reduction	24.08 lbs/yr

5 Project Cost Estimates and Funding Sources

Estimated Project Costs are presented in Table 10.

Table 10: Estimated Project Costs

No.	Sewershed	Existing TP Load (lbs/yr)	BMP	Estimated TP Load Reduction (lbs/yr)	Estimated Project Cost	Cost per lb. TP Removed
1	394A	171.32	Concrete Swale Retrofit	69.39	$400,000	$5,765

***Estimated Project Costs are based on best available published planning data from the "Costs of Stormwater Management Practicies in Maryland Counties", prepared by the University of Maryland, Center for Environmental Sciences. These Costs were then modified to reflect potential Costs considering design, engineering, permitting, legal, land acquisition and right-of-way costs, geotechnical evaluation, possible landscaping/plantings, etc...**

The total estimated project costs for structural BMP 1 is $400,000. These costs are based on estimations and best available prices for planning level cost estimations, and may be revised as further design details are determined. The Borough will fund this BMP through their general fund.

6 Operations & Maintenance

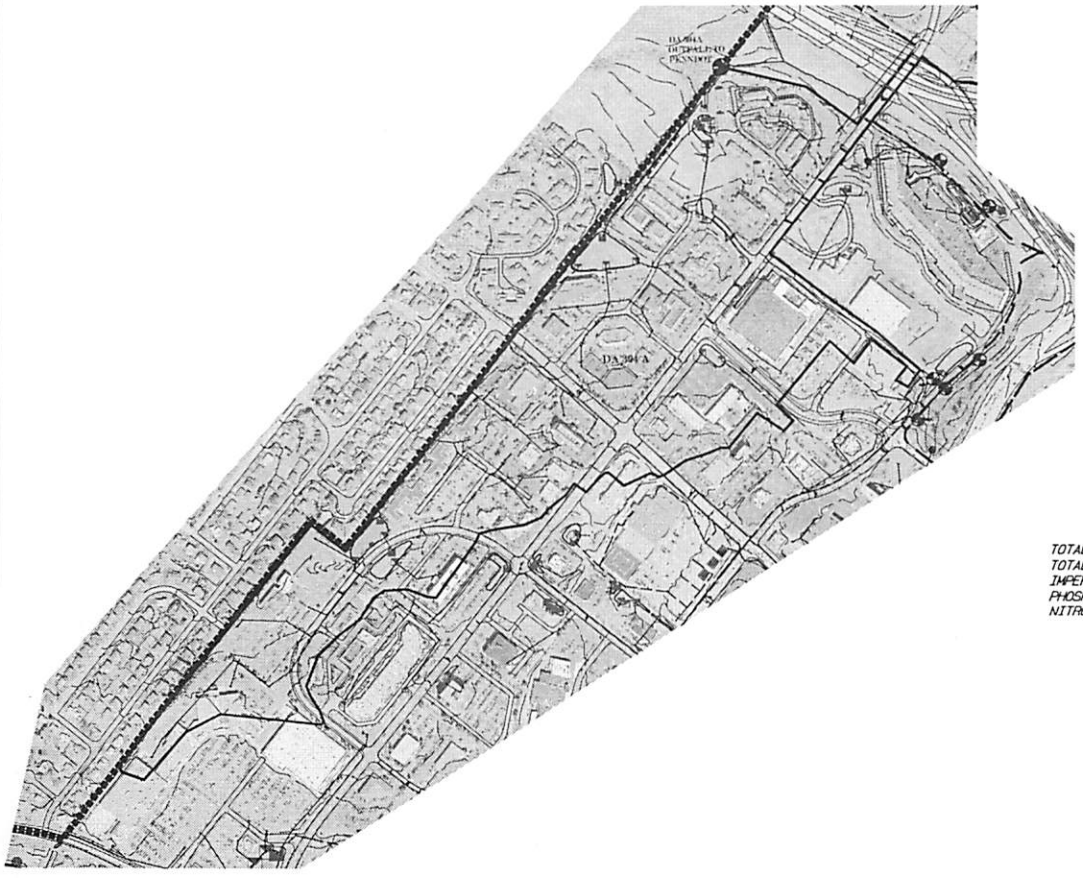
The Borough MS4 O&M Manual will be updated to include further maintenance of the proposed vegetated swale BMP, and submitted as part of the 1st annual status report to meet the requirements of MCM #6. The Borough MS4 Contact Person identified in Section 1 of this report will be considered the responsible official for ongoing O&M requirements.

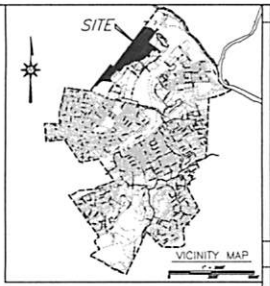
Tulpehocken Creek
Pollution Reduction Plan

Wyomissing Borough
Berks County, Pennsylvania

APPENDIX A

MAPPING





GENERAL NOTES:

1. THIS PLAN WAS PREPARED AS A SHEET TO THE FORMAL SUBMISSION OF A SET OF PLANS FOR ESTABLISHED IN THE BOROUGH OF WYOMISSING.
2. THE BOUNDARY AND TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED ON GEOMATION DATA FROM THE COUNTY OF BERKS, PENNSYLVANIA SPATIAL DATA ACCESS (PASDA) AND FEMA. THIS SHOULD NOT BE CONSTRUED AS A FIELD SURVEY.
3. ALL EXISTING UNDERGROUND UTILITIES SHOWN HAVE BEEN FIELD VERIFIED WITH THE BOROUGH.
4. ALL LABELS FOR EXISTING FEATURE ARE SLANTED AND ALL PROPOSED FEATURES ARE STRAIGHT.

SHEET NOTES:

1. THE BOROUGH OF WYOMISSING IS ENTIRELY WITHIN THE 2010 URBANIZED AREA AS DETERMINED BY THE U.S. CENSUS.

LEGEND:

- EXISTING STORM SEWER & CATCH BASIN
- EXISTING JUNCTION BOX
- EXISTING CONTOURS
- EXISTING OUTFALL LOCATION
- EXISTING HIGH POINT
- EXISTING WATER FLOW LINE
- EXISTING MUNICIPAL BOUNDARY
- EXISTING DRAINAGE AREA BOUNDARY
- EXISTING POWCOT PLANNING AREA

TOTAL DRAINAGE AREA = 106.95 ACRES
TOTAL IMPERVIOUS AREA = 68.22 ACRES
IMPERVIOUS AREA = 63.79%
PHOSPHORUS LOADING = 171.32 LBS/YEAR
NITROGEN LOADING = 3,551.00 LBS/YEAR

GRAPHIC SCALE
1" = 200'
0 200 400 800

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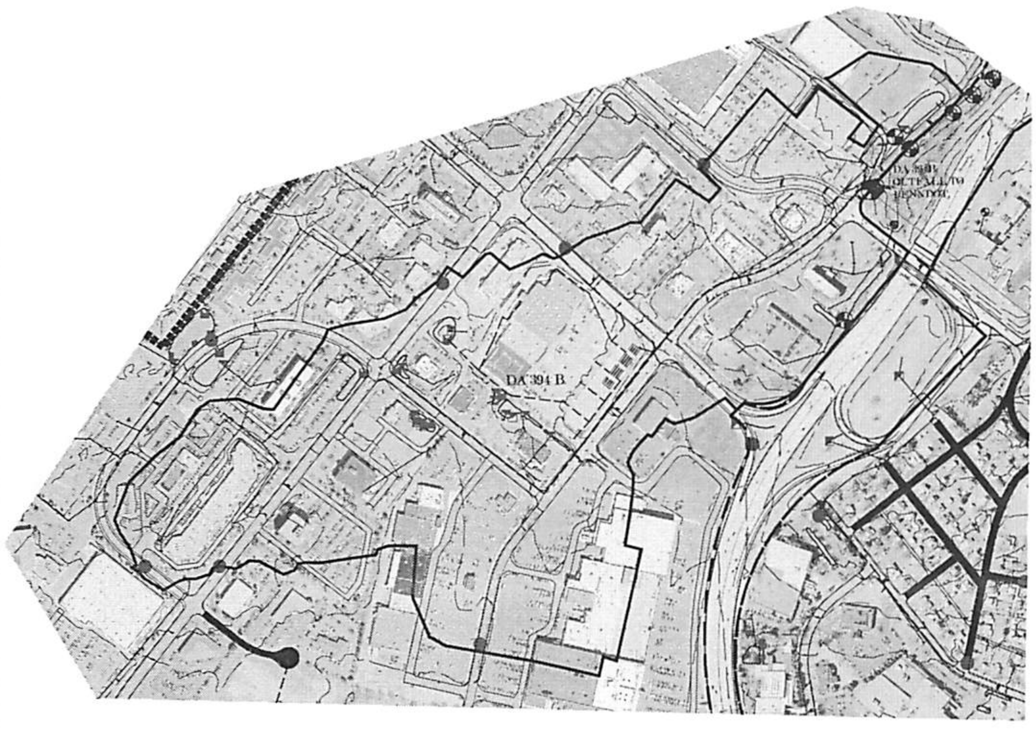
DRAINAGE AREA 394 A
" MS4 STORMWATER MAP "

DRAFT

DESIGN BY: AMK/JMB	CHK'D BY: JB
DRAWN BY: JCM	SCALE: 1"=200'
	SHEET NO. 1 OF 12
	PLAN NO. MS4 MAP - P01

Client: BOROUGH OF WYOMISSING
Location: WYOMISSING BOROUGH, BERKS COUNTY, PA



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- EXISTING JUNCTION BOX
- EXISTING CONTOURS
- EXISTING OUTFALL LOCATION
- EXISTING HIGH POINT
- EXISTING WATER FLOW LINE
- EXISTING MUNICIPAL BOUNDARY
- EXISTING DRAINAGE AREA BOUNDARY
- EXISTING POLLUTANT PLANNING AREA

TOTAL DRAINAGE AREA = 112.88 ACRES
TOTAL IMPERVIOUS AREA = 76.71 ACRES
IMPERVIOUS AREA = 67.96%
PHOSPHORUS LOADING = 200.08 LBS/YEAR
NITROGEN LOADING = 3972.00 LBS/YEAR

GRAPHIC SCALE 1" = 200'

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DRAINAGE AREA 394 B
" MS4 STORMWATER MAP "

DRAFT

Client: BOROUGH OF WYOMISSING
Location: WYOMISSING BOROUGH, BERKS COUNTY, PA
Date: JANUARY 30, 2017

Drawn By: AMK/JMB	Field: JB
Principal: JCM	Scale: 1"=200'
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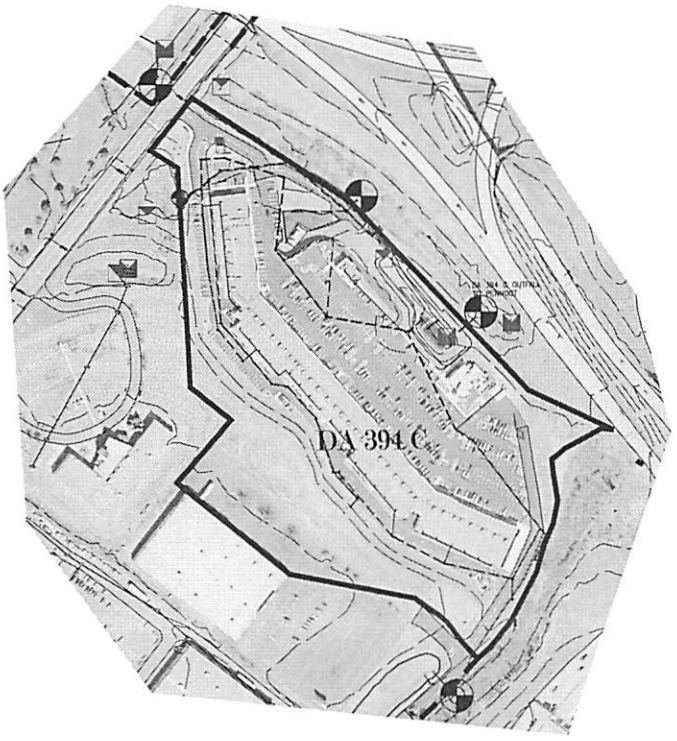
Plan No. MS4 MAP - P02	



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- EXISTING JUNCTION BOX
- EXISTING CONTOURS
- EXISTING OUTFALL LOCATION
- EXISTING HIGH POINT
- EXISTING WATER FLOW LINE
- EXISTING SUBACTIVE BOUNDARY
- EXISTING DRAINAGE AREA BOUNDARY
- EXISTING PERVIOUS PLANNING AREA

TOTAL DRAINAGE AREA = 15.97 ACRES
TOTAL IMPERVIOUS AREA = 10.47 ACRES
IMPERVIOUS AREA = 65.56%
PHOSPHORUS LOADING = 22.45 LBS/YEAR
NITROGEN LOADING = 445.64 LBS/YEAR

GRAPHIC SCALE
1" = 100'
0 100' 300'

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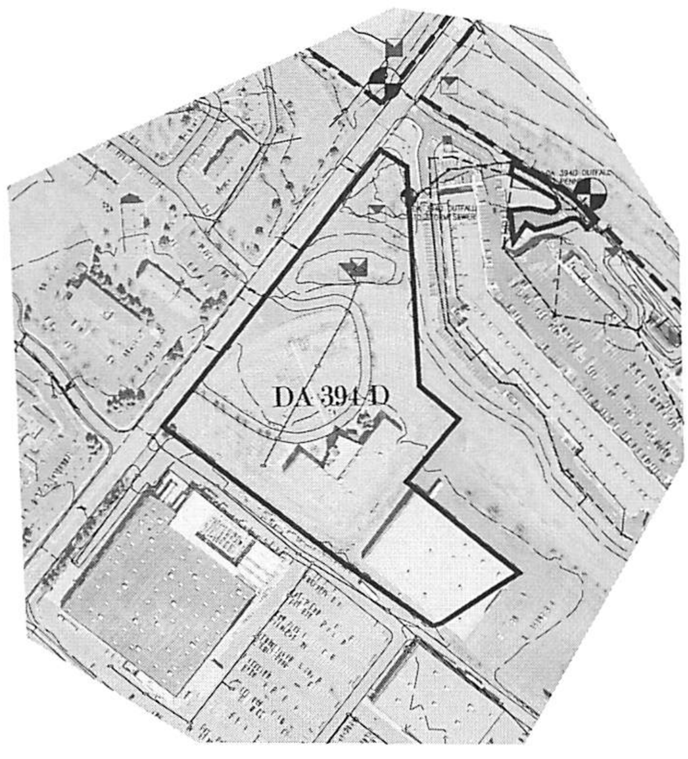
DRAINAGE AREA 394 C
" MS4 STORMWATER MAP "

Drawn by: AJK/JMB	Date: JB
Checked by: JCM	Scale: 1" = 100'
	Sheet No. 3 OF 12
	File No. MS4 MAP - PG3



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- EXISTING CONTOURS
- EXISTING OUTFALL LOCATION
- EXISTING HIGH POINT
- EXISTING WATER FLOW LINE
- EXISTING MUNICIPAL BOUNDARY
- EXISTING DRAINAGE AREA BOUNDARY
- EXISTING PCA/IDOT PLANNING AREA

TOTAL DRAINAGE AREA = 7.61 ACRES
TOTAL IMPERVIOUS AREA = 5.34 ACRES
IMPERVIOUS AREA = 70.17%
PHOSPHORUS LOADING = 11.51 LBS/YEAR
NITROGEN LOADING = 200.60 LBS/YEAR

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www.McCarthy-Engineering.com
315 East Second Street, Boyertown, PA 19512, Phone: 610.369.3190

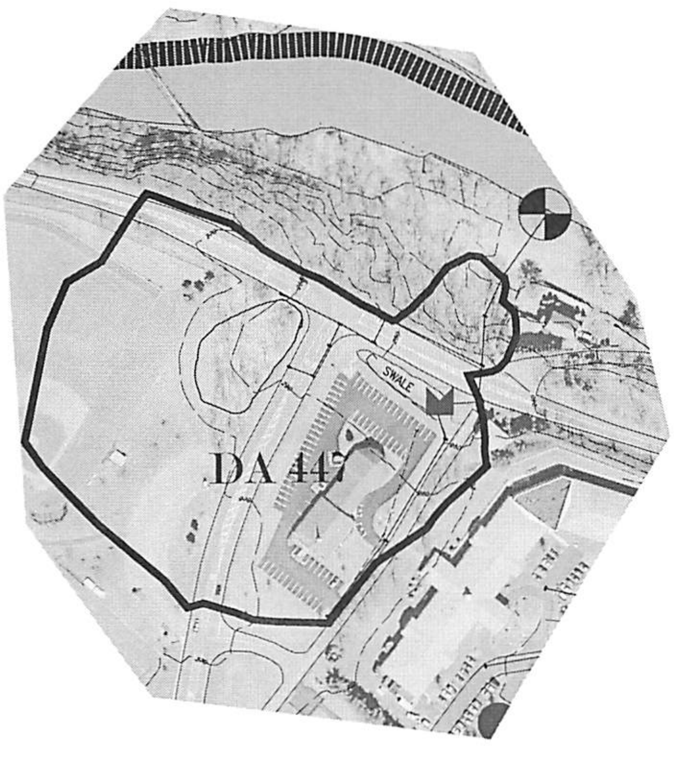
DRAINAGE AREA 394 D
" MS4 STORMWATER MAP "

DRAFT

Client: BOROUGH OF WYOMISSING
Location: WYOMISSING BOROUGH, BERKS COUNTY, PA
Date: JANUARY 30, 2017

DRAWN BY: AMK/JMB	FIELD ENGINEER: JB
PRINCIPAL: JCM	SCALE: 1"=100'
SHEET NO. 4 OF 12	
PLAN NO. MS4 MAP-P04	

GRAPHIC SCALE 1" = 100'
0 100' 200' 300'



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- EXISTING WATER FLOW LINE
- EXISTING MUNICIPAL BOUNDARY
- EXISTING DRAINAGE AREA BOUNDARY
- EXISTING POLLUTANT PLANNING AREA

TOTAL DRAINAGE AREA = 6.72 ACRES
TOTAL IMPERVIOUS AREA = 2.37 ACRES
IMPERVIOUS AREA = 35.27%
PHOSPHORUS LOADING = 5.29 LBS/YEAR
NITROGEN LOADING = 129.37 LBS/YEAR

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DRAINAGE AREA 447
" MS4 STORMWATER MAP "

DRAFT

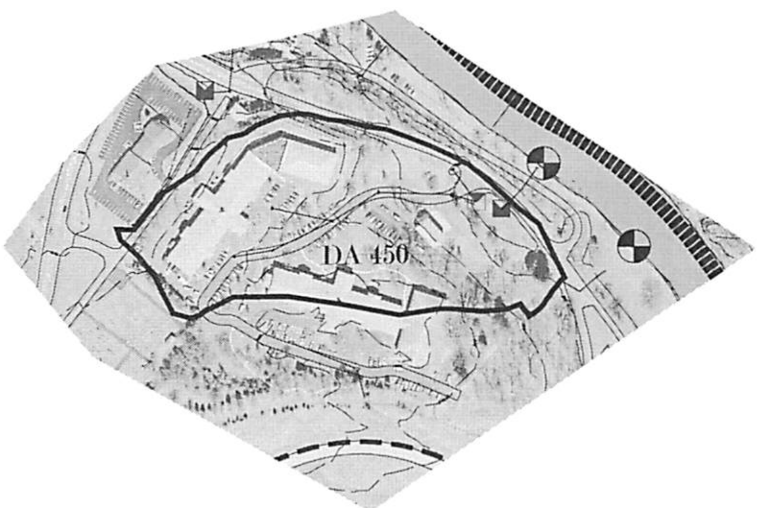
Client: BOROUGH OF WYOMISSING
Location: WYOMISSING BOROUGH, BERKS COUNTY, PA
Date: JANUARY 10, 2017

AMK/JWB	JB
JCM	1"=100'

5 OF 12

MS4 MAP - P05

GRAPHIC SCALE 1" = 100'



GENERAL NOTES:

1. THIS PLAN WAS PREPARED AS A SHEET TO THE FORMAL SUBMISSION OF A SET OF PLANS FOR STORMWATER IN THE BOROUGH OF WYOMISSING.
2. THE BOUNDARY AND TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED ON GEOSPATIAL DATA FROM THE COUNTY OF BERKS, PENNSYLVANIA SPATIAL DATA ACCESS (PASDA) AND FEMA. THIS SHOULD NOT BE CONSTRUED AS A FIELD SURVEY.
3. ALL EXISTING UNDERGROUND UTILITIES SHOWN HAVE BEEN FIELD VERIFIED WITH THE BOROUGH.
4. ALL LABELS FOR EXISTING FEATURE ARE SLANTED AND ALL PROPOSED FEATURES ARE STRAIGHT.

SHEET NOTES:

1. THE BOROUGH OF WYOMISSING IS ENTIRELY WITHIN THE 2010 URBANIZED AREA AS DETERMINED BY THE U.S. CENSUS.

LEGEND:

- EXISTING STORM SEWER & CATCH BASIN
- EXISTING JUNCTION BOX
- EXISTING CONTOURS
- EXISTING OUTFALL LOCATION
- EXISTING HIGH POINT
- EXISTING WATER FLOW LINE
- EXISTING MUNICIPAL BOUNDARY
- EXISTING DRAINAGE AREA BOUNDARY
- EXISTING POLLUTANT PLANNING AREA

TOTAL DRAINAGE AREA = 7.82 ACRES
TOTAL IMPERVIOUS AREA = 2.86 ACRES
IMPERVIOUS AREA = 36.57%
PHOSPHORUS LOADING = 10.19 LBS/YEAR
NITROGEN LOADING = 246.61 LBS/YEAR

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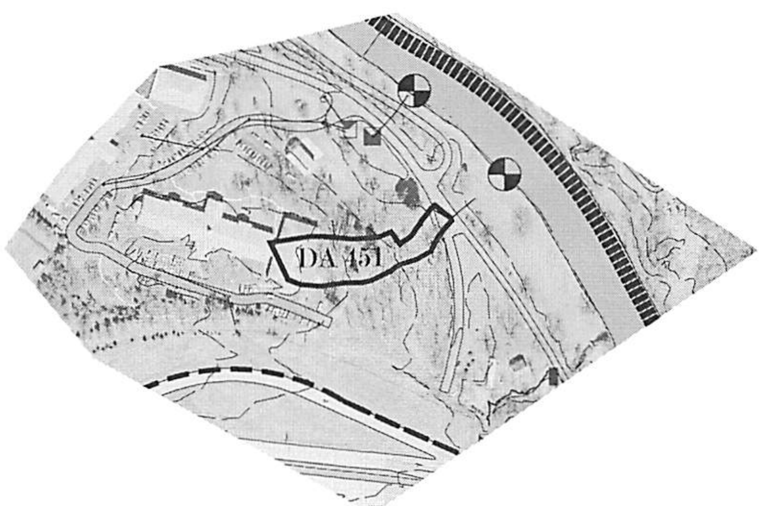
315 East Second Street, Boyertown, PA 19512, Phone: 610.364.3190

DRAINAGE AREA 450
" MS4 STORMWATER MAP "

DRAFT

Client: BOROUGH OF WYOMISSING
Location: WYOMISSING BOROUGH, BERKS COUNTY, PA
Date: JANUARY 10, 2017

AMK/JWB	JB
JCM	1"=100'
6 OF 12	
MS4 MAP-P06	



VICINITY MAP

GENERAL NOTES:

1. THIS PLAN WAS PREPARED AS A SHEET TO THE FORMAL SUBMISSION OF A SET OF PLANS FOR STORMSHEDS IN THE BOROUGH OF WYOMISSING.
2. THE BOUNDARY AND TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED ON GEOSPATIAL DATA FROM THE COUNTY OF BERKS, PENNSYLVANIA SPATIAL DATA ACCESS (PASDA) AND FEMA. THIS SHOULD NOT BE CONSTRUED AS A FIELD SURVEY.
3. ALL EXISTING UNDERGROUND UTILITIES SHOWN HAVE BEEN FIELD VERIFIED WITH THE BOROUGH.
4. ALL LABELS FOR EXISTING FEATURE ARE SLANTED AND ALL PROPOSED FEATURES ARE STRAIGHT.

SHEET NOTES:

1. THE BOROUGH OF WYOMISSING IS ENTIRELY WITHIN THE 2010 URBANIZED AREA AS DETERMINED BY THE U.S. CENSUS.

LEGEND:

- EXISTING STORM SEWER & CATCH BASIN
- EXISTING JUNCTION BOX
- EXISTING CONTOURS
- EXISTING OUTFALL LOCATION
- EXISTING HIGH POINT
- EXISTING WATER FLOW LINE
- EXISTING MUNICIPAL BOUNDARY
- EXISTING DRAINAGE AREA BOUNDARY
- EXISTING PEMADOT PLANNING AREA

TOTAL DRAINAGE AREA = 0.84 ACRES
TOTAL IMPERVIOUS AREA = 0.24 ACRES
IMPERVIOUS AREA = 28.57%
PHOSPHORUS LOADING = 1.13 LBS/YEAR
NITROGEN LOADING = 29.25 LBS/YEAR

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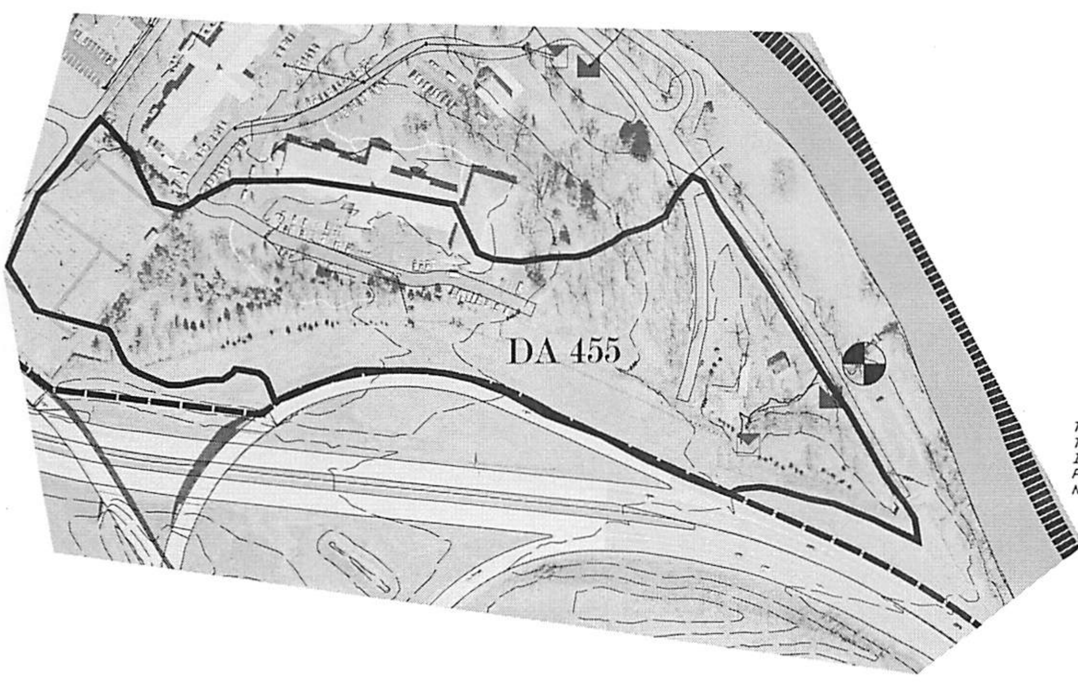
DRAINAGE AREA 451
" MS4 STORMWATER MAP "
DRAFT

Client: BOROUGH OF WYOMISSING
Location: WYOMISSING BOROUGH, BERKS COUNTY, PA
Date: JANUARY 10, 2017

AMK/JWB	JB
JCM	1"=100'

SHEET NO. 7 OF 12

PLAN NO. MS4 MAP - P07



GENERAL NOTES:

1. THIS PLAN WAS PREPARED AS A SHEET TO THE FORMAL SUBMISSION OF A SET OF PLANS FOR STORMSHEDS IN THE BOROUGH OF WYOMISSING.
2. THE BOUNDARY AND TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED ON GEOSPATIAL DATA FROM THE COUNTY OF BERKS, PENNSYLVANIA SPATIAL DATA ACCESS (PASDA) AND FEMA. THIS SHOULD NOT BE CONSTRUED AS A FIELD SURVEY.
3. ALL EXISTING UNDERGROUND UTILITIES SHOWN HAVE BEEN FIELD VERIFIED WITH THE BOROUGH.
4. ALL LABELS FOR EXISTING FEATURE ARE SLANTED AND ALL PROPOSED FEATURES ARE STRAIGHT.

SHEET NOTES:

1. THE BOROUGH OF WYOMISSING IS ENTIRELY WITHIN THE 2010 URBANIZED AREA AS DETERMINED BY THE U.S. CENSUS.

LEGEND:

- EXISTING STORM SEWER & CATCH BASIN
- EXISTING JUNCTION BOX
- EXISTING CONTOURS
- EXISTING OUTFALL LOCATION
- EXISTING HIGH POINT
- EXISTING WATER FLOW LINE
- EXISTING MUNICIPAL BOUNDARY
- EXISTING DRAINAGE AREA BOUNDARY
- EXISTING PCNOOT PLANNING AREA

TOTAL DRAINAGE AREA = 11.54 ACRES
TOTAL IMPERVIOUS AREA = 1.70 ACRES
IMPERVIOUS AREA = 14.73%
PHOSPHORUS LOADING = 7.42 LBS/YEAR
NITROGEN LOADING = 218.53 LBS/YEAR

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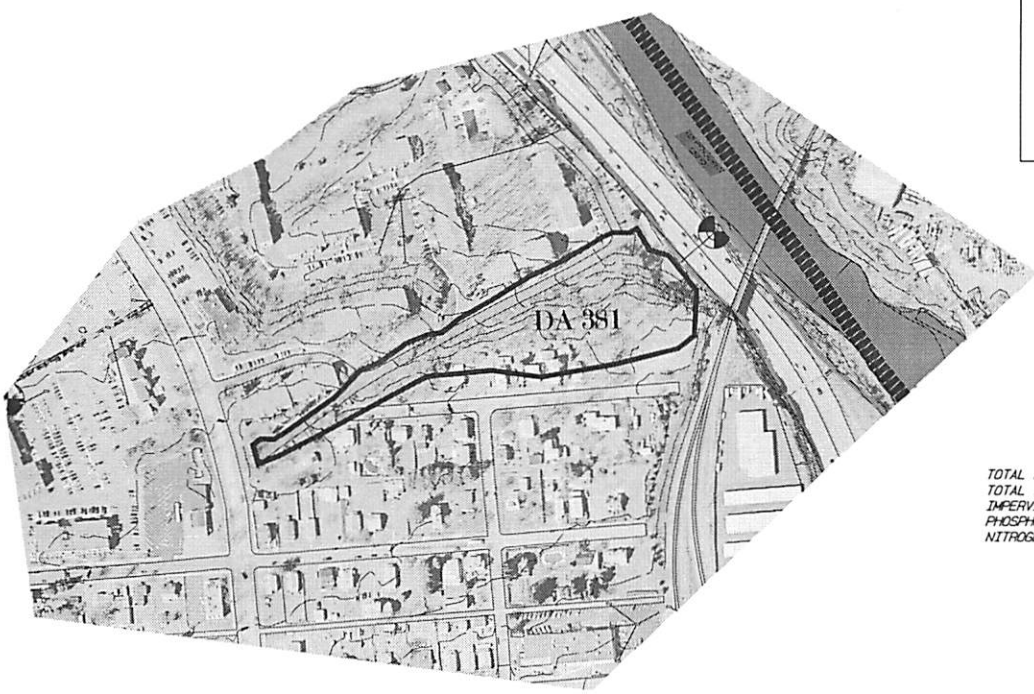
DRAINAGE AREA 455
" MS4 STORMWATER MAP "
DRAFT

Client: BOROUGH OF WYOMISSING
Location: WYOMISSING BOROUGH, BERKS COUNTY, PA
Date: JANUARY 10, 2017

AMK/JMB	JB
JCM	1"=100'

8 OF 12

MS4 MAP - P08



VICINITY MAP

GENERAL NOTES:

1. THIS PLAN WAS PREPARED AS A SHEET TO THE FORMAL SUBMISSION OF A SET OF PLANS FOR STORMSHEDS IN THE BOROUGH OF WYOMISSING.
2. THE BOUNDARY AND TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED ON GEOSPATIAL DATA FROM THE COUNTY OF BERKS, PENNSYLVANIA SPATIAL DATA ACCESS (PASDA) AND FEMA. THIS SHOULD NOT BE CONSTRUED AS A FIELD SURVEY.
3. ALL EXISTING UNDERGROUND UTILITIES SHOWN HAVE BEEN FIELD VERIFIED WITH THE BOROUGH.
4. ALL LABELS FOR EXISTING FEATURE ARE SLANTED AND ALL PROPOSED FEATURES ARE STRAIGHT.

SHEET NOTES:

1. THE BOROUGH OF WYOMISSING IS ENTIRELY WITHIN THE 2010 URBANIZED AREA AS DETERMINED BY THE U.S. CENSUS.

LEGEND:

- EXISTING STORM SEWER & CATCH BASIN
- EXISTING JUNCTION BOX
- EXISTING CONTOURS
- EXISTING OUTFALL LOCATION
- EXISTING HIGH POINT
- EXISTING WATER FLOW LINE
- EXISTING MUNICIPAL BOUNDARY
- EXISTING DRAINAGE AREA BOUNDARY
- EXISTING POWDOOT PLANNING AREA

TOTAL DRAINAGE AREA = 3.80 ACRES
TOTAL IMPERVIOUS AREA = 1.00 ACRES
IMPERVIOUS AREA = 54.55%
PHOSPHORUS LOADING = 5.00 LBS/YEAR
NITROGEN LOADING = 132.07 LBS/YEAR

GRAPHIC SCALE 1" = 100'
0 100' 200' 300'

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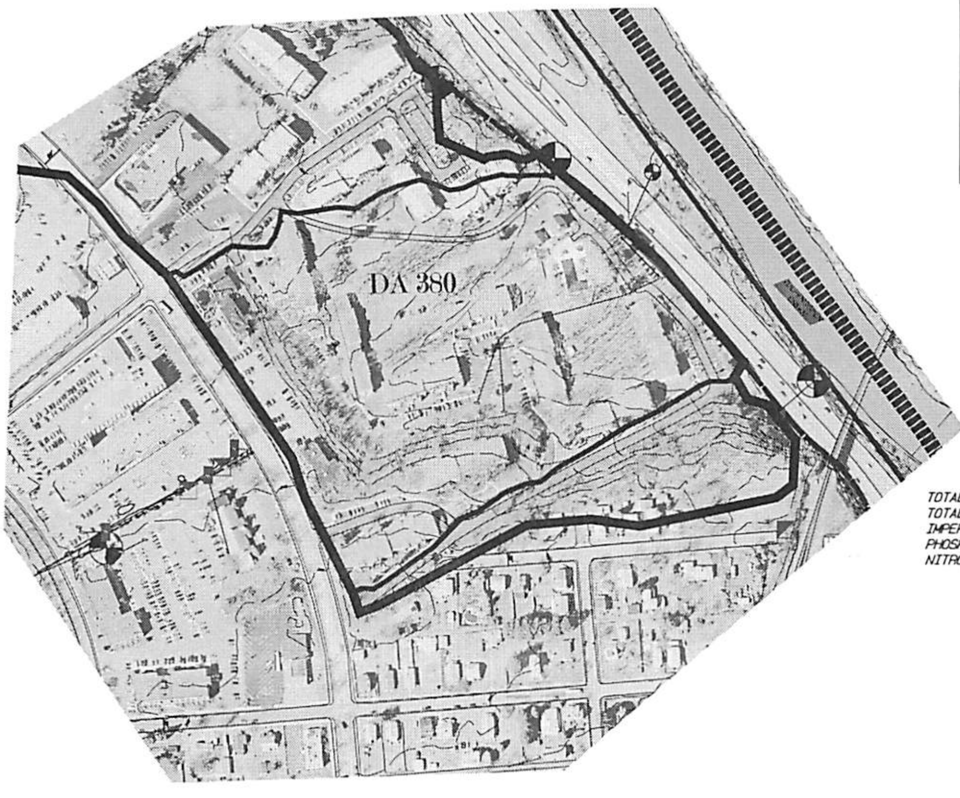
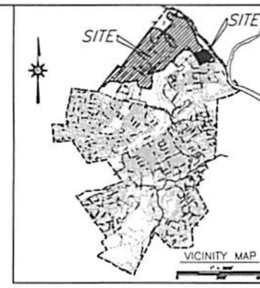
DRAINAGE AREA 381
" MS4 STORMWATER MAP "

Client: BOROUGH OF WYOMISSING
Location: WYOMISSING BOROUGH, BERKS COUNTY, PA
Date: JANUARY 10, 2017

Drawn by: AAK/JWB | Plan reviewed: JB
Checked: JCM | Scale: 1"=100'
SHEET NO. 9 OF 12
PLAN NO. MS4 MAP - P09





GENERAL NOTES:

1. THIS PLAN WAS PREPARED AS A SHEET TO THE FORMAL SUBMISSION OF A SET OF PLANS FOR STORMSHEDS IN THE BOROUGH OF WYOMISSING.
2. THE BOUNDARY AND TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED ON GEOSPATIAL DATA FROM THE COUNTY OF BERKS, PENNSYLVANIA SPATIAL DATA ACCESS (PASDA) AND PEMA. THIS SHOULD NOT BE CONSTRUED AS A FIELD SURVEY.
3. ALL EXISTING UNDERGROUND UTILITIES SHOWN HAVE BEEN FIELD VERIFIED WITH THE BOROUGH.
4. ALL LABELS FOR EXISTING FEATURE ARE SLANTED AND ALL PROPOSED FEATURES ARE STRAIGHT.

SHEET NOTES:

1. THE BOROUGH OF WYOMISSING IS ENTIRELY WITHIN THE 2010 URBANIZED AREA AS DETERMINED BY THE U.S. CENSUS.

LEGEND:

- EXISTING STORM SEWER & CATCH BASIN
- EXISTING JUNCTION BOX
- EXISTING CONTOURS
- EXISTING OUTFALL LOCATION
- EXISTING HIGH POINT
- EXISTING WATER FLOW LINE
- EXISTING MUNICIPAL BOUNDARY
- EXISTING DRAINAGE AREA BOUNDARY
- EXISTING PEMDOT PLANNING AREA

TOTAL DRAINAGE AREA = 16.68 ACRES
TOTAL IMPERVIOUS AREA = 9.96 ACRES
IMPERVIOUS AREA = 59.71%
PHOSPHORUS LOADING = 27.08 LBS/YEAR
NITROGEN LOADING = 525.16 LBS/YEAR

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DRAINAGE AREA 380
" MS4 STORMWATER MAP "

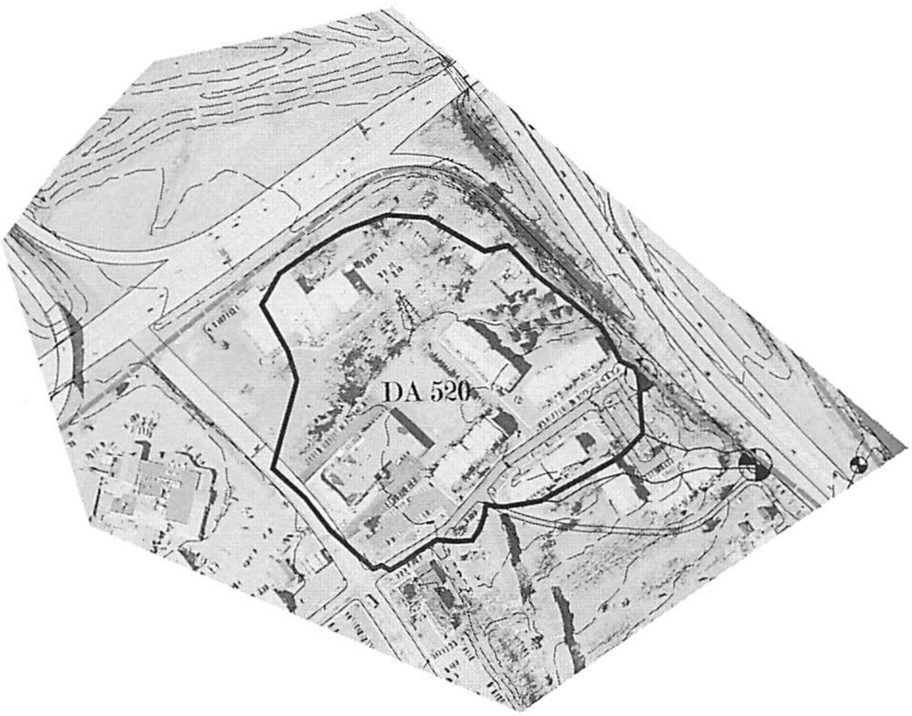
Client: BOROUGH OF WYOMISSING
Location: WYOMISSING BOROUGH, BERKS COUNTY, PA
Date: JANUARY 10, 2017

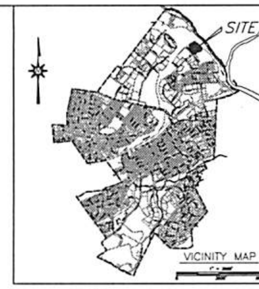
AWK/JWB	JB
JCM	1"=100'

10 OF 12

MS4 MAP - P10

GRAPHIC SCALE
1" = 100'
0 100' 200' 300'





GENERAL NOTES:

1. THIS PLAN WAS PREPARED AS A SHEET TO THE FORMAL SUBMISSION OF A SET OF PLANS FOR STORMSHEDS IN THE BOROUGH OF WYOMISSING.
2. THE BOUNDARY AND TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED ON GEOSPATIAL DATA FROM THE COUNTY OF BERKS, PENNSYLVANIA SPATIAL DATA ACCESS (PASDA) AND FEMA. THIS SHOULD NOT BE CONSTRUED AS A FIELD SURVEY.
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SHEET NOTES:

1. THE BOROUGH OF WYOMISSING IS ENTIRELY WITHIN THE 2010 URBANIZED AREA AS DETERMINED BY THE U.S. CENSUS.

LEGEND:

- EXISTING STORM SEWER & CATCH BASIN
- EXISTING JUNCTION BOX
- EXISTING CONTOURS
- EXISTING OUTFALL LOCATION
- EXISTING HIGH POINT
- EXISTING WATER FLOW LINE
- EXISTING MUNICIPAL BOUNDARY
- EXISTING DRAINAGE AREA BOUNDARY
- EXISTING POINT PLANNING AREA

TOTAL DRAINAGE AREA = 11.12 ACRES
TOTAL IMPERVIOUS AREA = 6.46 ACRES
IMPERVIOUS AREA = 58.09%
PHOSPHORUS LOADING = 19.17 LBS/YEAR
NITROGEN LOADING = 396.33 LBS/YEAR

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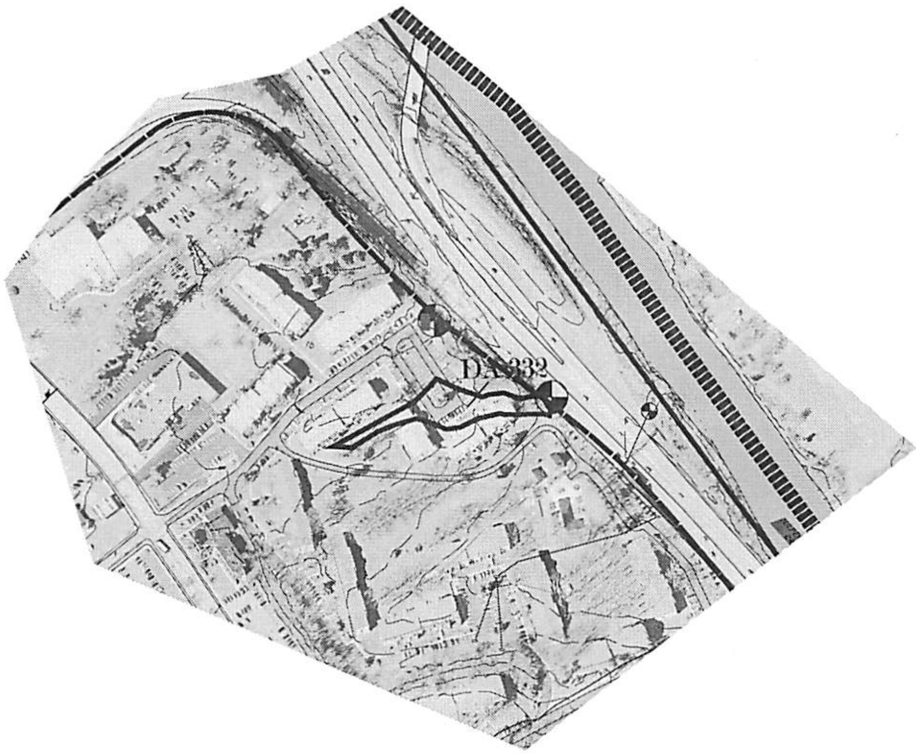
DRAINAGE AREA 520
" MS4 STORMWATER MAP "

Client: BOROUGH OF WYOMISSING
Location: WYOMISSING BOROUGH, BERKS COUNTY, PA
Date: JANUARY 10, 2017

AMK/JMB	JB
JCM	1"=100'
11 OF 12	
MS4 MAP -P11	

GRAPHIC SCALE 1" = 100'
0 100' 200' 300'



VICINITY MAP

GENERAL NOTES:

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2. THE BOUNDARY AND TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED ON GEOSPATIAL DATA FROM THE COUNTY OF BERKS, PENNSYLVANIA SPATIAL DATA ACCESS (PASDA) AND FEMA. THIS SHOULD NOT BE CONSTRUED AS A FIELD SURVEY.
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4. ALL LABELS FOR EXISTING FEATURE ARE SLANTED AND ALL PROPOSED FEATURES ARE STRAIGHT.

SHEET NOTES:

1. THE BOROUGH OF WYOMISSING IS ENTIRELY WITHIN THE 2010 URBANIZED AREA AS DETERMINED BY THE U.S. CENSUS.

LEGEND:

- EXISTING STORM SEWER & CATCH BASIN
- EXISTING JUNCTION BOX
- EXISTING CONTOURS
- EXISTING OUTFALL LOCATION
- EXISTING HIGH POINT
- EXISTING WATER FLOW LINE
- EXISTING MUNICIPAL BOUNDARY
- EXISTING DRAINAGE AREA BOUNDARY
- EXISTING POINCOT PLANNING AREA

TOTAL DRAINAGE AREA = 0.55 ACRES
TOTAL IMPERVIOUS AREA = 0.30 ACRES
IMPERVIOUS AREA = 54.55%
PHOSPHORUS LOADING = 0.92 LBS/YEAR
NITROGEN LOADING = 19.55 LBS/YEAR

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DRAINAGE AREA 332
" MS4 STORMWATER MAP "
DRAFT

Client: BOROUGH OF WYOMISSING
Location: WYOMISSING BOROUGH, BERKS COUNTY, PA
Date: JANUARY 10, 2017

AMK/JMB	JB
JCM	1"=100'
12 OF 12	
MS4 MAP -P12	

GRAPHIC SCALE 1" = 100'

Tulpehocken Creek
Pollution Reduction Plan

Wyomissing Borough
Berks County, Pennsylvania

APPENDIX B

SEDIMENT LOADING CALCULATIONS

Wyomissing Borough
Sewershed Area and Pollutant Loading Summary

No.	Sewershed	Total Area (AC)	Impervious Area (Ac)	Pevious Area (Ac)	Existing BMP (Y/N)	TP Loading (lbs/yr)	TN Loading (lbs/yr)
1	455	11.5	1.7	9.8	Y	7.42	218.53
2	451	0.8	0.2	0.6	N	1.13	29.25
3	450	7.8	2.9	5.0	Y	10.19	260.32
4	447	6.7	2.4	4.4	y	5.29	129.37
5	332	0.6	0.3	0.3	N	0.92	19.55
6	381	3.8	1.0	2.8	N	5.00	132.07
7	380	16.7	10.0	6.7	N	27.08	525.16
8	394d	7.6	5.3	2.3	Y	11.51	200.60
9	394c	16.0	10.5	5.5	y	22.45	445.64
10	394b	112.9	76.7	36.2	Y	200.08	3,972.00
11	520	11.1	6.5	4.7	N	19.17	396.33
12	394a	107.0	68.2	38.7	Y	171.32	3,551.00
	Totals	**302.5**	**185.6**	**116.9**		**481.56**	**9,879.82**

Tulpehocken Creek
Pollution Reduction Plan

Wyomissing Borough
Berks County, Pennsylvania

APPENDIX C

REFERENCES

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
STORMWATER DISCHARGES FROM
SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS
BMP EFFECTIVENESS VALUES

This table of BMP effectiveness values (i.e., pollutant removal efficiencies) is intended for use by MS4s that are developing and implementing Pollutant Reduction Plans and TMDL Plans to comply with NPDES permit requirements. The values used in this table generally consider pollutant reductions from both overland flow and reduced downstream erosion, and are based primarily on average values within the Chesapeake Assessment Scenario Tool (CAST) (www.casttool.org). Design considerations, operation and maintenance, and construction sequences should be as outlined in the Pennsylvania Stormwater BMP Manual, Chesapeake Bay Program guidance, or other technical sources. The Department of Environmental Protection (DEP) will update the information contained in this table as new information becomes available. Interested parties may submit information to DEP for consideration in updating this table to DEP's MS4 resource account, RA-EPPAMS4@pa.gov. Where an MS4 proposes a BMP not identified in this document or in Chesapeake Bay Program expert panel reports, other technical resources may be consulted for BMP effectiveness values. Note – TN = Total Nitrogen and TP = Total Phosphorus.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Wet Ponds and Wetlands	20%	45%	60%	A water impoundment structure that intercepts stormwater runoff then releases it to an open water system at a specified flow rate. These structures retain a permanent pool and usually have retention times sufficient to allow settlement of some portion of the intercepted sediments and attached nutrients/toxics. Until recently, these practices were designed specifically to meet water quantity, not water quality objectives. There is little or no vegetation living within the pooled area nor are outfalls directed through vegetated areas prior to open water release. Nitrogen reduction is minimal.
Dry Detention Basins and Hydrodynamic Structures	5%	10%	10%	Dry Detention Ponds are depressions or basins created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Hydrodynamic Structures are devices designed to improve quality of stormwater using features such as swirl concentrators, grit chambers, oil barriers, baffles, micropools, and absorbent pads that are designed to remove sediments, nutrients, metals, organic chemicals, or oil and grease from urban runoff.
Dry Extended Detention Basins	20%	20%	60%	Dry extended detention (ED) basins are depressions created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Dry ED basins are designed to dry out between storm events, in contrast with wet ponds, which contain standing water permanently. As such, they are similar in construction and function to dry detention basins, except that the duration of detention of stormwater is designed to be longer, theoretically improving treatment effectiveness.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Infiltration Practices w/ Sand, Veg.	85%	85%	95%	A depression to form an infiltration basin where sediment is trapped and water infiltrates the soil. No underdrains are associated with infiltration basins and trenches, because by definition these systems provide complete infiltration. Design specifications require infiltration basins and trenches to be built in good soil, they are not constructed on poor soils, such as C and D soil types. Engineers are required to test the soil before approval to build is issued. To receive credit over the longer term, jurisdictions must conduct yearly inspections to determine if the basin or trench is still infiltrating runoff.
Filtering Practices	40%	60%	80%	Practices that capture and temporarily store runoff and pass it through a filter bed of either sand or an organic media. There are various sand filter designs, such as above ground, below ground, perimeter, etc. An organic media filter uses another medium besides sand to enhance pollutant removal for many compounds due to the increased cation exchange capacity achieved by increasing the organic matter. These systems require yearly inspection and maintenance to receive pollutant reduction credit.
Filter Strip Runoff Reduction	20%	54%	56%	Urban filter strips are stable areas with vegetated cover on flat or gently sloping land. Runoff entering the filter strip must be in the form of sheet-flow and must enter at a non-erosive rate for the site-specific soil conditions. A 0.4 design ratio of filter strip length to impervious flow length is recommended for runoff reduction urban filter strips.
Filter Strip Stormwater Treatment	0%	0%	22%	Urban filter strips are stable areas with vegetated cover on flat or gently sloping land. Runoff entering the filter strip must be in the form of sheet-flow and must enter at a non-erosive rate for the site-specific soil conditions. A 0.2 design ratio of filter strip length to impervious flow length is recommended for stormwater treatment urban filter strips.
Bioretention – Raingarden (C/D soils w/ underdrain)	25%	45%	55%	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has an underdrain and is in C or D soil.
Bioretention / Raingarden (A/B soils w/ underdrain)	70%	75%	80%	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has an underdrain and is in A or B soil.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Bioretention / Raingarden (A/B soils w/o underdrain)	80%	85%	90%	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has no underdrain and is in A or B soil.
Vegetated Open Channels (C/D Soils)	10%	10%	50%	Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed, includes bioswales. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils. This BMP has no underdrain and is in C or D soil.
Vegetated Open Channels (A/B Soils)	45%	45%	70%	Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed, includes bioswales. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils. This BMP has no underdrain and is in A or B soil.
Bioswale	70%	75%	80%	With a bioswale, the load is reduced because, unlike other open channel designs, there is now treatment through the soil. A bioswale is designed to function as a bioretention area.
Permeable Pavement w/o Sand or Veg. (C/D Soils w/ underdrain)	10%	20%	55%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, no sand or vegetation and is in C or D soil.
Permeable Pavement w/o Sand or Veg. (A/B Soils w/ underdrain)	45%	50%	70%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, no sand or vegetation and is in A or B soil.
Permeable Pavement w/o Sand or Veg. (A/B Soils w/o underdrain)	75%	80%	85%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has no underdrain, no sand or vegetation and is in A or B soil.
Permeable Pavement w/ Sand or Veg. (A/B Soils w/ underdrain)	50%	50%	70%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, has sand and/or vegetation and is in A or B soil.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Permeable Pavement w/ Sand or Veg. (A/B Soils w/o underdrain)	80%	80%	85%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has no underdrain, has sand and/or vegetation and is in A or B soil.
Permeable Pavement w/ Sand or Veg. (C/D Soils w/ underdrain)	20%	20%	55%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, has sand and/or vegetation and is in C or D soil.
Stream Restoration	0.075 lbs/ft/yr	0.068 lbs/ft/yr	44.88 lbs/ft/yr	An annual mass nutrient and sediment reduction credit for qualifying stream restoration practices that prevent channel or bank erosion that otherwise would be delivered downstream from an actively enlarging or incising urban stream. Applies to 0 to 3rd order streams that are not tidally influenced. If one of the protocols is cited and pounds are reported, then the mass reduction is received for the protocol.
Forest Buffers	25%	50%	50%	An area of trees at least 35 feet wide on one side of a stream, usually accompanied by trees, shrubs and other vegetation that is adjacent to a body of water. The riparian area is managed to maintain the integrity of stream channels and shorelines, to reduce the impacts of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals. (Note – the values represent pollutant load reductions from stormwater draining through buffers).
Tree Planting	10%	15%	20%	The BMP effectiveness values for tree planting are estimated by DEP. DEP estimates that 100 fully mature trees of mixed species (both deciduous and non-deciduous) provide pollutant load reductions for the equivalent of one acre (i.e., one mature tree = 0.01 acre). The BMP effectiveness values given are based on immature trees (seedlings or saplings); the effectiveness values are expected to increase as the trees mature. To determine the amount of pollutant load reduction that can credited for tree planting efforts: 1) multiply the number of trees planted by 0.01; 2) multiply the acreage determined in step 1 by the pollutant loading rate for the land prior to planting the trees (in lbs/acre/year); and 3) multiply the result of step 2 by the BMP effectiveness values given.
Street Sweeping	3%	3%	9%	Street sweeping must be conducted 25 times annually. Only count those streets that have been swept at least 25 times in a year. The acres associated with all streets that have been swept at least 25 times in a year would be eligible for pollutant reductions consistent with the given BMP effectiveness values.

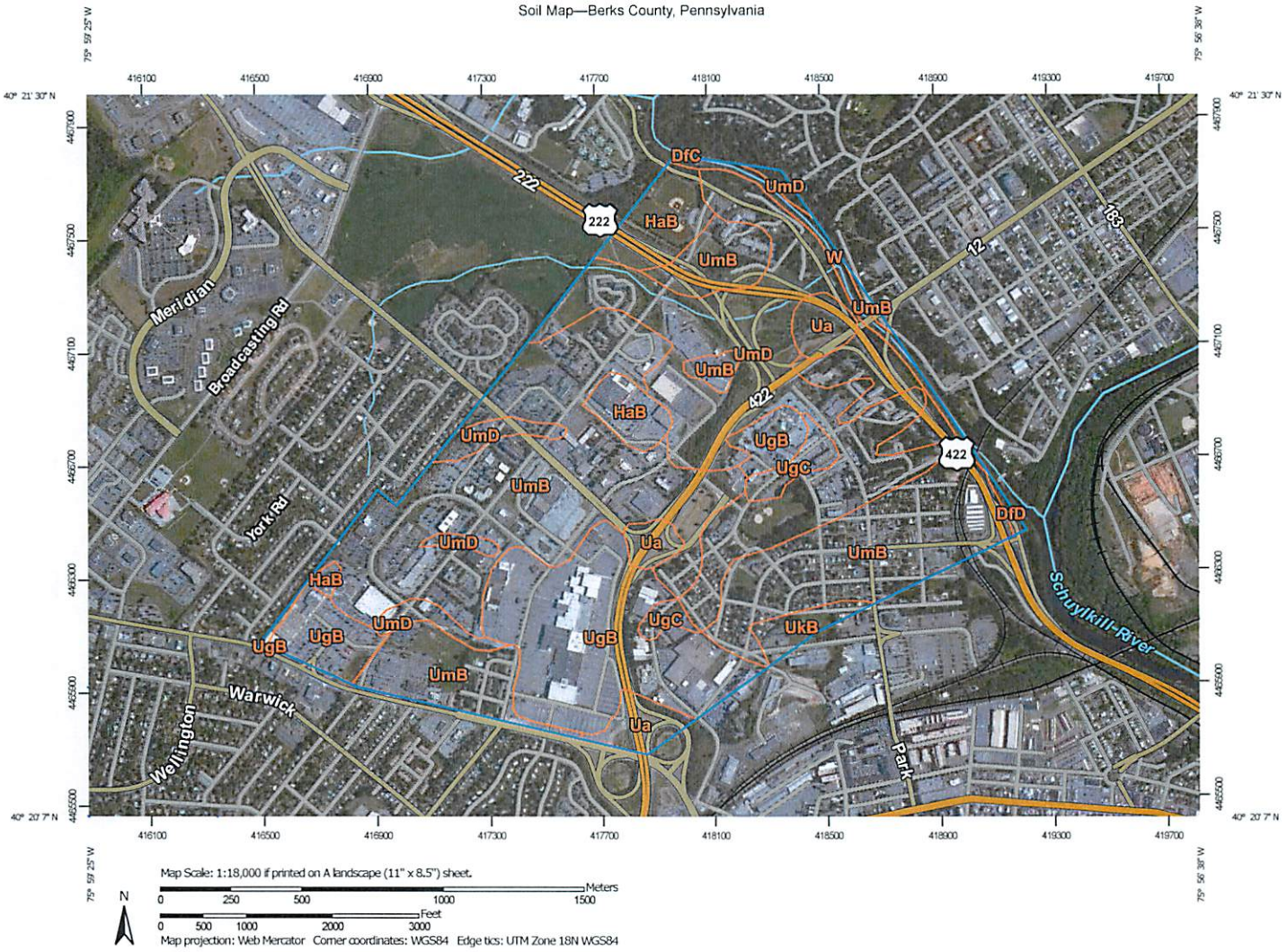
BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Storm Sewer System Solids Removal	0.0027 for sediment, 0.0111 for organic matter	0.0006 for sediment, 0.0012 for organic matter	1 – TN and TP concentrations	This BMP (also referred to as "Storm Drain Cleaning") involves the collection or capture and proper disposal of solid material within the storm system to prevent discharge to surface waters. Examples include catch basins, stormwater inlet filter bags, end of pipe or outlet solids removal systems and related practices. Credit is authorized for this BMP only when proper maintenance practices are observed (i.e., inspection and removal of solids as recommended by the system manufacturer or other available guidelines). The entity using this BMP for pollutant removal credits must demonstrate that they have developed and are implementing a standard operating procedure for tracking the material removed from the sewer system. Locating such BMPs should consider the potential for backups onto roadways or other areas that can produce safety hazards. To determine pollutant reductions for this BMP, these steps must be taken: 1) Measure the weight of solid/organic material collected (lbs). Sum the total weight of material collected for an annual period. Note – do not include refuse, debris and floatables in the determination of total mass collected. 2) Convert the annual wet weight captured into annual dry weight (lbs) by using site-specific measurements (i.e., dry a sample of the wet material to find its weight) or by using default factors of 0.7 (material that is predominantly wet sediment) or 0.2 (material that is predominantly wet organic matter, e.g., leaf litter). 3) Multiply the annual dry weight of material collected by default or site-specific pollutant concentration factors. The default concentrations are shown in the BMP Effectiveness Values columns. Alternatively, the material may be sampled (at least annually) to determine site-specific pollutant concentrations. DEP will allow up to 50% of total pollutant reduction requirements to be met through this BMP. The drainage area treated by this BMP may be no greater than 0.5 acre unless it can be demonstrated that the specific system proposed is capable of treating stormwater from larger drainage areas. For planning purposes, the sediment removal efficiency specified by the manufacturer may be assumed, but no higher than 80%.

ATTACHMENT B

DEVELOPED LAND LOADING RATES FOR PA COUNTIES[1,2,3]

County	Category	Acres	TN lbs/acre/yr	TP lbs/acre/yr	TSS (Sediment) lbs/acre/yr
Adams	impervious developed	10,373.2	33.43	2.1	1,398.77
	pervious developed	44,028.6	22.99	0.8	207.67
Bedford	impervious developed	9,815.2	19.42	1.9	2,034.34
	pervious developed	19,425	17.97	0.68	301.22
Berks	impervious developed	1,292.4	36.81	2.26	1,925.79
	pervious developed	5,178.8	34.02	0.98	264.29
Blair	impervious developed	3,587.9	20.88	1.73	1,813.55
	pervious developed	9,177.5	18.9	0.62	267.34
Bradford	impervious developed	10,423	14.82	2.37	1,880.87
	pervious developed	23,709.7	13.05	0.85	272.25
Cambria	impervious developed	3,237.9	20.91	2.9	2,155.29
	pervious developed	8,455.4	19.86	1.12	325.3
Cameron	impervious developed	1,743.2	18.46	2.98	2,574.49
	pervious developed	1,334.5	19.41	1.21	379.36
Carbon	impervious developed	25.1	28.61	3.97	2,177.04
	pervious developed	54.2	30.37	2.04	323.36
Centre	impervious developed	7,828.2	19.21	2.32	1,771.63
	pervious developed	15,037.1	18.52	0.61	215.84
Chester	impervious developed	1,838.4	21.15	1.46	1,504.78
	pervious developed	10,439.8	14.09	0.36	185.12
Clearfield	impervious developed	9,638.5	17.54	2.78	1,902.9
	pervious developed	17,444.3	18.89	1.05	266.62
Clinton	impervious developed	7,238.5	18.02	2.80	1,856.91
	pervious developed	11,153.8	16.88	0.92	275.81
Columbia	impervious developed	7,343.1	21.21	3.08	1,929.18
	pervious developed	21,848.2	22.15	1.22	280.39
Cumberland	impervious developed	8,774.8	28.93	1.11	2,065.1
	pervious developed	26,908.6	23.29	0.34	306.95
Dauphin	impervious developed	3,482.4	28.59	1.07	1,999.14
	pervious developed	9,405.8	21.24	0.34	299.62
Elks	impervious developed	1,317.7	18.91	2.91	1,556.93
	pervious developed	1,250.1	19.32	1.19	239.85
Franklin	impervious developed	13,832.3	31.6	2.72	1,944.85
	pervious developed	49,908.6	24.37	0.76	308.31
Fulton	impervious developed	3,712.9	22.28	2.41	1,586.75
	pervious developed	4,462.3	18.75	0.91	236.54
Huntington	impervious developed	7,321.9	18.58	1.63	1,647.53
	pervious developed	11,375.4	17.8	0.61	260.15
Indiana	impervious developed	589	19.29	2.79	1,621.25
	pervious developed	972	20.1	1.16	220.68
Jefferson	impervious developed	21.4	18.07	2.76	1,369.63
	pervious developed	20.4	19.96	1.24	198.60
Juniata	impervious developed	3,770.2	22.58	1.69	1,903.96
	pervious developed	8,928.3	17.84	0.55	260.68
Lackawana	impervious developed	2,969.7	19.89	2.84	1,305.05
	pervious developed	7,783.9	17.51	0.76	132.98
Lancaster	impervious developed	4,918.7	38.53	1.55	1,480.43
	pervious developed	21,649.7	22.24	0.36	190.93
Lebanon	impervious developed	1,192.1	40.58	1.85	1,948.53
	pervious developed	5,150	27.11	0.4	269.81
Luzerne	impervious developed	5,857	20.43	3	1,648.22
	pervious developed	13,482.9	19.46	0.98	221.19
Lycoming	impervious developed	10,031.7	16.48	2.57	1,989.64
	pervious developed	19,995.5	16	0.84	277.38

Soil Map—Berks County, Pennsylvania



Map Scale: 1:18,000 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 250 500 1000 1500

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

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 1:24,000.

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: Berks County, Pennsylvania
Survey Area Data: Version 13, Sep 19, 2016

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

Date(s) aerial images were photographed: Mar 19, 2011—Jul 1, 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

Berks County, Pennsylvania (PA011)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
DfC	Duffield-Ryder silt loams, 8 to 15 percent slopes	0.0	0.0%
DfD	Duffield-Ryder silt loams, 15 to 25 percent slopes	1.6	0.2%
HaB	Hagerstown-Duffield silt loams, 3 to 8 percent slopes	36.7	4.9%
Ua	Udorthents	27.7	3.7%
UgB	Urban land, 0 to 8 percent slopes	130.9	17.4%
UgC	Urban land, 8 to 15 percent slopes	12.8	1.7%
UkB	Urban land-Berks complex, 0 to 8 percent slopes	9.5	1.3%
UmB	Urban land-Duffield complex, 0 to 8 percent slopes	340.5	45.2%
UmD	Urban land-Duffield complex, 8 to 25 percent slopes	180.7	24.0%
W	Water	12.6	1.7%
Totals for Area of Interest		**753.1**	**100.0%**

Berks County, Pennsylvania

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

Map Unit Setting

National map unit symbol: l73v
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

Data Source Information

Soil Survey Area: Berks County, Pennsylvania
Survey Area Data: Version 13, Sep 19, 2016

Tulpehocken Creek
Pollution Reduction Plan

Wyomissing Borough
Berks County, Pennsylvania

APPENDIX D

PUBLIC PARTICIPATION