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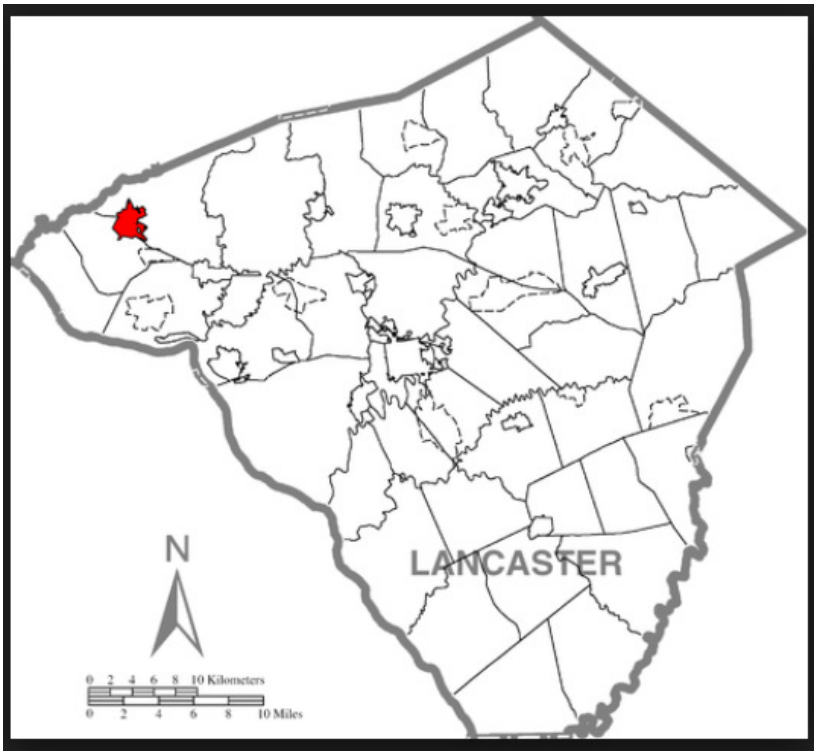
POLLUTANT REDUCTION PLAN

FOR

ELIZABETHTOWN BOROUGH, LANCASTER COUNTY

July 2017



Prepared by:

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Hanover Project ETWN17-12(CBP)

Introduction

Elizabethtown Borough is located in Lancaster County in southcentral Pennsylvania. The community consists of 11,545 residents based on the 2010 census. Elizabethtown Borough is approximately 2.6 square miles in size which includes areas of residential, institutional and commercial development, municipal and state road systems and open space. About 0.38% of the Borough's area is comprised of water. The Borough was designated an MS4 by DEP in 2003 based on population and density. Part of the 2018 MS4 Permit is the preparation of a Pollutant Reduction Plan for Impaired Streams and the Chesapeake Bay TMDL.

A. Public Participation

Public participation is an important component for a successful MS4 program. The enclosed combined Pollutant Reduction Plan for the impaired waters of Conoy Creek and the Chesapeake Bay was published for public review and comment on _____. Notice of the public review period was advertised in the Middletown Press and Journal on _____. A copy of the public notice is provided in Appendix A. The public was provided with 30 days to review and comment on the Pollution Reduction Plan at which point the comments were considered and a copy of the Borough's record of consideration is included in Appendix B. Comments were also accepted at a public meeting held by the Borough on August 17, 2017.

B. Map

A copy of the Borough's MS4 Map including outfalls, delineated watersheds for each outfall and entire stormwater conveyance system is included in Appendix H. A copy of the Land Use Map is provided on the next page.

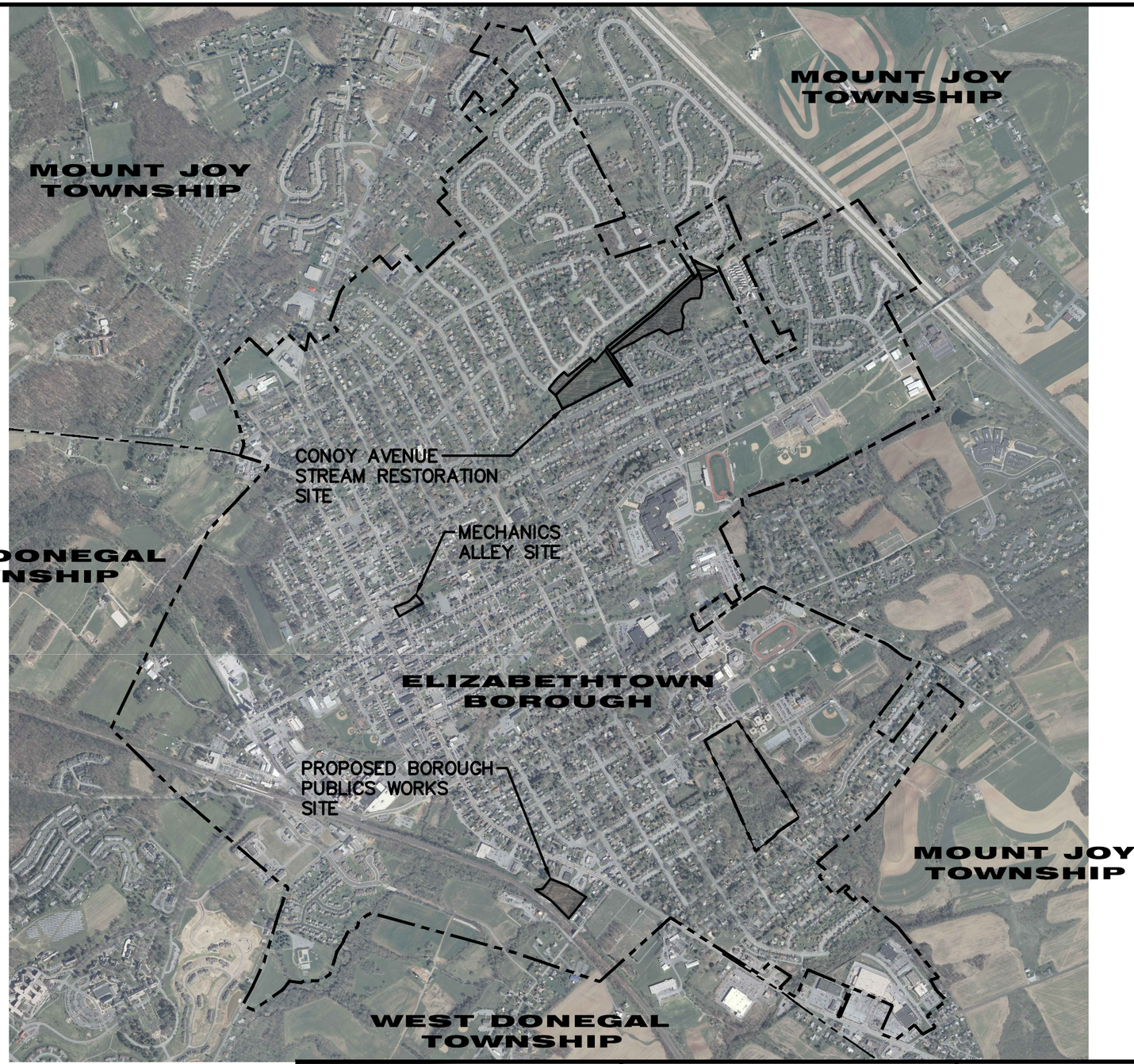
C. Pollutants of Concern

Surface Waters

Areas of Elizabethtown Borough drain to both the Conoy Creek Watershed and Conewago Creek Watershed both of which flow into the Susquehanna River and ultimately into the Chesapeake Bay.

Conewago Creek Watershed

A small area in the northern portion of the Borough along Mount Gretna Road drains north towards an unnamed Tributary to Conewago Creek. The area of the Borough that drains to Conewago Creek is approximately five (5) acres. Conewago Creek has a watershed that is approximately 52.5 square miles in area. The watershed collects runoff from areas in three (3) counties: Lebanon County, Dauphin County and Lancaster County. The Creek ultimately discharges into the main branch of the Susquehanna River near the area of Falmouth in Conoy Township. The main branch of the Conewago Creek is 23 miles long and the mouth of the Conewago Creek is located in Lebanon County at Mount Gretna Heights. Approximately 16 miles of the creek are classified as impaired waters, including multiple tributaries such as Lynch Run, Hoffer Creek and two (2) unnamed tributaries.



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ELIZABETHTOWN BOROUGH
LANCASTER COUNTY
PENNSYLVANIA

PLAN TITLE: LAND USE MAP
PROJECT TITLE: ELIZABETHTOWN BOROUGH CBP

1,500 0 750 1,500
1" =1,500

DRAWN BY: ERK
CHECKED BY: JAP
SCALE: AS NOTED
DATE: 2017 JULY 19
PROJECT NO. ETWN17-12(CBP)
SHEET NO. 01 OF 01

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The Conewago Creek Watershed has a TMDL Plan prepared for PADEP by the Pennsylvania State University Environmental Resources Research Institute dated March 2, 2001, last revised June 27, 2006. The TMDL is related to agriculture. The area of the Borough that drains to the Conewago Creek is residential in nature and PADEP has determined with the 2008 MS4 Permit, Elizabethtown Borough does not have a wasteload allocation under the TMDL.

Conoy Creek Watershed

The Conoy Creek Watershed discharges to the Susquehanna River at the edge of Conoy Township which is west of Elizabethtown Borough. Conoy Creek Watershed originates in Mount Joy Township where it then flows through Elizabethtown Borough, West Donegal Township prior to entering Conoy Township and ultimately discharging into the Susquehanna River. Conoy Creek is listed as having impairments for Pathogens and Siltation (sedimentation).

Pathogens

The urbanized area for the Borough discharges to the Conoy Creek Watershed. Conoy Creek and its unnamed tributaries are listed as having a pathogen impairment from an unknown source. The regulation of pathogen impairments is still being developed and studied. Healthy streams have a certain level of pathogens in them naturally. Currently, under the 2018 MS4 Permit there are no reduction requirements for pathogen impairments, the permit set up is designed to continue to research the pathogens with help and documentation from municipalities over the next five (5) year cycle. The Borough will follow the permit in addressing the noted pathogen impairment through the five (5) year permit cycle as outline by Appendix B of the MS4 Permit.

Susquehanna River Watershed

The Susquehanna River Watershed is approximately 27,100 square miles (17,344,000 acres) in size. The watershed includes areas in New York State, Pennsylvania and Maryland and eventually discharges into the Chesapeake Bay. Tributaries to the Susquehanna River include the Swatara Creek, the Conestoga River, the Chemung River, the Juniata River and more.

The streams in Elizabethtown Borough are not classified as high quality or exceptional value streams/watersheds. Both the Conewago Creek and Conoy Creek drain towards the western edge of Lancaster County and flow into the Susquehanna River. The Conewago Creek intersects the Susquehanna River south of Three Mile Island. The creek mouth is the municipal boundary between Londonderry Township, Dauphin County and Conoy Township, Lancaster County. The Susquehanna River outlets into the Chesapeake Bay in Maryland. The Chesapeake Bay is listed with impairments for nutrients and siltation (sediment).

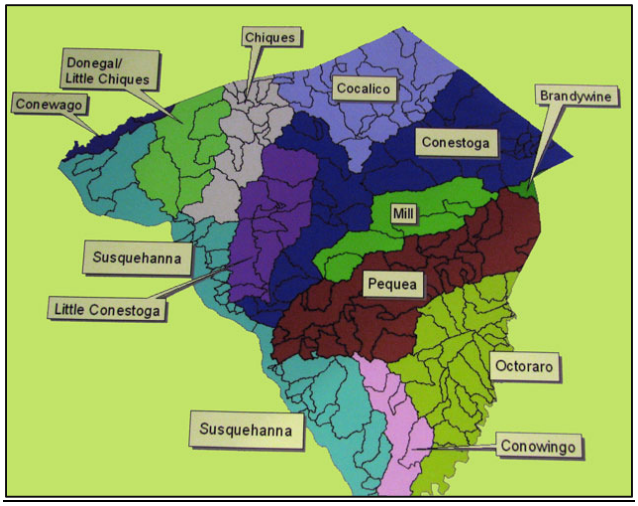

Figure 1. Lancaster County Watershed Map

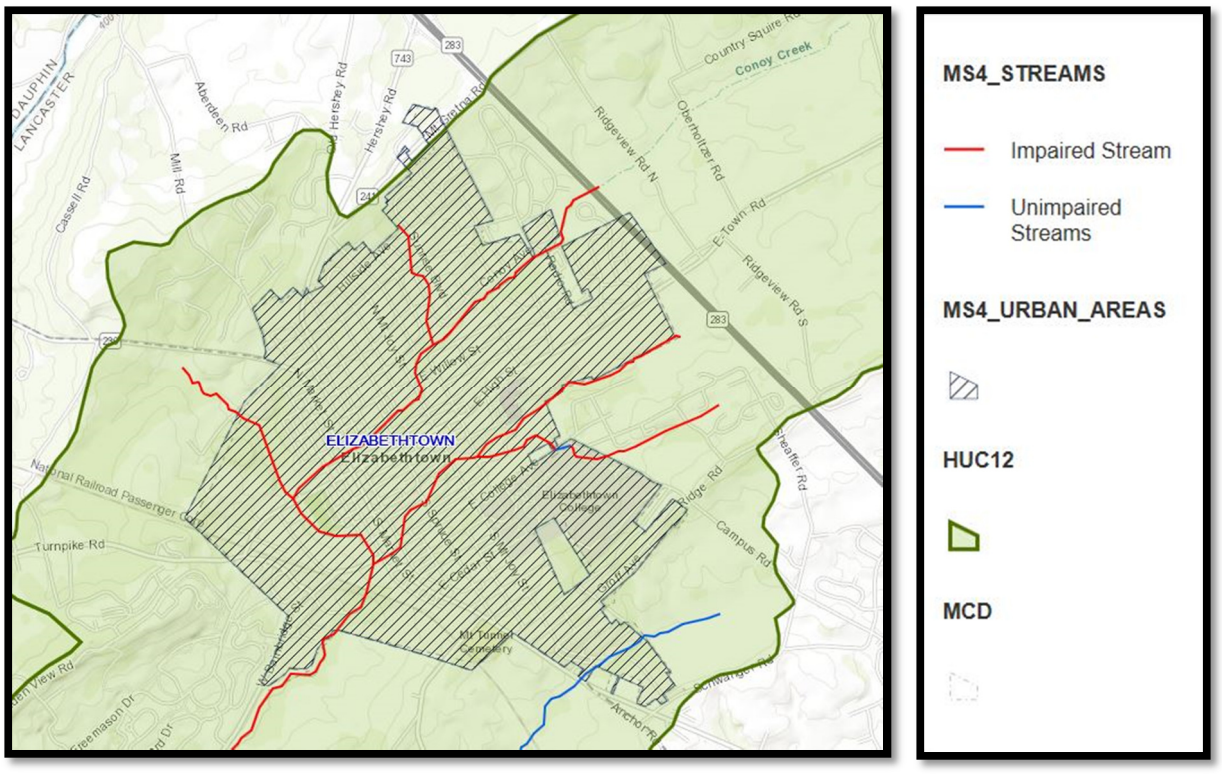

Figure 2. Elizabethtown Borough Conoy Creek Map

D. Existing Loading for Pollutants of Concern

Baseline Study

As required in the 2018 MS4 Permit, a baseline study is to be prepared to establish the existing sediment, phosphorus and nitrogen loads within the Borough's MS4 planning area. As described in Section C, Conoy Creek is listed as an impaired stream which drains to the Susquehanna River and ultimately the Chesapeake Bay. The baseline study and proposed BMPs are located within the drainage areas for Conoy Creek. Per the Pollution Reduction Plan instructions, the BMPs have been placed in areas that will benefit the impaired waters of Conoy Creek.

Methodology

The simplified method was used in the derivation of the baseload calculations for the Borough. The watersheds were delineated based on current PASDA topographical information and the Borough's mapped stormwater sewer system. Each outfall was delineated with a contributing drainage area, the area of the delineated watershed for each outfall system was then analyzed for the amount of impervious and pervious area contributing to the outfall. The watershed impervious vs. pervious area delineation was based on the cover percentages from PADEP's Statewide MS4 Land Cover Estimates in Appendix C. The calculated impervious and pervious areas were then used to determine the base load for each watershed using the Development Land Loading Rates for PA Counties in PADEP Document 3800-PM-BCW0100k last dated 3/2017 (Appendix D). The baseline analysis was for Sediment, Phosphorus and Nitrogen loadings.

Results

The baseline study analyzed 103 outfall watersheds for the Borough of Elizabethtown. Each watershed was examined for the existing Sediment, Phosphorus and Nitrogen. Table 1 in Appendix E calculates the Sediment loading for the planning areas within the Borough. Table 2 analyzes the Phosphorus loading and Table 3 includes the Nitrogen load calculations. The following Figures show the resulting total load for Sediment, Phosphorus and Nitrogen and the associated reductions required to be achieved.

The baseload in pounds for Sediment within the Borough's planning area is 866,226.94 lbs. which per the 2018 Permit is required to be reduced by 10%. The Borough is required to show a reduction in Sediment load of 86,622.69 lbs. over the 5 year permit.

Total Sediment Loading (lbs.)	Required Reduction	Required Lbs. Reduction
866,226.94	10%	86,622.69

The baseload in pounds for Phosphorus within the Borough's planning area is 991.97 lbs. which per the 2018 Permit is required to be reduced by 5%. The Borough is required to show a reduction in Phosphorus load of 49.60 lbs. over the 5 year permit.

Total Phosphorus Loading (lbs.)	Required Reduction	Required Lbs. Reduction
991.97	5%	49.60

The baseload in pounds for Nitrogen within the Borough's planning area is 31,817.79 lbs. which per the 2018 Permit is required to be reduced by 3%. The Borough is required to show a reduction in Nitrogen load of 954.53 lbs. over the 5 year permit.

Total Nitrogen Loading (lbs.)	Required Reduction	Required Lbs. Reduction
31,817.79	3%	954.53

Per the Permit Application Package, permittees are encouraged to select BMPs to achieve the 10% Sediment loading reduction objective, as DEP expects that overall within the Bay Watershed the TP (5%) and TN(3%) goals will be met. The Borough is listed as having the impaired Conoy Creek requirements for Appendix B – Pathogens and Appendix E- Siltation. The Chesapeake Bay impairments are for Appendix D for Nutrients and Siltation. Per the Permit Application the Borough is to focus on the 10% Sediment reduction as the local impaired water has the siltation (sediment) impairment. The 10% reduction requirement for the impaired streams also applies to the overall Chesapeake Bay 10% reduction requirement.

E. Proposed BMPs

In order to meet the required reductions of the Impaired Stream Pollutant Reduction Plan and Chesapeake Bay Pollutant Reduction Plan the Borough has planned for several projects within the Borough. The projects are described in detail in Appendix G. The reduction efficiencies credited for each proposed BMP have been derived from the PA DEP National Pollutant Discharge Elimination System (NPDES) Stormwater Discharges from Small Municipal Separate Storm Sewer Systems BMP Effectiveness Values Table (refer to Appendix F). A summary of proposed BMPs and their reduction capacity is found at the end of Appendix F. The proposed projects include; conversion of a paved municipal parking area to permeable pavers, the relocation of the Borough Maintenance Compound to a new location, construction of a Bioretention Basin to treat the site runoff and the Borough proposes a stream restoration project of Conoy Creek. Below is the summary of the reduction achieved after the above projects are installed in the Borough, the 10% sediment and 5% phosphorus reduction requirements are satisfied and the 2018 permit requirements have been satisfied.

	Prior to BMPs	Post-CBPRP
Required Sediment Load Reduction (lbs.)	86,622.69	-3927.64
Required Phosphorus Load Reduction (lbs.)	49.60	-85.59
Required Nitrogen Load Reduction (lbs.)	954.53	744.79

F. Funding

Mechanics Alley Parking – The Borough applied for grant funding under the 2017 DEP MS4 Grant program. Funding from Borough Funds and possible grant funding through local, state and federal programs.

Borough Maintenance Compound – Funding from Borough Funds and possible grant funding through local, state and federal programs.

Streambank Restoration – Conoy Creek – Funding from Borough Funds and possible grant funding through local, state and federal programs.

G. Operation and Maintenance Responsibilities

The Operation and Maintenance responsibilities are outlined in the specific project descriptions in Appendix G. The Borough will be responsible for maintenance of the permeable pavers proposed at the Mechanics Alley Parking Lot and at the new Maintenance Compound. The Streambank restoration project is planned to be on Borough-owned property. Should the restoration extend onto a privately-owned property the Borough will work with the property owner. The design plans will include the detailed operation and maintenance requirements for the Streambank restoration project.

Summary

Elizabethtown Borough plans to complete the planning, permitting and construction stages of the listed projects starting after DEP's approval of this Chesapeake Bay Pollutant Reduction Plan. With the installation of the projects listed in this plan, the impaired stream reduction requirements have been met and; therefore, the Chesapeake Bay reduction requirements have been met and the Borough will have met the reduction requirements for their 2018-2023 MS4 Permit.

References

1. "Elizabethtown, Pennsylvania." Wikipedia: The Free Encyclopedia. Wikimedia Foundation, Inc. 17 May 2016. Web.

2. "Susquehanna River." Wikipedia: The Free Encyclopedia. Wikimedia Foundation, Inc. 31 May 2016. Web.

3. "Conoy Creek." Wikipedia: The Free Encyclopedia. Wikimedia Foundation, Inc. 9 March 2016. Web.

4. "Conewago Creek (east)." Wikipedia: The Free Encyclopedia. Wikimedia Foundation, Inc. 13 May 2016. Web.

5. Kofroth, Matt. Lancaster Watershed Map. 2010-2015. Donegal Trout Unlimited Website/Lancaster County Conservation District. 2 June 2016. http://www.donegaltu.org/maps.html .

6. Pennsylvania Department of Environmental Protection MS4 Requirements Interactive Map Elizabethtown Borough. Retrieved July 2017. http://www.depgis.state.pa.us/MS4/index.html

7. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.sc.egov.usda.gov/. Accessed [07/15/2017].

Appendix A – Public Notice

Appendix B – Record of Consideration of Public Comment

Appendix C –DEP Simplified Method Land Cover Estimates

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

STATEWIDE MS4 LAND COVER ESTIMATES

The Pennsylvania Department of Environmental Protection (DEP) has developed this table of impervious and pervious land cover percentages within and outside of urbanized areas (UAs) to assist municipal MS4 permittees and applicants in developing estimates of existing pollutant loading for Pollutant Reduction Plans (PRPs) and TMDL Plans. DEP does not require that the data in this table be utilized and offers it only as a possible resource to MS4s. An MS4 may determine based on its own analysis that different percentages of impervious and pervious surfaces exist within the municipality. In addition, this table was developed without consideration to whether a PRP and/or TMDL Plan must be developed by an MS4; the MS4 Requirements Table identifies DEP's expectations for development of a PRP and/or TMDL Plan. In other words, the presence of a municipality in this table does not mean a PRP and/or TMDL Plan must be developed.

For those MS4s that do need to develop a plan, this table may be used to streamline the existing pollutant loading calculation. After determining the planning area (i.e., the storm sewershed(s) that drain to the Chesapeake Bay and/or locally impaired waters), DEP's simplified method of calculating existing pollutant loads as described in its PRP Instructions document calls for the determination of the percentages of impervious and pervious land cover within the planning area. The planning area will consist of the UA (or a portion thereof) and may include areas outside of the UA (if stormwater drains into the MS4 from outside the UA).

An example of how this table can be used is as follows:

Abbottstown Boro determines that its planning area for a Chesapeake Bay PRP is 500 acres. This includes all of the UA (321 acres) as well as 179 acres that drain into the MS4 from outside the UA. Abbottstown would like to determine its existing load of sediment (prior to any consideration of existing structural BMPs). Using Attachment B of DEP's PRP Instructions for sediment loading rates, Abbottstown calculates the following existing load:

321 acres UA x 0.3 (30% UA Impervious from table below) x 1,398.77 lbs/acre/yr =	134,702 lbs/yr
321 acres UA x 0.7 (70% UA Pervious from table below) x 207.67 lbs/acre/yr =	46,663 lbs/yr
179 acres outside UA x 0.28 (28% Outside UA Impervious from table below) x 1,398.77 lbs/acre/yr =	70,106 lbs/yr*
179 acres outside UA x 0.72 (72% Outside UA Pervious from table below) x 207.67 lbs/acre/yr =	26,765 lbs/yr*
Total:	278,236 lbs/yr

* MS4s may also elect to use loading rates for undeveloped land presented in Attachment B of DEP's PRP Instructions for areas outside of the UA.

The column for "UA Acres" in the table may or may not be useful in this calculation. If only a portion of the UA is part of the planning area, the MS4 will need to determine the applicable area using different methods.

DEP developed this table using the following methods:

Cartographic Boundary Shapefiles - Urban Areas 2010 were overlain on NLCD 2011 Land Cover (2011 Edition, amended 2014) - National Geospatial Data Asset (NGDA) Land Use/Land Cover data in order to calculate the percentages in the table. The High, Medium and Low Density Residential and mixed land uses were parsed to account for pervious and impervious surfaces within each land use classification. High Density is considered 87% impervious, Medium Density is 52% impervious, and Low Density is 15% impervious. This analysis was performed for entire municipalities but broken out into areas within the UA and outside of the UA.

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Adams	ABBOTTSTOWN BORO	30%	70%	28%	72%	321.0
Montgomery	ABINGTON TWP	42%	58%	42%	58%	9,922.4
Butler	ADAMS TWP	13%	87%	7%	93%	6,222.3
Cambria	ADAMS TWP	36%	64%	3%	97%	77.4
Westmoreland	ADAMSBURG BORO	27%	73%	18%	82%	103.5
Lancaster	ADAMSTOWN BORO	24%	76%	20%	80%	686.1
Lancaster	AKRON BORO	43%	57%	43%	57%	790.8
Lehigh	ALBURTIS BORO	32%	68%	32%	68%	445.4
Delaware	ALDAN BORO	56%	44%	56%	44%	386.6
Allegheny	ALEPPO TWP	10%	90%	14%	86%	845.5
Beaver	ALIQUIPPA CITY	43%	57%	43%	57%	2,839.0
Blair	ALLEGHENY TWP	36%	64%	11%	89%	3,731.3
Westmoreland	ALLEGHENY TWP	12%	88%	5%	95%	3,894.1
Northampton	ALLEN TWP	12%	88%	8%	92%	2,027.7
Washington	ALLENPORT BORO	31%	69%	8%	92%	279.7
Berks	ALSACE TWP	13%	87%	6%	94%	1,282.6
Blair	ALTOONA CITY	64%	36%	63%	37%	6,196.7
Montgomery	AMBLER BORO	71%	29%	71%	29%	545.2
Beaver	AMBRIDGE BORO	58%	42%	58%	42%	1,113.2
Berks	AMITY TWP	21%	79%	12%	88%	4,870.4
Washington	AMWELL TWP	20%	80%	3%	97%	105.4
Lebanon	ANNVILLE TWP	34%	66%	34%	66%	979.9
Blair	ANTIS TWP	22%	78%	4%	96%	1,830.5
Franklin	ANTRIM TWP	20%	80%	7%	93%	4,366.4
Armstrong	APOLLO BORO	48%	52%	44%	56%	206.7
Lackawanna	ARCHBALD BORO	41%	59%	11%	89%	1,626.5
Westmoreland	ARNOLD CITY	63%	37%	63%	37%	519.6
Westmoreland	ARONA BORO	14%	86%	15%	85%	286.8
Luzerne	ASHLEY BORO	33%	67%	33%	67%	591.6
Allegheny	ASPINWALL BORO	67%	33%	66%	34%	244.8
Delaware	ASTON TWP	34%	66%	34%	66%	3,735.0
Chester	ATGLEN BORO	26%	74%	21%	79%	359.0
Allegheny	AVALON BORO	47%	53%	47%	53%	436.4
Luzerne	AVOCA BORO	40%	60%	40%	60%	660.7
Chester	AVONDALE BORO	35%	65%	35%	65%	309.0
Beaver	BADEN BORO	25%	75%	25%	75%	1,582.5
Allegheny	BALDWIN BORO	37%	63%	37%	63%	3,764.3
Allegheny	BALDWIN TWP	46%	54%	47%	53%	318.3
Berks	BALLY BORO	49%	51%	48%	52%	330.0
Northampton	BANGOR BORO	37%	63%	37%	63%	979.0
Carbon	BANKS TWP	10%	90%	3%	97%	667.8
Lycoming	BASTRESS TWP	9%	91%	1%	99%	2.4
Northampton	BATH BORO	17%	83%	17%	83%	581.4
Luzerne	BEAR CREEK TWP	2%	98%	2%	98%	44,163.5
Beaver	BEAVER BORO	47%	53%	48%	52%	687.3
Beaver	BEAVER FALLS CITY	46%	54%	43%	57%	1,391.4
Carbon	BEAVER MEADOWS BORO	34%	66%	30%	70%	157.4
Berks	BECHTELSVILLE BORO	26%	74%	26%	74%	321.2
Bucks	BEDMINSTER TWP	13%	87%	6%	94%	1,444.9
Allegheny	BELL ACRES BORO	62%	38%	7%	93%	52.0
Fayette	BELLE VERNON BORO	34%	66%	36%	64%	223.1
Allegheny	BELLEVUE BORO	45%	55%	45%	55%	718.1

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Blair	BELLWOOD BORO	52%	48%	51%	49%	284.6
Allegheny	BEN AVON BORO	42%	58%	42%	58%	284.6
Allegheny	BEN AVON HEIGHTS BORO	14%	86%	15%	85%	110.3
Centre	BENNER TWP	15%	85%	6%	94%	726.6
Bucks	BENSALEM TWP	39%	61%	39%	61%	13,306.6
Washington	BENTLEYVILLE BORO	34%	66%	16%	84%	712.2
Berks	BERN TWP	27%	73%	10%	90%	2,692.3
Adams	BERWICK TWP	15%	85%	7%	93%	372.0
Columbia	BERWICK BORO	51%	49%	51%	49%	1,953.5
Delaware	BETHEL TWP	20%	80%	21%	79%	3,442.6
Allegheny	BETHEL PARK BORO	40%	60%	40%	60%	7,489.0
Northampton	BETHLEHEM CITY	40%	60%	39%	61%	12,356.2
Northampton	BETHLEHEM TWP	34%	66%	30%	70%	7,782.1
Beaver	BIG BEAVER BORO	32%	68%	7%	93%	287.0
Berks	BIRDSBORO BORO	48%	52%	47%	53%	853.3
Chester	BIRMINGHAM TWP	25%	75%	20%	80%	2,732.6
Blair	BLAIR TWP	35%	65%	11%	89%	1,330.7
Lackawanna	BLAKELY BORO	39%	61%	26%	74%	1,525.2
Allegheny	BLAWNOX BORO	43%	57%	44%	56%	283.1
Columbia	BLOOMSBURG TOWN	32%	68%	31%	69%	2,867.3
Carbon	BOWMANSTOWN BORO	40%	60%	26%	74%	274.1
Berks	BOYERTOWN BORO	63%	37%	63%	37%	495.9
Allegheny	BRACKENRIDGE BORO	59%	41%	59%	41%	359.8
Allegheny	BRADDOCK BORO	41%	59%	42%	58%	408.1
Allegheny	BRADDOCK HILLS BORO	27%	73%	28%	72%	626.5
Allegheny	BRADFORD WOODS BORO	14%	86%	14%	86%	588.0
Berks	BRECKNOCK TWP	10%	90%	5%	95%	1,651.6
Lancaster	BRECKNOCK TWP	16%	84%	7%	93%	3,035.7
Allegheny	BRENTWOOD BORO	45%	55%	45%	55%	927.2
Columbia	BRIAR CREEK BORO	27%	73%	19%	81%	408.3
Columbia	BRIAR CREEK TWP	28%	72%	6%	94%	853.8
Montgomery	BRIDGEPORT BORO	70%	30%	69%	31%	457.4
Allegheny	BRIDGEVILLE BORO	50%	50%	50%	50%	703.7
Beaver	BRIDGEWATER BORO	34%	66%	34%	66%	466.7
Beaver	BRIGHTON TWP	15%	85%	9%	91%	4,235.6
Bucks	BRISTOL BORO	45%	55%	45%	55%	1,186.7
Bucks	BRISTOL TWP	39%	61%	40%	60%	10,948.7
Delaware	BROOKHAVEN BORO	47%	53%	47%	53%	1,088.5
Cambria	BROWNSTOWN BORO	36%	64%	36%	64%	149.6
Fayette	BROWNSVILLE BORO	31%	69%	30%	70%	674.9
Fayette	BROWNSVILLE TWP	28%	72%	9%	91%	190.4
Montgomery	BRYN ATHYN BORO	13%	87%	12%	88%	1,236.5
Bucks	BUCKINGHAM TWP	21%	79%	14%	86%	9,780.6
Butler	BUFFALO TWP	11%	89%	5%	95%	2,998.6
Fayette	BULLSKIN TWP	18%	82%	4%	96%	1,540.3
Northampton	BUSHKILL TWP	10%	90%	7%	93%	6,567.9
Adams	BUTLER TWP	41%	59%	3%	97%	44.9
Butler	BUTLER CITY	50%	50%	50%	50%	1,725.8
Luzerne	BUTLER TWP	10%	90%	6%	94%	6,875.7
Lancaster	CAERNARVON TWP	30%	70%	3%	97%	48.3
Washington	CALIFORNIA BORO	34%	66%	11%	89%	1,166.9
Butler	CALLERY BORO	14%	86%	11%	89%	229.2

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Chester	CALN TWP	32%	68%	32%	68%	5,723.4
Cumberland	CAMP HILL BORO	53%	47%	53%	47%	1,343.8
Wayne	CANAAN TWP	3%	97%	3%	97%	12,386.0
Washington	CANONSBURG BORO	52%	48%	52%	48%	1,443.9
Washington	CANTON TWP	18%	82%	12%	88%	5,809.8
Lackawanna	CARBONDALE CITY	36%	64%	36%	64%	2,028.9
Lackawanna	CARBONDALE TWP	29%	71%	4%	96%	522.3
Cumberland	CARLISLE BORO	54%	46%	53%	47%	3,398.9
Allegheny	CARNEGIE BORO	57%	43%	57%	43%	1,038.8
Washington	CARROLL TWP	14%	86%	12%	88%	5,254.8
York	CARROLL TWP	15%	85%	9%	91%	3,243.9
Allegheny	CASTLE SHANNON BORO	48%	52%	48%	52%	1,013.9
Lehigh	CATASAUQUA BORO	44%	56%	45%	55%	856.9
Columbia	CATAWISSA BORO	49%	51%	36%	64%	232.1
Columbia	CATAWISSA TWP	12%	88%	3%	97%	187.0
Washington	CECIL TWP	24%	76%	10%	90%	4,330.8
Beaver	CENTER TWP	22%	78%	20%	80%	8,284.4
Berks	CENTERPORT BORO	34%	66%	31%	69%	95.9
Washington	CENTERVILLE BORO	19%	81%	8%	92%	272.1
Berks	CENTRE TWP	7%	93%	4%	96%	2,420.7
Delaware	CHADDS FORD TWP	17%	83%	9%	91%	1,395.6
Allegheny	CHALFANT BORO	52%	48%	52%	48%	103.0
Bucks	CHALFONT BORO	39%	61%	40%	60%	1,048.3
Franklin	CHAMBERSBURG BORO	47%	53%	47%	53%	4,457.4
York	CHANCEFORD TWP	17%	83%	3%	97%	671.2
Northampton	CHAPMAN BORO	11%	89%	11%	89%	227.5
Washington	CHARLEROI BORO	66%	34%	66%	34%	538.2
Chester	CHARLESTOWN TWP	18%	82%	12%	88%	1,793.7
Washington	CHARTIERS TWP	20%	80%	8%	92%	3,882.2
Montgomery	CHELTENHAM TWP	45%	55%	45%	55%	5,779.5
Delaware	CHESTER CITY	51%	49%	45%	55%	3,101.9
Delaware	CHESTER TWP	43%	57%	42%	58%	906.2
Delaware	CHESTER HEIGHTS BORO	15%	85%	15%	85%	1,419.3
Allegheny	CHESWICK BORO	50%	50%	44%	56%	295.8
Beaver	CHIPPEWA TWP	21%	79%	13%	87%	4,048.6
Lancaster	CHRISTIANA BORO	32%	68%	32%	68%	314.1
Allegheny	CHURCHILL BORO	30%	70%	30%	70%	1,400.5
Allegheny	CLAIRTON CITY	34%	66%	32%	68%	1,808.5
Mercer	CLARK BORO	33%	67%	6%	94%	175.5
Lackawanna	CLARKS GREEN BORO	79%	21%	79%	21%	343.4
Lackawanna	CLARKS SUMMIT BORO	60%	40%	59%	41%	1,009.7
Lancaster	CLAY TWP	15%	85%	6%	94%	2,983.7
Lebanon	CLEONA BORO	34%	66%	34%	66%	542.6
Susquehanna	CLIFFORD TWP	21%	79%	2%	98%	3.4
Delaware	CLIFTON HEIGHTS BORO	54%	46%	53%	47%	402.7
Butler	CLINTON TWP	11%	89%	2%	98%	73.0
Wayne	CLINTON TWP	28%	72%	2%	98%	135.0
Wyoming	CLINTON TWP	25%	75%	3%	97%	61.3
Washington	COAL CENTER BORO	49%	51%	40%	60%	45.2
Chester	COATESVILLE CITY	54%	46%	54%	46%	1,196.4
Washington	COKEBURG BORO	29%	71%	29%	71%	262.6

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Berks	COLEBROOKDALE TWP	22%	78%	14%	86%	2,864.6
Centre	COLLEGE TWP	35%	65%	19%	81%	3,806.7
Montgomery	COLLEGEVILLE BORO	46%	54%	47%	53%	1,027.0
Allegheny	COLLIER TWP	22%	78%	17%	83%	5,593.6
Delaware	COLLINGDALE BORO	51%	49%	50%	50%	558.2
Lancaster	COLUMBIA BORO	44%	56%	44%	56%	1,549.8
Delaware	COLWYN BORO	38%	62%	39%	61%	166.7
Delaware	CONCORD TWP	19%	81%	19%	81%	8,485.3
Cambria	CONEMAUGH TWP	35%	65%	6%	94%	247.0
Somerset	CONEMAUGH TWP	17%	83%	5%	95%	1,840.5
Lancaster	CONESTOGA TWP	11%	89%	3%	97%	1,047.1
Adams	CONEWAGO TWP	21%	79%	13%	87%	3,233.4
Dauphin	CONEWAGO TWP	7%	93%	6%	94%	539.9
York	CONEWAGO TWP	25%	75%	7%	93%	1,861.0
Fayette	CONNELLSVILLE CITY	50%	50%	47%	53%	1,354.6
Fayette	CONNELLSVILLE TWP	25%	75%	5%	95%	846.9
Lancaster	CONOY TWP	7%	93%	4%	96%	1,597.2
Montgomery	CONSHOHOCKEN BORO	67%	33%	67%	33%	660.5
Beaver	CONWAY BORO	45%	55%	45%	55%	958.7
Luzerne	CONYNGHAM BORO	29%	71%	29%	71%	652.9
Montour	COOPER TWP	33%	67%	5%	95%	97.9
Lehigh	COOPERSBURG BORO	36%	64%	36%	64%	598.7
Lehigh	COPLAY BORO	47%	53%	47%	53%	403.4
Allegheny	CORAOPOLIS BORO	52%	48%	52%	48%	949.4
Lebanon	CORNWALL BORO	16%	84%	9%	91%	1,567.7
Luzerne	COURTDALE BORO	14%	86%	14%	86%	646.8
Allegheny	CRAFTON BORO	45%	55%	46%	54%	732.9
Butler	CRANBERRY TWP	23%	77%	22%	78%	13,665.2
Allegheny	CRESCENT TWP	15%	85%	15%	85%	1,523.0
Adams	CUMBERLAND TWP	18%	82%	6%	94%	1,677.2
Berks	CUMRU TWP	26%	74%	13%	87%	4,583.9
Cambria	DAISYTOWN BORO	25%	75%	26%	74%	142.5
Cambria	DALE BORO	73%	27%	71%	29%	112.8
Luzerne	DALLAS BORO	23%	77%	22%	78%	1,442.9
Luzerne	DALLAS TWP	22%	78%	9%	91%	3,243.7
York	DALLASTOWN BORO	50%	50%	50%	50%	501.1
Lackawanna	DALTON BORO	33%	67%	11%	89%	348.0
Montour	DANVILLE BORO	43%	57%	43%	57%	985.3
Delaware	DARBY BORO	47%	53%	46%	54%	535.0
Delaware	DARBY TWP	48%	52%	49%	51%	917.9
Beaver	DARLINGTON BORO	58%	42%	58%	42%	53.2
Beaver	DARLINGTON TWP	31%	69%	4%	96%	220.2
Beaver	DAUGHERTY TWP	13%	87%	7%	93%	1,560.6
Dauphin	DAUPHIN BORO	37%	63%	32%	68%	223.3
Fayette	DAWSON BORO	37%	63%	36%	64%	101.0
Monroe	DELAWARE WATER GAP BORO	30%	70%	13%	87%	440.8
Westmoreland	DELMONT BORO	19%	81%	19%	81%	671.9
Lancaster	DENVER BORO	43%	57%	43%	57%	833.5
Dauphin	DERRY TWP	25%	75%	18%	82%	10,540.4
Westmoreland	DERRY BORO	25%	75%	24%	76%	510.6
Westmoreland	DERRY TWP	14%	86%	3%	97%	3,919.3
Lackawanna	DICKSON CITY BORO	40%	60%	29%	71%	1,899.8
York	DILLSBURG BORO	42%	58%	42%	58%	514.7

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Washington	DONORA BORO	37%	63%	35%	65%	1,281.6
Allegheny	DORMONT BORO	66%	34%	66%	34%	485.2
Berks	DOUGLASS TWP	9%	91%	7%	93%	3,205.8
Montgomery	DOUGLASS TWP	26%	74%	14%	86%	3,818.7
York	DOVER BORO	46%	54%	46%	54%	336.6
York	DOVER TWP	27%	73%	8%	92%	4,628.3
Chester	DOWNINGTOWN BORO	45%	55%	45%	55%	1,423.4
Bucks	DOYLESTOWN BORO	51%	49%	51%	49%	1,382.6
Bucks	DOYLESTOWN TWP	25%	75%	25%	75%	9,927.0
Allegheny	DRAVOSBURG BORO	22%	78%	23%	77%	683.9
Bucks	DUBLIN BORO	40%	60%	40%	60%	372.9
Lycoming	DUBOISTOWN BORO	31%	69%	28%	72%	391.2
Fayette	DUNBAR BORO	41%	59%	34%	66%	312.2
Fayette	DUNBAR TWP	14%	86%	3%	97%	3,083.3
Blair	DUNCANSVILLE BORO	52%	48%	49%	51%	301.2
Washington	DUNLEVY BORO	17%	83%	13%	87%	220.2
Lackawanna	DUNMORE BORO	41%	59%	29%	71%	3,766.0
Luzerne	DUPONT BORO	39%	61%	39%	61%	972.1
Allegheny	DUQUESNE CITY	46%	54%	46%	54%	1,298.7
Luzerne	DURYEA BORO	35%	65%	15%	85%	1,367.8
Berks	EARL TWP	12%	88%	4%	96%	875.2
Lancaster	EARL TWP	15%	85%	9%	91%	2,801.4
Northampton	EAST ALLEN TWP	15%	85%	9%	91%	3,184.9
Northampton	EAST BANGOR BORO	16%	84%	12%	88%	303.9
Chester	EAST BRADFORD TWP	21%	79%	15%	85%	6,342.4
Chester	EAST BRANDYWINE TWP	14%	86%	13%	87%	6,429.5
Chester	EAST CALN TWP	26%	74%	26%	74%	2,338.9
Lancaster	EAST COCALICO TWP	20%	80%	13%	87%	6,539.1
Cambria	EAST CONEMAUGH BORO	50%	50%	49%	51%	176.7
Chester	EAST COVENTRY TWP	12%	88%	11%	89%	5,508.1
Allegheny	EAST DEER TWP	17%	83%	17%	83%	1,601.1
Lancaster	EAST DONEGAL TWP	24%	76%	7%	93%	2,401.4
Lancaster	EAST EARL TWP	23%	77%	7%	93%	2,093.9
Chester	EAST FALLOWFIELD TWP	12%	88%	7%	93%	4,095.2
Chester	EAST GOSHEN TWP	37%	63%	37%	63%	6,488.6
Montgomery	EAST GREENVILLE BORO	65%	35%	65%	35%	336.8
Dauphin	EAST HANOVER TWP	13%	87%	5%	95%	3,686.4
Lancaster	EAST HEMPFIELD TWP	32%	68%	27%	73%	11,069.7
Westmoreland	EAST HUNTINGDON TWP	20%	80%	7%	93%	3,770.1
Lancaster	EAST LAMPETER TWP	30%	70%	21%	79%	7,541.2
Delaware	EAST LANSDOWNE BORO	56%	44%	56%	44%	131.1
Allegheny	EAST MCKEESPORT BORO	46%	54%	45%	55%	263.1
York	EAST MANCHESTER TWP	14%	86%	10%	90%	5,086.6
Chester	EAST MARLBOROUGH TWP	19%	81%	12%	88%	5,296.8
Montgomery	EAST NORRITON TWP	43%	57%	43%	57%	3,882.9
Chester	EAST NOTTINGHAM	14%	86%	10%	90%	5,154.2

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
	TWP					
Northampton	EASTON CITY	47%	53%	42%	58%	2,673.0
Carbon	EAST PENN TWP	27%	73%	4%	96%	265.5
Cumberland	EAST PENNSBORO TWP	35%	65%	29%	71%	5,664.3
Lancaster	EAST PETERSBURG BORO	51%	49%	51%	49%	772.0
Chester	EAST PIKELAND TWP	23%	77%	20%	80%	4,553.3
Allegheny	EAST PITTSBURGH BORO	67%	33%	68%	32%	245.0
York	EAST PROSPECT BORO	27%	73%	27%	73%	210.4
Beaver	EAST ROCHESTER BORO	42%	58%	42%	58%	288.2
Bucks	EAST ROCKHILL TWP	16%	84%	8%	92%	1,987.0
Monroe	EAST STROUDSBURG BORO	46%	54%	47%	53%	1,826.6
Cambria	EAST TAYLOR TWP	20%	80%	8%	92%	1,129.8
Chester	EASTTOWN TWP	35%	65%	33%	67%	4,879.9
Beaver	EASTVALE BORO	45%	55%	38%	62%	69.1
Westmoreland	EAST VANDERGRIFT BORO	45%	55%	46%	54%	97.9
Chester	EAST VINCENT TWP	18%	82%	12%	88%	3,532.2
Washington	EAST WASHINGTON BORO	50%	50%	50%	50%	286.3
Chester	EAST WHITELAND TWP	37%	63%	37%	63%	6,995.7
Beaver	ECONOMY BORO	17%	83%	11%	89%	4,832.8
Delaware	EDDYSTONE BORO	68%	32%	55%	45%	637.8
Allegheny	EDGEWOOD BORO	47%	53%	47%	53%	372.0
Allegheny	EDGEWORTH BORO	27%	73%	27%	73%	1,056.3
Delaware	EDGMONT TWP	14%	86%	8%	92%	2,827.3
Luzerne	EDWARDSVILLE BORO	44%	56%	44%	56%	779.1
Washington	ELCO BORO	31%	69%	12%	88%	80.1
Allegheny	ELIZABETH BORO	46%	54%	45%	55%	259.0
Allegheny	ELIZABETH TWP	17%	83%	9%	91%	5,773.7
Lancaster	ELIZABETH TWP	18%	82%	7%	93%	1,494.2
Lancaster	ELIZABETHTOWN BORO	49%	51%	49%	51%	1,702.4
Chester	ELK TWP	17%	83%	6%	94%	560.1
Lawrence	ELLPORT BORO	38%	62%	38%	62%	322.4
Washington	ELLSWORTH BORO	24%	76%	24%	76%	469.6
Lawrence	ELLWOOD CITY BORO	47%	53%	44%	56%	1,339.2
Lehigh	EMMAUS BORO	48%	52%	48%	52%	1,841.7
Allegheny	EMSWORTH BORO	36%	64%	36%	64%	437.9
Lancaster	EPHRATA BORO	49%	51%	50%	50%	2,219.8
Lancaster	EPHRATA TWP	24%	76%	12%	88%	3,436.7
Erie	ERIE CITY	61%	39%	61%	39%	11,566.7
Allegheny	ETNA BORO	61%	39%	61%	39%	504.2
Butler	EVANS CITY BORO	26%	74%	25%	75%	506.4
Fayette	EVERSON BORO	30%	70%	28%	72%	119.6
Berks	EXETER TWP	29%	71%	16%	84%	7,339.1
Luzerne	EXETER BORO	33%	67%	19%	81%	1,592.1
Westmoreland	EXPORT BORO	19%	81%	19%	81%	258.5
Wyoming	FACTORYVILLE BORO	21%	79%	21%	79%	462.3
Fayette	FAIRCHANCE BORO	36%	64%	36%	64%	759.5
Lycoming	FAIRFIELD TWP	17%	83%	7%	93%	1,761.2

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Erie	FAIRVIEW TWP	21%	79%	11%	89%	5,792.0
Luzerne	FAIRVIEW TWP	13%	87%	5%	95%	1,650.6
York	FAIRVIEW TWP	28%	72%	14%	86%	8,094.3
Washington	FALLOWFIELD TWP	17%	83%	6%	94%	1,649.4
Bucks	FALLS TWP	37%	63%	27%	73%	11,271.3
Beaver	FALLSTON BORO	34%	66%	34%	66%	345.4
Mercer	FARRELL CITY	54%	46%	55%	45%	1,455.4
Allegheny	FAWN TWP	13%	87%	4%	96%	582.8
Fayette	FAYETTE CITY BORO	30%	70%	26%	74%	155.2
Lackawanna	FELL TWP	15%	85%	5%	95%	1,378.0
York	FELTON BORO	17%	83%	17%	83%	325.6
Centre	FERGUSON TWP	27%	73%	7%	93%	5,420.0
Cambria	FERNDALE BORO	56%	44%	56%	44%	236.7
Allegheny	FINDLAY TWP	43%	57%	15%	85%	4,820.6
Washington	FINLEYVILLE BORO	64%	36%	63%	37%	74.2
Berks	FLEETWOOD BORO	52%	48%	52%	48%	660.9
Delaware	FOLCROFT BORO	32%	68%	32%	68%	895.0
Susquehanna	FOREST CITY BORO	29%	71%	28%	72%	597.0
Allegheny	FOREST HILLS BORO	46%	54%	46%	54%	996.8
Northampton	FORKS TWP	31%	69%	22%	78%	4,240.9
Luzerne	FORTY FORT BORO	45%	55%	45%	55%	972.4
Allegheny	FORWARD TWP	28%	72%	5%	95%	756.6
Butler	FORWARD TWP	8%	92%	2%	98%	344.6
Luzerne	FOSTER TWP	35%	65%	3%	97%	310.2
Lehigh	FOUNTAIN HILL BORO	55%	45%	55%	45%	485.2
Allegheny	FOX CHAPEL BORO	7%	93%	7%	93%	5,017.8
Montgomery	FRANCONIA TWP	25%	75%	24%	76%	8,060.4
Beaver	FRANKLIN TWP	7%	93%	7%	93%	11,612.8
Cambria	FRANKLIN BORO	33%	67%	32%	68%	365.1
Carbon	FRANKLIN TWP	25%	75%	8%	92%	969.4
Chester	FRANKLIN TWP	11%	89%	9%	91%	4,662.0
Fayette	FRANKLIN TWP	10%	90%	2%	98%	95.2
York	FRANKLIN TWP	16%	84%	5%	95%	1,128.3
Allegheny	FRANKLIN PARK BORO	23%	77%	17%	83%	5,922.8
York	FRANKLINTOWN BORO	46%	54%	28%	72%	78.1
Blair	FRANKSTOWN TWP	29%	71%	5%	95%	2,930.0
Allegheny	FRAZER TWP	37%	63%	7%	93%	753.7
Beaver	FREEDOM BORO	45%	55%	44%	56%	484.2
Blair	FREEDOM TWP	41%	59%	6%	94%	130.8
Luzerne	FREELAND BORO	51%	49%	50%	50%	429.6
Northampton	FREEMANSBURG BORO	36%	64%	35%	65%	458.6
Armstrong	FREEPORT BORO	17%	83%	16%	84%	682.4
Cambria	GEISTOWN BORO	54%	46%	53%	47%	679.2
Fayette	GEORGES TWP	12%	88%	4%	96%	2,529.5
Fayette	GERMAN TWP	19%	81%	3%	97%	172.8
Adams	GETTYSBURG BORO	47%	53%	47%	53%	1,063.7
Armstrong	GILPIN TWP	33%	67%	3%	97%	132.5
Erie	GIRARD BORO	31%	69%	27%	73%	1,221.8
Erie	GIRARD TWP	14%	86%	5%	95%	1,677.7
Allegheny	GLASSPORT BORO	37%	63%	37%	63%	1,140.8
Lackawanna	GLENBURN TWP	18%	82%	7%	93%	733.9
Northampton	GLENDON BORO	32%	68%	32%	68%	396.4
Allegheny	GLENFIELD BORO	14%	86%	15%	85%	401.2
Delaware	GLENOLDEN BORO	48%	52%	48%	52%	624.8

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Allegheny	GLEN OSBORNE BORO	13%	87%	13%	87%	354.1
York	GOLDSBORO BORO	30%	70%	28%	72%	249.0
Susquehanna	GREAT BEND BORO	44%	56%	40%	60%	178.2
Susquehanna	GREAT BEND TWP	37%	63%	2%	98%	390.0
Franklin	GREENCASTLE BORO	52%	48%	52%	48%	1,007.5
Erie	GREENE TWP	10%	90%	3%	97%	282.4
Franklin	GREENE TWP	25%	75%	9%	91%	7,998.1
Montgomery	GREEN LANE BORO	35%	65%	35%	65%	212.1
Westmoreland	GREENSBURG CITY	33%	67%	33%	67%	2,605.9
Allegheny	GREEN TREE BORO	42%	58%	42%	58%	1,318.0
Franklin	GUILFORD TWP	32%	68%	10%	90%	5,023.7
York	HALLAM BORO	42%	58%	35%	65%	342.4
Susquehanna	HALLSTEAD BORO	44%	56%	42%	58%	251.9
Berks	HAMBURG BORO	39%	61%	39%	61%	1,279.9
Adams	HAMILTON TWP	9%	91%	4%	96%	422.2
Franklin	HAMILTON TWP	24%	76%	6%	94%	3,370.1
Monroe	HAMILTON TWP	16%	84%	6%	94%	3,406.5
Cumberland	HAMPDEN TWP	40%	60%	36%	64%	9,885.5
Allegheny	HAMPTON TWP	20%	80%	19%	81%	9,826.7
Lehigh	HANOVER TWP	40%	60%	40%	60%	2,697.2
Luzerne	HANOVER TWP	25%	75%	14%	86%	6,048.8
Northampton	HANOVER TWP	37%	63%	35%	65%	4,018.6
Washington	HANOVER TWP	29%	71%	3%	97%	290.0
York	HANOVER BORO	61%	39%	61%	39%	2,368.9
Erie	HARBORCREEK TWP	28%	72%	11%	89%	5,516.0
Allegheny	HARMAR TWP	30%	70%	22%	78%	2,335.3
Beaver	HARMONY TWP	26%	74%	26%	74%	1,951.1
Butler	HARMONY BORO	29%	71%	28%	72%	249.4
Centre	HARRIS TWP	32%	68%	4%	96%	1,344.8
Dauphin	HARRISBURG CITY	41%	59%	41%	59%	7,473.4
Allegheny	HARRISON TWP	23%	77%	21%	79%	4,426.2
Luzerne	HARVEYS LAKE BORO	18%	82%	11%	89%	1,524.5
Montgomery	HATBORO BORO	67%	33%	67%	33%	909.9
Montgomery	HATFIELD BORO	52%	48%	52%	48%	410.3
Montgomery	HATFIELD TWP	41%	59%	41%	59%	6,376.5
Delaware	HAVERFORD TWP	39%	61%	39%	61%	6,372.1
Allegheny	HAYSVILLE BORO	9%	91%	9%	91%	147.4
Luzerne	HAZLE TWP	25%	75%	10%	90%	4,772.8
Luzerne	HAZLETON CITY	41%	59%	42%	58%	3,847.7
Allegheny	HEIDELBERG BORO	59%	41%	60%	40%	183.8
Berks	HEIDELBERG TWP	22%	78%	5%	95%	876.7
Lebanon	HEIDELBERG TWP	23%	77%	5%	95%	250.4
Lehigh	HEIDELBERG TWP	15%	85%	4%	96%	392.2
York	HEIDELBERG TWP	21%	79%	7%	93%	421.5
York	HELLAM TWP	24%	76%	6%	94%	1,365.3
Northampton	HELLERTOWN BORO	48%	52%	48%	52%	845.9
Columbia	HEMLOCK TWP	24%	76%	6%	94%	913.3
Westmoreland	HEMPFIELD TWP	17%	83%	11%	89%	20,777.6
Lycoming	HEPBURN TWP	17%	83%	4%	96%	332.2
Berks	HEREFORD TWP	35%	65%	4%	96%	251.9
Mercer	HERMITAGE CITY	28%	72%	16%	84%	8,105.8
Dauphin	HIGHSPIRE BORO	49%	51%	49%	51%	469.1
Bucks	HILLTOWN TWP	17%	83%	13%	87%	8,349.8
Blair	HOLLIDAYSBURG BORO	38%	62%	38%	62%	1,483.9

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Allegheny	HOMESTEAD BORO	68%	32%	67%	33%	416.9
Beaver	HOMEWOOD BORO	19%	81%	17%	83%	98.4
Chester	HONEY BROOK BORO	42%	58%	43%	57%	298.5
Chester	HONEY BROOK TWP	8%	92%	6%	94%	3,191.2
Beaver	HOPEWELL TWP	18%	82%	16%	84%	8,149.2
Montgomery	HORSHAM TWP	37%	63%	37%	63%	11,094.9
Washington	HOUSTON BORO	47%	53%	45%	55%	234.8
Luzerne	HUGHESTOWN BORO	27%	73%	27%	73%	582.6
Bucks	HULMEVILLE BORO	35%	65%	35%	65%	253.6
Dauphin	HUMMELSTOWN BORO	53%	47%	49%	51%	789.6
Westmoreland	HUNKER BORO	7%	93%	6%	94%	124.2
Westmoreland	HYDE PARK BORO	14%	86%	12%	88%	160.4
Allegheny	INDIANA TWP	12%	88%	8%	92%	5,885.5
Indiana	INDIANA BORO	57%	43%	56%	44%	1,130.0
Beaver	INDUSTRY BORO	46%	54%	6%	94%	198.2
Allegheny	INGRAM BORO	60%	40%	60%	40%	277.5
Westmoreland	IRWIN BORO	40%	60%	39%	61%	538.9
Bucks	IVYLAND BORO	44%	56%	44%	56%	227.5
Butler	JACKSON TWP	13%	87%	6%	94%	1,173.2
Cambria	JACKSON TWP	13%	87%	3%	97%	464.5
Lebanon	JACKSON TWP	15%	85%	9%	91%	4,411.3
Luzerne	JACKSON TWP	12%	88%	5%	95%	1,626.0
Monroe	JACKSON TWP	20%	80%	5%	95%	92.7
York	JACKSON TWP	17%	83%	8%	92%	3,306.2
York	JACOBUS BORO	37%	63%	28%	72%	407.4
Westmoreland	JEANNETTE CITY	52%	48%	52%	48%	1,537.9
Butler	JEFFERSON TWP	10%	90%	4%	96%	1,096.8
Allegheny	JEFFERSON HILLS BORO	14%	86%	13%	87%	8,538.3
Luzerne	JENKINS TWP	33%	67%	12%	88%	2,557.6
Montgomery	JENKINTOWN BORO	63%	37%	63%	37%	372.7
Lackawanna	JERMYN BORO	39%	61%	39%	61%	489.8
Lackawanna	JESSUP BORO	46%	54%	17%	83%	1,078.5
Cambria	JOHNSTOWN CITY	49%	51%	49%	51%	3,880.0
Lebanon	JONESTOWN BORO	28%	72%	28%	72%	408.1
Blair	JUNIATA TWP	26%	74%	2%	98%	135.5
Berks	KENHORST BORO	53%	47%	53%	47%	372.0
Allegheny	KENNEDY TWP	22%	78%	22%	78%	3,536.8
Chester	KENNETT TWP	18%	82%	12%	88%	5,663.4
Chester	KENNETT SQUARE BORO	52%	48%	52%	48%	683.6
Allegheny	KILBUCK TWP	7%	93%	7%	93%	1,690.4
Luzerne	KINGSTON BORO	68%	32%	68%	32%	1,395.8
Luzerne	KINGSTON TWP	26%	74%	10%	90%	2,575.2
Armstrong	KISKIMINETAS TWP	20%	80%	2%	98%	173.0
Schuylkill	KLINE TWP	30%	70%	4%	96%	415.6
Beaver	KOPPEL BORO	46%	54%	41%	59%	323.1
Luzerne	LAFLIN BORO	27%	73%	27%	73%	862.5
Erie	LAKE CITY BORO	33%	67%	29%	71%	966.0
Lancaster	LANCASTER CITY	63%	37%	63%	37%	4,706.6
Lancaster	LANCASTER TWP	31%	69%	29%	71%	3,378.2
Bucks	LANGHORNE BORO	45%	55%	44%	56%	316.3
Bucks	LANGHORNE MANOR BORO	39%	61%	39%	61%	384.9
Montgomery	LANSDALE BORO	65%	35%	65%	35%	1,915.5

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Delaware	LANSDOWNE BORO	46%	54%	46%	54%	763.7
Lackawanna	LAPLUME TWP	21%	79%	7%	93%	135.9
Luzerne	LARKSVILLE BORO	32%	68%	18%	82%	1,380.7
Westmoreland	LATROBE BORO	50%	50%	50%	50%	1,467.1
Berks	LAURELDALE BORO	52%	48%	52%	48%	507.9
Erie	LAWRENCE PARK TWP	56%	44%	56%	44%	1,122.2
Lancaster	LEACOCK TWP	14%	86%	6%	94%	1,431.5
Lebanon	LEBANON CITY	54%	46%	54%	46%	2,660.6
Armstrong	LEECHBURG BORO	53%	47%	51%	49%	289.0
Berks	LEESPORT BORO	45%	55%	44%	56%	469.1
Allegheny	LEET TWP	13%	87%	13%	87%	957.0
Allegheny	LEETSDALE BORO	53%	47%	54%	46%	747.6
Northampton	LEHIGH TWP	8%	92%	6%	94%	9,423.5
Carbon	LEHIGHTON BORO	48%	52%	46%	54%	1,036.3
Luzerne	LEHMAN TWP	8%	92%	4%	96%	1,229.6
Cumberland	LEMOYNE BORO	63%	37%	63%	37%	1,025.1
Franklin	LETTERKENNY TWP	17%	83%	4%	96%	280.9
York	LEWISBERRY BORO	49%	51%	48%	52%	88.8
Allegheny	LIBERTY BORO	19%	81%	19%	81%	940.6
Westmoreland	LIGONIER TWP	2%	98%	2%	98%	58,966.8
Montgomery	LIMERICK TWP	25%	75%	20%	80%	8,796.5
Allegheny	LINCOLN BORO	13%	87%	7%	93%	207.5
Lancaster	LITITZ BORO	51%	49%	51%	49%	1,483.2
Blair	LOGAN TWP	37%	63%	10%	90%	5,568.4
York	LOGANVILLE BORO	28%	72%	27%	73%	466.4
Chester	LONDON BRITAIN TWP	13%	87%	8%	92%	1,755.6
Chester	LONDONDERRY TWP	25%	75%	5%	95%	131.6
Dauphin	LONDONDERRY TWP	16%	84%	7%	93%	2,112.7
Chester	LONDON GROVE TWP	15%	85%	11%	89%	4,851.8
Berks	LONGSWAMP TWP	11%	89%	4%	96%	1,709.9
Cambria	LORAIN BORO	34%	66%	35%	65%	217.2
Cumberland	LOWER ALLEN TWP	32%	68%	32%	68%	6,546.7
Berks	LOWER ALSACE TWP	23%	77%	10%	90%	1,200.3
Westmoreland	LOWER BURRELL CITY	19%	81%	14%	86%	4,515.0
Delaware	LOWER CHICHESTER TWP	47%	53%	47%	53%	681.9
Montgomery	LOWER FREDERICK TWP	14%	86%	9%	91%	2,150.5
Montgomery	LOWER GWYNEDD TWP	39%	61%	39%	61%	5,957.5
Berks	LOWER HEIDELBERG TWP	20%	80%	6%	94%	1,350.4
Lehigh	LOWER MACUNGIE TWP	25%	75%	21%	79%	11,936.7
Bucks	LOWER MAKEFIELD TWP	32%	68%	32%	68%	11,435.8
Montgomery	LOWER MERION TWP	41%	59%	41%	59%	15,258.4
Lehigh	LOWER MILFORD TWP	16%	84%	6%	94%	1,393.4
Montgomery	LOWER MORELAND TWP	40%	60%	40%	60%	4,661.5
Northampton	LOWER MT BETHEL TWP	30%	70%	6%	94%	400.3
Northampton	LOWER NAZARETH TWP	28%	72%	18%	82%	3,509.7
Chester	LOWER OXFORD TWP	16%	84%	7%	93%	1,550.6
Dauphin	LOWER PAXTON TWP	31%	69%	29%	71%	16,190.1

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Montgomery	LOWER POTTSGROVE TWP	31%	69%	30%	70%	5,047.8
Montgomery	LOWER PROVIDENCE TWP	34%	66%	31%	69%	9,017.4
Montgomery	LOWER SALFORD TWP	25%	75%	21%	79%	6,737.8
Northampton	LOWER SAUCON TWP	18%	82%	8%	92%	3,956.8
Bucks	LOWER SOUTHAMPTON TWP	41%	59%	41%	59%	4,299.5
Dauphin	LOWER SWATARA TWP	26%	74%	22%	78%	7,943.2
Carbon	LOWER TOWAMENSING TWP	29%	71%	5%	95%	464.7
York	LOWER WINDSOR TWP	13%	87%	6%	94%	1,051.4
Cambria	LOWER YODER TWP	23%	77%	5%	95%	1,243.8
Lehigh	LOWHILL TWP	17%	83%	5%	95%	235.0
Lycoming	LOYALSOCK TWP	43%	57%	16%	84%	3,688.1
Fayette	LUZERNE TWP	25%	75%	4%	96%	754.7
Luzerne	LUZERNE BORO	44%	56%	43%	57%	441.0
Lycoming	LYCOMING TWP	34%	66%	3%	97%	195.0
Schuylkill	MCADOO BORO	54%	46%	52%	48%	228.0
Allegheny	MCCANDLESS TWP	29%	71%	26%	74%	9,046.2
Washington	MCDONALD BORO	54%	46%	54%	46%	325.1
Erie	MCKEAN TWP	9%	91%	4%	96%	633.1
Allegheny	MCKEESPORT CITY	48%	52%	48%	52%	3,448.0
Allegheny	MCKEES ROCKS BORO	63%	37%	63%	37%	716.8
Adams	MCSHERRYSTOWN BORO	48%	52%	48%	52%	327.1
Lehigh	MACUNGIE BORO	41%	59%	41%	59%	626.5
Carbon	MAHONING TWP	15%	85%	5%	95%	521.3
Lawrence	MAHONING TWP	14%	86%	3%	97%	597.7
Montour	MAHONING TWP	37%	63%	13%	87%	1,441.2
Berks	MAIDENCREEK TWP	33%	67%	12%	88%	2,251.3
Columbia	MAIN TWP	52%	48%	2%	98%	24.9
Chester	MALVERN BORO	38%	62%	37%	63%	817.1
York	MANCHESTER BORO	41%	59%	41%	59%	490.3
York	MANCHESTER TWP	28%	72%	25%	75%	8,594.2
Lancaster	MANHEIM BORO	53%	47%	53%	47%	887.4
Lancaster	MANHEIM TWP	35%	65%	34%	66%	15,011.9
Lancaster	MANOR TWP	21%	79%	7%	93%	5,189.9
Westmoreland	MANOR BORO	15%	85%	15%	85%	1,232.1
Delaware	MARCUS HOOK BORO	79%	21%	65%	35%	710.0
Lancaster	MARIETTA BORO	37%	63%	37%	63%	477.9
Berks	MARION TWP	17%	83%	3%	97%	315.1
Montgomery	MARLBOROUGH TWP	22%	78%	7%	93%	1,211.6
Delaware	MARPLE TWP	30%	70%	30%	70%	6,741.4
Butler	MARS BORO	36%	64%	36%	64%	285.8
Allegheny	MARSHALL TWP	23%	77%	14%	86%	4,523.6
Perry	MARYSVILLE BORO	32%	68%	16%	84%	530.1
Lackawanna	MAYFIELD BORO	44%	56%	19%	81%	438.8
Crawford	MEADVILLE CITY	38%	62%	38%	62%	2,797.8
Cumberland	MECHANICSBURG BORO	47%	53%	47%	53%	1,541.3
Delaware	MEDIA BORO	49%	51%	49%	51%	487.6
Fayette	MENALLEN TWP	22%	78%	5%	95%	23.4
Dauphin	MIDDLE PAXTON TWP	13%	87%	2%	98%	1,824.7
Butler	MIDDLESEX TWP	6%	94%	3%	97%	987.3

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Cumberland	MIDDLESEX TWP	28%	72%	10%	90%	2,674.8
Monroe	MIDDLE SMITHFIELD TWP	22%	78%	6%	94%	3,447.7
Cambria	MIDDLE TAYLOR TWP	6%	94%	3%	97%	52.2
Bucks	MIDDLETOWN TWP	34%	66%	34%	66%	12,357.7
Dauphin	MIDDLETOWN BORO	46%	54%	47%	53%	1,308.7
Delaware	MIDDLETOWN TWP	19%	81%	17%	83%	7,438.7
Washington	MIDWAY BORO	42%	58%	36%	64%	223.8
Columbia	MIFFLIN TWP	35%	65%	5%	95%	582.8
Bucks	MILFORD TWP	16%	84%	8%	92%	3,873.9
Delaware	MILLBOURNE BORO	60%	40%	55%	45%	44.2
Erie	MILLCREEK TWP	38%	62%	33%	67%	16,622.1
Lebanon	MILLCREEK TWP	34%	66%	4%	96%	525.2
Lancaster	MILLERSVILLE BORO	41%	59%	41%	59%	1,238.6
Allegheny	MILLVALE BORO	52%	48%	52%	48%	438.6
Chester	MODENA BORO	20%	80%	20%	80%	222.8
Berks	MOHNTON BORO	41%	59%	42%	58%	490.8
Beaver	MONACA BORO	39%	61%	39%	61%	1,530.3
York	MONAGHAN TWP	9%	91%	4%	96%	1,094.9
Westmoreland	MONESSEN CITY	31%	69%	30%	70%	1,835.2
Washington	MONONGAHELA CITY	31%	69%	30%	70%	1,257.7
Cumberland	MONROE TWP	24%	76%	6%	94%	901.8
Allegheny	MONROEVILLE BORO	29%	71%	29%	71%	12,573.2
Montgomery	MONTGOMERY TWP	49%	51%	49%	51%	6,802.7
Columbia	MONTOUR TWP	27%	73%	6%	94%	612.6
Lycoming	MONTOURSVILLE BORO	52%	48%	32%	68%	1,328.7
Allegheny	MOON TWP	27%	73%	26%	74%	13,376.9
Northampton	MOORE TWP	16%	84%	5%	95%	2,935.7
Lackawanna	MOOSIC BORO	26%	74%	25%	75%	3,923.4
Bucks	MORRISVILLE BORO	50%	50%	46%	54%	1,136.1
Delaware	MORTON BORO	57%	43%	57%	43%	232.6
Lancaster	MT JOY BORO	42%	58%	42%	58%	1,551.1
Lancaster	MOUNT JOY TWP	26%	74%	9%	91%	2,809.7
Allegheny	MT LEBANON TWP	50%	50%	50%	50%	3,893.1
Allegheny	MT OLIVER BORO	48%	52%	48%	52%	221.4
Berks	MT PENN BORO	55%	45%	55%	45%	273.1
Adams	MOUNT PLEASANT TWP	11%	89%	4%	96%	513.5
Washington	MOUNT PLEASANT TWP	38%	62%	2%	98%	158.4
Westmoreland	MOUNT PLEASANT BORO	38%	62%	38%	62%	644.1
Westmoreland	MOUNT PLEASANT TWP	12%	88%	4%	96%	3,271.0
Lancaster	MOUNTVILLE BORO	44%	56%	44%	56%	550.9
York	MOUNT WOLF BORO	35%	65%	35%	65%	335.1
Berks	MUHLENBERG TWP	48%	52%	39%	61%	5,880.6
Allegheny	MUNHALL BORO	47%	53%	47%	53%	1,517.6
Westmoreland	MURRYSVILLE BORO	15%	85%	8%	92%	8,692.5
Lebanon	MYERSTOWN BORO	47%	53%	48%	52%	546.0
Luzerne	NANTICOKE CITY	35%	65%	34%	66%	2,224.2
Montgomery	NARBERTH BORO	67%	33%	67%	33%	322.9
Northampton	NAZARETH BORO	44%	56%	44%	56%	1,068.3
Luzerne	NESCOPECK BORO	38%	62%	27%	73%	403.2
Delaware	NETHER PROVIDENCE TWP	33%	67%	33%	67%	3,034.3
Allegheny	NEVILLE TWP	37%	63%	37%	63%	1,499.3

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
York	NEWBERRY TWP	12%	88%	9%	91%	10,792.2
Beaver	NEW BRIGHTON BORO	58%	42%	57%	43%	708.5
Bucks	NEW BRITAIN BORO	38%	62%	39%	61%	774.2
Bucks	NEW BRITAIN TWP	22%	78%	14%	86%	5,175.7
Lawrence	NEW CASTLE CITY	41%	59%	41%	59%	5,478.6
Cumberland	NEW CUMBERLAND BORO	54%	46%	53%	47%	1,070.0
Washington	NEW EAGLE BORO	39%	61%	35%	65%	660.7
Chester	NEW GARDEN TWP	23%	77%	22%	78%	8,944.6
Montgomery	NEW HANOVER TWP	20%	80%	9%	91%	3,949.3
Lancaster	NEW HOLLAND BORO	49%	51%	49%	51%	1,243.8
Bucks	NEW HOPE BORO	31%	69%	29%	71%	818.6
Westmoreland	NEW KENSINGTON CITY	39%	61%	39%	61%	2,525.6
Chester	NEWLIN TWP	10%	90%	2%	98%	85.9
Chester	NEW LONDON TWP	14%	86%	13%	87%	6,044.6
Susquehanna	NEW MILFORD BORO	24%	76%	24%	76%	650.4
Susquehanna	NEW MILFORD TWP	2%	98%	2%	98%	29,060.5
Adams	NEW OXFORD BORO	37%	63%	38%	62%	387.1
Luzerne	NEWPORT TWP	22%	78%	4%	96%	1,193.0
Blair	NEWRY BORO	52%	48%	52%	48%	54.9
York	NEW SALEM BORO	29%	71%	29%	71%	288.0
Beaver	NEW SEWICKLEY TWP	18%	82%	7%	93%	2,452.2
Westmoreland	NEW STANTON BORO	25%	75%	19%	81%	1,245.7
Lackawanna	NEWTON TWP	24%	76%	4%	96%	163.3
Bucks	NEWTOWN BORO	55%	45%	55%	45%	354.6
Bucks	NEWTOWN TWP	27%	73%	25%	75%	6,886.6
Delaware	NEWTOWN TWP	21%	79%	21%	79%	6,463.4
Montgomery	NORRISTOWN BORO	62%	38%	62%	38%	2,310.4
Bucks	NORTHAMPTON TWP	28%	72%	28%	72%	16,673.3
Northampton	NORTHAMPTON BORO	46%	54%	46%	54%	1,639.2
Lebanon	NORTH ANNVILLE TWP	12%	88%	5%	95%	120.6
Armstrong	NORTH APOLLO BORO	29%	71%	28%	72%	369.0
Westmoreland	NORTH BELLE VERNON BORO	50%	50%	49%	51%	259.2
Washington	NORTH BETHLEHEM TWP	2%	98%	2%	98%	13,955.9
Allegheny	NORTH BRADDOCK BORO	38%	62%	38%	62%	991.4
Northampton	NORTH CATASAUQUA BORO	33%	67%	33%	67%	477.6
Columbia	NORTH CENTRE TWP	18%	82%	5%	95%	242.6
Washington	NORTH CHARLEROI BORO	63%	37%	59%	41%	177.4
York	NORTH CODORUS TWP	12%	88%	7%	93%	2,956.2
Lebanon	NORTH CORNWALL TWP	22%	78%	13%	87%	3,004.7
Chester	NORTH COVENTRY TWP	17%	83%	12%	88%	5,892.1
Allegheny	NORTH FAYETTE TWP	33%	67%	12%	88%	3,674.7
Washington	NORTH FRANKLIN TWP	23%	77%	16%	84%	2,848.0
Westmoreland	NORTH HUNTINGDON TWP	18%	82%	15%	85%	13,442.1
Westmoreland	NORTH IRWIN BORO	13%	87%	13%	87%	130.3
Lebanon	NORTH LEBANON TWP	25%	75%	14%	86%	4,580.4

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Lebanon	NORTH LONDONDERRY TWP	30%	70%	19%	81%	3,683.5
Cumberland	NORTH MIDDLETON TWP	23%	77%	9%	91%	4,768.9
Beaver	NORTH SEWICKLEY TWP	14%	86%	7%	93%	832.0
Washington	NORTH STRABANE TWP	27%	73%	12%	88%	5,274.1
Fayette	NORTH UNION TWP	26%	74%	12%	88%	6,580.8
Allegheny	NORTH VERSAILLES TWP	24%	76%	25%	75%	5,303.6
Montgomery	NORTH WALES BORO	65%	35%	65%	35%	376.6
Lehigh	NORTH WHITEHALL TWP	13%	87%	12%	88%	16,037.3
York	NORTH YORK BORO	62%	38%	62%	38%	184.0
Delaware	NORWOOD BORO	42%	58%	42%	58%	517.9
Washington	NOTTINGHAM TWP	16%	84%	3%	97%	612.4
Luzerne	NUANGOLA BORO	10%	90%	6%	94%	386.8
Allegheny	OAKDALE BORO	31%	69%	31%	69%	294.6
Allegheny	OAKMONT BORO	36%	64%	35%	65%	1,097.3
Allegheny	OHARA TWP	23%	77%	23%	77%	4,724.9
Allegheny	OHIO TWP	15%	85%	15%	85%	4,208.7
Beaver	OHIOVILLE BORO	3%	97%	3%	97%	15,168.4
Westmoreland	OKLAHOMA BORO	21%	79%	20%	80%	207.2
Lackawanna	OLD FORGE BORO	40%	60%	40%	60%	2,167.8
Lycoming	OLD LYCOMING TWP	44%	56%	15%	85%	1,338.5
Berks	OLEY TWP	27%	73%	5%	95%	933.8
Lackawanna	OLYPHANT BORO	39%	61%	20%	80%	1,632.6
Berks	ONTELAUNEE TWP	32%	68%	18%	82%	2,625.7
Columbia	ORANGE TWP	8%	92%	3%	97%	438.3
Columbia	ORANGEVILLE BORO	18%	82%	20%	80%	207.0
Adams	OXFORD TWP	11%	89%	9%	91%	3,660.1
Chester	OXFORD BORO	36%	64%	36%	64%	1,252.6
Somerset	PAINT BORO	38%	62%	38%	62%	187.4
Somerset	PAINT TWP	39%	61%	4%	96%	288.5
Northampton	PALMER TWP	39%	61%	34%	66%	5,617.5
Carbon	PALMERTON BORO	35%	65%	34%	66%	1,585.5
Lebanon	PALMYRA BORO	53%	47%	52%	48%	1,228.9
Lancaster	PARADISE TWP	17%	83%	7%	93%	2,255.2
Chester	PARKESBURG BORO	37%	63%	36%	64%	809.6
Armstrong	PARKS TWP	23%	77%	3%	97%	282.9
Delaware	PARKSIDE BORO	51%	49%	51%	49%	128.4
Carbon	PARRYVILLE BORO	25%	75%	11%	89%	277.0
Beaver	PATTERSON TWP	31%	69%	31%	69%	1,043.9
Beaver	PATTERSON HEIGHTS BORO	31%	69%	32%	68%	149.1
Centre	PATTON TWP	31%	69%	10%	90%	3,431.6
Dauphin	PAXTANG BORO	49%	51%	49%	51%	246.5
Northampton	PEN ARGYL BORO	26%	74%	25%	75%	890.4
Dauphin	PENBROOK BORO	70%	30%	69%	31%	281.7
Berks	PENN TWP	3%	97%	3%	97%	12,092.1
Chester	PENN TWP	19%	81%	15%	85%	3,356.4
Lancaster	PENN TWP	15%	85%	9%	91%	6,997.2
Perry	PENN TWP	30%	70%	4%	96%	413.7
Westmoreland	PENN BORO	32%	68%	31%	69%	100.6

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Westmoreland	PENN TWP	13%	87%	9%	91%	8,773.3
York	PENN TWP	34%	66%	24%	76%	4,879.9
Bucks	PENNDEL BORO	61%	39%	61%	39%	269.9
Allegheny	PENN HILLS TWP	24%	76%	24%	76%	12,410.7
Montgomery	PENNSBURG BORO	55%	45%	55%	45%	511.1
Chester	PENNSBURY TWP	20%	80%	9%	91%	1,485.2
Allegheny	PENNSBURY VILLAGE BORO	47%	53%	46%	54%	46.9
Lancaster	PEQUEA TWP	9%	91%	8%	92%	5,491.8
Bucks	PERKASIE BORO	36%	64%	36%	64%	1,640.1
Montgomery	PERKIOMEN TWP	27%	73%	27%	73%	3,127.0
Berks	PERRY TWP	23%	77%	6%	94%	482.3
Lawrence	PERRY TWP	2%	98%	2%	98%	11,849.3
Washington	PETERS TWP	25%	75%	23%	77%	11,241.6
Chester	PHOENIXVILLE BORO	43%	57%	43%	57%	2,380.2
Lycoming	PIATT TWP	4%	96%	4%	96%	6,542.0
Allegheny	PINE TWP	15%	85%	13%	87%	7,812.4
Allegheny	PITCAIRN BORO	44%	56%	43%	57%	351.9
Allegheny	PITTSBURGH CITY	45%	55%	45%	55%	37,351.3
Luzerne	PITTSTON CITY	53%	47%	52%	48%	1,085.6
Luzerne	PITTSTON TWP	35%	65%	14%	86%	2,777.5
Northampton	PLAINFIELD TWP	21%	79%	8%	92%	2,939.8
Luzerne	PLAINS TWP	29%	71%	19%	81%	4,685.6
Allegheny	PLEASANT HILLS BORO	40%	60%	41%	59%	1,776.8
Allegheny	PLUM BORO	20%	80%	15%	85%	11,357.5
Bucks	PLUMSTEAD TWP	22%	78%	9%	91%	3,833.3
Luzerne	PLYMOUTH BORO	57%	43%	57%	43%	738.3
Luzerne	PLYMOUTH TWP	20%	80%	3%	97%	636.8
Montgomery	PLYMOUTH TWP	53%	47%	53%	47%	5,429.1
Monroe	POCONO TWP	17%	83%	9%	91%	5,503.8
Chester	POCOPSON TWP	17%	83%	10%	90%	1,876.4
Schuylkill	PORT CLINTON BORO	26%	74%	8%	92%	105.4
Allegheny	PORT VUE BORO	36%	64%	36%	64%	744.4
Beaver	POTTER TWP	34%	66%	13%	87%	948.9
Montgomery	POTTSTOWN BORO	60%	40%	60%	40%	3,188.0
Schuylkill	POTTSVILLE CITY	39%	61%	39%	61%	2,600.8
Monroe	PRICE TWP	13%	87%	3%	97%	654.8
Luzerne	PRINGLE BORO	49%	51%	49%	51%	297.3
Delaware	PROSPECT PARK BORO	55%	45%	55%	45%	475.0
Lancaster	PROVIDENCE TWP	8%	92%	5%	95%	1,642.6
Beaver	PULASKI TWP	32%	68%	32%	68%	465.7
Bucks	QUAKERTOWN BORO	49%	51%	49%	51%	1,302.6
Delaware	RADNOR TWP	26%	74%	26%	74%	8,832.9
Allegheny	RANKIN BORO	55%	45%	55%	45%	310.9
Lackawanna	RANSOM TWP	5%	95%	2%	98%	69.6
Lancaster	RAPHO TWP	22%	78%	6%	94%	2,209.1
Berks	READING CITY	58%	42%	58%	42%	6,452.2
Montgomery	RED HILL BORO	52%	48%	51%	49%	433.5
York	RED LION BORO	53%	47%	53%	47%	835.7
Fayette	REDSTONE TWP	18%	82%	6%	94%	1,324.8
Allegheny	RESERVE TWP	22%	78%	22%	78%	1,306.3
Luzerne	RICE TWP	13%	87%	4%	96%	886.0
Allegheny	RICHLAND TWP	16%	84%	11%	89%	5,726.8
Bucks	RICHLAND TWP	21%	79%	13%	87%	5,547.9

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Cambria	RICHLAND TWP	30%	70%	20%	80%	6,547.4
Lebanon	RICHLAND BORO	25%	75%	21%	79%	650.9
Bucks	RICHLANDTOWN BORO	49%	51%	49%	51%	165.7
Berks	RICHMOND TWP	32%	68%	7%	93%	275.3
Delaware	RIDLEY TWP	53%	47%	52%	48%	3,290.3
Delaware	RIDLEY PARK BORO	51%	49%	51%	49%	686.8
Northumberland	RIVERSIDE BORO	41%	59%	14%	86%	814.2
Berks	ROBESON TWP	15%	85%	4%	96%	1,235.0
Berks	ROBESONIA BORO	37%	63%	35%	65%	534.5
Allegheny	ROBINSON TWP	27%	73%	26%	74%	9,109.9
Washington	ROBINSON TWP	47%	53%	4%	96%	153.0
Beaver	ROCHESTER BORO	68%	32%	68%	32%	450.1
Beaver	ROCHESTER TWP	24%	76%	15%	85%	1,310.4
Berks	ROCKLAND TWP	9%	91%	4%	96%	179.4
Montgomery	ROCKLEDGE BORO	54%	46%	55%	45%	219.7
Washington	ROSCOE BORO	57%	43%	46%	54%	115.7
Northampton	ROSETO BORO	32%	68%	32%	68%	396.1
Delaware	ROSE VALLEY BORO	16%	84%	16%	84%	465.9
Allegheny	ROSS TWP	33%	67%	33%	67%	9,263.1
Monroe	ROSS TWP	16%	84%	5%	95%	496.9
Allegheny	ROSSLYN FARMS BORO	28%	72%	27%	73%	355.9
Westmoreland	ROSTRAVER TWP	17%	83%	9%	91%	6,791.0
Dauphin	ROYALTON BORO	36%	64%	33%	67%	211.9
Montgomery	ROYERSFORD BORO	65%	35%	64%	36%	509.4
Berks	RUSCOMBMANOR TWP	8%	92%	7%	93%	1,298.7
Delaware	RUTLEDGE BORO	23%	77%	23%	77%	94.7
Perry	RYE TWP	15%	85%	2%	98%	290.7
Chester	SADSBURY TWP	24%	76%	13%	87%	1,489.8
Lancaster	SADSBURY TWP	12%	88%	4%	96%	1,872.7
Berks	ST LAWRENCE BORO	36%	64%	36%	64%	563.8
Franklin	ST THOMAS TWP	16%	84%	4%	96%	2,792.9
Luzerne	SALEM TWP	26%	74%	4%	96%	1,097.1
Westmoreland	SALEM TWP	22%	78%	4%	96%	1,149.8
Montgomery	SALFORD TWP	9%	91%	6%	94%	925.3
Lancaster	SALISBURY TWP	21%	79%	4%	96%	1,286.5
Lehigh	SALISBURY TWP	20%	80%	17%	83%	5,887.4
Butler	SAXONBURG BORO	17%	83%	17%	83%	569.4
Cambria	SCALP LEVEL BORO	22%	78%	21%	79%	406.9
Chester	SCHUYLKILL TWP	21%	79%	18%	82%	4,333.7
Montgomery	SCHWENKSVILLE BORO	40%	60%	40%	60%	259.4
Allegheny	SCOTT TWP	54%	46%	55%	45%	2,485.1
Columbia	SCOTT TWP	24%	76%	21%	79%	4,034.9
Lackawanna	SCOTT TWP	32%	68%	7%	93%	318.8
Westmoreland	SCOTTDALE BORO	49%	51%	49%	51%	736.6
Lackawanna	SCRANTON CITY	47%	53%	35%	65%	11,657.5
Bucks	SELLERSVILLE BORO	38%	62%	38%	62%	747.6
Butler	SEVEN FIELDS BORO	44%	56%	44%	56%	523.5
Allegheny	SEWICKLEY BORO	37%	63%	37%	63%	704.6
Westmoreland	SEWICKLEY TWP	16%	84%	5%	95%	838.9
Allegheny	SEWICKLEY HILLS BORO	35%	65%	11%	89%	116.7
Allegheny	SHALER TWP	38%	62%	38%	62%	7,163.4
Mercer	SHARON CITY	57%	43%	57%	43%	2,414.3

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Delaware	SHARON HILL BORO	57%	43%	57%	43%	489.6
Allegheny	SHARPSBURG BORO	58%	42%	59%	41%	416.4
Mercer	SHARPSVILLE BORO	52%	48%	51%	49%	896.5
Mercer	SHENANGO TWP	28%	72%	6%	94%	439.6
Berks	SHILLINGTON BORO	60%	40%	60%	40%	617.5
Cumberland	SHIREMANSTOWN BORO	55%	45%	54%	46%	192.1
Berks	SHOEMAKERSVILLE BORO	43%	57%	35%	65%	271.6
Bucks	SILVERDALE BORO	37%	63%	37%	63%	264.8
Cumberland	SILVER SPRING TWP	24%	76%	13%	87%	6,326.3
Berks	SINKING SPRING BORO	51%	49%	50%	50%	804.9
Montgomery	SKIPPACK TWP	20%	80%	16%	84%	6,312.6
Lehigh	SLATINGTON BORO	38%	62%	37%	63%	859.4
Washington	SMITH TWP	23%	77%	5%	95%	402.0
Monroe	SMITHFIELD TWP	15%	85%	8%	92%	5,120.3
Bucks	SOLEBURY TWP	22%	78%	9%	91%	2,514.2
Washington	SOMERSET TWP	27%	73%	3%	97%	90.1
Montgomery	SOUDERTON BORO	55%	45%	55%	45%	717.8
Lackawanna	SOUTH ABINGTON TWP	31%	69%	25%	75%	3,879.2
Lebanon	SOUTH ANNVILLE TWP	28%	72%	5%	95%	348.0
Beaver	SOUTH BEAVER TWP	20%	80%	3%	97%	154.5
Armstrong	SOUTH BUFFALO TWP	12%	88%	3%	97%	212.3
Columbia	SOUTH CENTRE TWP	23%	77%	19%	81%	2,858.8
Chester	SOUTH COATESVILLE BORO	28%	72%	29%	71%	1,147.9
Fayette	SOUTH CONNELLSVILLE BORO	50%	50%	22%	78%	409.8
Chester	SOUTH COVENTRY TWP	19%	81%	8%	92%	1,003.9
Allegheny	SOUTH FAYETTE TWP	15%	85%	12%	88%	9,982.7
Washington	SOUTH FRANKLIN TWP	13%	87%	4%	96%	49.1
Westmoreland	SOUTH GREENSBURG BORO	49%	51%	49%	51%	449.8
Dauphin	SOUTH HANOVER TWP	22%	78%	13%	87%	3,253.9
Berks	SOUTH HEIDELBERG TWP	18%	82%	8%	92%	2,670.6
Beaver	SOUTH HEIGHTS BORO	28%	72%	28%	72%	256.0
Westmoreland	SOUTH HUNTINGDON TWP	19%	81%	3%	97%	139.6
Lebanon	SOUTH LEBANON TWP	22%	78%	10%	90%	4,845.3
Lebanon	SOUTH LONDONDERRY TWP	24%	76%	7%	93%	1,754.1
Cumberland	SOUTH MIDDLETON TWP	37%	63%	8%	92%	3,787.9
Cambria	SOUTHMONT BORO	37%	63%	37%	63%	669.7
Allegheny	SOUTH PARK TWP	19%	81%	19%	81%	5,625.3
Mercer	SOUTH PYMATUNING TWP	18%	82%	3%	97%	687.3
Washington	SOUTH STRABANE TWP	26%	74%	13%	87%	5,889.6
Fayette	SOUTH UNION TWP	30%	70%	18%	82%	5,678.7
Allegheny	SOUTH VERSAILLES TWP	9%	91%	6%	94%	316.6
Westmoreland	SOUTHWEST GREENSBURG BORO	60%	40%	60%	40%	254.6

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Lehigh	SOUTH WHITEHALL TWP	39%	61%	27%	73%	7,076.8
Lycoming	SOUTH WILLIAMSPORT BORO	41%	59%	41%	59%	1,359.2
Washington	SPEERS BORO	31%	69%	31%	69%	647.0
Berks	SPRING TWP	41%	59%	21%	79%	5,391.7
Centre	SPRING TWP	34%	66%	8%	92%	797.4
Chester	SPRING CITY BORO	41%	59%	40%	60%	512.8
Allegheny	SPRINGDALE BORO	49%	51%	44%	56%	596.5
Allegheny	SPRINGDALE TWP	14%	86%	14%	86%	1,527.6
York	SPRINGETTSBURY TWP	37%	63%	34%	66%	9,473.5
Bucks	SPRINGFIELD TWP	14%	86%	4%	96%	978.5
Delaware	SPRINGFIELD TWP	42%	58%	42%	58%	4,035.9
Montgomery	SPRINGFIELD TWP	41%	59%	41%	59%	4,340.8
York	SPRINGFIELD TWP	16%	84%	6%	94%	854.0
York	SPRING GARDEN TWP	41%	59%	40%	60%	4,195.5
York	SPRING GROVE BORO	44%	56%	42%	58%	447.6
Centre	STATE COLLEGE BORO	57%	43%	57%	43%	2,924.7
Dauphin	STEELTON BORO	45%	55%	45%	55%	1,191.8
Washington	STOCKDALE BORO	44%	56%	24%	76%	82.7
Northampton	STOCKERTOWN BORO	37%	63%	37%	63%	631.2
Cambria	STONYCREEK TWP	23%	77%	17%	83%	1,396.6
Allegheny	STOWE TWP	40%	60%	39%	61%	1,463.2
Adams	STRABAN TWP	25%	75%	7%	93%	1,194.2
Lancaster	STRASBURG BORO	40%	60%	39%	61%	600.9
Lancaster	STRASBURG TWP	8%	92%	6%	94%	2,014.8
Monroe	STROUD TWP	18%	82%	12%	88%	12,314.7
Monroe	STROUDSBURG BORO	49%	51%	49%	51%	1,103.9
Luzerne	SUGARLOAF TWP	32%	68%	6%	94%	728.3
Luzerne	SUGAR NOTCH BORO	19%	81%	19%	81%	642.9
Erie	SUMMIT TWP	24%	76%	12%	88%	5,775.6
Dauphin	SUSQUEHANNA TWP	28%	72%	28%	72%	9,482.8
Lycoming	SUSQUEHANNA TWP	31%	69%	4%	96%	384.7
Westmoreland	SUTERSVILLE BORO	24%	76%	24%	76%	173.8
Delaware	SWARTHMORE BORO	23%	77%	23%	77%	898.7
Dauphin	SWATARA TWP	37%	63%	31%	69%	8,184.1
Lebanon	SWATARA TWP	9%	91%	4%	96%	2,592.7
Allegheny	SWISSVALE BORO	56%	44%	56%	44%	794.9
Luzerne	SWOYERSVILLE BORO	40%	60%	38%	62%	1,361.4
Allegheny	TARENTUM BORO	34%	66%	34%	66%	884.7
Northampton	TATAMY BORO	29%	71%	29%	71%	335.4
Lackawanna	TAYLOR BORO	31%	69%	26%	74%	2,476.8
Montgomery	TELFORD BORO	50%	50%	50%	50%	656.5
Lancaster	TERRE HILL BORO	40%	60%	40%	60%	291.9
Allegheny	THORNBURG BORO	23%	77%	23%	77%	281.2
Chester	THORNBURY TWP	16%	84%	16%	84%	2,468.0
Delaware	THORNBURY TWP	12%	88%	12%	88%	5,334.6
Lackawanna	THROOP BORO	40%	60%	21%	79%	1,464.4
Berks	TILDEN TWP	22%	78%	6%	94%	1,827.3
Delaware	TINICUM TWP	41%	59%	30%	70%	3,679.3
Berks	TOPTON BORO	47%	53%	46%	54%	423.7
Montgomery	TOWAMENCIN TWP	39%	61%	34%	66%	5,298.7
Westmoreland	TRAFFORD BORO	24%	76%	24%	76%	907.2
Delaware	TRAINER BORO	58%	42%	51%	49%	677.8
Montgomery	TRAPPE BORO	32%	68%	32%	68%	1,367.0

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Chester	TREDYFFRIN TWP	40%	60%	37%	63%	11,382.4
Bucks	TRUMBAUERSVILLE BORO	33%	67%	33%	67%	282.1
Bucks	TULLYTOWN BORO	25%	75%	22%	78%	1,141.5
Berks	TULPEHOCKEN TWP	17%	83%	4%	96%	272.1
Allegheny	TURTLE CREEK BORO	54%	46%	54%	46%	650.2
Washington	TWILIGHT BORO	29%	71%	8%	92%	91.5
Adams	UNION TWP	20%	80%	4%	96%	269.2
Berks	UNION TWP	18%	82%	4%	96%	1,414.6
Lebanon	UNION TWP	26%	74%	7%	93%	533.3
Washington	UNION TWP	22%	78%	11%	89%	2,324.3
Fayette	UNIONTOWN CITY	58%	42%	58%	42%	1,313.3
Westmoreland	UNITY TWP	15%	85%	6%	94%	11,343.6
Delaware	UPLAND BORO	39%	61%	40%	60%	423.0
Cumberland	UPPER ALLEN TWP	24%	76%	24%	76%	8,515.8
Westmoreland	UPPER BURRELL TWP	19%	81%	4%	96%	125.2
Delaware	UPPER CHICHESTER TWP	35%	65%	35%	65%	4,293.9
Delaware	UPPER DARBY TWP	53%	47%	53%	47%	5,014.1
Montgomery	UPPER DUBLIN TWP	44%	56%	44%	56%	8,499.9
Lycoming	UPPER FAIRFIELD TWP	19%	81%	3%	97%	86.6
Montgomery	UPPER FREDERICK TWP	13%	87%	8%	92%	879.9
Montgomery	UPPER GWYNEDD TWP	44%	56%	44%	56%	5,202.6
Montgomery	UPPER HANOVER TWP	21%	79%	10%	90%	2,694.8
Lancaster	UPPER LEACOCK TWP	34%	66%	12%	88%	2,148.0
Lehigh	UPPER MACUNGIE TWP	30%	70%	23%	77%	11,412.2
Bucks	UPPER MAKEFIELD TWP	23%	77%	13%	87%	3,495.6
Montgomery	UPPER MERION TWP	43%	57%	43%	57%	11,049.2
Lehigh	UPPER MILFORD TWP	14%	86%	9%	91%	4,468.4
Montgomery	UPPER MORELAND TWP	48%	52%	48%	52%	5,110.6
Northampton	UPPER MT BETHEL TWP	16%	84%	3%	97%	97.6
Northampton	UPPER NAZARETH TWP	16%	84%	15%	85%	4,288.8
Chester	UPPER OXFORD TWP	22%	78%	5%	95%	261.9
Montgomery	UPPER POTTSGROVE TWP	21%	79%	21%	79%	3,227.3
Delaware	UPPER PROVIDENCE TWP	19%	81%	19%	81%	3,689.6
Montgomery	UPPER PROVIDENCE TWP	27%	73%	27%	73%	11,579.6
Allegheny	UPPER ST CLAIR TWP	33%	67%	33%	67%	6,248.6
Montgomery	UPPER SALFORD TWP	19%	81%	12%	88%	1,481.5
Lehigh	UPPER SAUCON TWP	20%	80%	13%	87%	7,723.8
Bucks	UPPER SOUTHAMPTON TWP	39%	61%	39%	61%	4,229.5
Fayette	UPPER TYRONE TWP	10%	90%	5%	95%	1,355.6
Chester	UPPER UWCHLAN TWP	18%	82%	15%	85%	5,913.1
Cambria	UPPER YODER TWP	32%	68%	8%	92%	1,431.7
Chester	UWCHLAN TWP	35%	65%	35%	65%	6,691.9
Butler	VALENCIA BORO	19%	81%	19%	81%	211.6
Chester	VALLEY TWP	24%	76%	23%	77%	3,304.2
Montour	VALLEY TWP	35%	65%	7%	93%	210.9

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Fayette	VANDERBILT BORO	47%	53%	45%	55%	106.7
Westmoreland	VANDERGRIFT BORO	41%	59%	41%	59%	831.5
Lackawanna	VANDLING BORO	18%	82%	12%	88%	513.3
Beaver	VANPORT TWP	35%	65%	32%	68%	643.4
Allegheny	VERONA BORO	50%	50%	50%	50%	383.2
Allegheny	VERSAILLES BORO	39%	61%	39%	61%	329.5
Allegheny	WALL BORO	20%	80%	22%	78%	262.9
Chester	WALLACE TWP	7%	93%	6%	94%	1,727.8
Northampton	WALNUTPORT BORO	35%	65%	35%	65%	498.1
Bucks	WARMINSTER TWP	45%	55%	45%	55%	6,524.4
Bucks	WARRINGTON TWP	25%	75%	25%	75%	8,816.5
York	WARRINGTON TWP	3%	97%	3%	97%	23,023.0
Luzerne	WARRIOR RUN BORO	12%	88%	13%	87%	489.1
Bucks	WARWICK TWP	24%	76%	20%	80%	5,137.2
Lancaster	WARWICK TWP	20%	80%	16%	84%	9,002.7
Berks	WASHINGTON TWP	14%	86%	6%	94%	1,422.9
Fayette	WASHINGTON TWP	24%	76%	7%	93%	1,415.1
Lehigh	WASHINGTON TWP	11%	89%	6%	94%	4,491.1
Northampton	WASHINGTON TWP	8%	92%	5%	95%	3,483.1
Washington	WASHINGTON CITY	59%	41%	58%	42%	1,855.4
Westmoreland	WASHINGTON TWP	10%	90%	4%	96%	2,318.9
Lackawanna	WAVERLY TWP	26%	74%	13%	87%	1,256.7
Lawrence	WAYNE TWP	4%	96%	4%	96%	10,395.1
Lehigh	WEISENBERG TWP	15%	85%	5%	95%	1,343.4
Carbon	WEISSPORT BORO	32%	68%	26%	74%	83.5
Berks	WERNERSVILLE BORO	47%	53%	48%	52%	488.4
Erie	WESLEYVILLE BORO	59%	41%	59%	41%	339.0
Lackawanna	WEST ABINGTON TWP	3%	97%	3%	97%	3,514.6
Chester	WEST BRADFORD TWP	15%	85%	13%	87%	8,105.5
Chester	WEST BRANDYWINE TWP	18%	82%	15%	85%	5,216.7
Washington	WEST BROWNSVILLE BORO	29%	71%	21%	79%	531.6
Chester	WEST CALN TWP	9%	91%	6%	94%	6,106.4
Chester	WEST CHESTER BORO	73%	27%	73%	27%	1,186.4
Lancaster	WEST COCALICO TWP	10%	90%	5%	95%	5,609.7
Montgomery	WEST CONSHOHOCKEN BORO	48%	52%	48%	52%	575.0
Lebanon	WEST CORNWALL TWP	25%	75%	7%	93%	458.4
Allegheny	WEST DEER TWP	15%	85%	7%	93%	5,142.3
Lancaster	WEST DONEGAL TWP	15%	85%	10%	90%	5,317.3
Lancaster	WEST EARL TWP	29%	71%	11%	89%	2,634.5
Northampton	WEST EASTON BORO	46%	54%	48%	52%	211.6
Allegheny	WEST ELIZABETH BORO	33%	67%	33%	67%	164.3
Chester	WEST GOSHEN TWP	45%	55%	45%	55%	7,659.6
Chester	WEST GROVE BORO	54%	46%	53%	47%	427.4
Dauphin	WEST HANOVER TWP	22%	78%	10%	90%	4,670.0
Luzerne	WEST HAZLETON BORO	52%	48%	50%	50%	908.9
Lancaster	WEST HEMPFIELD TWP	16%	84%	16%	84%	11,594.0
Allegheny	WEST HOMESTEAD BORO	39%	61%	39%	61%	650.2
Lancaster	WEST LAMPETER TWP	26%	74%	16%	84%	5,330.2

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Lebanon	WEST LEBANON TWP	12%	88%	10%	90%	411.3
Westmoreland	WEST LEECHBURG BORO	44%	56%	44%	56%	253.3
York	WEST MANCHESTER TWP	28%	72%	25%	75%	10,675.8
York	WEST MANHEIM TWP	16%	84%	5%	95%	2,283.8
Beaver	WEST MAYFIELD BORO	29%	71%	29%	71%	511.1
Mercer	WEST MIDDLESEX BORO	35%	65%	33%	67%	494.2
Allegheny	WEST MIFFLIN BORO	32%	68%	33%	67%	9,351.3
Cambria	WESTMONT BORO	38%	62%	38%	62%	1,492.0
Westmoreland	WEST NEWTON BORO	29%	71%	29%	71%	711.0
Montgomery	WEST NORRITON TWP	40%	60%	40%	60%	3,929.8
Chester	WEST NOTTINGHAM TWP	16%	84%	5%	95%	1,380.5
Chester	WEST PIKELAND TWP	21%	79%	12%	88%	1,874.2
Luzerne	WEST PITTSTON BORO	64%	36%	63%	37%	598.5
Montgomery	WEST POTTSGROVE TWP	31%	69%	31%	69%	1,493.7
Berks	WEST READING BORO	73%	27%	73%	27%	380.3
Bucks	WEST ROCKHILL TWP	23%	77%	9%	91%	1,973.1
Chester	WEST SADSBURY TWP	10%	90%	8%	92%	860.6
Cambria	WEST TAYLOR TWP	24%	76%	5%	95%	269.2
Chester	WESTTOWN TWP	30%	70%	30%	70%	5,579.7
Allegheny	WEST VIEW BORO	57%	43%	57%	43%	641.4
Chester	WEST VINCENT TWP	11%	89%	6%	94%	2,804.1
Chester	WEST WHITELAND TWP	32%	68%	32%	68%	8,294.2
Luzerne	WEST WYOMING BORO	33%	67%	13%	87%	693.2
York	WEST YORK BORO	68%	32%	68%	32%	327.3
Mercer	WHEATLAND BORO	49%	51%	49%	51%	554.8
Allegheny	WHITAKER BORO	59%	41%	60%	40%	213.6
Beaver	WHITE TWP	25%	75%	25%	75%	445.4
Allegheny	WHITEHALL BORO	41%	59%	41%	59%	2,119.2
Lehigh	WHITEHALL TWP	32%	68%	32%	68%	8,156.3
Montgomery	WHITEMARSH TWP	24%	76%	24%	76%	9,425.7
Allegheny	WHITE OAK BORO	18%	82%	18%	82%	4,249.5
Montgomery	WHITPAIN TWP	41%	59%	41%	59%	8,230.0
Luzerne	WILKES-BARRE CITY	60%	40%	60%	40%	4,631.0
Luzerne	WILKES-BARRE TWP	52%	48%	52%	48%	1,877.9
Allegheny	WILKINS TWP	31%	69%	31%	69%	1,709.7
Allegheny	WILKINSBURG BORO	39%	61%	39%	61%	1,455.1
Northampton	WILLIAMS TWP	17%	83%	7%	93%	1,825.9
Lycoming	WILLIAMSPORT CITY	52%	48%	50%	50%	5,886.2
Chester	WILLISTOWN TWP	30%	70%	15%	85%	4,023.5
Allegheny	WILMERDING BORO	53%	47%	54%	46%	275.6
Northampton	WILSON BORO	65%	35%	65%	35%	742.2
Somerset	WINDBER BORO	34%	66%	34%	66%	1,230.1
Northampton	WIND GAP BORO	36%	64%	37%	63%	869.1
Berks	WINDSOR TWP	24%	76%	3%	97%	371.0
York	WINDSOR BORO	28%	72%	28%	72%	372.0
York	WINDSOR TWP	15%	85%	11%	89%	10,809.6
Butler	WINFIELD TWP	7%	93%	2%	98%	551.6
Berks	WOMELSDORF BORO	41%	59%	39%	61%	550.9
Lycoming	WOODWARD TWP	12%	88%	5%	95%	682.4
Montgomery	WORCESTER TWP	22%	78%	17%	83%	4,954.8

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Cumberland	WORMLEYSBURG BORO	45%	55%	44%	56%	547.4
Luzerne	WRIGHT TWP	19%	81%	12%	88%	2,367.2
Bucks	WRIGHTSTOWN TWP	19%	81%	11%	89%	1,017.0
York	WRIGHTSVILLE BORO	38%	62%	31%	69%	363.7
Luzerne	WYOMING BORO	33%	67%	33%	67%	1,002.6
Berks	WYOMISSING BORO	54%	46%	54%	46%	2,896.1
Bucks	YARDLEY BORO	34%	66%	32%	68%	605.3
Luzerne	YATESVILLE BORO	33%	67%	33%	67%	390.0
Delaware	YEADON BORO	43%	57%	43%	57%	1,020.5
York	YOE BORO	45%	55%	45%	55%	136.7
York	YORK CITY	67%	33%	67%	33%	3,413.3
York	YORK TWP	27%	73%	20%	80%	10,852.3
York	YORKANA BORO	21%	79%	22%	78%	72.7
York	YORK HAVEN BORO	30%	70%	25%	75%	191.1
Westmoreland	YOUNGSTOWN BORO	24%	76%	24%	76%	71.8
Westmoreland	YOUNGWOOD BORO	28%	72%	28%	72%	1,218.1
Butler	ZELIENOPLE BORO	24%	76%	24%	76%	1,257.7

Appendix D – DEP Simplified Method Land Loading Rates

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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 POLLUTANT REDUCTION PLAN (PRP) INSTRUCTIONS

The Department of Environmental Protection (DEP) has developed these instructions to assist MS4 applicants and permittees (MS4s) in the preparation of Pollutant Reduction Plans (PRPs) for stormwater discharges of nutrients and sediment to surface waters in the Chesapeake Bay watershed, and for stormwater discharges to local surface waters impaired for nutrients and/or sediment. MS4s identified in DEP's MS4 Requirements Table (available at www.dep.pa.gov/MS4) as needing to comply with Appendix D and/or Appendix E of the PAG-13 General Permit or an individual permit must attach PRP(s) to the NOI for General Permit coverage or application for an individual permit, except as noted below. These instructions explain how to develop a satisfactory PRP for both the Chesapeake Bay (Appendix D) and impaired waters (Appendix E).

NOTE – A PRP is not required to be attached to the NOI or individual permit application if the applicant has received an Advanced Waiver Approval (see Waiver Application Instructions, 3800-PM-BCW0100f). A PRP is also not required to be attached to the NOI or individual permit application if the applicant is not eligible for a waiver but has completed its mapping of all stormwater outfalls and can demonstrate the following (as shown on a map submitted with the NOI or individual permit application):

- There are no stormwater discharges to the Chesapeake Bay watershed; and/or
- There are no stormwater discharges to local surface waters impaired for nutrients and/or sediment.

I. General Information

A. **Terms**: The term "nutrients" refers to "Total Nitrogen" (TN) and "Total Phosphorus" (TP) unless specifically stated otherwise in DEP's latest Integrated Report. The terms "sediment," "siltation," and "suspended solids" all refer to inorganic solids and are hereinafter referred to as "sediment." The term, "storm sewershed" is defined in the PAG-13 General Permit as the land area that drains to the municipal separate storm sewer from within the jurisdiction of the MS4 permittee. This term is used in these instructions as well as the term, "PRP Planning Area" (or "Planning Area"), which refers to all of the storm sewersheds that an MS4 must calculate existing loads and plan load reductions for.

B. **Pollutants of Concern and Required Reductions**: For all PRPs, MS4s shall calculate existing loading of the pollutant(s) of concern, in lbs/year; calculate the minimum reduction in loading, in lbs/year; select Best Management Practice(s) (BMP(s)) to reduce loading; and demonstrate that the selected BMP(s) will achieve the minimum reductions.

For Chesapeake Bay PRPs (Appendix D), the pollutants of concern are sediment, TP and TN and the minimum reductions in loading are 10%, 5% and 3%, respectively. Permittees are encouraged to select appropriate BMPs to achieve the 10% sediment loading reduction objective, as it expected that, overall within the Bay watershed, the TP (5%) and TN (3%) goals will be achieved when a 10% reduction in sediment is achieved.

For PRPs developed for impaired waters (Appendix E), the pollutant(s) are based on the impairment listing, as provided in the MS4 Requirements Table. If the impairment is based on siltation only, a minimum 10% sediment reduction is required. If the impairment is based on nutrients only or other surrogates for nutrients (e.g., "Excessive Algal Growth" and "Organic Enrichment/Low D.O."), a minimum 5% TP reduction is required. If the impairment is due to both siltation and nutrients, both sediment (10% reduction) and TP (5% reduction) must be addressed. PRPs may use a presumptive approach in which it is assumed that a 10% sediment reduction will also accomplish a 5% TP reduction. However, MS4s may not presume that a reduction in nutrients will accomplish a commensurate reduction in sediment.

C. **Existing Pollutant Loading**: Existing loading must be calculated and reported for the portion of the Planning Area which drains to impaired waters as of the date of the development of the PRP. MS4s may not claim

credit for street sweeping and other non-structural BMPs implemented in the past. If structural BMPs were implemented prior to development of the PRP and continue to be operated and maintained, the MS4 may claim pollutant reduction credit in the form of reduced existing loading.

Each impairment identified on the MS4 Requirements Table ("Table") must be addressed in a PRP document. The Table listings for each MS4 are different because they reflect local conditions, which is why an MS4 must carefully interpret the information on the Table.

For example, it is not unusual for the Table to list a requirement which reflects a discharge from an **entire municipality** to the Chesapeake Bay drainage. The Table may also list a requirement to address a local impaired water which also drains to the Chesapeake Bay. A BMP located in the area which drains to the locally impaired waters will be credited to the PRP requirements of both obligations.

Example 1 – An MS4 discharges to Stream A and Stream B. Both streams are tributary to River C. Stream A is impaired for sediment, and Stream B is unimpaired. River C is impaired for sediment and nutrients. The PRP Planning Area includes the drainage area of all MS4 outfalls that discharge to Streams A and B. The existing load to Stream A must be calculated both due to the local impairment and because of the impairment to River C. The existing load to Stream B must be calculated due to the impairment to River C. The MS4 may choose to presume that a 10% sediment reduction will address the nutrient obligation as well as sediment. The result is therefore to calculate the sediment load for the entire Planning Area, and to propose BMPs that reduce 10% of that load within the permit term. Note that BMPs should be located within the storm sewershed of the locally impaired water (Stream A) rather than Stream B unless approved by DEP.

NOTE – An MS4 may not reduce its obligations for achieving permit term pollutant load reductions through previously installed BMPs. An MS4 may use all BMPs installed prior to the date of the load calculation to reduce its estimate of existing pollutant loading. For example, if a rain garden was installed ten years ago and is expected to remove 100 lbs of sediment annually, and the overall annual loading of sediment in the storm sewershed is estimated to be 1,000 lbs without specifically addressing the rain garden, an MS4 may not claim that the rain garden satisfies its obligations to reduce sediment loading by 10%. The MS4 may, however, use the rain garden to demonstrate that the existing load is 900 lbs instead of 1,000 lbs, and that 90 lbs rather than 100 lbs needs to be reduced during the term of permit coverage.

NOTE - MapShed, or any other watershed model where channel erosion is explicitly modeled, should be run on a minimum of ~10 mi^2 area to properly account for downstream channel impacts and include impaired waters identified in the MS4 Requirements Table. Aggregation of these waters up to approximately the 12-digit HUC scale for modeling purposes is acceptable. Modeling may not be done at the individual storm sewershed or municipal scale where the extent of downstream impact is not included in load calculation.

D. **BMP Effectiveness**: All MS4s must use the BMP effectiveness values contained within DEP's BMP Effectiveness Values document (3800-PM-BCW0100m) or Chesapeake Bay Program expert panel reports for BMPs listed in those resources when determining pollutant load reductions in PRPs, except as otherwise approved by DEP. An example of other approaches that may be approved by DEP include the use of thoroughly vetted mechanistic models with self-contained BMP modules (e.g., Storm Water Management Model (SWMM), WinSLAMM) to demonstrate achievement of reduction targets. Application of these data intensive models could allow for a streamlining of the planning and design phases of BMPs that may provide future cost savings as municipalities move toward implementation of the plan. Such resources must be documented in the PRP, and must reflect both overland flow and in-stream erosion components.

NOTE - Calculation of sediment load reductions for PRP purposes using the *Expert Panel to Define Removal Rates for Individual Stream Restoration Projects* report should be done as follows:

- Where existing sediment loads are calculated using the Chesapeake Bay loading rates (i.e., the "simplified method" illustrated in Attachments C and D), the Sediment Delivery Ratio (SDR) of 0.181 must be applied and the effectiveness value contained in Table 3 of the Expert Panel Report applies (44.88 lb/ft/yr TSS). The effectiveness values in document 3800-PM-BCW0100m implicitly apply the SDR; thus, sediment load reductions calculated from stream restoration projects must be consistent.

Alternately, sediment reduction from streambank restoration projects when existing loads are calculated using the simplified method may be estimated using the Protocols outlined in Section 5 of the report and must then apply the 0.181 SDR along with the 50% efficiency uncertainty factor.

- Where existing sediment loads were calculated using modeling at a local watershed scale, the default rate to be used is 115 lb/ft/yr. This default rate comes from a convergence of MapShed modeled streambank erosion loads from a group of urbanized watersheds, the 248 lb/ft default edge-of-field (EOF) rate in the Expert Panel Report with the 50% efficiency uncertainty factor specified for the Protocols applied, and field data were collected following the BANCS methodology where projects have been implemented and load reductions calculated using the Protocols.

  Alternately, sediment reduction from streambank restoration projects when existing loads are calculated using modeling at a local scale may be estimated using the Protocols outlined in Section 5 of the report and must then apply the 50% efficiency uncertainty factor.

NOTE – Use of default effectiveness values (44.88 lb/ft/yr and 115 lb/ft/yr) will be accepted for the subsequent permit term. It is recommended that the data required to complete load calculations using the Protocols be collected during the design phase for use in subsequent load reduction calculations.

NOTE – Desktop MapShed users may not use the streambank restoration or street sweeping components included in the MapShed BMP editor for pollutant reduction calculations. Pollutant reductions associated with streambank restoration projects must use the methods described above; whereas, reductions from street sweeping must be calculated in accordance with the *Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices* or the BMP Effectiveness Values Table.

NOTE – If BMP effectiveness values are updated in DEP's BMP Effectiveness Values document or in Chesapeake Bay Program expert panel reports between the time the PRP is approved and the time the final report is developed to document compliance with the permit, those updated effectiveness values may optionally be used.

E. **Combining PRPs**: If an MS4 discharges stormwater to local surface waters that drain to the Chesapeake Bay watershed (Appendix D) that are also impaired for nutrients and/or sediment (Appendix E), separate or combined PRPs may be submitted, at the MS4's discretion.

For MS4s within the Chesapeake Bay watershed who are submitting combined PRPs to address both Appendices D and E, it is recommended that permittees focus on the impaired local surface waters first, and then determine if the BMPs proposed in the Planning Area(s) for locally impaired waters will be sufficient to meet the overall pollutant reduction requirements for the Planning Area for the Chesapeake Bay. In general, PRPs that include both local impaired waters (Appendix E) and Chesapeake Bay watershed (Appendix D) must address the local impaired waters (i.e., credit cannot generally be claimed under Appendix E for BMPs implemented outside of the Planning Area of the local impaired waters).

F. **Joint PRPs**: An MS4 may develop and submit a joint PRP in concert with (an)other MS4(s). In general, the MS4s participating in a joint PRP should have contiguous land areas. The area to be used to calculate existing loads is the PRP Planning Area for all MS4 jurisdictions.

DEP requires that joint PRP participants document their involvement with a written agreement. DEP recommends that such agreements include the following topics:

- Scope of the Agreement
  - Complete Pollutant Reduction Plan implementation (or individual BMP implementation)

- Roles and Responsibilities
  - How projects will be selected
  - Selection of engineering and other contracted services
  - Long-term O&M
  - Adaptive management of the PRP (or the individual BMPs) over the permit term
  - Commitment to using the Plan (or to implementing the individual BMP)

- Allocations of Cost and pollutant reduction
  - Methodology for sharing the cost
  - Methodology for distributing the pollutant reductions

- Timeline for implementation
  - Schedule of milestones to complete and implement the plan (or the individual BMP)

MS4s participating in collaborative efforts are encouraged to contact DEP's Bureau of Clean Water during the PRP development phase for feedback on proposed approaches.

G. **BMP Selection**: MS4s may propose and take credit for only those BMPs that are not required to meet regulatory requirements or otherwise go above and beyond regulatory requirements. For example, a BMP that was installed to meet Chapter 102 NPDES permit requirements for stormwater associated with construction activities may not be used to meet permit term minimum pollutant reductions unless the MS4 can demonstrate that the BMP exceeded regulatory requirements; if this is done, the MS4 may take credit for only those reductions that will occur as a result of exceeding regulatory requirements.

NOTE – Street sweeping may be proposed as a BMP for pollutant loading reductions if 1) street sweeping is not the only method identified for reducing pollutant loading, and 2) the BMP effectiveness values contained in 3800-PM-BCW0100m or Chesapeake Bay Program expert panel reports are utilized.

H. **Offsets**. DEP may authorize the use of offsets toward meeting PRP load reduction requirements, if an individual permit application is submitted. Please refer to DEP's TMDL Plan Instructions (3800-PM-BCW0200d) for additional information.

II. Required PRP Elements

Each PRP must include the following elements. The paragraph numbers in these instructions correspond to the organization of the PRP. For example, Section A of the PRP must be "Public Participation," Section B must be the map, Section C must be "Pollutants of Concern," etc.

A. **Public Participation**. The MS4 shall complete the following public participation measures listed below, and report in the PRP that each was completed.

- The applicant shall make a complete copy of the PRP available for public review.

- The applicant shall publish, in a newspaper of general circulation in the area, a public notice containing a statement describing the plan, where it may be reviewed by the public, and the length of time the permittee will provide for the receipt of comments. The public notice must be published at least 45 days prior to the deadline for submission of the PRP to DEP. **Attach a copy of the public notice to the PRP**.

- The applicant shall accept written comments for a minimum of 30 days from the date of public notice. **Attach a copy of all written comments received from the public to the PRP**.

- The applicant shall accept comments from any interested member of the public at a public meeting or hearing, which may include a regularly scheduled meeting of the governing body of the municipality or municipal authority that is the permittee.

- The applicant shall consider and make a record of the consideration of each timely comment received from the public during the public comment period concerning the plan, identifying any changes made to the plan in response to the comment. **Attach a copy of the permittee's record of consideration of all timely comment received in the public comment period to the PRP**.

For PRPs developed on a regional scale by multiple MS4 permittees or by co-permittees, the collaborating permittees may implement these public participation requirements as a joint effort as long as the notice of the availability of the PRP and the notice of a public meeting or hearing reaches the target audience groups of all permittees involved in the joint effort.

B. **Map**. Attach a map that identifies **land uses and/or impervious/pervious surfaces** and the **storm sewershed boundary** associated with each MS4 outfall that discharges to impaired surface waters, or surface waters draining to the Chesapeake Bay (see note below), and calculate the storm sewershed area that is subject to Appendix D and/or Appendix E. In addition, the map must identify the proposed location(s) of structural BMP(s) that will be implemented to achieve the required pollutant load reductions.

The map may be the same as that used to satisfy MCM #3 of the PAG-13 General Permit, with the addition of land use and/or impervious/pervious surfaces, the storm sewershed boundary, and locations of proposed BMPs, or may be a different map.

The map must be sufficiently detailed to identify the PRP Planning Area relevant to satisfying the requirements of Appendix D and/or Appendix E, and to demonstrate that BMPs will be located in appropriate storm sewersheds to meet the requirements.

NOTE – Delineation of storm sewersheds associated with individual MS4 outfalls is typically necessary in order to determine the PRP Planning Area. The MS4 may display the storm sewershed for each MS4 outfall or just the PRP Planning Area, at its discretion. In cases where there are no local surface water impairments but the entire municipality is located in the Chesapeake Bay watershed, the map can display the entire storm sewershed within the municipality, without distinction between discharges to various local surface waters. In addition, a municipality entirely within the Chesapeake Bay watershed with no local surface water impairments may elect to consider the entire urbanized area within its municipality as its PRP Planning Area, and calculate existing loading using that area.

Figure 1 presents an example storm sewershed map developed for a single MS4 applicant's PRP to address two impaired surface waters. Figure 1 shows an example municipality (whose border is shown with an orange line) and its urbanized area (green border). It also delineates the drainage areas of MS4 outfalls (storm sewersheds), which are labeled as letters. Each storm sewershed is represented by hatched lines of different colors. Storm sewersheds A, B, C, G and H drain to Farm Creek and storm sewersheds D, E, F, J and K drain to Muddy Creek. (As noted above, delineation of the combined storm sewershed in lieu of individual storm sewersheds may be done at the MS4's discretion). A red dotted line depicts the combined storm sewershed ("planning area") for Farm Creek, and a blue dotted line indicates the combined storm sewershed for Muddy Creek. BMPs selected to address pollutant reductions for Farm Creek and Muddy Creek must be implemented within the red and blue dotted borders, respectively, except that in the Farm Creek storm sewershed one area has been parsed because this site already has NPDES permit coverage for stormwater (see below). Storm sewershed H includes some area within the municipality and urbanized area, although the outfall is located in a different municipality. The portion of storm sewershed H that is within the municipality must be included in the planning area for the Farm Creek PRP. Also, storm sewershed K includes area both inside and outside of the municipality; the portion of storm sewershed K that is within the municipality must be included in the planning area for the Muddy Creek PRP. (Note – this example map does not show the location of selected structural BMPs, but this would be expected for an actual map).

The map may show areas that are to be "parsed" from the PRP Planning Area. In other words, at the MS4's discretion (subject to DEP rules), certain areas may be shown on the map that are within the Planning Area but are not included in the calculation of land area and existing pollutant loading. Guidance on parsing is contained in **Attachment A**. Note that if parsing is done, BMPs implemented within the parsed area will not count toward achieving pollutant reduction objectives.

C. **Pollutants of Concern**. Identify the pollutants of concern for each storm sewershed or the overall PRP Planning Area (see Section I.B of these instructions).

D. **Determine Existing Loading for Pollutants of Concern**. Identify the date associated with the existing loading estimate (see Section I.C of these instructions). Calculate the existing loading, in lbs per year, for the pollutant(s) of concern in the PRP Planning Area.

Figure 1: Example Storm Sewershed Map

There are several possible methods to estimate existing loading, ranging from simplistic to complex. One method to estimate existing loading that is acceptable to DEP is to determine the percent impervious and pervious surface within the urbanized area of the storm sewershed and calculate existing loading by multiplying the developed impervious and developed pervious land areas (acres) by pollutant loading rates (lbs/acre/year) ("simplified method"). The MS4 may use loading rates for undeveloped land for areas outside of the urbanized area which flows into the urbanized area. Where structural BMPs are currently in place and are functioning, the existing loading estimate may be reduced to account for pollutant reductions from those BMPs.

Attachment B presents land loading rates for impervious and pervious surfaces for each county within the Chesapeake Bay watershed, as well as generalized loading rates for counties outside of the Chesapeake Bay watershed, which may be used if the simplified method for estimating existing loading is selected.

Attachment C presents an example calculation of existing sediment loading for a Chesapeake Bay PRP using DEP's simplified method. **Attachment D** presents an example calculation of existing sediment loading for an impaired waters PRP, outside of the Chesapeake Bay watershed, using DEP's simplified method.

Use of DEP's simplified method is not required. Any methodology that calculates existing pollutant loading in terms of lbs per year, evaluates BMP-based pollutant reductions utilizing the BMP effectiveness values contained in 3800-PM-BCW0100m or Chesapeake Bay Program expert panel reports, uses average annual precipitation conditions, considers both overland flow and stream erosion, and is based on sound science may be considered acceptable.

Whatever tool or approach that is used to estimate existing loading from the PRP Planning Area must also be used to estimate existing loading to planned BMPs. This avoids errors in percent pollutant removal calculations that would result if different methods were used. Later BMP design efforts will usually apply a more sophisticated method than used in planning to calculate load to a BMP. The design loading may not however be used to alter the assumed pollutant reduction by the BMP unless the PRP is revised to apply the more sophisticated method to the load from the storm sewershed as a whole.

MS4s may claim "credit" for structural BMPs implemented prior to development of the PRP to reduce existing loading estimates. In order to claim credit, identify all such structural BMPs in Section D of the PRP along with the following information:

- A detailed description of the BMP;
- Latitude and longitude coordinates for the BMP;
- Location of the BMP on the storm sewershed map;
- The permit number, if any, that authorized installation of the BMP;
- Calculations demonstrating the pollutant reductions achieved by the BMP;
- The date the BMP was installed and a statement that the BMP continues to serve the function(s) it was designed for; and
- The operation and maintenance (O&M) activities and O&M frequencies associated with the BMP.

The MS4 permittee may optionally submit design drawings of the BMP for previously installed or future BMPs with the PRP.

E. **Select BMPs To Achieve the Minimum Required Reductions in Pollutant Loading**. Identify the minimum required reductions in pollutant loading (see Section I.B of these instructions). Applicants must propose the implementation of BMP(s) or land use changes within the PRP Planning Area that will result in meeting the minimum required reductions in pollutant loading within the Planning Area. These BMP(s) must be implemented within 5 years of DEP's approval of coverage under the PAG-13 General Permit or an individual permit, and may be located on either public or private property. If the applicant is aware of BMPs that will be implemented by others (either in cooperation with the applicant or otherwise) within the Planning Area that will result in net pollutant loading reductions, the applicant may include those BMPs within its PRP.

Historic street sweeping practices should not be considered in calculating credit for future practices. All proposed street sweeping practices may be used for credit if the minimum standard is met for credit (see

3800-PM-BCW0100m). In other words, if sweeping was conducted 1/month and will be increased to 25/year in the future, the MS4 does not need to use the "net reduction" resulting from the increased sweeping; it may take credit for the full amount of reductions from 25/year sweeping.

The names and descriptions of BMPs and land uses reported in the PRP should be in accordance with the Chesapeake Bay Program Model. The names and descriptions are available through CAST (log into www.casttool.org, select "Documentation," select "Source Data" and see worksheets named "Land Use Definitions" and "BMP Definitions").

Opportunities for BMP installation vary across a municipality, and for that reason MS4s with multiple PRP obligations need not propose BMPs to address each impairment listed in the Table during the permit term. The existing loading must be calculated for the entire PRP Planning Area which drains to impaired waters, but pollutant controls to be installed during the subsequent permit term may be located such that they reduce the load in one sub-watershed by less than 10% and by more than 10% in another (as long as the overall amount of lbs reduced constitutes 10% of the existing loading for the entire PRP Planning Area).

Example 2 – An MS4 has stormwater discharges to three separate streams, A, B, and C, all of which are in the same HUC-12 basin. All three are impaired for sediment and are identified on the Table as needing a PRP. The MS4 decides to combine all three watersheds into one PRP, and maps the PRP Planning Area as the combination of the storm sewersheds for Streams A, B, and C. The existing load from the PRP Planning Area is estimated to be 100,000 lbs/yr, and the required load reduction is 10,000 lbs/yr. The MS4 has identified an existing flood control basin within the PRP Planning Area that can be retrofitted to provide the full 10,000 lbs/yr reduction. Although the flood control basin is within the storm sewershed of only one impaired stream, the reduction is credited to the entire PRP Planning Area, and therefore BMPs are not required during the permit term for the storm sewersheds which drain to the other two impaired streams.

Example 3 – An MS4 has stormwater discharges which flow to two different HUC-12 basins. The MS4 attempted to locate BMPs so that they would reduce the sediment from both respective areas by 10%. It was however infeasible to fully address the load in the Planning Areas separately. The MS4 discussed the issue with DEP and it was agreed that the load reductions could be more than 10% in one basin and less than 10% in the other (but the total reduction would be at least 10% of the combined existing load).

See **Attachments C and D** for examples of selecting BMPs to meet pollutant reduction requirements in Chesapeake Bay PRPs and impaired waters PRPs, respectively.

F. **Identify Funding Mechanism(s)**. Prior to approving coverage DEP will evaluate the feasibility of implementation of an applicant's PRP. Part of this analysis includes a review of the applicant's proposed method(s) by which BMPs will be funded. Applicants must identify all project sponsors and partners and probable funding sources for each BMP.

G. **Identify Responsible Parties for Operation and Maintenance (O&M) of BMPs**. Once implemented the BMPs must be maintained in order to continue producing the expected pollutant reductions. Applicants must identify the following for each selected BMP:

- The party(ies) responsible for ongoing O&M;
- The activities involved with O&M for each BMP; and
- The frequency at which O&M activities will occur.

MS4 permittees will need to identify actual O&M activities in Annual MS4 Status Reports submitted under the General Permit.

III. Submission of PRP

Attach one copy of the PRP with the NOI or individual permit application that is submitted to the regional office of DEP responsible for reviewing the NOI or application. In addition, one copy of the PRP (not the NOI or application) must be submitted to DEP's Bureau of Clean Water (BCW). BCW prefers electronic copies of PRPs, if possible. Email the electronic version of the PRP, including map(s) (if feasible), to RA-EPPAMS4@pa.gov. If the MS4 determines that submission of an electronic copy is not possible, submit a hard copy to: PA Department

of Environmental Protection, Bureau of Clean Water, 400 Market Street, PO Box 8774, Harrisburg, PA 17105-8774.

IV. PRP Implementation and Final Report

Under the PAG-13 General Permit, the permittee must achieve the required pollutant load reductions within 5 years following DEP's approval of coverage under the General Permit, and must submit a report demonstrating compliance with the minimum pollutant load reductions as an attachment to the first Annual MS4 Status Report that is due following completion of the 5th year of General Permit coverage.

For example, if DEP issues written approval of coverage to a permittee on June 1, 2018, the required pollutant load reductions must be implemented by June 1, 2023 and the final report documenting the BMPs that were implemented (with appropriate calculations) must be attached to the annual report that is due September 30, 2023.

ATTACHMENT A

PARSING GUIDELINES FOR MS4s IN POLLUTANT REDUCTION PLANS

DEP has developed these guidelines to assist owners and operators of MS4s that are required to develop Pollutant Reduction Plans (PRPs) in understanding where it is possible to "parse" land area in the course of developing those plans. For the purpose of this document, parsing is defined as a process in which land area is removed from a Planning Area in order to calculate the actual or target pollutant loads that are applicable to an MS4.

Parsing is not required by NPDES permits and is therefore optional; however, some MS4 permittees may benefit from parsing. When parsing is done, best management practices (BMPs) implemented within the land area that is parsed may not be considered for meeting pollutant loading reductions.

MS4s must identify the target pollutant loadings (i.e., existing pollutant loading minus loading reduced by existing BMPs). In order to estimate existing pollutant loading, MS4s may parse out appropriate land area.

All parsing must be supported by a map and a determination of the area being parsed and/or appropriate calculations demonstrating how the parsing was done.

Parsing for PRPs

Parsing provides an opportunity for an MS4 permittee to eliminate areas within the storm sewershed that do not drain to the MS4 and areas that are already covered by an NPDES permit (i.e., not a waiver or no exposure certification) for the control of stormwater. For example, the land area of an industrial site that is covered by the PAG-03 General Permit for Stormwater Associated with Industrial Activity that discharges stormwater to the MS4 may be parsed out of the assessment of land area within the storm sewershed that is subject to the calculation of existing pollutant loading. If, however, the industrial land area is removed, BMPs implemented on that land may not be used as credit toward meeting the MS4's pollutant loading reduction requirements. Other examples of land area that may be parsed include:

- The land area associated with non-municipal stormwater NPDES permit coverage that exists within the urbanized area of a municipality (in such cases the entities may submit a combined PRP);
- Land area associated with PennDOT roadways and the Pennsylvania Turnpike (roads and right of ways);
- Lands associated with the production area of a Concentrated Animal Feeding Operation that is covered by an NPDES permit;
- Land areas in which stormwater runoff does not enter the MS4. If an accurate storm sewershed map is developed, these lands may be parsed or excluded as part of that process. Potential examples include homeowner's associations and schools which do not contain municipal roads or other municipal infrastructure.

If parsing is initially done for the PRP but the MS4 permittee decides later that it would be in their best interests to include that land in the PRP, the permittee may submit a modified PRP to DEP, following the public participation requirements of Appendices D and E of the permit.

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

County	Category	Acres	TN lbs/acre/yr	TP lbs/acre/yr	TSS (Sediment) lbs/acre/yr
McKean	impervious developed	38.7	20.93	3.21	1,843.27
	pervious developed	5.3	22.58	1.45	249.26
Mifflin	impervious developed	5,560.2	21.83	1.79	1,979.13
	pervious developed	16,405.5	21.13	0.71	296.07
Montour	impervious developed	5,560.2	21.83	1.79	1,979.13
	pervious developed	16,405.5	21.13	0.71	296.07
Northumberland	impervious developed	8,687.3	25.73	1.54	2,197.08
	pervious developed	25,168.3	24.63	0.54	367.84
Perry	impervious developed	5,041.1	26.77	1.32	2,314.7
	pervious developed	9,977	23.94	0.51	343.16
Potter	impervious developed	2,936.3	16.95	2.75	1,728.34
	pervious developed	2,699.3	17.11	1.09	265.2
Schuylkill	impervious developed	5,638.7	30.49	1.56	1,921.08
	pervious developed	14,797.2	29.41	0.57	264.04
Snyder	impervious developed	4,934.2	28.6	1.11	2,068.16
	pervious developed	14,718.1	24.35	0.4	301.5
Somerset	impervious developed	1,013.6	25.13	2.79	1,845.7
	pervious developed	851.2	25.71	1.14	293.42
Sullivan	impervious developed	3,031.7	19.08	2.85	2,013.9
	pervious developed	3,943.4	21.55	1.31	301.58
Susquehanna	impervious developed	7,042.1	19.29	2.86	1,405.73
	pervious developed	14,749.7	20.77	1.21	203.85
Tioga	impervious developed	7,966.9	12.37	2.09	1,767.75
	pervious developed	18,090.3	12.22	0.76	261.94
Union	impervious developed	4,382.6	22.98	2.04	2,393.55
	pervious developed	14,065.3	20.88	0.69	343.81
Wayne	impervious developed	320.5	18.69	2.89	1,002.58
	pervious developed	509	21.14	1.31	158.48
Wyoming	impervious developed	3,634.4	16.03	2.53	2,022.32
	pervious developed	10,792.9	13.75	0.7	238.26
York	impervious developed	10,330.7	29.69	1.18	1,614.15
	pervious developed	40,374.8	18.73	0.29	220.4
All Other Counties	impervious developed	-	23.06	2.28	1,839
	pervious developed	-	20.72	0.84	264.96

Notes:

1 These land loading rate values may be used to derive existing pollutant loading estimates under DEP's simplified method for PRP development. MS4s may choose to develop estimates using other scientifically sound methods.

2 Acres and land loading rate values for named counties in the Chesapeake Bay watershed are derived from CAST. (The column for Acres represents acres within the Chesapeake Bay watershed). For MS4s located outside of the Chesapeake Bay watershed, the land loading rates for "All Other Counties" may be used to develop PRPs under Appendix E; these values are average values across the Chesapeake Bay watershed.

3 For land area outside of the urbanized area, undeveloped land loading rates may be used where appropriate. When using the simplified method, DEP recommends the following loading rates (for any county) for undeveloped land:

- TN – 10 lbs/acre/yr
- TP – 0.33 lbs/acre/yr
- TSS (Sediment) – 234.6 lbs/acre/yr

These values were derived by using the existing loads for each pollutant, according to the 2014 Chesapeake Bay Progress Run, and dividing by the number of acres for the unregulated stormwater subsector.

ATTACHMENT C

CHESAPEAKE BAY PRP EXAMPLE USING DEP SIMPLIFIED METHOD

This example illustrates how Sections D and E of a Chesapeake Bay PRP may be developed using DEP's simplified method.

Section D. Determine Existing Loading for Pollutants of Concern.

ABC City in Dauphin County, PA has a total of 1,000 acres in its storm sewershed for surface waters draining to the Chesapeake Bay, 40% (400 acres) of which are impervious, 40% (400 acres) of which are pervious and 20% (200 acres) of which are undeveloped. The City must prepare a PRP for Chesapeake Bay waters and must follow Appendix D in the PAG-13 General Permit.

The date of this existing loading determination is September 16, 2017 (date of NOI submission). The MS4 is not considering any previously installed structural BMPs.

According to Attachment B of the PRP Instructions, Dauphin County's developed and undeveloped land loading rates for sediment are as follows:

Category	Sediment Loading Rate (lbs/acre/yr)
Impervious developed	1,999.14
Pervious developed	299.62
Undeveloped	234.6

The existing loading using DEP's simplified method is calculated as follows:

(400 acres x 1,999.14 lbs/acre/yr) + (400 acres x 299.62 lbs/acre/yr) + (200 acres x 234.6 lbs/acre/yr)
= 964,424 lbs/yr

Section E. Select BMPs To Achieve the Minimum Required Reductions in Pollutant Loading.

The City needs to determine the minimum sediment loading (lbs/yr) that must be reduced within 5 years following DEP's approval of coverage. The minimum percent reduction according to Appendix D is 10%.

Minimum Sediment Reduction Required = 964,424 lbs/yr existing loading x 0.1 (10%) = 96,442 lbs/yr sediment

The following describes the analysis of BMPs undertaken by ABC City to reduce 96,442 lbs/yr of sediment.

BMP Option 1. The City currently conducts street sweeping at a frequency of 1/month. The City's engineer proposes to increase street sweeping to 25 times per year (or approximately 2/month, the minimum necessary to obtain credit in the Chesapeake Bay Model). The BMP effectiveness value for street sweeping 25 times per year (the same street) is 9% for sediment (see 3800-PM-BCW0100m). Of the 400 acres that are impervious in the storm sewershed, 100 acres represent City streets that will be swept at the increased frequency. The following sediment loading reduction from increased street sweeping is estimated (values are rounded):

Estimated Sediment Reduction = 100 acres x 1,999.14 lbs/acre/yr x 0.09 (9%) = 17,992 lbs/yr

The minimum sediment loading reduction of 96,442 lbs/yr is not satisfied by increased street sweeping. (Even if satisfied, street sweeping may not be the only BMP proposed in a PRP). Additional BMPs are needed.

BMP Option 2. The City examines the BMP effectiveness values and notices that permeable pavement results in relatively high pollutant reductions. The City has applied for a grant to modify three municipally-owned parking lots (a total of 3 acres) to permeable pavement, and believes the work could be completed within 5 years of PAG-13 General

Permit coverage approval. The sediment BMP effectiveness value for permeable pavement is 85% for A or B soil without an underdrain.

Estimated reductions use the BMP effectiveness value above multiplied by the BMP acres and the impervious surface loading rates:

Estimated Sediment Reduction = 3 acres x 1,999.14 lbs/acre/yr x 0.85 (85%) = 5,098 lbs/yr

The minimum sediment loading reduction of 96,442 lbs/yr has not been met; a balance of 73,352 lbs/yr remains (96,442 lbs/yr – 17,992 lbs/yr – 5,098 lbs/yr). Additional or alternative BMPs are needed.

BMP Option 3. The City has been approached by the local girl scouts who are seeking a project relating to stormwater management. The City's engineer looks at a map and the BMP effectiveness values and suggests that a bioswale could be installed in the City's park, which sits adjacent to a stream and receives drainage from 5 acres of pervious developed land and 2 acres of impervious developed land. Stormwater currently flows through a 24-inch pipe but could be removed for this project. The bioswale would replace 100 feet of pipe receiving drainage from 7 acres. The sediment BMP effectiveness value for a bioswale is 80%.

Estimated Sediment Reduction, Impervious = 2 acres x 1,999.14 lbs/acre/yr x 0.8 (80%) = 3,199 lbs/yr
Estimated Sediment Reduction, Pervious = 5 acres x 299.62 lbs/acre/yr x 0.8 (80%) = 1,198 lbs/yr

The total sediment reduction would be 4,397 lbs/yr, leaving a balance of 68,955 lbs/yr for sediment. Additional or alternative BMPs are needed.

BMP Option 4. The City is considering "Urban Stream Restoration" through cooperation with a watershed group. A total of 1,000 linear feet of stream banks will be restored. The sediment BMP effectiveness value is 44 lbs/ft.

Upon completion of the project, the following sediment loading reduction is anticipated:

Estimated Sediment Reduction = 1,000 ft x 44.88 lbs/ft = 44,880 lbs/yr

The restoration of 1,000 linear feet of stream banks will not satisfy the minimum required sediment reduction, leaving a balance of 24,075 lbs/yr. Additional or alternative BMPs are needed.

BMP Option 5. During heavy rains stormwater promotes flooding on a PennDOT roadway. The pipe used to convey stormwater is too small to handle design storm events. The proposed solution was replacement with a larger pipe; however, the City's engineer determines that an infiltration basin could be sized properly upstream of the pipe to accommodate average annual stormwater flow conditions and help reduce flooding during severe weather. The best location for this basin is on privately-owned property that is undeveloped (outside of the urbanized area). The City proposes to acquire a right-of-way to install the basin, which will treat runoff from 34 acres of undeveloped land, and apply for a PENNVEST loan to pay for it. The sediment BMP effectiveness value is determined to be 95%.

Upon completion of the project, the following sediment loading reduction is anticipated:

Estimated Sediment Reduction = 34 acres x 234.6 lbs/acre/yr x 0.95 (95%) = 7,578 lbs/yr

The installation of an infiltration basin will not satisfy the minimum required sediment reduction, leaving a balance of 16,497 lbs/yr. Additional or alternative BMPs are needed.

BMP Option 6. The City is evaluating the possibility of installing sediment filter bags on some of its stormwater inlets. The City has 150 stormwater inlets, and 100 have drainage areas of 0.5 acre or less. The City proposes to purchase and maintain 100 filter bags that receive drainage from 40 acres of impervious developed land. The manufacturer of the filter bags claims up to 95% removal of sediment when properly maintained; for planning purposes, 80% efficiency is used. According to the manufacturer, the filter bags will need to be inspected and solids removed at least monthly and following rain events of 0.5 inch or more.

Upon completing the installation of filter bags, the following annual loading of material to the filter bags is estimated as follows:

Estimated Material Captured = 40 acres x 1,999.14 lbs/acre/yr x 0.8 (80%) = 63,972 lbs/yr (wet weight)

It is estimated that, by weight, 50% of the material captured will be inorganic sediment, 40% will be organic material, and 10% will be debris and refuse. The 10% debris and refuse component will need to be deducted (6,397 lbs/yr), leaving 57,575 lbs/yr in wet weight.

Of the remaining wet material collected, it is estimated that 55% will be inorganic sediment and 45% will be organic material. The material, in dry weight, is as follows (the factors are contained in DEP's Effectiveness Values document):

- 57,575 lbs/yr wet weight x 0.55 (55%) x 0.7 = 22,166 lbs/yr dry weight sediment
- 57,575 lbs/yr wet weight x 0.45 (45%) x 0.2 = 5,182 lbs/yr dry weight sediment

In order to find the total annual sediment reduction from this BMP that can be used toward meeting PRP reduction requirements, the fraction of TN and TP in the dry weight sediment need to be excluded (the factors are contained in DEP's Effectiveness Values document):

Fraction (in terms of loading) of TN in dry weight sediment:

22,166 lbs/yr x 0.0027 = 60 lbs/yr TN
5,182 lbs/yr x 0.0111 = 58 lbs/yr TN

Fraction (in terms of loading) of TP in dry weight sediment:

22,166 x 0.0006 = 13 lbs/yr TP
5,182 lbs/yr x 0.0012 = 6 lbs/yr TP

The total sediment loading reduction from this BMP is estimated as 27,211 lbs/yr (22,166 + 5,182 – (60 + 58 + 13 + 6)). The installation of sediment filter bags will satisfy 28% of the City's sediment pollutant loading reduction requirement, and will satisfy the balance after considering BMP Option 5.

Summary of Alternatives and Selection of BMPs

The City evaluates its BMP alternatives and selects Option 4, Urban Stream Restoration, because it believes the watershed group will receive a grant from DEP to cover most of the costs and because of the significant pollutant reductions the project offers. The City also selects Option 6 because of the relatively high reductions that can be achieved through filter bags, with proper maintenance. These two projects do not satisfy the full reduction needed, so at least one more must be selected. The City decides to pursue Option 5, infiltration, as it may help reduce a roadway flooding issue. The City still has not met its minimum required reduction, so it therefore decides to increase street sweeping frequency to 2/month.

In summary, the City in this example will commit to implementing the following BMPs in its PRP to meet the 10% sediment loading reduction requirement for the PAG-13 General Permit:

Selected BMP	Estimated Sediment Loading Reduction (lbs/yr)
Street Sweeping	17,992
Urban Stream Restoration	44,880
Infiltration Basin	7,578
Sediment Filter Bags on 100 Inlets	27,211
Total:	97,661 ✓
Minimum Required:	96,442

ATTACHMENT D

IMPAIRED WATERS PRP EXAMPLE USING DEP SIMPLIFIED METHOD

This example illustrates how Sections D and E of an impaired waters PRP may be developed using DEP's simplified method.

Section D. Determine Existing Loading for Pollutants of Concern.

XYZ Township in Allegheny County, PA has a total of 2,000 acres in a storm sewershed that drains to a surface water that is impaired for siltation and nutrients. The MS4 Requirements Table specifies that a PRP for impaired waters (Appendix E) must be developed. In this storm sewershed, 30% (600 acres) is impervious developed land and 70% (1,400 acres) is pervious developed land.

The date of this existing loading determination is January 1, 2017 (the date of PRP development).

According to Attachment B of the PRP Instructions, Allegheny County's (outside of the Chesapeake Bay watershed) developed land loading rates for sediment are as follows:

Category	Sediment Loading Rate (lbs/acre/yr)	TP Loading Rate (lbs/acre/yr)
Impervious developed	1,839	2.28
Pervious developed	264.96	0.84

The existing loading using DEP's simplified method is calculated as follows:

Existing Sediment Loading: (600 acres x 1,839 lbs/acre/yr) + (1,400 acres x 264.96 lbs/acre/yr) = 1,474,344 lbs/yr
Existing TP Loading: (600 acres x 2.28 lbs/acre/yr) + (1,400 acres x 0.84 lbs/acre/yr) = 2,544 lbs/yr

Section E. Select BMPs To Achieve the Minimum Required Reductions in Pollutant Loading.

The Township needs to determine the minimum sediment and Total Phosphorus (TP) loading (lbs/yr) that must be reduced within 5 years following DEP's approval of coverage. The minimum percent reduction according to Appendix E is 10% for sediment and 5% for TP.

Minimum Sediment Reduction Required = 964,424 lbs/yr existing loading x 0.1 (10%) = 147,434 lbs/yr sediment
Minimum TP Reduction Required = 2,544 lbs/yr existing loading x 0.05 (5%) = 127 lbs/yr TP

The following describes the analysis of BMPs undertaken by XYZ Township to reduce sediment and TP loads.

BMP Option 1. The City currently conducts street sweeping at a frequency of once every three months. The City's engineer proposes to increase street sweeping to 25 times per year. The BMP effectiveness value for street sweeping 25 times per year (the same street) is 9% for sediment and 3% for TP (see 3800-PM-BCW0100m). Of the 600 acres that are impervious in the storm sewershed, 150 acres represent City streets that will be swept at the increased frequency. The following sediment loading reduction from increased street sweeping is estimated (values are rounded):

Estimated Sediment Reduction = 150 acres x 1,839 lbs/acre/yr x 0.09 (9%) = 24,827 lbs/yr
Estimated TP Reduction = 150 acres x 2.28 lbs/acre/yr x 0.03 (3%) = 10 lbs/yr

The minimum sediment and TP loading reductions are not satisfied by increased street sweeping. (Even if satisfied, street sweeping may not be the only BMP proposed in a PRP). Additional BMPs are needed.

BMP Option 2. The Township has been planning to establish an authority and begin charging a fee based on the area of impervious surface associated with parcels. The fee can be offset through the installation of BMPs that reduce the rate and volume of stormwater runoff. The Township is aware of a large industrial operation within the

storm sewershed that is planning to construct to remove vacant parking lots and install a series of infiltration galleries to treat runoff from approximately half of its complex, or about 50 acres. The BMP effectiveness values for TP and sediment are 85% and 95%, respectively. Of the 50 acres to be treated, 45 are impervious and 5 are pervious.

Estimated Sediment Reduction, Impervious = 45 acres x 1,839 lbs/acre/yr x 0.95 (95%) = 78,617 lbs/yr
Estimated Sediment Reduction, Pervious = 5 acres x 264.96 lbs/acre/yr x 0.95 (95%) = 1,259 lbs/yr

Estimated TP Reduction, Impervious = 45 acres x 2.28 lbs/acre/yr x 0.85 (85%) = 87 lbs/yr
Estimated TP Reduction, Pervious = 5 acres x 0.84 lbs/acre/yr x 0.85 (85%) = 4 lbs/yr

The minimum sediment loading reduction of 147,434 lbs/yr has not been met; a balance of 42,731 lbs/yr remains (147,434 lbs/yr – 24,827 lbs/yr – 78,617 lbs/yr). Additional or alternative BMPs are needed.

The minimum TP loading reduction of 127 lbs/yr has not been met; a balance of 26 lbs/yr remains (127 lbs/yr – 10 lbs/yr – 87 lbs/yr – 4 lbs/yr). Additional or alternative BMPs are needed.

BMP Option 3. The Township has a park with a lake used for recreation, which is owned and operated by the county. The lake is manmade and receives inflow from a small stream. This stream receives stormwater discharges from 10 MS4 outfalls prior to flowing into the lake, draining an area of 75 acres, 25 of which are in the Township (all of which are impervious). The Township is aware that the lake is nearly full of sediment, and is considering dredging the lake. The Township learned that dredging sediment will not count toward meeting pollutant reduction goals, but is still interested in dredging for future recreational use. It is also cognizant that the same problem could recur unless steps are taken upstream to reduce stormwater flows. The Township engineer proposes to reroute stormwater piping to bypass the small stream into a belowground mixed media filtration system, immediately upstream from the lake, which will provide some infiltration but will also capture sediment. The upstream end of the lake will be dredged to make room for the filtration system, and the outflow from this BMP would discharge to the lake. Both the Township and County agree in principal to the proposal, and believe grant funds can be secured for the work.

Estimated Sediment Reduction = 25 acres x 1,839 lbs/acre/yr x 0.95 (95%) = 43,676 lbs/yr

Estimated TP Reduction = 25 acres x 2.28 lbs/acre/yr x 0.85 (85%) = 48 lbs/yr

NOTE – If the neighboring municipality was an MS4 permittee and the permittees collaborated on the PRP, credit for an additional 50 acres could have been taken.

With the selection of this BMP, the sediment and TP loading reduction requirements will be met.

Summary of Alternatives and Selection of BMPs

The Township wishes to pursue all three BMPs it has evaluated. These BMPs will meet the objectives of 10% and 5% loading reductions for sediment and TP, respectively:

Selected BMP	Estimated Sediment Loading Reduction (lbs/yr)	Estimated TP Loading Reduction (lbs/yr)
Street Sweeping 25/Year	24,827	10
Infiltration Practices (Industrial)	79,876	91
Infiltration Practices (County Park)	43,676	48
Total:	148,379 ✓	149 ✓
Minimum Required:	147,434	127

Appendix E – Baseline Calculations

Watershed ID	Total Drainage Area (Acres)	Total Drainage Area (SF)	Drainage Area in UA (SF)*	Drainage Area outside UA (SF)**	UA Percent Impervious (%)	UA Percent Pervious (%)	Outside UA Percent Impervious (%)	Outside UA Percent Pervious (%)	UA Impervious Area (SF)	UA Pervious Area (SF)	Outside UA Impervious Area (SF)	Outside UA Pervious Area (SF)	Total Impervious Area (SF)	Total Pervious Area (SF)	Sediment Loading Coefficient - Impervious (lbs.)	Sediment Loading Coefficient - Pervious (lbs.)	Watershed - Impervious Load (lbs.)	Watershed - Pervious Load (lbs.)	Total Load (lbs.)
001	11.57	503,928	447,708	55,559	49	51			219,376.92	228,331.08	-	-	219,376.92	228,331.08	1480.43	190.93	7,455.74	1,000.81	8,456.55
002	21.45	934,299	913,766	20,533	49	51			447,745.34	466,020.66	-	-	447,745.34	466,020.66	1480.43	190.93	15,217.07	2,042.64	17,259.71
003	9.69	422,054	422,054	-	49	51			206,806.46	215,247.54	-	-	206,806.46	215,247.54	1480.43	190.93	7,028.52	943.46	7,971.99
004	9.81	427,197	427,197	-	49	51			209,326.53	217,870.47	-	-	209,326.53	217,870.47	1480.43	190.93	7,114.17	954.96	8,069.13
005	2.53	110,296	110,296	-	49	51			54,045.04	56,250.96	-	-	54,045.04	56,250.96	1480.43	190.93	1,836.77	246.56	2,083.33
006	35.90	1,563,793	1,403,203	-	49	51			687,569.47	715,633.53	-	-	687,569.47	715,633.53	1480.43	190.93	23,367.73	3,136.73	26,504.46
007	4.86	211,571	211,571	-	49	51			103,669.79	107,901.21	-	-	103,669.79	107,901.21	1480.43	190.93	3,523.32	472.95	3,996.27
008	1.06	46,297	46,297	-	49	51			22,685.53	23,611.47	-	-	22,685.53	23,611.47	1480.43	190.93	770.99	103.49	874.48
009	0.86	37,472	37,472	-	49	51			18,361.28	19,110.72	-	-	18,361.28	19,110.72	1480.43	190.93	624.03	83.77	707.79
010	2.09	91,001	91,001	-	49	51			44,590.49	46,410.51	-	-	44,590.49	46,410.51	1480.43	190.93	1,515.45	203.42	1,718.88
011	0.22	9,420	9,420	-	49	51			4,615.80	4,804.20	-	-	4,615.80	4,804.20	1480.43	190.93	156.87	21.06	177.93
011A	8.91	388,124	98,703	289,420	49	51			48,364.47	50,338.53	-	-	48,364.47	50,338.53	1480.43	190.93	1,643.71	220.64	1,864.36
011B	9.87	430,149	193,767	237,192	49	51			94,945.83	98,821.17	-	-	94,945.83	98,821.17	1480.43	190.93	3,226.83	433.15	3,659.98
012	5.11	222,495	195,696	26,799	49	51			95,891.04	99,804.96	-	-	95,891.04	99,804.96	1480.43	190.93	3,258.95	437.46	3,696.41
013	7.73	336,553	336,553	-	49	51			164,910.97	171,642.03	-	-	164,910.97	171,642.03	1480.43	190.93	5,604.66	752.33	6,357.00
014	3.68	160,425	160,425	-	49	51			78,608.25	81,816.75	-	-	78,608.25	81,816.75	1480.43	190.93	2,671.58	358.62	3,030.19
015	0.10	4,186	4,186	-	49	51			2,051.14	2,134.86	-	-	2,051.14	2,134.86	1480.43	190.93	69.71	9.36	79.07
016	0.47	20,627	20,627	-	49	51			10,107.23	10,519.77	-	-	10,107.23	10,519.77	1480.43	190.93	343.50	46.11	389.61
017	50.29	2,190,468	2,097,008	91,301	49	51			1,027,533.92	1,069,474.08	-	-	1,027,533.92	1,069,474.08	1480.43	190.93	34,921.76	4,687.66	39,609.43
018	0.54	23,484	23,484	-	49	51			11,507.16	11,976.84	-	-	11,507.16	11,976.84	1480.43	190.93	391.08	52.50	443.58
019	13.42	584,549	584,549	-	49	51			286,429.01	298,119.99	-	-	286,429.01	298,119.99	1480.43	190.93	9,734.58	1,306.70	11,041.28
020	3.45	150,332	150,332	-	49	51			73,662.68	76,669.32	-	-	73,662.68	76,669.32	1480.43	190.93	2,503.50	336.05	2,839.55
021	2.10	91,427	91,427	-	49	51			44,799.23	46,627.77	-	-	44,799.23	46,627.77	1480.43	190.93	1,522.55	204.38	1,726.92
022	1.62	70,550	70,550	-	49	51			34,569.50	35,980.50	-	-	34,569.50	35,980.50	1480.43	190.93	1,174.88	157.71	1,332.59
023	3.64	158,522	129,892	28,629	49	51			63,647.08	66,244.92	-	-	63,647.08	66,244.92	1480.43	190.93	2,163.11	290.36	2,453.47
024	12.69	552,914	498,925	-	49	51			244,473.25	254,451.75	-	-	244,473.25	254,451.75	1480.43	190.93	8,308.67	1,115.30	9,423.97
025	0.20	8,589	8,589	-	49	51			4,208.61	4,380.39	-	-	4,208.61	4,380.39	1480.43	190.93	143.03	19.20	162.23
026	8.27	360,262	360,262	-	49	51			176,528.38	183,733.62	-	-	176,528.38	183,733.62	1480.43	190.93	5,999.49	805.33	6,804.82
027	0.45	19,485	19,485	-	49	51			9,547.65	9,937.35	-	-	9,547.65	9,937.35	1480.43	190.93	324.49	43.56	368.04
028	2.78	121,004	121,004	-	49	51			59,291.96	61,712.04	-	-	59,291.96	61,712.04	1480.43	190.93	2,015.10	270.49	2,285.59
029	0.81	35,492	5,499	-	49	51			2,694.51	2,804.49	-	-	2,694.51	2,804.49	1480.43	190.93	91.58	12.29	103.87
030	0.90	39,237	39,237	-	49	51			19,226.13	20,010.87	-	-	19,226.13	20,010.87	1480.43	190.93	653.42	87.71	741.13
031	1.08	47,207	37,315		49	51			18,284.35	19,030.65	-	-	18,284.35	19,030.65	1480.43	190.93	621.41	83.41	704.83
032																			
033	0.87	37,830	37,830	-	49	51			18,536.70	19,293.30	-	-	18,536.70	19,293.30	1480.43	190.93	629.99	84.57	714.55
034	3.53	153,870	153,870	-	49	51			75,396.30	78,473.70	-	-	75,396.30	78,473.70	1480.43	190.93	2,562.42	343.96	2,906.38
035	7.06	307,451	307,451	-	49	51			150,650.99	156,800.01	-	-	150,650.99	156,800.01	1480.43	190.93	5,120.02	687.28	5,807.30
036	2.74	119,516	119,217	-	49	51			58,416.33	60,800.67	-	-	58,416.33	60,800.67	1480.43	190.93	1,985.34	266.50	2,251.84
037	25.50	1,110,792	1,110,792	-	49	51			544,288.08	566,503.92	-	-	544,288.08	566,503.92	1480.43	190.93	18,498.17	2,483.07	20,981.24
038	1.80	78,375	78,375	-	49	51			38,403.75	39,971.25	-	-	38,403.75	39,971.25	1480.43	190.93	1,305.19	175.20	1,480.39
039	1.75	76,376	76,376	-	49	51			37,424.24	38,951.76	-	-	37,424.24	38,951.76	1480.43	190.93	1,271.90	170.73	1,442.63
040																			
041																			
042	7.55	328,684	322,446	6,238	49	51			157,998.54	164,447.46	-	-	157,998.54	164,447.46	1480.43	190.93	5,369.74	720.80	6,090.54
043																			
044	1.39	60,585	60,585	-	49	51			29,686.65	30,898.35	-	-	29,686.65	30,898.35	1480.43	190.93	1,008.93	135.43	1,144.36
045	3.44	149,693	138,506	-	49	51			67,867.94	70,638.06	-	-	67,867.94	70,638.06	1480.43	190.93	2,306.56	309.62	2,616.18
046	0.94	41,010	41,010	-	49	51			20,094.90	20,915.10	-	-	20,094.90	20,915.10	1480.43	190.93	682.95	91.67	774.62
047	1.03	45,071	45,071	-	49	51			22,084.79	22,986.21	-	-	22,084.79	22,986.21	1480.43	190.93	750.57	100.75	851.33
048	0.15	6,670	6,670	-	49	51			3,268.30	3,401.70	-	-	3,268.30	3,401.70	1480.43	190.93	111.08	14.91	125.99
049																			
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061																			
062	7.98	347,693	347,693	-	49	51			170,369.57	177,323.43	-	-	170,369.57	177,323.43	1480.43	190.93	5,790.18	777.24	6,567.41
063	10.79	469,998	464,537	-	49	51			227,623.13	236,913.87	-	-	227,623.13	236,913.87	1480.43	190.93	7,736.00	1,038.43	8,774.43
064	0.59	25,539	25,539	-	49	51			12,514.11	13,024.89	-	-	12,514.11	13,024.89	1480.43	190.93	425.30	57.09	482.39
065																			
066																			
067																			
068																			
069	2.14	93,069	93,069	-	49	51			45,603.81	47,465.19	-	-	45,603.81	47,465.19	1480.43	190.93	1,549.89	208.05	1,757.94
070																			
071	10.28	447,746	190,393	257,353	49	51			93,292.57	97,100.43	-	-	93,292.57	97,100.43	1480.43	190.93	3,170.64	425.61	3,596.25
072	3.20	139,220	66,802	72,418	49	51			32,732.98	34,069.02	-	-	32,732.98	34,069.02	1480.43	190.93	1,112.46	149.33	1,261.79

073	3.54	154,285	94,494	59,791	49	51			46,302.06	48,191.94	-	-	46,302.06	48,191.94	1480.43	190.93	1,573.62	211.23	1,784.85
074	36.39	1,585,228	1,552,187	-	49	51			760,571.63	791,615.37	-	-	760,571.63	791,615.37	1480.43	190.93	25,848.78	3,469.77	29,318.55
075	7.85	341,812	341,812	-	49	51			167,487.88	174,324.12	-	-	167,487.88	174,324.12	1480.43	190.93	5,692.24	764.09	6,456.33
076	0.58	25,332	4,018	-	49	51			1,968.82	2,049.18	-	-	1,968.82	2,049.18	1480.43	190.93	66.91	8.98	75.89
077	1.81	78,912	53,892	-	49	51			26,407.08	27,484.92	-	-	26,407.08	27,484.92	1480.43	190.93	897.47	120.47	1,017.94
078	8.59	374,264	372,964	1,300	49	51			182,752.36	190,211.64	-	-	182,752.36	190,211.64	1480.43	190.93	6,211.02	833.73	7,044.75
079	2.18	94,813	94,813	-	49	51			46,458.37	48,354.63	-	-	46,458.37	48,354.63	1480.43	190.93	1,578.93	211.95	1,790.88
080	1.18	51,404	51,404	-	49	51			25,187.96	26,216.04	-	-	25,187.96	26,216.04	1480.43	190.93	856.04	114.91	970.95
081	12.86	560,043	248,883	281,059	49	51			121,952.67	126,930.33	-	-	121,952.67	126,930.33	1480.43	190.93	4,144.68	556.35	4,701.04
082	2.67	116,441	90,871	25,435	49	51			44,526.79	46,344.21	-	-	44,526.79	46,344.21	1480.43	190.93	1,513.29	203.13	1,716.42
083	22.51	980,495	904,365	-	49	51			443,138.85	461,226.15	-	-	443,138.85	461,226.15	1480.43	190.93	15,060.52	2,021.62	17,082.14
083A	1.34	58,520	58,520	-	49	51			28,674.80	29,845.20	-	-	28,674.80	29,845.20	1480.43	190.93	974.54	130.82	1,105.36
084	6.86	298,739	298,739	-	49	51			146,382.11	152,356.89	-	-	146,382.11	152,356.89	1480.43	190.93	4,974.94	667.80	5,642.74
085	15.87	691,450	638,519	-	49	51			312,874.31	325,644.69	-	-	312,874.31	325,644.69	1480.43	190.93	10,633.35	1,427.35	12,060.69
086	0.74	32,087	32,087	-	49	51			15,722.63	16,364.37	-	-	15,722.63	16,364.37	1480.43	190.93	534.35	71.73	606.08
087	0.61	26,541	22,887	-	49	51			11,214.63	11,672.37	-	-	11,214.63	11,672.37	1480.43	190.93	381.14	51.16	432.30
088	0.16	6,934	6,934	-	49	51			3,397.66	3,536.34	-	-	3,397.66	3,536.34	1480.43	190.93	115.47	15.50	130.97
089	0.63	27,588	27,588	-	49	51			13,518.12	14,069.88	-	-	13,518.12	14,069.88	1480.43	190.93	459.43	61.67	521.10
090	6.95	302,765	300,583	-	49	51			147,285.67	153,297.33	-	-	147,285.67	153,297.33	1480.43	190.93	5,005.65	671.93	5,677.58
091	3.32	144,631	0	-	49	51			-	-	-	-	-	-	1480.43	190.93	-	-	-
092	5.37	233,837	52,627	-	49	51			25,787.43	26,839.97	-	-	25,787.43	26,839.97	1480.43	190.93	876.41	117.64	994.05
093	2.63	114,563	0	-	49	51			0.10	0.10	-	-	0.10	0.10	1480.43	190.93	0.00	0.00	0.00
094																			
095																			
096																			
097																			
098	8.31	361,942	327,397	-	49	51			160,424.53	166,972.47	-	-	160,424.53	166,972.47	1480.43	190.93	5,452.19	731.87	6,184.05
099																			
100	9.84	428,464	386,683	-	49	51			189,474.67	197,208.33	-	-	189,474.67	197,208.33	1480.43	190.93	6,439.49	864.39	7,303.88
101	53.73	2,340,399	2,177,191	8,940	49	51			1,066,823.59	1,110,367.41	-	-	1,066,823.59	1,110,367.41	1480.43	190.93	36,257.06	4,866.91	41,123.97
102																			
103	2.48	107,907	99,341	8,566	49	51			48,677.09	50,663.91	-	-	48,677.09	50,663.91	1480.43	190.93	1,654.34	222.07	1,876.41
104	3.66	159,216	159,216	-	49	51			78,015.84	81,200.16	-	-	78,015.84	81,200.16	1480.43	190.93	2,651.45	355.91	3,007.36
105	24.10	1,049,880	464,748	585,132	49	51			227,726.52	237,021.48	-	-	227,726.52	237,021.48	1480.43	190.93	7,739.51	1,038.90	8,778.41
106																			
107	2.74	119,178	99,658	-	49	51			48,832.42	50,825.58	-	-	48,832.42	50,825.58	1480.43	190.93	1,659.62	222.78	1,882.39
108	12.00	522,899	436,521	-	49	51			213,895.29	222,625.71	-	-	213,895.29	222,625.71	1480.43	190.93	7,269.44	975.80	8,245.25
109	10.29	448,198	409,930	-	49	51			200,865.70	209,064.30	-	-	200,865.70	209,064.30	1480.43	190.93	6,826.62	916.36	7,742.98
109-A	2.53	110,207	110,207	-	49	51			54,001.43	56,205.57	-	-	54,001.43	56,205.57	1480.43	190.93	1,835.29	246.36	2,081.65
110	1.74	75,918	75,918	-	49	51			37,199.82	38,718.18	-	-	37,199.82	38,718.18	1480.43	190.93	1,264.27	169.71	1,433.98
111																			
112																			
113	1.61	70,031	70,031	-	49	51			34,315.19	35,715.81	-	-	34,315.19	35,715.81	1480.43	190.93	1,166.24	156.55	1,322.78
114	33.59	1,463,184	1,231,619	260,778	49	51			603,493.31	628,125.69	-	-	603,493.31	628,125.69	1480.43	190.93	20,510.32	2,753.17	23,263.49
115	1.81	78,713	78,713	-	49	51			38,569.37	40,143.63	-	-	38,569.37	40,143.63	1480.43	190.93	1,310.82	175.96	1,486.77
116	134.23	5,847,253	4,747,538	1,099,715	49	51			2,326,293.62	2,421,244.38	-	-	2,326,293.62	2,421,244.38	1480.43	190.93	79,061.41	10,612.68	89,674.08
117	0.71	30,794	29,935	688	49	51			14,668.15	15,266.85	-	-	14,668.15	15,266.85	1480.43	190.93	498.51	66.92	565.43
118																			
119	42.50	1,851,246	1,371,080	480,166	49	51			671,829.20	699,250.80	-	-	671,829.20	699,250.80	1480.43	190.93	22,832.78	3,064.92	25,897.71
120	13.68	596,022	596,022	-	49	51			292,050.78	303,971.22	-	-	292,050.78	303,971.22	1480.43	190.93	9,925.64	1,332.35	11,257.99
121	19.06	830,281	830,281	-	49	51			406,837.69	423,443.31	-	-	406,837.69	423,443.31	1480.43	190.93	13,826.78	1,856.02	15,682.80
122	0.74	32,381	32,381	-	49	51			15,866.69	16,514.31	-	-	15,866.69	16,514.31	1480.43	190.93	539.25	72.38	611.63
122A	0.35	15,141	15,141	-	49	51			7,419.09	7,721.91	-	-	7,419.09	7,721.91	1480.43	190.93	252.15	33.85	285.99
123	16.71	727,954	671,447	-	49	51			329,009.03	342,437.97	-	-	329,009.03	342,437.97	1480.43	190.93	11,181.70	1,500.96	12,682.66
124	0.72	31,292	31,292	-	49	51			15,333.08	15,958.92	-	-	15,333.08	15,958.92	1480.43	190.93	521.11	69.95	591.06
125	1.32	57,675	25,594	-	49	51			12,541.06	13,052.94	-	-	12,541.06	13,052.94	1480.43	190.93	426.22	57.21	483.43
126	54.12	2,357,407	989,264	1,368,143	49	51			484,739.36	504,524.64	-	-	484,739.36	504,524.64	1480.43	190.93	16,474.35	2,211.41	18,685.76
127	38.33	1,669,579	1,618,141	51,437	49	51			792,889.09	825,251.91	-	-	792,889.09	825,251.91	1480.43	190.93	26,947.13	3,617.20	30,564.33
128																			
129																			
130	18.41	801,861	768,199	-	49	51			376,417.51	391,781.49	-	-	376,417.51	391,781.49	1480.43	190.93	12,792.92	1,717.24	14,510.16
131																			
132																			
133																			
134																			
135	22.81	993,603	604,836	-	49	51			296,369.64	308,466.36	-	-	296,369.64	308,466.36	1480.43	190.93	10,072.42	1,352.05	11,424.47
135A	21.74	946,994	192,535	17,194	49	51			94,342.05	98,192.75	-	-	94,342.05	98,192.75	1480.43	190.93	3,206.31	430.39	3,636.70
136																			
137	7.37	320,934	320,934	-	49	51			157,257.66	163,676.34	-	-	157,257.66	163,676.34	1480.43	190.93	5,344.56	717.42	6,061.98
138	194.16	8,457,535	7,599,266	813,179	49	51			3,723,640.34	3,875,625.66	-	-	3,723,640.34	3,875,625.66	1480.43	190.93	126,551.63	16,987.45	143,539.07
139	5.25	228,690	228,690	-	49	51			112,058.10	116,631.90	-	-	112,058.10	116,631.90	1480.43	190.93	3,808.41	511.22	4,319.62
140	16.32	711,002	600,572	110,430	49	51			294,280.28	306,291.72	-	-	294,280.28	306,291.72	1480.43	190.93	10,001.41	1,342.52	11,343.93
141																			
142	2.38	103,568	64,729	2,297	49	51			31,717.21	33,011.79	-	-	31,717.21	33,011.79	1480.43	190.93	1,077.94	144.70	1,222.64
143	2.13	92,940	92,940	-	49	51			45,540.60	47,399.40	-	-	45,540.60	47,399.40	1480.43	190.93	1,547.74	207.76	1,755.50
Total	1,256.97	54,753,569	45,859,909	6,259,692					22,471,355.61	23,388,553.79	-	-	22,471,355.61	23,388,553.79			763,711.41	102,515.53	866,226.94

* Parsed Areas from Parsing Chart on following page (light green - Parsed)

**Drainage Area Outside the UA is in adjacent municipality. (orange highlight)

*** Parsed NPDES Areas (light blue)

Parsed Areas *			
Watershed	**Reason for Parsing**	**Area in UA (SF)**	**Area Outside UA (SF)**
006	PennDOT ROW	160,590	-
017	PennDOT ROW	2,159	-
024	PennDOT ROW	53,989	-
029	PennDOT ROW	29,993	-
031	PennDOT ROW	9,892	-
036	PennDOT ROW	299	-
045	PennDOT ROW	11,187	-
063	PennDOT ROW	5,461	-
074	PennDOT ROW	33,041	-
076	PennDOT ROW	21,314	-
077	PennDOT ROW	25,020	-
081	PennDOT ROW	30,101	-
082	PennDOT ROW	135	
083	PennDOT ROW	76,130	-
085	PennDOT ROW	52,931	-
087	PennDOT ROW	3,654	-
090	PennDOT ROW	2,182	-
91	NPDES	144,631	
92	NPDES	181,210	
93	NPDES	114,563	
098	PennDOT ROW	34,545	-
100	PennDOT ROW	41,781	-
101	PennDOT ROW	154,268	-
107	PennDOT ROW	19,520	-
108	PennDOT ROW	86,378	-
109	PennDOT ROW	38,268	-
114	PennDOT ROW	24,786	-
123	PennDOT ROW	56,507	-
125	PennDOT ROW	32,081	-
130	PennDOT ROW	33,662	-
135	PennDOT ROW	79,491	-
135	NPDES	309,276	
135A	NPDES	754,459	
138	PennDOT ROW	45,090	-
142	PennDOT ROW	36,180	-
Total		2,704,774	

Total Sediment Loading (lbs.)	Required Reduction	Required Lbs. Reduction
866,226.94	10%	86,622.69

Watershed ID	Total Drainage Area (Acres)	Total Drainage Area (SF)	Drainage Area in UA (SF)*	Drainage Area outside UA (SF)*	UA Percent Impervious (%)	UA Percent Pervious (%)	Outside UA Percent Impervious (%)	Outside UA Percent Pervious (%)	UA Impervious Area (SF)	UA Pervious Area (SF)	Outside UA Impervious Area (SF)	Outside UA Pervious Area (SF)	Total Impervious Area (SF)	Total Pervious Area (SF)	Phosphorus Loading Coefficient - Impervious (lbs.)	Phosphorus Loading Coefficient - Pervious (lbs.)	Watershed - Impervious Load (lbs.)	Watershed - Pervious Load (lbs.)	Total Load (lbs.)
001	11.57	503,928	447,708	55,559	49	51			219,376.92	228,331.08	-	-	219,376.92	228,331.08	1.55	0.36	7.81	1.89	9.69
002	21.45	934,299	913,766	20,533	49	51			447,745.34	466,020.66	-	-	447,745.34	466,020.66	1.55	0.36	15.93	3.85	19.78
003	9.69	422,054	422,054	-	49	51			206,806.46	215,247.54	-	-	206,806.46	215,247.54	1.55	0.36	7.36	1.78	9.14
004	9.81	427,197	427,197	-	49	51			209,326.53	217,870.47	-	-	209,326.53	217,870.47	1.55	0.36	7.45	1.80	9.25
005	2.53	110,296	110,296	-	49	51			54,045.04	56,250.96	-	-	54,045.04	56,250.96	1.55	0.36	1.92	0.46	2.39
006	35.90	1,563,793	1,403,203	-	49	51			687,569.47	715,633.53	-	-	687,569.47	715,633.53	1.55	0.36	24.47	5.91	30.38
007	4.86	211,571	211,571	-	49	51			103,669.79	107,901.21	-	-	103,669.79	107,901.21	1.55	0.36	3.69	0.89	4.58
008	1.06	46,297	46,297	-	49	51			22,685.53	23,611.47	-	-	22,685.53	23,611.47	1.55	0.36	0.81	0.20	1.00
009	0.86	37,472	37,472	-	49	51			18,361.28	19,110.72	-	-	18,361.28	19,110.72	1.55	0.36	0.65	0.16	0.81
010	2.09	91,001	91,001	-	49	51			44,590.49	46,410.51	-	-	44,590.49	46,410.51	1.55	0.36	1.59	0.38	1.97
011	0.22	9,420	9,420	-	49	51			4,615.80	4,804.20	-	-	4,615.80	4,804.20	1.55	0.36	0.16	0.04	0.20
011A	8.91	388,124	98,703	289,420	49	51			48,364.47	50,338.53	-	-	48,364.47	50,338.53	1.55	0.36	1.72	0.42	2.14
011B	9.87	430,149	193,767	237,192	49	51			94,945.83	98,821.17	-	-	94,945.83	98,821.17	1.55	0.36	3.38	0.82	4.20
012	5.11	222,495	195,696	26,799	49	51			95,891.04	99,804.96	-	-	95,891.04	99,804.96	1.55	0.36	3.41	0.82	4.24
013	7.73	336,553	336,553	-	49	51			164,910.97	171,642.03	-	-	164,910.97	171,642.03	1.55	0.36	5.87	1.42	7.29
014	3.68	160,425	160,425	-	49	51			78,608.25	81,816.75	-	-	78,608.25	81,816.75	1.55	0.36	2.80	0.68	3.47
015	0.10	4,186	4,186	-	49	51			2,051.14	2,134.86	-	-	2,051.14	2,134.86	1.55	0.36	0.07	0.02	0.09
016	0.47	20,627	20,627	-	49	51			10,107.23	10,519.77	-	-	10,107.23	10,519.77	1.55	0.36	0.36	0.09	0.45
017	50.29	2,190,468	2,097,008	91,301	49	51			1,027,533.92	1,069,474.08	-	-	1,027,533.92	1,069,474.08	1.55	0.36	36.56	8.84	45.40
018	0.54	23,484	23,484	-	49	51			11,507.16	11,976.84	-	-	11,507.16	11,976.84	1.55	0.36	0.41	0.10	0.51
019	13.42	584,549	584,549	-	49	51			286,429.01	298,119.99	-	-	286,429.01	298,119.99	1.55	0.36	10.19	2.46	12.66
020	3.45	150,332	150,332	-	49	51			73,662.68	76,669.32	-	-	73,662.68	76,669.32	1.55	0.36	2.62	0.63	3.25
021	2.10	91,427	91,427	-	49	51			44,799.23	46,627.77	-	-	44,799.23	46,627.77	1.55	0.36	1.59	0.39	1.98
022	1.62	70,550	70,550	-	49	51			34,569.50	35,980.50	-	-	34,569.50	35,980.50	1.55	0.36	1.23	0.30	1.53
023	3.64	158,522	129,892	28,629	49	51			63,647.08	66,244.92	-	-	63,647.08	66,244.92	1.55	0.36	2.26	0.55	2.81
024	12.69	552,914	498,925	-	49	51			244,473.25	254,451.75	-	-	244,473.25	254,451.75	1.55	0.36	8.70	2.10	10.80
025	0.20	8,589	8,589	-	49	51			4,208.61	4,380.39	-	-	4,208.61	4,380.39	1.55	0.36	0.15	0.04	0.19
026	8.27	360,262	360,262	-	49	51			176,528.38	183,733.62	-	-	176,528.38	183,733.62	1.55	0.36	6.28	1.52	7.80
027	0.45	19,485	19,485	-	49	51			9,547.65	9,937.35	-	-	9,547.65	9,937.35	1.55	0.36	0.34	0.08	0.42
028	2.78	121,004	121,004	-	49	51			59,291.96	61,712.04	-	-	59,291.96	61,712.04	1.55	0.36	2.11	0.51	2.62
029	0.81	35,492	5,499	-	49	51			2,694.51	2,804.49	-	-	2,694.51	2,804.49	1.55	0.36	0.10	0.02	0.12
030	0.90	39,237	39,237	-	49	51			19,226.13	20,010.87	-	-	19,226.13	20,010.87	1.55	0.36	0.68	0.17	0.85
031	1.08	47,207	37,315		49	51			18,284.35	19,030.65	-	-	18,284.35	19,030.65	1.55	0.36	0.65	0.16	0.81
032																			
033	0.87	37,830	37,830	-	49	51			18,536.70	19,293.30	-	-	18,536.70	19,293.30	1.55	0.36	0.66	0.16	0.82
034	3.53	153,870	153,870	-	49	51			75,396.30	78,473.70	-	-	75,396.30	78,473.70	1.55	0.36	2.68	0.65	3.33
035	7.06	307,451	307,451	-	49	51			150,650.99	156,800.01	-	-	150,650.99	156,800.01	1.55	0.36	5.36	1.30	6.66
036	2.74	119,516	86,475	-	49	51			42,372.75	44,102.25	-	-	42,372.75	44,102.25	1.55	0.36	1.51	0.36	1.87
037	25.50	1,110,792	1,110,792	-	49	51			544,288.08	566,503.92	-	-	544,288.08	566,503.92	1.55	0.36	19.37	4.68	24.05
038	1.80	78,375	78,375	-	49	51			38,403.75	39,971.25	-	-	38,403.75	39,971.25	1.55	0.36	1.37	0.33	1.70
039	1.75	76,376	76,376	-	49	51			37,424.24	38,951.76	-	-	37,424.24	38,951.76	1.55	0.36	1.33	0.32	1.65
040																			
041																			
042	7.55	328,684	322,446	6,238	49	51			157,998.54	164,447.46	-	-	157,998.54	164,447.46	1.55	0.36	5.62	1.36	6.98
043																			
044	1.39	60,585	60,585	-	49	51			29,686.65	30,898.35	-	-	29,686.65	30,898.35	1.55	0.36	1.06	0.26	1.31
045	3.44	149,693	128,379	-	49	51			62,905.71	65,473.29	-	-	62,905.71	65,473.29	1.55	0.36	2.24	0.54	2.78
046	0.94	41,010	41,010	-	49	51			20,094.90	20,915.10	-	-	20,094.90	20,915.10	1.55	0.36	0.72	0.17	0.89
047	1.03	45,071	45,071	-	49	51			22,084.79	22,986.21	-	-	22,084.79	22,986.21	1.55	0.36	0.79	0.19	0.98
048	0.15	6,670	6,670	-	49	51			3,268.30	3,401.70	-	-	3,268.30	3,401.70	1.55	0.36	0.12	0.03	0.14
049																			
050																			
051																			
052																			
053																			
054																			
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056																			
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059																			
060																			
061																			
062	7.98	347,693	347,693	-	49	51			170,369.57	177,323.43	-	-	170,369.57	177,323.43	1.55	0.36	6.06	1.47	7.53
063	10.79	469,998	464,537	-	49	51			227,623.13	236,913.87	-	-	227,623.13	236,913.87	1.55	0.36	8.10	1.96	10.06
064	0.59	25,539	25,539	-	49	51			12,514.11	13,024.89	-	-	12,514.11	13,024.89	1.55	0.36	0.45	0.11	0.55
065																			
066																			
067																			
068																			

069	2.14	93,069	93,069	-	49	51			45,603.81	47,465.19	-	-	45,603.81	47,465.19	1.55	0.36	1.62	0.39	2.01
070																			
071	10.28	447,746	190,393	257,353	49	51			93,292.57	97,100.43	-	-	93,292.57	97,100.43	1.55	0.36	3.32	0.80	4.12
072	3.20	139,220	66,802	72,418	49	51			32,732.98	34,069.02	-	-	32,732.98	34,069.02	1.55	0.36	1.16	0.28	1.45
073	3.54	154,285	94,494	59,791	49	51			46,302.06	48,191.94	-	-	46,302.06	48,191.94	1.55	0.36	1.65	0.40	2.05
074	36.39	1,585,228	1,552,187	-	49	51			760,571.63	791,615.37	-	-	760,571.63	791,615.37	1.55	0.36	27.06	6.54	33.61
075	7.85	341,812	341,812	-	49	51			167,487.88	174,324.12	-	-	167,487.88	174,324.12	1.55	0.36	5.96	1.44	7.40
076	0.58	25,332	4,018	-	49	51			1,968.82	2,049.18	-	-	1,968.82	2,049.18	1.55	0.36	0.07	0.02	0.09
077	1.81	78,912	53,892	-	49	51			26,407.08	27,484.92	-	-	26,407.08	27,484.92	1.55	0.36	0.94	0.23	1.17
078	8.59	374,264	372,964	1,300	49	51			182,752.36	190,211.64	-	-	182,752.36	190,211.64	1.55	0.36	6.50	1.57	8.07
079	2.18	94,813	94,813	-	49	51			46,458.37	48,354.63	-	-	46,458.37	48,354.63	1.55	0.36	1.65	0.40	2.05
080	1.18	51,404	51,404	-	49	51			25,187.96	26,216.04	-	-	25,187.96	26,216.04	1.55	0.36	0.90	0.22	1.11
081	12.86	560,043	248,883	281,059	49	51			121,952.67	126,930.33	-	-	121,952.67	126,930.33	1.55	0.36	4.34	1.05	5.39
082	2.67	116,441	90,871	25,435	49	51			44,526.79	46,344.21	-	-	44,526.79	46,344.21	1.55	0.36	1.58	0.38	1.97
083	22.51	980,495	904,365	-	49	51			443,138.85	461,226.15	-	-	443,138.85	461,226.15	1.55	0.36	15.77	3.81	19.58
083A	1.34	58,520	58,520	-	49	51			28,674.80	29,845.20	-	-	28,674.80	29,845.20	1.55	0.36	1.02	0.25	1.27
084	6.86	298,739	298,739	-	49	51			146,382.11	152,356.89	-	-	146,382.11	152,356.89	1.55	0.36	5.21	1.26	6.47
085	15.87	691,450	638,519	-	49	51			312,874.31	325,644.69	-	-	312,874.31	325,644.69	1.55	0.36	11.13	2.69	13.82
086	0.74	32,087	32,087	-	49	51			15,722.63	16,364.37	-	-	15,722.63	16,364.37	1.55	0.36	0.56	0.14	0.69
087	0.61	26,541	22,887	-	49	51			11,214.63	11,672.37	-	-	11,214.63	11,672.37	1.55	0.36	0.40	0.10	0.50
088	0.16	6,934	6,934	-	49	51			3,397.66	3,536.34	-	-	3,397.66	3,536.34	1.55	0.36	0.12	0.03	0.15
089	0.63	27,588	27,588	-	49	51			13,518.12	14,069.88	-	-	13,518.12	14,069.88	1.55	0.36	0.48	0.12	0.60
090	6.95	302,765	300,583	-	49	51			147,285.67	153,297.33	-	-	147,285.67	153,297.33	1.55	0.36	5.24	1.27	6.51
091	3.32	144,631	0	-	49	51			-	-	-	-	-	-	1.55	0.36	-	-	-
092	5.37	233,837	52,627	-	49	51			25,787.43	26,839.97	-	-	25,787.43	26,839.97	1.55	0.36	0.92	0.22	1.14
093	2.63	114,563	0	-	49	51			0.10	0.10	-	-	0.10	0.10	1.55	0.36	0.00	0.00	0.00
094																			
095																			
096																			
097																			
098	8.31	361,942	327,397	-	49	51			160,424.53	166,972.47	-	-	160,424.53	166,972.47	1.55	0.36	5.71	1.38	7.09
099																			
100	9.84	428,464	386,683	-	49	51			189,474.67	197,208.33	-	-	189,474.67	197,208.33	1.55	0.36	6.74	1.63	8.37
101	53.73	2,340,399	2,177,191	8,940	49	51			1,066,823.59	1,110,367.41	-	-	1,066,823.59	1,110,367.41	1.55	0.36	37.96	9.18	47.14
102																			
103	2.48	107,907	99,341	8,566	49	51			48,677.09	50,663.91	-	-	48,677.09	50,663.91	1.55	0.36	1.73	0.42	2.15
104	3.66	159,216	159,216	-	49	51			78,015.84	81,200.16	-	-	78,015.84	81,200.16	1.55	0.36	2.78	0.67	3.45
105	24.10	1,049,880	464,748	585,132	49	51			227,726.52	237,021.48	-	-	227,726.52	237,021.48	1.55	0.36	8.10	1.96	10.06
106																			
107	2.74	119,178	99,658	-	49	51			48,832.42	50,825.58	-	-	48,832.42	50,825.58	1.55	0.36	1.74	0.42	2.16
108	12.00	522,899	436,521	-	49	51			213,895.29	222,625.71	-	-	213,895.29	222,625.71	1.55	0.36	7.61	1.84	9.45
109	10.29	448,198	409,930	-	49	51			200,865.70	209,064.30	-	-	200,865.70	209,064.30	1.55	0.36	7.15	1.73	8.88
109-A	2.53	110,207	110,207	-	49	51			54,001.43	56,205.57	-	-	54,001.43	56,205.57	1.55	0.36	1.92	0.46	2.39
110	1.74	75,918	75,918	-	49	51			37,199.82	38,718.18	-	-	37,199.82	38,718.18	1.55	0.36	1.32	0.32	1.64
111																			
112																			
113	1.61	70,031	70,031	-	49	51			34,315.19	35,715.81	-	-	34,315.19	35,715.81	1.55	0.36	1.22	0.30	1.52
114	33.59	1,463,184	1,231,619	260,778	49	51			603,493.31	628,125.69	-	-	603,493.31	628,125.69	1.55	0.36	21.47	5.19	26.67
115	1.81	78,713	78,713	-	49	51			38,569.37	40,143.63	-	-	38,569.37	40,143.63	1.55	0.36	1.37	0.33	1.70
116	134.23	5,847,253	4,747,538	1,099,715	49	51			2,326,293.62	2,421,244.38	-	-	2,326,293.62	2,421,244.38	1.55	0.36	82.78	20.01	102.79
117	0.71	30,794	29,935	688	49	51			14,668.15	15,266.85	-	-	14,668.15	15,266.85	1.55	0.36	0.52	0.13	0.65
118																			
119	42.50	1,851,246	1,371,080	480,166	49	51			671,829.20	699,250.80	-	-	671,829.20	699,250.80	1.55	0.36	23.91	5.78	29.68
120	13.68	596,022	596,022	-	49	51			292,050.78	303,971.22	-	-	292,050.78	303,971.22	1.55	0.36	10.39	2.51	12.90
121	19.06	830,281	830,281	-	49	51			406,837.69	423,443.31	-	-	406,837.69	423,443.31	1.55	0.36	14.48	3.50	17.98
122	0.74	32,381	32,381	-	49	51			15,866.69	16,514.31	-	-	15,866.69	16,514.31	1.55	0.36	0.56	0.14	0.70
122A	0.35	15,141	15,141	-	49	51			7,419.09	7,721.91	-	-	7,419.09	7,721.91	1.55	0.36	0.26	0.06	0.33
123	16.71	727,954	671,447	-	49	51			329,009.03	342,437.97	-	-	329,009.03	342,437.97	1.55	0.36	11.71	2.83	14.54
124	0.72	31,292	31,292	-	49	51			15,333.08	15,958.92	-	-	15,333.08	15,958.92	1.55	0.36	0.55	0.13	0.68
125	1.32	57,675	25,594	-	49	51			12,541.06	13,052.94	-	-	12,541.06	13,052.94	1.55	0.36	0.45	0.11	0.55
126	54.12	2,357,407	989,264	1,368,143	49	51			484,739.36	504,524.64	-	-	484,739.36	504,524.64	1.55	0.36	17.25	4.17	21.42
127	38.33	1,669,579	1,618,141	51,437	49	51			792,889.09	825,251.91	-	-	792,889.09	825,251.91	1.55	0.36	28.21	6.82	35.03
128																			
129																			
130	18.41	801,861	768,199	-	49	51			376,417.51	391,781.49	-	-	376,417.51	391,781.49	1.55	0.36	13.39	3.24	16.63
131																			
132																			
133																			
134																			
135	22.81	993,603	604,836	-	49	51			296,369.64	308,466.36	-	-	296,369.64	308,466.36	1.55	0.36	10.55	2.55	13.10
135A	21.74	946,994	192,535	17,194	49	51			94,342.05	98,192.75	-	-	94,342.05	98,192.75	1.55	0.36	3.36	0.81	4.17
136																			
137	7.37	320,934	320,934	-	49	51			157,257.66	163,676.34	-	-	157,257.66	163,676.34	1.55	0.36	5.60	1.35	6.95
138	194.16	8,457,535	7,599,266	813,179	49	51			3,723,640.34	3,875,625.66	-	-	3,723,640.34	3,875,625.66	1.55	0.36	132.50	32.03	164.53
139	5.25	228,690	228,690	-	49	51			112,058.10	116,631.90	-	-	112,058.10	116,631.90	1.55	0.36	3.99	0.96	4.95

140	16.32	711,002	600,572	110,430	49	51			294,280.28	306,291.72	-	-	294,280.28	306,291.72	1.55	0.36	10.47	2.53	13.00
141																			
142	2.38	103,568	64,729	2,297	49	51			31,717.21	33,011.79	-	-	31,717.21	33,011.79	1.55	0.36	1.13	0.27	1.40
143	2.13	92,940	92,940	-	49	51			45,540.60	47,399.40	-	-	45,540.60	47,399.40	1.55	0.36	1.62	0.39	2.01
Total	1,256.97	54,753,569	45,817,040	6,259,692					22,450,349.80	23,366,690.60	-	-	22,450,349.80	23,366,690.60			798.85	193.11	991.97

* Parsed Areas from Parsing Chart (light green - Parsed)
**Drainage Area Outside the UA is in adjacent municipality. (blue highlight)
*** Parsed NPDES Areas (light blue)

Parsed Areas *			
Watershed	Reason for Parsing	Area in UA (SF)	Area Outside UA (SF)
006	PennDOT ROW	160,590	-
017	PennDOT ROW	2,159	-
024	PennDOT ROW	53,989	-
029	PennDOT ROW	29,993	-
031	PennDOT ROW	9,892	-
036	PennDOT ROW	299	-
045	PennDOT ROW	11,187	-
063	PennDOT ROW	5,461	-
074	PennDOT ROW	33,041	-
076	PennDOT ROW	21,314	-
077	PennDOT ROW	25,020	-
081	PennDOT ROW	30,101	-
082	PennDOT ROW	135	
083	PennDOT ROW	76,130	-
085	PennDOT ROW	52,931	-
087	PennDOT ROW	3,654	-
090	PennDOT ROW	2,182	-
91	NPDES	144,631	
92	NPDES	181,210	
93	NPDES	114,563	
098	PennDOT ROW	34,545	-
100	PennDOT ROW	41,781	-
101	PennDOT ROW	154,268	-
107	PennDOT ROW	19,520	-
108	PennDOT ROW	86,378	-
109	PennDOT ROW	38,268	-
114	PennDOT ROW	24,786	-
123	PennDOT ROW	56,507	-
125	PennDOT ROW	32,081	-
130	PennDOT ROW	33,662	-
135	PennDOT ROW	79,491	-
135	NPDES	309,276	
135A	NPDES	754,459	
138	PennDOT ROW	45,090	-
142	PennDOT ROW	36,180	-
Total		2,704,774	

Total Phosphorus Loading (lbs.)	Required Reduction	Required Lbs. Reduction
991.97	5%	49.60

Watershed ID	Total Drainage Area (Acres)	Total Drainage Area (SF)	Drainage Area in UA (SF)*	Drainage Area outside UA (SF)*	UA Percent Impervious (%)	UA Percent Pervious (%)	Outside UA Percent Impervious (%)	Outside UA Percent Pervious (%)	UA Impervious Area (SF)	UA Pervious Area (SF)	Outside UA Impervious Area (SF)	Outside UA Pervious Area (SF)	Total Impervious Area (SF)	Total Pervious Area (SF)	Total Nitrogen Loading Coefficient - Impervious (lbs.)	Total Nitrogen Loading Coefficient - Pervious (lbs.)	Watershed - Impervious Load (lbs.)	Watershed - Pervious Load (lbs.)	Total Load (lbs.)
001	11.57	503,928	447,708	55,559	49	51			219,376.92	228,331.08	-	-	219,376.92	228,331.08	38.53	22.24	194.04	116.58	310.62
002	21.45	934,299	913,766	20,533	49	51			447,745.34	466,020.66	-	-	447,745.34	466,020.66	38.53	22.24	396.04	237.93	633.97
003	9.69	422,054	422,054	-	49	51			206,806.46	215,247.54	-	-	206,806.46	215,247.54	38.53	22.24	182.93	109.90	292.82
004	9.81	427,197	427,197	-	49	51			209,326.53	217,870.47	-	-	209,326.53	217,870.47	38.53	22.24	185.15	111.24	296.39
005	2.53	110,296	110,296	-	49	51			54,045.04	56,250.96	-	-	54,045.04	56,250.96	38.53	22.24	47.80	28.72	76.52
006	35.90	1,563,793	1,403,203	-	49	51			687,569.47	715,633.53	-	-	687,569.47	715,633.53	38.53	22.24	608.17	365.37	973.55
007	4.86	211,571	211,571	-	49	51			103,669.79	107,901.21	-	-	103,669.79	107,901.21	38.53	22.24	91.70	55.09	146.79
008	1.06	46,297	46,297	-	49	51			22,685.53	23,611.47	-	-	22,685.53	23,611.47	38.53	22.24	20.07	12.06	32.12
009	0.86	37,472	37,472	-	49	51			18,361.28	19,110.72	-	-	18,361.28	19,110.72	38.53	22.24	16.24	9.76	26.00
010	2.09	91,001	91,001	-	49	51			44,590.49	46,410.51	-	-	44,590.49	46,410.51	38.53	22.24	39.44	23.70	63.14
011	0.22	9,420	9,420	-	49	51			4,615.80	4,804.20	-	-	4,615.80	4,804.20	38.53	22.24	4.08	2.45	6.54
011A	8.91	388,124	98,703	289,420	49	51			48,364.47	50,338.53	-	-	48,364.47	50,338.53	38.53	22.24	42.78	25.70	68.48
011B	9.87	430,149	193,767	237,192	49	51			94,945.83	98,821.17	-	-	94,945.83	98,821.17	38.53	22.24	83.98	50.45	134.44
012	5.11	222,495	195,696	26,799	49	51			95,891.04	99,804.96	-	-	95,891.04	99,804.96	38.53	22.24	84.82	50.96	135.77
013	7.73	336,553	336,553	-	49	51			164,910.97	171,642.03	-	-	164,910.97	171,642.03	38.53	22.24	145.87	87.63	233.50
014	3.68	160,425	160,425	-	49	51			78,608.25	81,816.75	-	-	78,608.25	81,816.75	38.53	22.24	69.53	41.77	111.30
015	0.10	4,186	4,186	-	49	51			2,051.14	2,134.86	-	-	2,051.14	2,134.86	38.53	22.24	1.81	1.09	2.90
016	0.47	20,627	20,627	-	49	51			10,107.23	10,519.77	-	-	10,107.23	10,519.77	38.53	22.24	8.94	5.37	14.31
017	50.29	2,190,468	2,097,008	91,301	49	51			1,027,533.92	1,069,474.08	-	-	1,027,533.92	1,069,474.08	38.53	22.24	908.88	546.03	1,454.91
018	0.54	23,484	23,484	-	49	51			11,507.16	11,976.84	-	-	11,507.16	11,976.84	38.53	22.24	10.18	6.11	16.29
019	13.42	584,549	584,549	-	49	51			286,429.01	298,119.99	-	-	286,429.01	298,119.99	38.53	22.24	253.35	152.21	405.56
020	3.45	150,332	150,332	-	49	51			73,662.68	76,669.32	-	-	73,662.68	76,669.32	38.53	22.24	65.16	39.14	104.30
021	2.10	91,427	91,427	-	49	51			44,799.23	46,627.77	-	-	44,799.23	46,627.77	38.53	22.24	39.63	23.81	63.43
022	1.62	70,550	70,550	-	49	51			34,569.50	35,980.50	-	-	34,569.50	35,980.50	38.53	22.24	30.58	18.37	48.95
023	3.64	158,522	129,892	28,629	49	51			63,647.08	66,244.92	-	-	63,647.08	66,244.92	38.53	22.24	56.30	33.82	90.12
024	12.69	552,914	498,925	-	49	51			244,473.25	254,451.75	-	-	244,473.25	254,451.75	38.53	22.24	216.24	129.91	346.16
025	0.20	8,589	8,589	-	49	51			4,208.61	4,380.39	-	-	4,208.61	4,380.39	38.53	22.24	3.72	2.24	5.96
026	8.27	360,262	360,262	-	49	51			176,528.38	183,733.62	-	-	176,528.38	183,733.62	38.53	22.24	156.14	93.81	249.95
027	0.45	19,485	19,485	-	49	51			9,547.65	9,937.35	-	-	9,547.65	9,937.35	38.53	22.24	8.45	5.07	13.52
028	2.78	121,004	121,004	-	49	51			59,291.96	61,712.04	-	-	59,291.96	61,712.04	38.53	22.24	52.45	31.51	83.95
029	0.81	35,492	5,499	-	49	51			2,694.51	2,804.49	-	-	2,694.51	2,804.49	38.53	22.24	2.38	1.43	3.82
030	0.90	39,237	39,237	-	49	51			19,226.13	20,010.87	-	-	19,226.13	20,010.87	38.53	22.24	17.01	10.22	27.22
031	1.08	47,207	37,315		49	51			18,284.35	19,030.65	-	-	18,284.35	19,030.65	38.53	22.24	16.17	9.72	25.89
032																			
033	0.87	37,830	37,830	-	49	51			18,536.70	19,293.30	-	-	18,536.70	19,293.30	38.53	22.24	16.40	9.85	26.25
034	3.53	153,870	153,870	-	49	51			75,396.30	78,473.70	-	-	75,396.30	78,473.70	38.53	22.24	66.69	40.07	106.76
035	7.06	307,451	307,451	-	49	51			150,650.99	156,800.01	-	-	150,650.99	156,800.01	38.53	22.24	133.25	80.06	213.31
036	2.74	119,516	119,217	-	49	51			58,416.33	60,800.67	-	-	58,416.33	60,800.67	38.53	22.24	51.67	31.04	82.71
037	25.50	1,110,792	1,110,792	-	49	51			544,288.08	566,503.92	-	-	544,288.08	566,503.92	38.53	22.24	481.44	289.23	770.67
038	1.80	78,375	78,375	-	49	51			38,403.75	39,971.25	-	-	38,403.75	39,971.25	38.53	22.24	33.97	20.41	54.38
039	1.75	76,376	76,376	-	49	51			37,424.24	38,951.76	-	-	37,424.24	38,951.76	38.53	22.24	33.10	19.89	52.99
040																			
041																			
042	7.55	328,684	322,446	6,238	49	51			157,998.54	164,447.46	-	-	157,998.54	164,447.46	38.53	22.24	139.75	83.96	223.71
043																			
044	1.39	60,585	60,585	-	49	51			29,686.65	30,898.35	-	-	29,686.65	30,898.35	38.53	22.24	26.26	15.78	42.03
045	3.44	149,693	138,506	-	49	51			67,867.94	70,638.06	-	-	67,867.94	70,638.06	38.53	22.24	60.03	36.06	96.10
046	0.94	41,010	41,010	-	49	51			20,094.90	20,915.10	-	-	20,094.90	20,915.10	38.53	22.24	17.77	10.68	28.45
047	1.03	45,071	45,071	-	49	51			22,084.79	22,986.21	-	-	22,084.79	22,986.21	38.53	22.24	19.53	11.74	31.27
048	0.15	6,670	6,670	-	49	51			3,268.30	3,401.70	-	-	3,268.30	3,401.70	38.53	22.24	2.89	1.74	4.63
049																			
050																			
051																			
052																			
053																			
054																			
055																			
056																			
057																			
058																			
059																			
060																			
061																			
062	7.98	347,693	347,693	-	49	51			170,369.57	177,323.43	-	-	170,369.57	177,323.43	38.53	22.24	150.70	90.53	241.23
063	10.79	469,998	464,537	-	49	51			227,623.13	236,913.87	-	-	227,623.13	236,913.87	38.53	22.24	201.34	120.96	322.30
064	0.59	25,539	25,539	-	49	51			12,514.11	13,024.89	-	-	12,514.11	13,024.89	38.53	22.24	11.07	6.65	17.72

065																		
066																		
067																		
068																		
069	2.14	93,069	93,069	-	49	51			45,603.81	47,465.19	-	-	45,603.81	47,465.19	38.53	22.24	40.34	24.23	64.57
070																		
071	10.28	447,746	190,393	257,353	49	51			93,292.57	97,100.43	-	-	93,292.57	97,100.43	38.53	22.24	82.52	49.58	132.10
072	3.20	139,220	66,802	72,418	49	51			32,732.98	34,069.02	-	-	32,732.98	34,069.02	38.53	22.24	28.95	17.39	46.35
073	3.54	154,285	94,494	59,791	49	51			46,302.06	48,191.94	-	-	46,302.06	48,191.94	38.53	22.24	40.96	24.60	65.56
074	36.39	1,585,228	1,552,187	-	49	51			760,571.63	791,615.37	-	-	760,571.63	791,615.37	38.53	22.24	672.75	404.17	1,076.91
075	7.85	341,812	341,812	-	49	51			167,487.88	174,324.12	-	-	167,487.88	174,324.12	38.53	22.24	148.15	89.00	237.15
076	0.58	25,332	4,018	-	49	51			1,968.82	2,049.18	-	-	1,968.82	2,049.18	38.53	22.24	1.74	1.05	2.79
077	1.81	78,912	53,892	-	49	51			26,407.08	27,484.92	-	-	26,407.08	27,484.92	38.53	22.24	23.36	14.03	37.39
078	8.59	374,264	372,964	1,300	49	51			182,752.36	190,211.64	-	-	182,752.36	190,211.64	38.53	22.24	161.65	97.11	258.76
079	2.18	94,813	94,813	-	49	51			46,458.37	48,354.63	-	-	46,458.37	48,354.63	38.53	22.24	41.09	24.69	65.78
080	1.18	51,404	51,404	-	49	51			25,187.96	26,216.04	-	-	25,187.96	26,216.04	38.53	22.24	22.28	13.38	35.66
081	12.86	560,043	248,883	281,059	49	51			121,952.67	126,930.33	-	-	121,952.67	126,930.33	38.53	22.24	107.87	64.81	172.68
082	2.67	116,441	90,871	25,435	49	51			44,526.79	46,344.21	-	-	44,526.79	46,344.21	38.53	22.24	39.39	23.66	63.05
083	22.51	980,495	904,365	-	49	51			443,138.85	461,226.15	-	-	443,138.85	461,226.15	38.53	22.24	391.97	235.48	627.45
083A	1.34	58,520	58,520	-	49	51			28,674.80	29,845.20	-	-	28,674.80	29,845.20	38.53	22.24	25.36	15.24	40.60
084	6.86	298,739	298,739	-	49	51			146,382.11	152,356.89	-	-	146,382.11	152,356.89	38.53	22.24	129.48	77.79	207.27
085	15.87	691,450	638,519	-	49	51			312,874.31	325,644.69	-	-	312,874.31	325,644.69	38.53	22.24	276.75	166.26	443.01
086	0.74	32,087	32,087	-	49	51			15,722.63	16,364.37	-	-	15,722.63	16,364.37	38.53	22.24	13.91	8.35	22.26
087	0.61	26,541	22,887	-	49	51			11,214.63	11,672.37	-	-	11,214.63	11,672.37	38.53	22.24	9.92	5.96	15.88
088	0.16	6,934	6,934	-	49	51			3,397.66	3,536.34	-	-	3,397.66	3,536.34	38.53	22.24	3.01	1.81	4.81
089	0.63	27,588	27,588	-	49	51			13,518.12	14,069.88	-	-	13,518.12	14,069.88	38.53	22.24	11.96	7.18	19.14
090	6.95	302,765	300,583	-	49	51			147,285.67	153,297.33	-	-	147,285.67	153,297.33	38.53	22.24	130.28	78.27	208.55
091	3.32	144,631	0	-	49	51			-	-	-	-	-	-	38.53	22.24	-	-	-
092	5.37	233,837	52,627	-	49	51			25,787.43	26,839.97	-	-	25,787.43	26,839.97	38.53	22.24	22.81	13.70	36.51
093	2.63	114,563	0	-	49	51			0.10	0.10	-	-	0.10	0.10	38.53	22.24	0.00	0.00	0.00
094																		
095																		
096																		
097																		
098	8.31	361,942	327,397	-	49	51			160,424.53	166,972.47	-	-	160,424.53	166,972.47	38.53	22.24	141.90	85.25	227.15
099																		
100	9.84	428,464	386,683	-	49	51			189,474.67	197,208.33	-	-	189,474.67	197,208.33	38.53	22.24	167.60	100.69	268.28
101	53.73	2,340,399	2,177,191	8,940	49	51			1,066,823.59	1,110,367.41	-	-	1,066,823.59	1,110,367.41	38.53	22.24	943.63	566.91	1,510.54
102																		
103	2.48	107,907	99,341	8,566	49	51			48,677.09	50,663.91	-	-	48,677.09	50,663.91	38.53	22.24	43.06	25.87	68.92
104	3.66	159,216	159,216	-	49	51			78,015.84	81,200.16	-	-	78,015.84	81,200.16	38.53	22.24	69.01	41.46	110.46
105	24.10	1,049,880	464,748	585,132	49	51			227,726.52	237,021.48	-	-	227,726.52	237,021.48	38.53	22.24	201.43	121.01	322.44
106																		
107	2.74	119,178	99,658	-	49	51			48,832.42	50,825.58	-	-	48,832.42	50,825.58	38.53	22.24	43.19	25.95	69.14
108	12.00	522,899	436,521	-	49	51			213,895.29	222,625.71	-	-	213,895.29	222,625.71	38.53	22.24	189.20	113.66	302.86
109	10.29	448,198	409,930	-	49	51			200,865.70	209,064.30	-	-	200,865.70	209,064.30	38.53	22.24	177.67	106.74	284.41
109-A	2.53	110,207	110,207	-	49	51			54,001.43	56,205.57	-	-	54,001.43	56,205.57	38.53	22.24	47.77	28.70	76.46
110	1.74	75,918	75,918	-	49	51			37,199.82	38,718.18	-	-	37,199.82	38,718.18	38.53	22.24	32.90	19.77	52.67
111																		
112																		
113	1.61	70,031	70,031	-	49	51			34,315.19	35,715.81	-	-	34,315.19	35,715.81	38.53	22.24	30.35	18.24	48.59
114	33.59	1,463,184	1,231,619	260,778	49	51			603,493.31	628,125.69	-	-	603,493.31	628,125.69	38.53	22.24	533.81	320.70	854.50
115	1.81	78,713	78,713	-	49	51			38,569.37	40,143.63	-	-	38,569.37	40,143.63	38.53	22.24	34.12	20.50	54.61
116	134.23	5,847,253	4,747,538	1,099,715	49	51			2,326,293.62	2,421,244.38	-	-	2,326,293.62	2,421,244.38	38.53	22.24	2,057.67	1,236.19	3,293.86
117	0.71	30,794	29,935	688	49	51			14,668.15	15,266.85	-	-	14,668.15	15,266.85	38.53	22.24	12.97	7.79	20.77
118																		
119	42.50	1,851,246	1,371,080	480,166	49	51			671,829.20	699,250.80	-	-	671,829.20	699,250.80	38.53	22.24	594.25	357.01	951.26
120	13.68	596,022	596,022	-	49	51			292,050.78	303,971.22	-	-	292,050.78	303,971.22	38.53	22.24	258.33	155.20	413.52
121	19.06	830,281	830,281	-	49	51			406,837.69	423,443.31	-	-	406,837.69	423,443.31	38.53	22.24	359.86	216.19	576.05
122	0.74	32,381	32,381	-	49	51			15,866.69	16,514.31	-	-	15,866.69	16,514.31	38.53	22.24	14.03	8.43	22.47
122A	0.35	15,141	15,141	-	49	51			7,419.09	7,721.91	-	-	7,419.09	7,721.91	38.53	22.24	6.56	3.94	10.50
123	16.71	727,954	671,447	-	49	51			329,009.03	342,437.97	-	-	329,009.03	342,437.97	38.53	22.24	291.02	174.84	465.85
124	0.72	31,292	31,292	-	49	51			15,333.08	15,958.92	-	-	15,333.08	15,958.92	38.53	22.24	13.56	8.15	21.71
125	1.32	57,675	25,594	-	49	51			12,541.06	13,052.94	-	-	12,541.06	13,052.94	38.53	22.24	11.09	6.66	17.76
126	54.12	2,357,407	989,264	1,368,143	49	51			484,739.36	504,524.64	-	-	484,739.36	504,524.64	38.53	22.24	428.77	257.59	686.36
127	38.33	1,669,579	1,618,141	51,437	49	51			792,889.09	825,251.91	-	-	792,889.09	825,251.91	38.53	22.24	701.33	421.34	1,122.67
128																		
129																		
130	18.41	801,861	768,199	-	49	51			376,417.51	391,781.49	-	-	376,417.51	391,781.49	38.53	22.24	332.95	200.03	532.98
131																		
132																		
133																		
134																		

135	22.81	993,603	604,836	-	49	51			296,369.64	308,466.36	-	-	296,369.64	308,466.36	38.53	22.24	262.15	157.49	419.64
135A	21.74	946,994	192,535	17,194	49	51			94,342.05	98,192.75	-	-	94,342.05	98,192.75	38.53	22.24	83.45	50.13	133.58
136																			
137	7.37	320,934	320,934	-	49	51			157,257.66	163,676.34	-	-	157,257.66	163,676.34	38.53	22.24	139.10	83.57	222.67
138	194.16	8,457,535	7,599,266	813,179	49	51			3,723,640.34	3,875,625.66	-	-	3,723,640.34	3,875,625.66	38.53	22.24	3,293.66	1,978.74	5,272.40
139	5.25	228,690	228,690	-	49	51			112,058.10	116,631.90	-	-	112,058.10	116,631.90	38.53	22.24	99.12	59.55	158.67
140	16.32	711,002	600,572	110,430	49	51			294,280.28	306,291.72	-	-	294,280.28	306,291.72	38.53	22.24	260.30	156.38	416.68
141																			
142	2.38	103,568	64,729	2,297	49	51			31,717.21	33,011.79	-	-	31,717.21	33,011.79	38.53	22.24	28.05	16.85	44.91
143	2.13	92,940	92,940	-	49	51			45,540.60	47,399.40	-	-	45,540.60	47,399.40	38.53	22.24	40.28	24.20	64.48
Total	1,256.97	54,753,569	45,859,909	6,259,692					22,471,355.61	23,388,553.79	-	-	22,471,355.61	23,388,553.79			19,876.52	11,941.26	31,817.79

* Parsed Areas from Parsing Chart on following page (light green - Parsed)
**Drainage Area Outside the UA is in adjacent municipality. (orange highlight)
*** Parsed NPDES Areas (light blue)

Parsed Areas *			
Watershed	Reason for Parsing	Area in UA (SF)	Area Outside UA (SF)
006	PennDOT ROW	160,590	-
017	PennDOT ROW	2,159	-
024	PennDOT ROW	53,989	-
029	PennDOT ROW	29,993	-
031	PennDOT ROW	9,892	-
036	PennDOT ROW	299	-
045	PennDOT ROW	11,187	-
063	PennDOT ROW	5,461	-
074	PennDOT ROW	33,041	-
076	PennDOT ROW	21,314	-
077	PennDOT ROW	25,020	-
081	PennDOT ROW	30,101	-
082	PennDOT ROW	135	-
083	PennDOT ROW	76,130	-
085	PennDOT ROW	52,931	-
087	PennDOT ROW	3,654	-
090	PennDOT ROW	2,182	-
91	NPDES	144,631	-
92	NPDES	181,210	-
93	NPDES	114,563	-
098	PennDOT ROW	34,545	-
100	PennDOT ROW	41,781	-
101	PennDOT ROW	154,268	-
107	PennDOT ROW	19,520	-
108	PennDOT ROW	86,378	-
109	PennDOT ROW	38,268	-
114	PennDOT ROW	24,786	-
123	PennDOT ROW	56,507	-
125	PennDOT ROW	32,081	-
130	PennDOT ROW	33,662	-
135	PennDOT ROW	79,491	-
135	NPDES	309,276	-
135A	NPDES	754,459	-
138	PennDOT ROW	45,090	-
142	PennDOT ROW	36,180	-
Total		2,704,774	

Total Nitrogen Loading (lbs.)	Required Reduction	Required Lbs. Reduction
31,817.79	3%	954.53

Proposed Chesapeake Bay Pollutant Reduction Projects

Watershed ID	Contributing Drainage Area (Acre)	Sediment Loading - Impervious (lbs.)	Sediment Loading - Pervious (lbs.)	Total Phosphorus Loading - Impervious (lbs.)	Total Phosphorus Loading - Pervious (lbs.)	Total Nitrogen Loading - Impervious (lbs.)	Total Nitrogen Loading - Pervious (lbs.)	Total Sediment Loading (lbs.)	Total Phosphorus Loading (lbs.)	Total Nitrogen Loading (lbs.)	Propsoed BMP	BMP Location	Sediment Reduction Efficiency (%)	Phosphorus Reduction Efficiency (%)	Nitrogen Reduction Efficiency (%)	Calculated Sediment Reduction (lbs.)	Calculated Phosphorus Reduction (lbs.)	Calculated Nitrogen Reduction (lbs.)
109-A	0.89	1480.43	190.93	1.55	0.36	38.53	22.24	1487.51	1.70	54.09	Permeable Pavement w/o Sand or Veg. (C/D Soils w/ underdrain)	Elizabethtown Free Lot (Borough Owned)	55	20	10	818.13	0.34	5.41
101	2.42	1480.43	190.93	1.55	0.36	38.53	22.24	2770.26	3.00	82.98	Bio-retention Bed w/ underdrain - B soils	Elizabethtown Public Works Compound	80	75	70	2,216.20	2.25	58.09
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0						0	0	0
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0						0	0	0
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0						0	0	0
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0						0	0	0
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0						0	0	0
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0						0	0	0
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0						0	0	0
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0						0	0	0
Total																3,034.34	2.59	63.49

Streambank Restoration

Watershed ID	Streambank Restoration Length	Sediment Loading - Impervious (lbs.)	Sediment Loading - Pervious (lbs.)	Total Phosphorus Loading - Impervious (lbs.)	Total Phosphorus Loading - Pervious (lbs.)	Total Nitrogen Loading - Impervious (lbs.)	Total Nitrogen Loading - Pervious (lbs.)	Total Sediment Loading (lbs.)	Total Phosphorus Loading (lbs.)	Total Nitrogen Loading (lbs.)	Propsoed BMP	BMP Location	Sediment Reduction Efficiency (lbs/ft/yr)	Phosphorus Reduction Efficiency (lbs/ft/yr)	Nitrogen Reduction Efficiency (lbs/ft/yr)	Calculated Sediment Reduction (lbs.)	Calculated Phosphorus Reduction (lbs.)	Calculated Nitrogen Reduction (lbs.)
	1900	1480.43	190.93	1.55	0.36	38.53	22.24	3175584	3629	115463	Streambank Restoration	North Lime Street to Radio Road	44.88	0.068	0.075	85,272.00	129.20	142.50
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0			44.88	0.068	0.075	0.00	0.00	0.00
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0			44.88	0.068	0.075	0.00	0.00	0.00
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0			44.88	0.068	0.075	0.00	0.00	0.00
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0			44.88	0.068	0.075	0.00	0.00	0.00
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0			44.88	0.068	0.075	0.00	0.00	0.00
		1480.43	190.93	1.55	0.36	38.53	22.24	0	0	0			44.88	0.068	0.075	0	0	0
Total																85,272.00	129.20	142.50

	Prior to BMPs	Post-CBPRP
Required Sediment Load Reduction (lbs.)	86,622.69	-1683.64
Required Phosphorus Load Reduction (lbs.)	49.60	-82.19
Required Nitrogen Load Reduction (lbs.)	954.53	748.54

Appendix F – DEP BMP Efficiency Table

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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%.

Appendix G - Proposed Projects

1.0 BMP: Permeable Pavers in C/D Soils with Underdrain

BMP Identification: Permeable Pavers

Location of BMP: Public Parking Lot at corner of Mechanics Alley and North Cherry Alley

Status of BMP Implementation: Design – Waiting on Grant Application Review

Milestones for BMP Implementation*:

Planning:	2017
Conceptual Design:	2017
Design and Permitting:	2017
Construction:	2018-2019

*Dependent upon DEP approval of Pollutant Reduction Plan.

Estimated Reductions (annual):

Annual Reduction – Infiltration

TN (Total Nitrogen) with 10% BMP reduction results in 5.41 lbs. reduction

TP (Total Phosphorous) with 20% BMP reduction results in 0.34 lbs. reduction

TSS (Total Suspended Sediment) with 55% BMP reduction results in 818.13 lbs. reduction

Rationale for BMP Selection:

The Borough is proposing to reconstruct a public parking lot that is located immediately adjacent to Conoy Creek. The stormwater runoff from the parking lot flows directly into the creek. The proposed parking lot is designed to function more efficiently in a traffic/accessibility aspect as well as reduce impervious area and install permeable pavers in the area of the parking stalls. Infiltration testing will be performed after the parking area has been removed; should favorable perc tests be obtained the BMP efficiency credits for this project will be updated.

BMP Operation and Maintenance (O&M):

Permeable Paver Maintenance Notes:

The Borough will responsible for maintenance of the parking lot and permeable paver BMP facility upon completion of the construction.

1. To Prevent Clogging of Paver Surface with Sediment:
    a. Pavers shall be vacuumed twice per year, at a minimum.
    b. Maintain planted areas adjacent to pavement.
    c. Immediately clean any soils deposited on pavement.
    d. Do not allow construction, staging, soil/mulch storage, etc. on unprotected pavement surface.

2. Winter Maintenance
    a. Abrasives such as sand or cinders should not be applied on or adjacent to the pervious pavement. Snow plowing shall be completed carefully with the plow blade set approximately one (1) inch higher than normal conditions. Blended salt, magnesium chloride-based liquid products or pre-treated salt are acceptable for use. Pre-treated salt is preferable.

3. Repairs
    a. Damaged areas shall be repaired with a patch type approved by a professional engineer and the Borough Engineer.

4. UNDER NO CIRCUMSTANCES SHOULD THE PERMEABLE PAVER SURFACE BE SEALED.

Refer to copy of the PCSM Summary prepared by Derck and Edson dated March 23, 2017.

POST CONSTRUCTION STORMWATER MANAGEMENT SUMMARY
FOR

ELIZABETHTOWN FREE LOT

BOROUGH OF ELIZABETHTOWN,
LANCASTER COUNTY, PA

PROJECT No. 16123

DERCK & EDSON

CAMPUSES · DOWNTOWNS · ATHLETICS

Report By:

DERCK & EDSON ASSOCIATES
33 SOUTH BROAD STREET
LITITZ, PA 17543

MARCH 23, 2017

TABLE OF CONTENTS

PROJECT DESCRIPTION

The Borough of Elizabethtown is proposing to reconstruct a public parking lot located at the corner of Mechanics Alley and North Cherry Alley. The existing parking lot borders the Conoy Creek and stormwater runoff from the parking lot flows directly to the creek.

The proposed parking lot will be configured to function more efficiently within the existing footprint. This reconfiguration will result in a reduction in impervious area on the site. Additionally, the parking stalls will be constructed with permeable pavers over top of a stone infiltration bed.

PROJECT DATA

Project Parcel Area = 38,703 sf
Existing Impervious Coverage = 26,862 sf
Proposed Impervious Coverage = 22,555 sf

Runoff Volume:

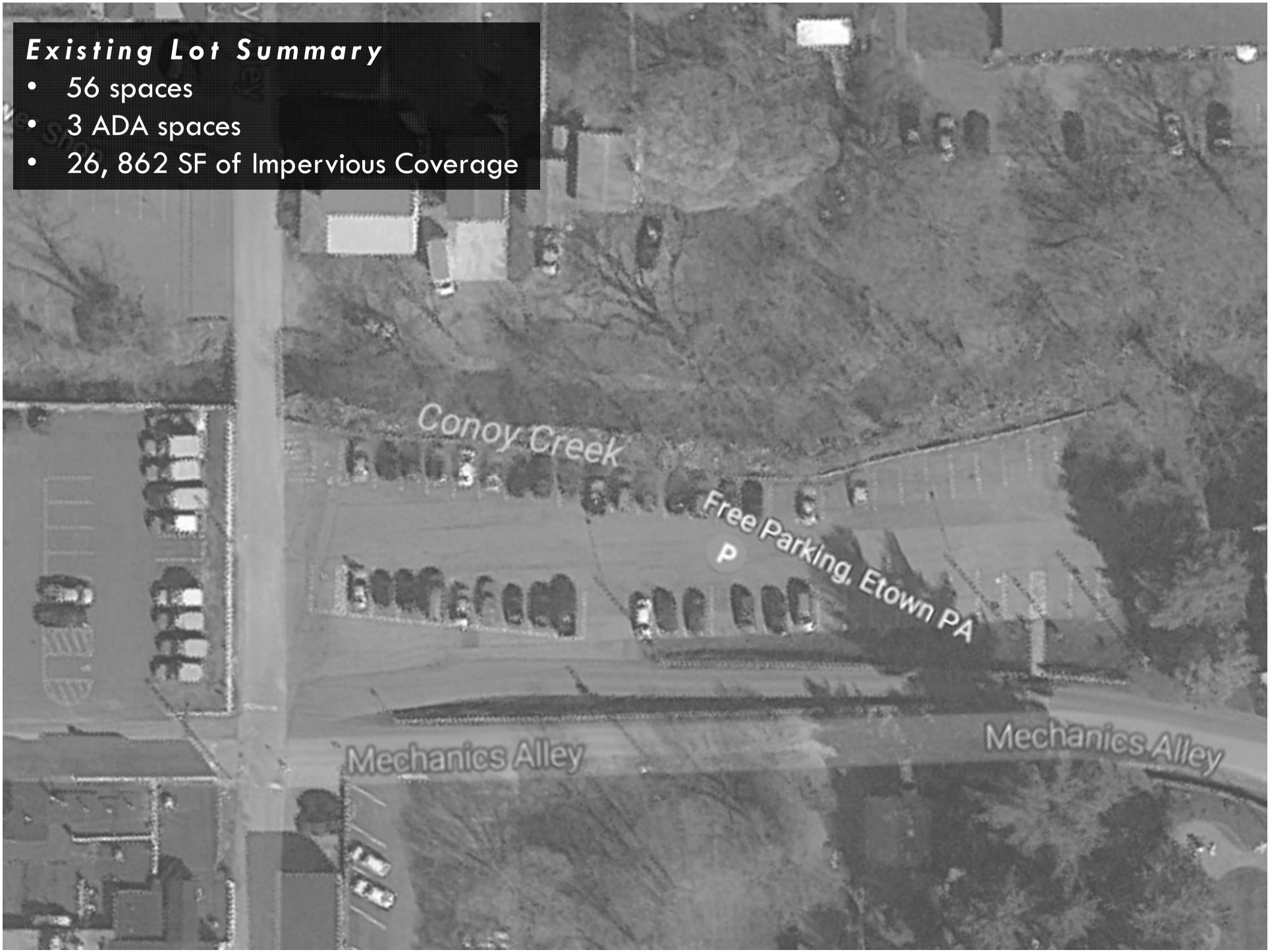
RUNOFF EVENT	PRE DEVELOPMENT VOLUME (cf)	POST DEVELOPMENT VOLUME (cf)	INFILTRATION VOLUME (cf)	TOTAL VOLUME REDUCTION (cf)	% VOLUME REDUCTION
2-YEAR	6922	6262	3822	4222	61%
10-YEAR	11,372	10,552	3822	4642	41%
25-YEAR	14,634	13,737	3822	4719	32%
100-YEAR	20,892	19,892	3822	4822	23%

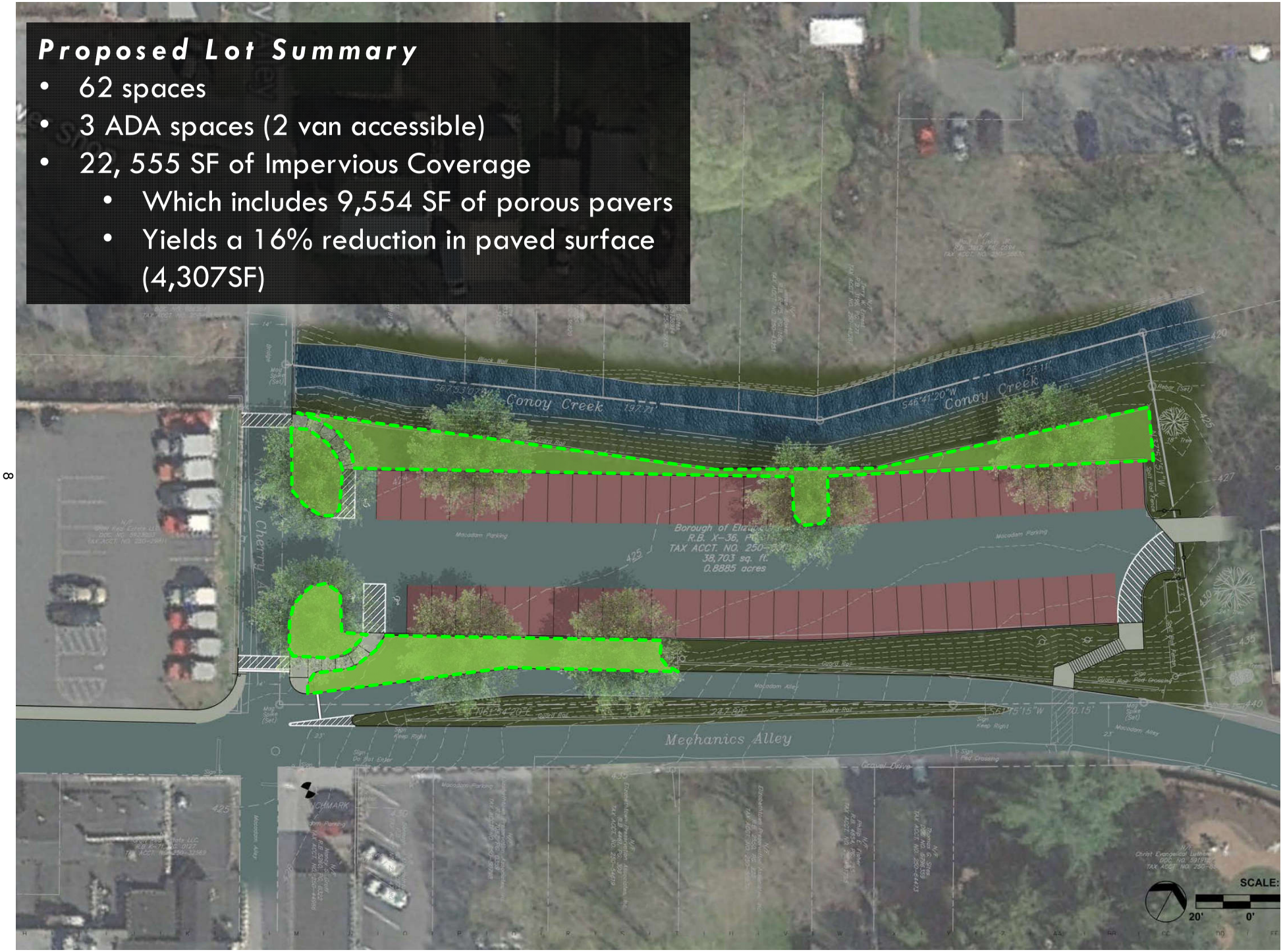
2-Year Storm Event Pollutant Load:

POLLUTANT	PRE DEVELOPMENT LOAD (lbs)	POST DEVELOPMENT LOAD (lbs)	LOAD REDUCTION VIA BMP (lbs)	NET POST DEVELOPMENT LOAD (lbs)	% LOAD REDUCTION
Total Suspended Solids (TSS)	31.6	33.4	12.0	21.4	32%
Total Phosphorous (TP)	0.08	0.08	0.03	0.05	38%
Nitrate	0.17	0.16	0.03	0.13	34%

APPENDIX A

SITE DESIGN SCHEMATICS


Existing Lot Summary
• 56 spaces
• 3 ADA spaces
• 26, 862 SF of Impervious Coverage
Conoy Creek
Free Parking, Etown PA
P
Mechanics Alley
Mechanics Alley


Proposed Lot Summary
• 62 spaces
• 3 ADA spaces (2 van accessible)
• 22, 555 SF of Impervious Coverage
• Which includes 9,554 SF of porous pavers
• Yields a 16% reduction in paved surface (4,307SF)
Conoy Creek
Mechanics Alley
Cherry Alley
Macadam Parking
Macadam Alley
Gravel Drive
Guard Rail
Block Wall
Borough of Elizabethtown
R.B. X-36, Pg. 1
TAX ACCT. NO. 250-24...
38,703 sq. ft.
0.8885 acres
SCALE:
20'
0'

APPENDIX B

RUNOFF VOLUME CALCULATIONS

Worksheet 4. Change in Runoff Volume for 2-Yr Storm Event

PROJECT: ELIZABETHTOWN FREE LOT

2-Year Rainfall 2.94 in

Total Site Area: 0.89 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (cf)
Pervious	C	11841	0.27	74	3.51	0.70	0.87	859
Impervious	C	26862	0.62	98	0.20	0.04	2.71	6063
TOTAL:		38703	0.89					6922

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (cf)
Pervious	C	16148	0.37	74	3.51	0.70	0.87	1171
Impervious	C	22555	0.52	98	0.20	0.04	2.71	5091
TOTAL:		38703	0.89					6262

Volume Increase (cf):	-660

Volume Increase = Developed Conditions Runoff - Existing Conditions Runoff

1. Runoff (in) = Q = (P-0.2S)^2 / (P+0.8S) where
   P = 2- Year Rainfall (in)
   S = (1000/ CN)-10
2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq ft)

Worksheet 4. Change in Runoff Volume for 10-Yr Storm Event

PROJECT: ELIZABETHTOWN FREE LOT

10-Year Rainfall 4.46 in

Total Site Area: 0.89 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (cf)
Pervious	C	11841	0.27	74	3.51	0.70	1.94	1916
Impervious	C	26862	0.62	98	0.20	0.04	4.22	9456
TOTAL:		38703	0.89					11372

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (cf)
Pervious	C	16148	0.37	74	3.51	0.70	1.94	2613
Impervious	C	22555	0.52	98	0.20	0.04	4.22	7940
TOTAL:		38703	0.89					10552

Volume Increase (cf):	-819

Volume Increase = Developed Conditions Runoff - Existing Conditions Runoff

1. Runoff (in) = Q = (P-0.2S)^2 / (P+0.8S) where
   P = 2- Year Rainfall (in)
   S = (1000/ CN)-10
2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq ft)

Worksheet 4. Change in Runoff Volume for 25-Yr Storm Event

PROJECT: ELIZABETHTOWN FREE LOT

25-Year Rainfall 5.54 in

Total Site Area: 0.89 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (cf)
Pervious	C	11841	0.27	74	3.51	0.70	2.80	2765
Impervious	C	26862	0.62	98	0.20	0.04	5.30	11869
TOTAL:		38703	0.89					14634

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (cf)
Pervious	C	16148	0.37	74	3.51	0.70	2.80	3771
Impervious	C	22555	0.52	98	0.20	0.04	5.30	9966
TOTAL:		38703	0.89					13737

Volume Increase (cf):	-897

Volume Increase = Developed Conditions Runoff - Existing Conditions Runoff

1. Runoff (in) = Q = (P-0.2S)^2 / (P+0.8S) where
   P = 2- Year Rainfall (in)
   S = (1000/ CN)-10
2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq ft)

Worksheet 4. Change in Runoff Volume for 100-Yr Storm Event

PROJECT: ELIZABETHTOWN FREE LOT

100-Year Rainfall 7.57 in

Total Site Area: 0.89 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (cf)
Pervious	C	11841	0.27	74	3.51	0.70	4.54	4483
Impervious	C	26862	0.62	98	0.20	0.04	7.33	16409
TOTAL:		38703	0.89					20892

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (cf)
Pervious	C	16148	0.37	74	3.51	0.70	4.54	6113
Impervious	C	22555	0.52	98	0.20	0.04	7.33	13778
TOTAL:		38703	0.89					19892

Volume Increase (cf):	-1000

Volume Increase = Developed Conditions Runoff - Existing Conditions Runoff

1. Runoff (in) = Q = (P-0.2S)^2 / (P+0.8S) where
   P = 2- Year Rainfall (in)
   S = (1000/ CN)-10
2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq ft)

NOAA Atlas 14, Volume 2, Version 3
Location name: Elizabethtown, Pennsylvania, USA*
Latitude: 40.1549°, Longitude: -76.6017°
Elevation: 427.51 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.320 (0.289-0.356)	0.381 (0.343-0.424)	0.449 (0.404-0.499)	0.498 (0.447-0.553)	0.557 (0.497-0.617)	0.599 (0.533-0.663)	0.640 (0.568-0.708)	0.677 (0.598-0.750)	0.723 (0.633-0.800)	0.758 (0.659-0.839)
10-min	0.512 (0.461-0.569)	0.610 (0.549-0.679)	0.719 (0.647-0.800)	0.797 (0.714-0.884)	0.888 (0.793-0.983)	0.954 (0.849-1.06)	1.02 (0.902-1.13)	1.07 (0.947-1.19)	1.14 (1.00-1.27)	1.19 (1.04-1.32)
15-min	0.639 (0.577-0.711)	0.767 (0.690-0.853)	0.910 (0.818-1.01)	1.01 (0.904-1.12)	1.13 (1.01-1.25)	1.21 (1.08-1.34)	1.29 (1.14-1.42)	1.36 (1.20-1.50)	1.44 (1.26-1.59)	1.50 (1.30-1.66)
30-min	0.877 (0.791-0.974)	1.06 (0.953-1.18)	1.29 (1.16-1.44)	1.46 (1.31-1.62)	1.67 (1.49-1.85)	1.82 (1.62-2.01)	1.97 (1.75-2.18)	2.11 (1.86-2.34)	2.29 (2.01-2.53)	2.43 (2.11-2.69)
60-min	1.09 (0.986-1.22)	1.33 (1.20-1.48)	1.66 (1.49-1.84)	1.90 (1.71-2.11)	2.22 (1.98-2.46)	2.47 (2.20-2.73)	2.71 (2.41-3.00)	2.96 (2.61-3.28)	3.29 (2.88-3.64)	3.54 (3.08-3.92)
2-hr	1.29 (1.16-1.43)	1.56 (1.41-1.74)	1.98 (1.78-2.20)	2.30 (2.07-2.55)	2.76 (2.47-3.05)	3.14 (2.79-3.46)	3.54 (3.12-3.90)	3.95 (3.46-4.36)	4.55 (3.94-5.03)	5.04 (4.33-5.57)
3-hr	1.41 (1.27-1.57)	1.71 (1.54-1.91)	2.16 (1.95-2.41)	2.52 (2.26-2.80)	3.02 (2.69-3.34)	3.43 (3.04-3.80)	3.87 (3.41-4.28)	4.33 (3.79-4.78)	4.98 (4.32-5.52)	5.52 (4.73-6.12)
6-hr	1.73 (1.56-1.94)	2.10 (1.89-2.35)	2.64 (2.38-2.96)	3.10 (2.77-3.46)	3.75 (3.33-4.18)	4.31 (3.80-4.78)	4.91 (4.30-5.44)	5.57 (4.83-6.16)	6.52 (5.58-7.22)	7.33 (6.19-8.12)
12-hr	2.11 (1.89-2.40)	2.55 (2.28-2.89)	3.23 (2.88-3.66)	3.81 (3.38-4.31)	4.68 (4.13-5.27)	5.44 (4.75-6.10)	6.28 (5.43-7.02)	7.20 (6.16-8.05)	8.61 (7.23-9.61)	9.82 (8.14-11.0)
24-hr	2.43 (2.24-2.68)	2.94 (2.71-3.24)	3.75 (3.44-4.13)	4.46 (4.08-4.90)	5.54 (5.02-6.06)	6.49 (5.83-7.07)	7.57 (6.73-8.21)	8.78 (7.71-9.50)	10.6 (9.18-11.5)	12.3 (10.4-13.2)
2-day	2.82 (2.59-3.12)	3.41 (3.14-3.77)	4.35 (3.99-4.80)	5.15 (4.71-5.67)	6.35 (5.76-6.96)	7.38 (6.64-8.08)	8.53 (7.61-9.32)	9.80 (8.65-10.7)	11.7 (10.2-12.8)	13.4 (11.5-14.6)
3-day	2.99 (2.76-3.29)	3.62 (3.34-3.98)	4.60 (4.23-5.06)	5.44 (4.99-5.97)	6.70 (6.10-7.32)	7.79 (7.04-8.50)	9.01 (8.07-9.81)	10.4 (9.19-11.3)	12.4 (10.8-13.5)	14.1 (12.2-15.4)
4-day	3.17 (2.92-3.46)	3.82 (3.53-4.18)	4.85 (4.48-5.31)	5.73 (5.27-6.27)	7.06 (6.44-7.69)	8.21 (7.44-8.93)	9.49 (8.53-10.3)	10.9 (9.72-11.8)	13.1 (11.5-14.2)	14.9 (12.9-16.2)
7-day	3.72 (3.44-4.05)	4.47 (4.15-4.88)	5.62 (5.20-6.12)	6.60 (6.09-7.18)	8.06 (7.39-8.75)	9.32 (8.49-10.1)	10.7 (9.69-11.6)	12.3 (11.0-13.3)	14.6 (12.9-15.8)	16.6 (14.5-18.0)
10-day	4.26 (3.98-4.61)	5.11 (4.77-5.53)	6.35 (5.91-6.86)	7.39 (6.85-7.96)	8.89 (8.20-9.57)	10.1 (9.32-10.9)	11.5 (10.5-12.4)	13.0 (11.8-14.0)	15.2 (13.6-16.3)	17.0 (15.0-18.3)
20-day	5.81 (5.47-6.20)	6.90 (6.50-7.37)	8.31 (7.81-8.87)	9.45 (8.86-10.1)	11.0 (10.3-11.8)	12.3 (11.5-13.1)	13.7 (12.7-14.6)	15.1 (13.9-16.1)	17.0 (15.6-18.2)	18.6 (16.9-19.9)
30-day	7.18 (6.79-7.63)	8.49 (8.02-9.01)	10.0 (9.48-10.7)	11.3 (10.6-12.0)	13.0 (12.2-13.8)	14.4 (13.5-15.3)	15.8 (14.8-16.8)	17.3 (16.0-18.3)	19.3 (17.8-20.5)	20.8 (19.1-22.2)
45-day	9.05 (8.60-9.52)	10.7 (10.1-11.2)	12.4 (11.8-13.0)	13.7 (13.0-14.4)	15.5 (14.7-16.3)	16.9 (16.0-17.7)	18.2 (17.2-19.1)	19.5 (18.4-20.6)	21.3 (19.9-22.4)	22.6 (21.1-23.8)
60-day	10.8 (10.3-11.3)	12.7 (12.1-13.3)	14.6 (13.9-15.3)	16.1 (15.3-16.9)	18.0 (17.1-18.8)	19.4 (18.4-20.3)	20.8 (19.7-21.8)	22.1 (20.9-23.2)	23.8 (22.4-25.0)	25.1 (23.5-26.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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APPENDIX C

INFILTRATION BED CALCULATIONS

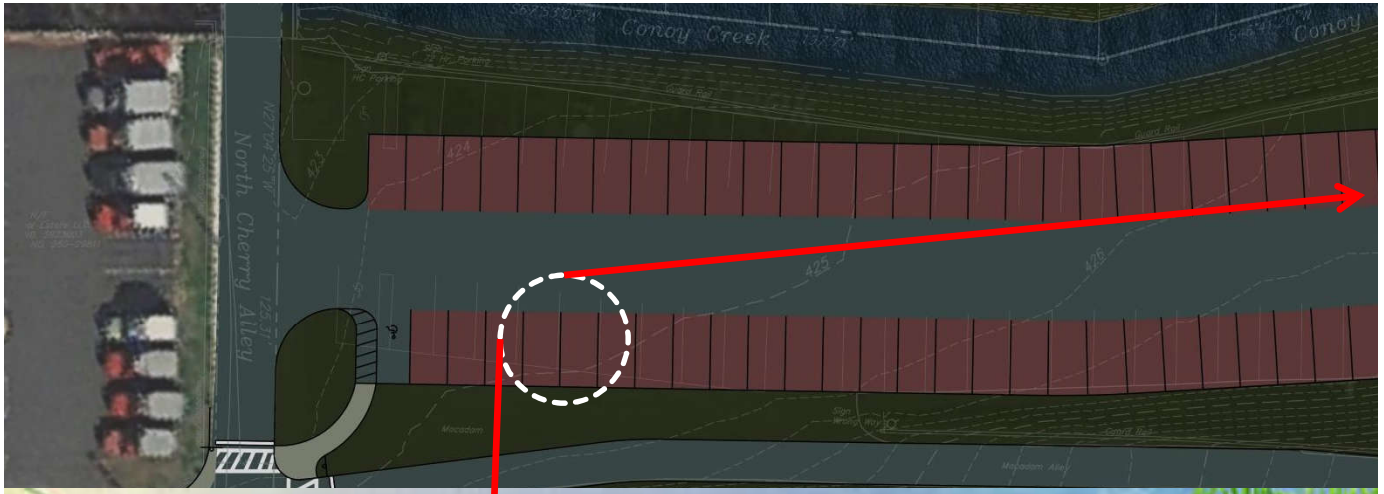
INFILTRATION BED STORAGE VOLUME

AREA OF PERVIOUS PAVERS = 9554 sf

DEPTH OF STONE BED = 1 FT

STONE VOIDS = 40%

VOLUME = (9554 sf)(1 FT)(0.40) = 3822 cf



Regimental Full Range Basketweave Pattern

Regimental Full Range Running Bond Pattern

Regimental Full Range Herringbone Pattern

Soil Map—Lancaster County, Pennsylvania
(Etown - Mechanics Alley)

Map Scale: 1:894 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 40 80 160 240

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 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Lancaster 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 26, 2011—Jul 2, 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

Lancaster County, Pennsylvania (PA071)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
LaC	Lansdale loam, 8 to 15 percent slopes	0.2	14.1%
Rd	Rowland silt loam	0.4	24.8%
Uc	Urban land	1.1	61.1%
Totals for Area of Interest		**1.7**	**100.0%**

2.0 BMP: Maintenance Garage Bio-retention Basin

BMP Identification: Bio-retention Basin
Location of BMP: 810 S. Market Street, Elizabethtown Borough
Status of BMP Implementation: Construction starting summer 2016

Milestones for BMP Implementation*:

Planning:	Fall/Winter 2015-2017
Conceptual Design:	Fall/Winter 2015-2017
Design and Permitting:	2016
Construction:	By 2023

*Dependent upon DEP approval of Pollutant Reduction Plan.

Estimated Reductions (annual):

Annual Reduction –

TN (Total Nitrogen) with 70% BMP reduction results in 58.09 lbs. reduction
TP (Total Phosphorous) with 75% BMP reduction results in 2.25 lbs. reduction
TSS (Total Suspended Sediment) with 80% BMP reduction results in 2,216.20 lbs. reduction

Rationale for BMP Selection:
The Borough Maintenance Garage is currently located in an older facility on East Plum Street. The facility primarily consisted of impervious coverage including the maintenance garage, parking and storage areas. In order to provide an updated maintenance building/facility, the Borough purchased a lot off of Market Street several years ago. The proposed maintenance building site is a re-development site, formerly part of a larger manufacturing site which was demolished. The Heritage Metal Property had contained 2.13 acres of impervious coverage for which the allotment was divided up between several lots. The Borough opted to follow their most recent SWM Ordinance and met all NPDES requirements. BMPs used included, sumped inlets with snouts, vegetated swales and a bioretention basin. The plan also calls for all storage bins for the pipes, catchbasins, etc. to be covered. The washbay has been designed to discharge to the sewer system which is key upgrade for the Borough's MS4 program.

BMP Operation and Maintenance (O&M):

1. Street sweeping/vacuuming:
    a. Must perform street sweeping/vacuuming on a quarterly bases and biweekly during winter months when anti-skid or salt is applied to the parking lot surface. A record of the sweeping must be maintained.

2. Bio-retention Bed:
    a. Bio-retention areas should be inspected at least two (2) times per year for sediment build-up, erosion, vegetative conditions, etc.
    b. During periods of extended drought, bio-retention areas may require watering.
    c. During normal operation, the basin valve is closed.

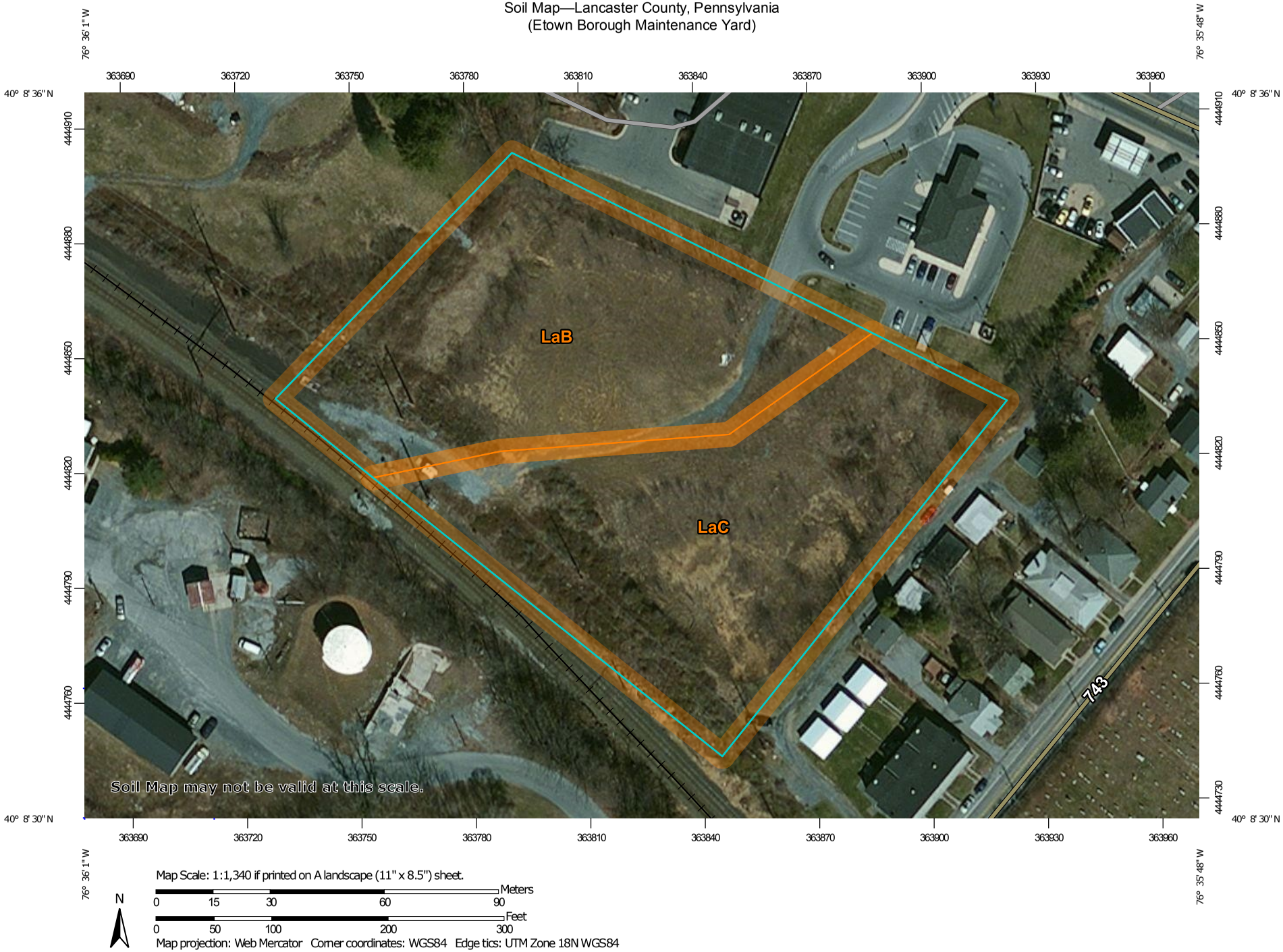
3. Permanent Erosion Control Measures will Include the Following:

a. After each storm event, regular clean out inlet, downspout screens to reduce sedimentation load to bio-retention bed.
b. Quarterly inspect and clean the inlets with SNOUTS.
c. Additionally, evaluate the drain down time of the bio-retention bed to ensure the time is between 24 to 72 hours.
d. The vegetative cover of the bio-retention bed should be maintained in good condition.
e. During dry periods, removal all debris and sedimentation build-up in the bio-retention bed.
f. Lawn mowing in the bio-retention bed.
g. Inspecting the bio-retention bed berm for stability.
h. Inspect the discharge pipe from bio-retention bed and level spreader.
i. During normal operation, the basin valve in the bio-retention bed is closed. The valve is used to drain the bed in an emergency or if maintenance is needed to be performed. During each inspection of the bed, inspect the valve for proper operation.

4. Additional Post-Construction Maintenance Inspection Requirements:
    a. Regular inspection of the SWM facilities. To assure proper implementation of BMPs, maintenance and care SWM BMPs shall be inspected by a qualified person, which may include the landowner, or the owner's designee (including the Borough for dedicated and owned facilities), according to the following minimum frequencies:
        i. Annually for the first five (5) years after the facility is built.
        ii. Once every three (3) years thereafter.
        iii. During or immediately after the cessation of a ten-year or greater storm (six (6) inch equivalent).
        iv. As specified in the O&M agreement pursuant to Section 602.
    b. All pipes, swales and detention facilities shall be kept free of any debris or other obstruct and in original design condition.
    c. A Removal of silt from all permanent structures which trap silt or sediment in order to keep the material from building up in grass waterways, pipes, detention or retention basins, infiltration structures or BMPs, and thus reducing their capacity to convey or store water.

Refer to attached copy of construction plans for the Borough Maintenance Garage.

Soil Map—Lancaster County, Pennsylvania
(Etown Borough Maintenance Yard)



Map Scale: 1:1,340 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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

MAP LEGEND

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

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Soil Survey Area: Lancaster 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 26, 2011—Jul 2, 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

Lancaster County, Pennsylvania (PA071)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
LaB	Lansdale loam, 3 to 8 percent slopes	1.8	47.8%
LaC	Lansdale loam, 8 to 15 percent slopes	2.0	52.2%
Totals for Area of Interest		**3.8**	**100.0%**

3.0 BMP: Stream Bank Restoration – Conoy Creek

BMP Identification: Stream Bank Restoration
Location of BMP: Between North Lime Street along Conoy Avenue to Radio Road
Status of BMP Implementation: Planning

Milestones for BMP Implementation:

Planning:	2017
Conceptual Design:	2017
Design and Permitting:	2018*
Construction:	2019*

*Dependent upon DEP approval of Pollutant Reduction Plan.

Estimated Reductions (annual):

Annual Reduction – Stream Bank Restoration (1,900 ft.)

TN (Total Nitrogen) with 0.075 lbs./ft. BMP reduction results in 142.50 lbs. reduction
TP (Total Phosphorous) with 0.068 lbs./ft. BMP reduction results in 129.20 lbs. reduction
TSS (Total Suspended Sediment) with 44.88 lbs./ft. BMP reduction results in 85,272.00 lbs. reduction

Rationale for BMP Selection:

The proposed streambank restoration area extending from North Lime Street along Conoy Avenue to the Radio Road (municipal boundary). Conoy Creek in this area has large areas of streambank erosion and as seen in the site photos has eroded unstabilized banks. In conjunction with the Streambank Restoration guidelines published by DEP on June 22, 2017 the site photos (additional are available upon request) document the existing streambank erosion and enlarging urban stream condition. The stretch of Conoy Creek within the project area is over 2,500 feet. The Borough proposes at least 2,000 feet of restoration as part of this project. Areas upstream of the stream have long vegetated filter strips and floodplain areas for stormwater mitigation in addition to any stormwater facilities located on the private land. As part of the planning process the Borough will survey the project area and determine the maximum extent of floodplain reconnection and riparian buffer areas.

BMP Operation and Maintenance (O&M):

The specific basin Operation and Maintenance Procedures will be planned as part of the basin retrofit design. General Riparian Buffer Maintenance includes:

Maintenance measures that should be performed regularly:

Watering

- Plantings need deep regular watering during the first growing season, either natural watering via rainfall, or planned watering, via caretaker.
- Planting in the fall increases the likelihood of sufficient rain during planting establishment.

Mulching

- Mulch will assist in moisture retention in the root zone of plantings, moderate soil temperature, provide some weed suppression, and decelerate evaporation
- Use coarse, organic mulch that is slow to decompose in order minimize repeat application
- Apply 2-4 inch layer, leaving air space around tree trunk to prevent fungus growth.
- Use combination of woodchips, leaves, and twigs that are stockpiled for six months to a year. Weed control
- Weed competition limits buffer growth and survival, therefore weeds should be controlled by either herbicides, mowing, or weed mats:

Herbicides

This is a short-term maintenance technique (2-3 years) that is generally considered less expensive and more flexible than mowing, and will result in a quicker establishment of the

buffer. Herbicide use is regulated by the PA Department of Agriculture. Proper care should be taken to ensure that proximity to water features is considered.

Mowing

Mowing controls the height of the existing grasses, yet increases nutrient uptake, therefore competition for nutrients will persist until the canopy closure shades out lower layers. A planting layout similar to a grid format will facilitate ease of mowing yet yield an unnaturally spaced community. Mowing may result in strikes on the tree trunks unless protective measures are utilized. Mowing should occur twice each growing season. Mower height should be set between 8 –12 inches.

Weed Mats

Weed mats are geo-textile fabrics that are used to suppress weed growth around newly planted vegetation by providing shade and preventing seed deposition. Weed mats are installed after planting, and should be removed once the trees have developed a canopy that will naturally shade out weeds.

Deer damage

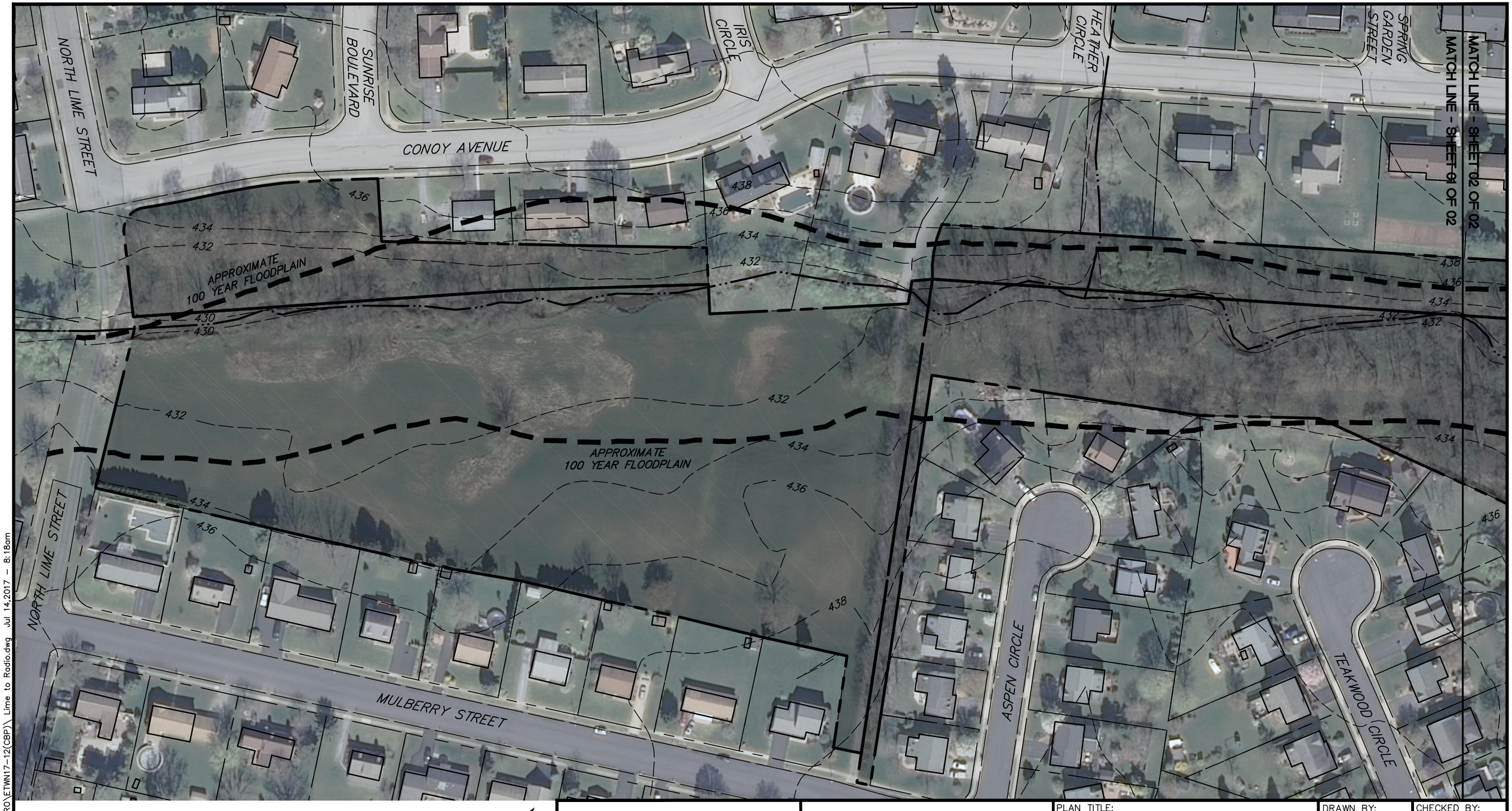
- Deer will browse all vegetation within reach, generally between 5-6 feet above the ground
- Approaches to minimize damage include: 1) selecting plants that deer do not prefer (ex. Paper
  Birch, Beech, Ash, Common Elderberry) 2) homemade deer repellants 3) tree shelters

Tree shelters

- Repair broken stakes
- Tighten stake lines
- Straighten leaning tubes
- Clean debris from tube
- Remove netting as tree grows
- Remove when tree is approximately 2 inches wide

Invasive Plants

- Monitor restoration sight regularly for any signs of invasive plants.
- Appendix B contains common invasive plants found in Pennsylvania.
- Choice of control method is based on a variety of considerations, but falls into three (3) general categories:
  - Mechanical
  - Mechanical with application of herbicide
  - Herbicide



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LEGEND

- EXISTING STREAM (CONOY CREEK)
- APPROXIMATE 100 YEAR FLOODPLAIN
- MUNICIPAL BOUNDARY (ELIZABETHTOWN BOROUGH)
- ELIZABETHTOWN BOROUGH PROPERTY

HanoverEngineering

Lancaster-Lebanon Office
20 C Snyder Lane P:717.721.7444
Ephrata, PA 17522-9101 F:717.721.7447
HanoverEng.com 30

ELIZABETHTOWN BOROUGH
LANCASTER COUNTY
PENNSYLVANIA

PLAN TITLE:

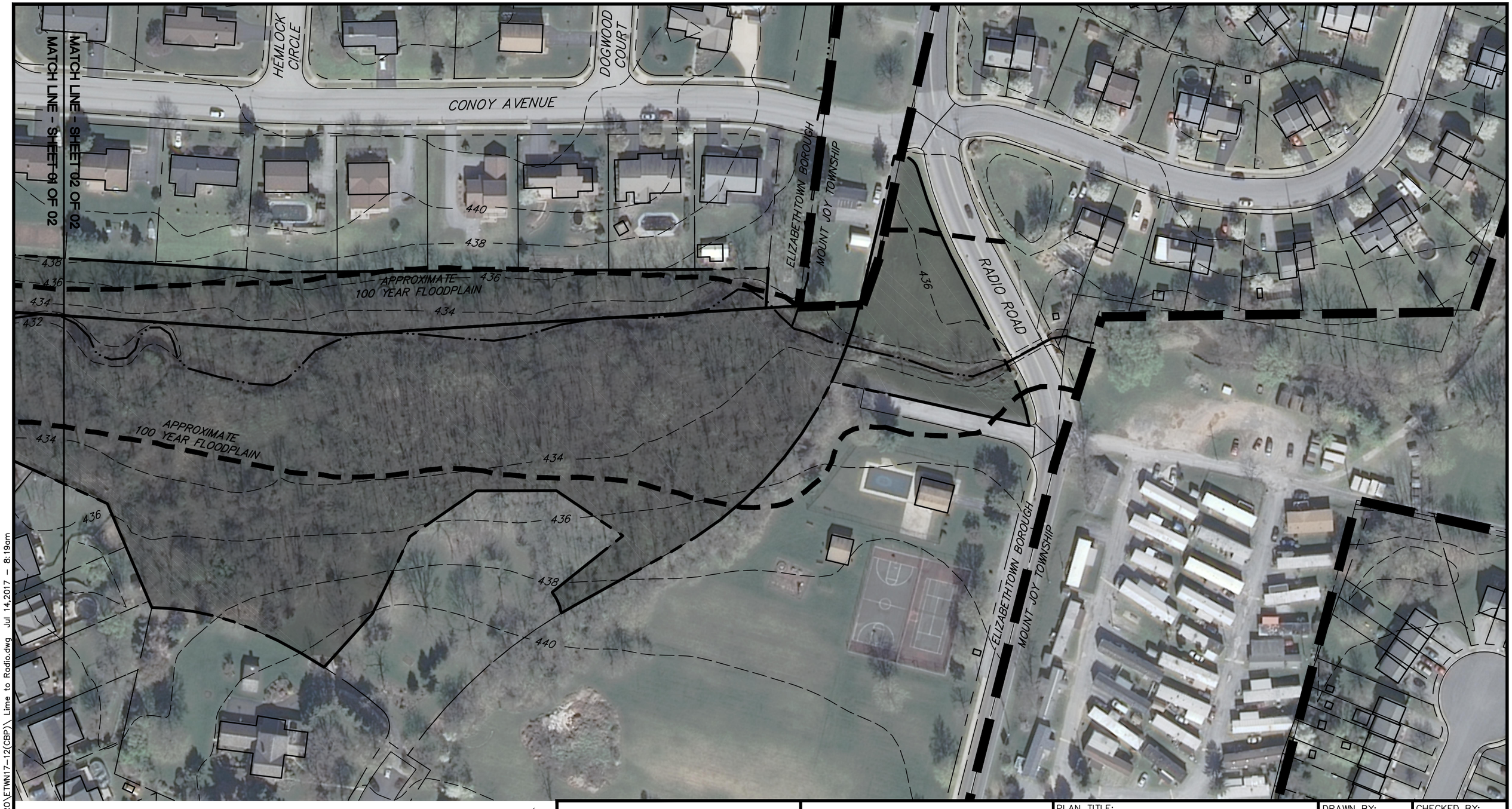
PROJECT TITLE: ELIZABETHTOWN BOROUGH CBP

50 0 50 100
1" = 100'

DRAWN BY:	CHECKED BY:
ERK	JAP
SCALE: SELECT SCALE	DATE: 2017 JULY 13

PROJECT NO. ETWN17-12(CBP)

SHEET NO. 01 OF 02



LEGEND

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- APPROXIMATE 100 YEAR FLOODPLAIN
- MUNICIPAL BOUNDARY (ELIZABETHTOWN BOROUGH)
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ELIZABETHTOWN BOROUGH
LANCASTER COUNTY
PENNSYLVANIA

PLAN TITLE:

PROJECT TITLE: ELIZABETHTOWN BOROUGH CBP

100 0 50 100
1" = 100'

DRAWN BY:	CHECKED BY:
ERK	JAP
SCALE: 1"=100'	DATE: 2017 JULY 13

PROJECT NO. ETWN17-12(CBP)

SHEET NO. 02 OF 02

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United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Lancaster County, Pennsylvania

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:5,320 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

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 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Lancaster 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 26, 2011—Jul 2, 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

Lancaster County, Pennsylvania (PA071)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
LaB	Lansdale loam, 3 to 8 percent slopes	13.9	25.7%
LaC	Lansdale loam, 8 to 15 percent slopes	7.0	13.0%
RaB	Readington silt loam, 3 to 8 percent slopes	12.2	22.6%
Rd	Rowland silt loam	14.2	26.3%
UaC	Ungers loam, 8 to 15 percent slopes	6.7	12.4%
Totals for Area of Interest		**53.9**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

Lancaster County, Pennsylvania

LaB—Lansdale loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l6sk
Elevation: 300 to 1,000 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 160 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lansdale and similar soils: 92 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lansdale

Setting

Landform: Hillsides
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and/or residuum weathered from conglomerate

Typical profile

Ap - 0 to 8 inches: loam
Bt - 8 to 34 inches: channery sandy loam
C - 34 to 46 inches: channery sandy loam
R - 46 to 50 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 42 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

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

Minor Components

Reaville

Percent of map unit: 8 percent

Landform: Hillslopes
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interfluve
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

LaC—Lansdale loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: l6sl
Elevation: 300 to 1,000 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lansdale and similar soils: 92 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lansdale

Setting

Landform: Hillsides
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and/or residuum weathered from conglomerate

Typical profile

Ap - 0 to 8 inches: loam
Bt - 8 to 34 inches: channery sandy loam
C - 34 to 46 inches: channery sandy loam
R - 46 to 50 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 42 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

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

Minor Components

Reaville

Percent of map unit: 8 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interfluve
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

RaB—Readington silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w05x
Elevation: 70 to 950 feet
Mean annual precipitation: 38 to 55 inches
Mean annual air temperature: 43 to 57 degrees F
Frost-free period: 170 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Readington and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Readington

Setting

Landform: Hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Base slope, head slope, side slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Triassic colluvium derived from shale and siltstone and/or triassic residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 10 inches: silt loam
Bt1 - 10 to 17 inches: silt loam
Bt2 - 17 to 34 inches: silty clay loam
Btx - 34 to 48 inches: clay loam
C - 48 to 58 inches: channery silt loam
R - 58 to 68 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 20 to 36 inches to fragipan; 40 to 60 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.3 inches)

Interpretive groups

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

Minor Components

Abbottstown

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

Penn

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

Reaville

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

Rd—Rowland silt loam

Map Unit Setting

National map unit symbol: l6tg
Elevation: 200 to 1,000 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 160 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Rowland

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 9 inches: silt loam
B - 9 to 25 inches: silt loam
C - 25 to 42 inches: silt loam
2C - 42 to 60 inches: Error

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.5 inches)

Interpretive groups

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

Minor Components

Bowmansville

Percent of map unit: 8 percent
Landform: Depressions, flood plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Readington

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Base slope, head slope, side slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Abbottstown

Percent of map unit: 1 percent
Hydric soil rating: No

UaC—Ungers loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: l6tj
Elevation: 250 to 1,500 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Ungers and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ungers

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and siltstone

Typical profile

H1 - 0 to 9 inches: loam
H2 - 9 to 40 inches: gravelly sandy clay loam
H3 - 40 to 60 inches: very channery sandy loam
H4 - 60 to 64 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 40 to 80 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

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

Minor Components

Penn

Percent of map unit: 7 percent
Hydric soil rating: No

Readington

Percent of map unit: 5 percent
Hydric soil rating: No

Bucks

Percent of map unit: 3 percent
Hydric soil rating: No

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Appendix H – MS4 Map