POLLUTION REDUCTION PLAN (PRP)

LOWER SAUCON TOWNSHIP
NORTHAMPTON COUNTY
PENNSYLVANIA

March 26, 2018

PREPARED FOR:

LOWER SAUCON TOWNSHIP
3700 OLD PHILADELPHIA PIKE
BETHLEHEM, PA 18015

Prepared by:

Hanover Engineering

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Hanover Project LS18-16

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Appendices

I. Introduction

Lower Saucon Township (Township) is a rural community adjacent to Hellertown Borough and the City of Bethlehem, Pennsylvania, located in Lehigh County in eastern Pennsylvania. The Township is approximately 24.3 square miles in size with a total population of approximately 10,772 according to the 2010 census. Approximately 4,004.2 acres (6.25 square miles) is classified as Urbanized Area (UA), in accordance with the most recent U.S. Census data. The portion of the UA that contributes stormwater to known stormwater outfalls into streams is approximately 1,058.2 acres (1.65 square miles); this area is known as the Planning Area for the development of this Pollution Reduction Plan (PRP). Within the Township, there are approximately 30.23 miles of State Highways and approximately 86.94 miles of Local Township Roads.

This Pollution Reduction Plan (PRP) was developed for the Township as a requirement of Permit PAI#132227 for their Municipal Separate Storm Sewer System (MS4). The PRP outlines the actions the Township will take to address pollutant loads to the streams within the Township and to the Lehigh River. These actions include public participation, mapping of outfalls and other discharges, calculation of pollutant loads, implementation of stormwater Best Management Practices (BMPs), and undertaking operations and maintenance (O&M) activities.

II. Public Participation

Public participation is an essential part of the PRP because it enhances buy-in from residents, business owners, and landowners that may have an impact on pollutant discharges, can uncover missing elements or errors in calculations, and builds cooperative partnerships among the Township and other entities.

The Township advertised the development of the PRP via Public Notice on March 26, 2018 in the Morning Call. The notice ran for 1 day and stated the PRP is available for review and comment from March 26, 2018 through April 25, 2018, from 8:30 am to 4:30 pm at the Township Building. A digital copy was also made available on the Township website. Proof of publication with a copy of the public notice is provided in Appendix A. The public was given 30 days to provide comments on the contents of the PRP. The Township also held public meetings on April 4, 2018 and April 18, 2018, to receive verbal commentary on the contents of the PRP.

A. Public Notice Language

PUBLIC NOTICE

NOTICE IS HEREBY GIVEN that the Council of Lower Saucon Township will receive public comments on the proposed Pollutant Reduction Plan (PRP) required for the 2018-2023 NPDES Municipal Separate Storm Sewer Systems (MS4) Permit.

The proposed PRP is available for review at the Township Office located at 3700 Old Philadelphia Pike, Bethlehem, PA 18015, from 8:30 a.m. to 4:30 p.m., Monday through Friday, March 26 through April 25, 2018. Digital copies are also available at www.lowersaucontownship.org. Requests for copies may be made by contacting the Township at 610-865-3291 or info@lowersaucontownship.org.

The Township will accept written comments for 30 calendar days from the date of this notice, must be postmarked no later than April 25, 2018, and addressed to Leslie Huhn, Township Manager, at the address listed above. Email comments may also be submitted to info@lowersaucontownship.org.

The email subject line shall include "Comments – Lower Saucon Township PRP". Township Council will provide an opportunity for interested parties to provide comments during their regularly scheduled meetings on April 4 and April 18, 2018, at 7:00 p.m. at the address listed above.

Leslie Huhn
Township Manager

B. List of Public Comments

No public comments were received by the Township. (to be revised following Public Comment Period)

C. List of Comments and Record of Consideration

No public comments were received by the Township, and therefore the amendments were neither considered nor made to the draft plan. (to be revised following Public Comment Period)

III. Mapping

A. Lower Saucon Township's Urbanized Area and MS4 Responsibilities

The Township is located within three (3) HUC12 watersheds, including the Lehigh River Watershed, Saucon Creek Watershed, and the Cooks Creek Watershed (see Figures 1 and 2). The Township's Urbanized Area (UA), however, is only found in the Saucon Creek and Lehigh River HUC12 Watersheds. The Planning Area within the UA, which includes the drainage areas of all MS4 regulated discharges is primarily within the Saucon Creek Watershed, with only one (1) MS4 discharge being located within the Lehigh River Watershed. A total of thirty-four (34) MS4 discharges were identified within the UA, with a total drainage area of 1,058.2 acres. Remaining lands within the UA are either in private ownership (non-municipal) or have been determined to not produce concentrated discharges of stormwater runoff from municipal land or infrastructure into "waters of the Commonwealth/United States."

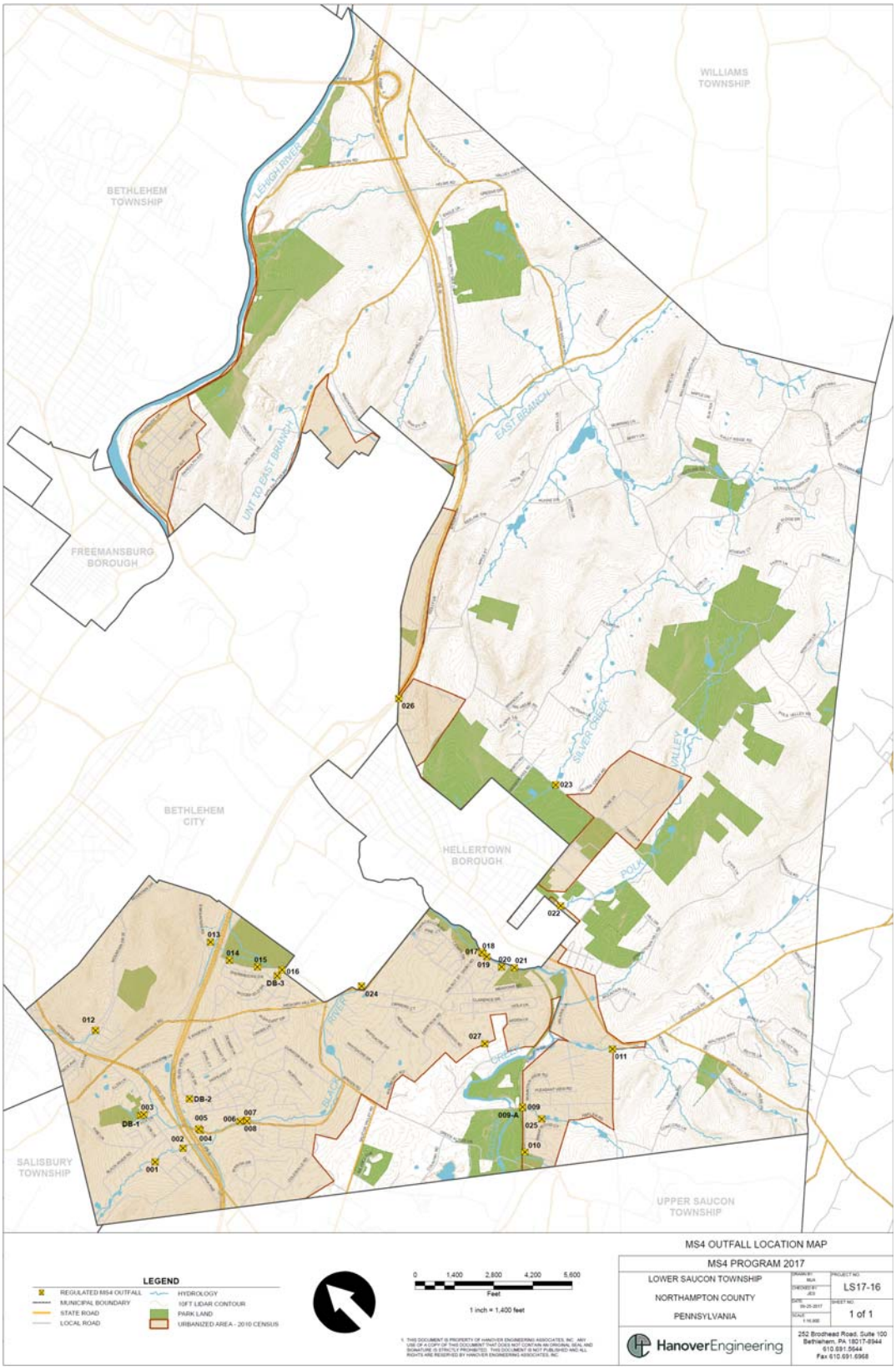


Figure 1: Map of Urbanized Area (UA) for Lower Saucon Township

B. Landuses within the MS4 Planning Area

Land-uses within the Township are comprised of primarily residential and woodlands, with lesser areas of open land, parks, agriculture, recreation, and natural areas. The landuses determined through the use of MapShed modeling software are summarized below in Table 1 and are shown in Appendix B.

Table 1. Landuse Areas within the MS4 Planning Area for Lower Saucon Township

Land Use Type	Area (acres)
Hay/Pasture	50.5
Cropland	10.3
Coniferous Forest	2.4
Deciduous Forest	40.4
Mixed Woodland	215.7
Wooded Wetlands	0.1
Emergent Wetlands	0.2
Turf/Golf	0.24
Low-Density Residential	376.26
Medium-Density Residential	193.37
High-Density Residential	19.82
Low-Density Mixed Urban	33.95
Medium-Density Mixed Urban	42.25
Open Land	72.74
TOTAL MS4 PLANNING AREA	**1,058.2**

C. MS4 Zone

The Township has only two (2) MS4 Zones, with the entire land area for both draining north into the Lehigh River via direct drainage from Urbanized Areas within the Lehigh River HUC12 watershed and via numerous outfalls to the streams within the Saucon Creek HUC12 watershed. The majority of the Township and the Urbanized Areas are within the Saucon Creek Watershed. Smaller Urbanized Areas are found in the direct drainage areas to the Lehigh River in the northern portion of the Township, and there are no Urbanized Areas within the Cooks Creek drainage area in the southern portion of the Township. Urbanized Areas are comprised primarily of medium and high density residential land uses, with lesser areas classified as commercial and institutional. Based on field evaluations conducted during 2003-2018, there are many smaller land areas within the Township's Urbanized Areas that do not contribute concentrate flows to Township-owned or operated facilities, or which do not contribute concentrated flows from Township-owned or operated facilities into nearby streams, and are therefore not included as Planning Area for the development of this Pollution Reduction Plan. The majority of the Township is rural residential and is not classified as Urbanized Area. The mapping provided in Appendices A and B shows the drainage areas within Lower Saucon Township.

D. Surface Waters

Ultimately, all stormwater discharges from the Urbanized Area (UA) in the Township are to the Lehigh River. The Lehigh River is classified as Warm Water Fishes, Migratory Fishes (WWF, MF) and is listed as non-attaining for aquatic life, with siltation from urban runoff and storm sewers as a source cause. MS4 outfall discharges within the Township are found in the drainage areas of smaller contributory streams which are also listed as non-attaining with siltation as a source cause, including: Black River (CWF, MF), Polk Valley Run (CWF, MF), Saucon Creek (CWF/HQ-CWF, MF), Silver Creek (CWF, MF), and an Unnamed tributary to the Lehigh River (WWF, MF). The Pennsylvania Department of Environmental Protection (DEP) has included these waterways on their MS4 Requirements Table, last revised March 5, 2018, as indicated below:

Table 2. MS4 Requirements Table for Lower Saucon Township

MS4 Name	NPDES ID	Individual Permit Required	Reason	Impaired Downstream Waters Names	Requirement(s)	Other Cause(s) of Impairment
Lower Saucon Township	PAI132227	Yes	IP	Delaware River	None	Mercury (5)
				Silver Creek	Appendix E-Siltation	None
				Lehigh River	Appendix C-PCB(5), Appendix E-Organic Enrichment/Low D.O., Siltation, Suspended Solids(5)	None
				Polk Valley Run	Appendix E-Siltation	None
				Saucon Creek	Appendix E-Siltation	None
				UNT to East Branch Saucon Creek	None	Other Habitat Alterations, Water/Flow Variability (4c)
				East Branch Saucon Creek	Appendix E-Siltation	None

NOTE: In watersheds where sediment is listed as a concern, the MS4 permittee must reduce sediment loading by 10 percent; where nutrients are listed as a concern, the MS4 permittee must reduce phosphorus by 5 percent and nitrogen by 3 percent. PA DEP assumes that the 5 percent reduction for phosphorus to be met with the 10 percent reduction in sediment.

IV. Pollutant Loadings

A. Methods

MapShed Version 1.5.1 was used to calculate the existing sediment load within the designated MS4 Planning Area of Lower Saucon Township. Loads from individual drainage areas were aggregated being all within the Lehigh River drainage area. There are three (3) HUC12 watersheds within Lower Saucon Township, including Lehigh River, Saucon Creek, and Cooks Creek (see Figure 2). Urbanized Areas with MS4 outfalls, however, are only found within the Lehigh River and Saucon Creek HUC12 watersheds, both of which drain to the same reach of the Lehigh River. All of the

MS4 outfalls within the Township drain to streams that are listed as Unattaining with the Source Cause listed as Siltation within five (5) miles of the outfall discharge points. Planning Areas within the Township were modeled within the combined 99.02-square mile HUC12 Lehigh River and Saucon Creek watershed basins.

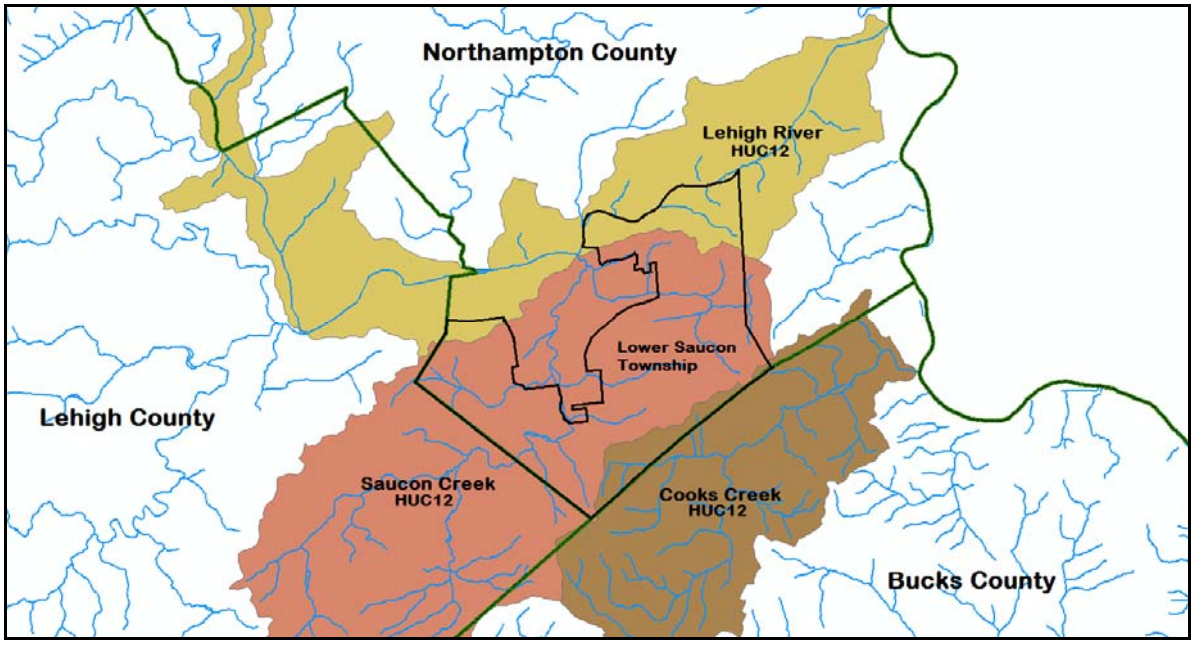


Figure 2: Map of MapShed Basin for Lower Saucon Township

B. Existing Stormwater BMPs in the Planning Area

Lower Saucon Township was historically an agricultural community on the outskirts of the City of Bethlehem and Hellertown Borough. In recent decades, many farms were converted to residential development and other landuses such as commercial, recreational, and institutional. Interstate 78 was also constructed through the Township to improve traffic flow through the region from east to west. The majority of the newer land development activities required varying degrees of stormwater management and water quality protection, including older facilities aimed largely at conveyance and flood protection to newer facilities aimed at improving and protecting water quality.

C. Pollutant Load Calculation

To model the existing sediment load for the MS4 Planning Areas in Lower Saucon Township using the MapShed program, a base model run of the aggregated Lehigh River and Saucon Creek HUC12 watersheds was performed. The Urbanized Area of the Township is primarily within the Saucon Creek HUC12 watershed, with the remainder being a relatively small area within the Lehigh River HUC12 watershed. All of the Urbanized Area drains to the same stretch of the

Lehigh River, with similar geology and soils throughout, sufficient to support aggregating the HUC12 watersheds for determination of pollutant loading coefficients in MapShed.

MapShed was used to determine landuses and sediment runoff coefficients, or loading rates, for the Urbanized Area within Lower Saucon Township. ArcMap was then used to develop drainage areas to all previously identified MS4 outfalls, for which the same landuse data were applied to determine the sediment load for the Planning Area within the Urbanized Area. The Existing Pollutant Loading for sediment was then calculated for the Planning Area using the previously derived landuse loading coefficients. See Table 3, below, for landuse loading rates and respective pollutant load calculations.

Following a thorough review of mapping and records, as well as field evaluations, the Planning Area does not contain any active, functioning, and maintained stormwater Best Management Practices designed and implemented for water quality improvement. Therefore, no credit for sediment loading reduction was applied to the calculation of the Existing Sediment Load from the Planning Area.

Table 3. MapShed Sediment Land Use Loading Rates and Calculated Pollutant Loads – Lehigh River/Saucon Creek HUC12 Watershed Area

Land Cover	Sediment Loading Rate (lbs/ac/yr)	Area (ac)	Sediment Load (lbs/yr)
Hay/Pasture	146.2	50.51	7,384.7
Cropland	1,498.0	10.26	15,367.0
Forest	17.5	258.50	4,523.8
Wetland	9.8	0.31	3.0
Turf/Golf	37.4	0.24	8.8
Low-Density Residential	33.0	376.26	12,416.7
Medium-Density Residential	160.1	193.37	30,958.0
High-Density Residential	160.1	19.82	3,173.7
Low-Density Mixed Urban	33.0	33.95	1,120.4
Medium-Density Mixed Urban	160.1	42.25	6,764.9
Open Land	255.7	72.74	18,598.9
TOTAL		**1,058.21**	**100,320.0**

Based on these existing load calculations, it was determined that the Township's existing sediment loading is 100,320.0 lbs/year.

D. Pollutant Load Reduction Requirements

Based on these existing load calculations it was determined that the Township's existing sediment loading is 100,320.0 lbs/year. Based on the MS4 Program requirement to reduce sediment

pollution by at least 10% from the Planning Area, the minimum sediment reduction required is 10,032.0 lbs/year, as summarized below in Table 4.

Table 4. Pollutant Load Reduction Requirements for the MS4 Planning Area within Lower Saucon Township

Planning Area Name	Total Acres	Land Use Sediment Load (lbs)	Total MapShed Sediment Load (lbs)
Saucon Creek/Lehigh River Watershed	1,058.2	100,320.0	100,320.0
Existing BMP Load Reduction	0	0	0
Final Existing Load			100,320.0
Required 10% Reduction			10,032.0

V. BMPs Selected to Achieve the Minimum Required Reductions in Pollutant Loading

Based on the 10% sediment load reduction targets established above, Lower Saucon Township has identified potential BMPs to meet the minimum load reductions during the next 5-year permit term. BMPs for stormwater management were determined, based on available public land, existing facilities, and potential for pollutant removal. All potential stormwater BMPs listed in the BMP Effectiveness Values table provided by PA DEP were considered. A list of the BMPs selected for Lower Saucon Township to meet sediment loading reduction goals is provided below in Table 6, with a location map provided in Appendix D.

A. Summary of Alternatives and Selection of BMPs

The Township identified and evaluated BMPs, according to the following criteria:

- Sediment reduction
- Cost-effectiveness of pollutant reduction
- Ownership (public vs. private land, single party vs. multi-party ownership)
- Funding and workforce availability
- Community benefit (site accessibility, flooding relief, aesthetics, etc.)
- Connectivity to other completed or proposed stormwater BMPs
- Timeframe to implement

The purpose of the evaluation was to determine the most cost-effective BMPs that would benefit water quality and the community. The highest priority BMPs are included in this PRP. The BMPs selected are a list of good opportunities that the Township has identified and may use to meet their required sediment reduction. The Township is not committing to implementing all the

BMPs listed in this PRP, as that would exceed their required reduction. The actual implemented BMPs will be based on further site evaluation, negotiations with stakeholders, detailed design criteria, permitting complexity, and cost. The plan will be adjusted and revised, as new opportunities arise and as necessary to accomplish reduction goals with the most cost-effective BMPs.

The Township will continuously evaluate cost-effective opportunities to meet required reductions. These could include working jointly with other municipalities on a joint project if viable opportunities arise. The Township will also evaluate opportunities to work with future private developers or land development applicants where cooperative efforts merit consideration. As new opportunities are selected for implementation to meet sediment reduction requirements, this PRP will be amended, advertised for public comment, and resubmitted to PA DEP.

B. Pollutant Removals

The minimum sediment reduction required for the Township in the Lehigh River and Saucon Creek Watersheds is 10,032.0 lbs/year, as shown above in Table 4.

Since MapShed was used to determine pollutant loading coefficients for the landuses within the Township and to calculate the existing load, the same data were used to calculate the load reductions resulting from the implementation of the proposed stormwater BMPs. Sediment removal efficiency values were taken from the PA DEP BMP Effectiveness Values table (3800-PM-BCW0100M) and applied to the pollutant loadings calculated for each proposed BMP to determine the reductions expected for each proposed BMP. Watersheds for proposed BMPs were developed in ArcMap using available Geographic Information Systems (GIS) data, including parcels, 2-foot Lidar topography, buildings, and landuse data. The BMP loading reduction value of 38,678.1 lbs/year was then subtracted from the required reduction of 10,320.0 lbs/year to show a surplus removal value of 28,646.1 lbs/year, assuming that all potential BMPs would be implemented.

The stormwater BMPs listed in Table 5 will be considered for implementation by the Township to meet their required sediment reduction. The Township is not committing to implement each BMP listed. BMPs will be chosen based on additional evaluation of cost-benefit once more detailed planning has been completed. The combination of selected BMPs will meet the required 10% reduction for sediment load from the Planning Area within the Township and will be implemented by the next 5-year permit term, or as formally extended. A summary of all the currently proposed BMPs and how they meet the required 10% load reduction is shown below in Table 5. Calculations for BMP sediment load reductions are provided in Appendix C. BMP project locations are shown in Appendix D. BMP designs will be added to this PRP as Appendix E, as they are completed, approved, and installed.

C. Operation and Maintenance Requirements

With regard to existing and future stormwater BMPs that may be constructed on private property and not managed by the Township, the Township's Stormwater Management Ordinance requires

legally binding Operation and Maintenance (O&M) provisions which must be completed for facilities not dedicated to or accepted by the Township. The Township's MS4 permit indicates and requires regular inspection by facility owners and Township staff at least one (1) time during each 5-year permit term. The Stormwater Management Ordinance also specifies regular inspection intervals by the owners, who are responsible for maintenance under various situations. Operation and Maintenance requirements for all stormwater management BMPs proposed for meeting the required MS4 Program pollutant reductions, including responsible parties, activities, and schedules are listed below in Table 5. The Township will be responsible for implementation of selected BMPs, as well as for regular inspections, sediment removal, and reconstruction of facilities, as needed to maintain full efficiency and functionality for sediment removal.

Table 5. Summary of Proposed BMPs in the Planning Area of Lower Saucon Township

BMP ID	BMP Type	Sediment Load Reduction (lbs/yr)	Percent of Total Reduction	Landowner	Installation Responsibility	Funding Mechanism	Operation & Maintenance Responsibility	Operation & Maintenance Activities/Schedule
003	Rain Garden C/D Soils w/Underdrain	123.3	0.32%	Lower Saucon Township 3700 Old Philadelphia Pike Parcel ID: Q6NW3 8 33	Township	Stormwater Fee/Grant Funds	Township	Annually, cut back perennial plants. Twice per year, check vegetation for condition, check inflow and remove sediments, re-mulch bare spots. Every three years, reapply mulch.
004	Bioretention Basin A/B Soils w/Underdrain	909.9	2.35%	Alejandro Valencia Valerya Lopez 2009 Majestic Overlook Drive Parcel ID: Q6 6 3B-16	Township	Stormwater Fee/Grant Funds	Township	Monthly, perform trash removal, inspect outlet for obstructions/clogging, and inspect inlet grates. Quarterly, street sweep parking lot. Annually, skim sand media and pump oil and grit from sediment chamber (once 50% full). Every two to three years, replace sand media (or as needed).
005	Bioretention Basin A/B Soils w/Underdrain	603.2	1.56%	Thomas R. Kay 1456 Greenwood Court Parcel ID: Q6SW2 4 6 Christina V. Haden Keith W. Moored 1452 Greenwood Court Parcel ID: Q6SW2 4 6G	Township	Stormwater Fee/Grant Funds	Township	Monthly, perform trash removal, inspect outlet for obstructions/clogging, and inspect inlet grates. Quarterly, street sweep parking lot. Annually, skim sand media and pump oil and grit from sediment chamber (once 50% full). Every two to three years, replace sand media (or as needed).
008	Bioretention Basin A/B Soils w/Underdrain	816.6	2.11%	PennDOT	Township	Stormwater Fee/Grant Funds	Township/ PennDOT	Monthly, perform trash removal, inspect outlet for obstructions/clogging, and inspect inlet grates. Quarterly, street sweep parking lot. Annually, skim sand media and pump oil and grit from sediment chamber (once 50% full). Every two to three years, replace sand media (or as needed).
013	Bioretention Swale	2,912.7	7.53%	Lehigh University Mountain Drive South Parcel ID: Q6 1 1	Township	Stormwater Fee/Grant Funds	Township	Annually, cut back perennial plants. Twice per year, check vegetation for condition, remove woody vegetation, remove accumulated sediments.
016	Bioretention Basin A/B Soils w/Underdrain	1,251.7	3.24%	Daniel A. Attieh Abigail L. Esten 2065 Majestic Overlook Drive Parcel ID: Q6 6 7	Township	Stormwater Fee/Grant Funds	Township	Monthly, perform trash removal, inspect outlet for obstructions/clogging, and inspect inlet grates. Quarterly, street sweep parking lot. Annually, skim sand media and pump oil and grit from sediment chamber (once 50% full). Every two to three years, replace sand media (or as needed).
022	Bioretention Basin A/B Soils w/Underdrain	4,375.2	11.31%	Saucon Valley School District 2100 Polk Valley Road Parcel ID: Q7 20 3	Township	Stormwater Fee/Grant Funds	Township	Monthly, perform trash removal, inspect outlet for obstructions/clogging, and inspect inlet grates. Quarterly, street sweep parking lot. Annually, skim sand media and pump oil and grit from sediment chamber (once 50% full). Every two to three years, replace sand media (or as needed).
024	Bioretention Basin A/B Soils w/Underdrain	9,901.1	25.60%	Gordon Petridis 1954 O'Brien's Court Parcel ID: Q711 4K Tendai Mawindi 1951 O'Brien's Court Parcel ID: Q711 4L	Township	Stormwater Fee/Grant Funds	Township	Monthly, perform trash removal, inspect outlet for obstructions/clogging, and inspect inlet grates. Quarterly, street sweep parking lot. Annually, skim sand media and pump oil and grit from sediment chamber (once 50% full). Every two to three years, replace sand media (or as needed).
025	Bioretention Basin A/B Soils w/Underdrain	326.0	0.84%	Mark K. & Jennifer L. Altemose 1661 Briarwood Circle Parcel ID: R7SW1 2 51	Township	Stormwater Fee/Grant Funds	Township	Monthly, perform trash removal, inspect outlet for obstructions/clogging, and inspect inlet grates. Quarterly, street sweep parking lot. Annually, skim sand media and pump oil and grit from sediment chamber (once 50% full). Every two to three years, replace sand media (or as needed).
027	Bioretention Swale	1,821.0	4.71%	John F. Cox 1745 Hawthorne Road Parcel ID: R7 2 6-14 William H. & Denise A. Spence 1746 Hawthorne Road Parcel ID: R7 2 6-10	Township	Stormwater Fee/Grant Funds	Township	Annually, cut back perennial plants. Twice per year, check vegetation for condition, remove woody vegetation, remove accumulated sediments.

032	Bioretention Basin A/B Soils w/Underdrain	1,795.5	4.64%	Donald J. & Jodie L. Morgan 1865 Viola Lane Parcel ID: R7 2 2P-16	Township	Stormwater Fee/Grant Funds	Township	Monthly, perform trash removal, inspect outlet for obstructions/clogging, and inspect inlet grates. Quarterly, street sweep parking lot. Annually, skim sand media and pump oil and grit from sediment chamber (once 50% full). Every two to three years, replace sand media (or as needed).
DB-1	Bioretention Basin A/B Soils w/Underdrain	1,955.4	5.06%	Lower Saucon Township 3700 Old Philadelphia Pike Parcel ID: Q6NW3 8 33	Township	Stormwater Fee/Grant Funds	Township	Monthly, perform trash removal, inspect outlet for obstructions/clogging, and inspect inlet grates. Quarterly, street sweep parking lot. Annually, skim sand media and pump oil and grit from sediment chamber (once 50% full). Every two to three years, replace sand media (or as needed).
DB-2	Bioretention Basin A/B Soils w/Underdrain	1,022.5	2.64%	Lower Saucon Township Glen View Drive Parcel ID: Q6 6 1A-12	Township	Stormwater Fee/Grant Funds	Township	Monthly, perform trash removal, inspect outlet for obstructions/clogging, and inspect inlet grates. Quarterly, street sweep parking lot. Annually, skim sand media and pump oil and grit from sediment chamber (once 50% full). Every two to three years, replace sand media (or as needed).
DB-3	Bioretention Basin A/B Soils w/Underdrain	10,864.0	28.09%	Lower Saucon Township 1692 Woodfield Drive Parcel ID: Q6 3 96	Township	Stormwater Fee/Grant Funds	Township	Monthly, perform trash removal, inspect outlet for obstructions/clogging, and inspect inlet grates. Quarterly, street sweep parking lot. Annually, skim sand media and pump oil and grit from sediment chamber (once 50% full). Every two to three years, replace sand media (or as needed).
TOTALS		**38,678.1**	**100.00%**					

VI. Summary

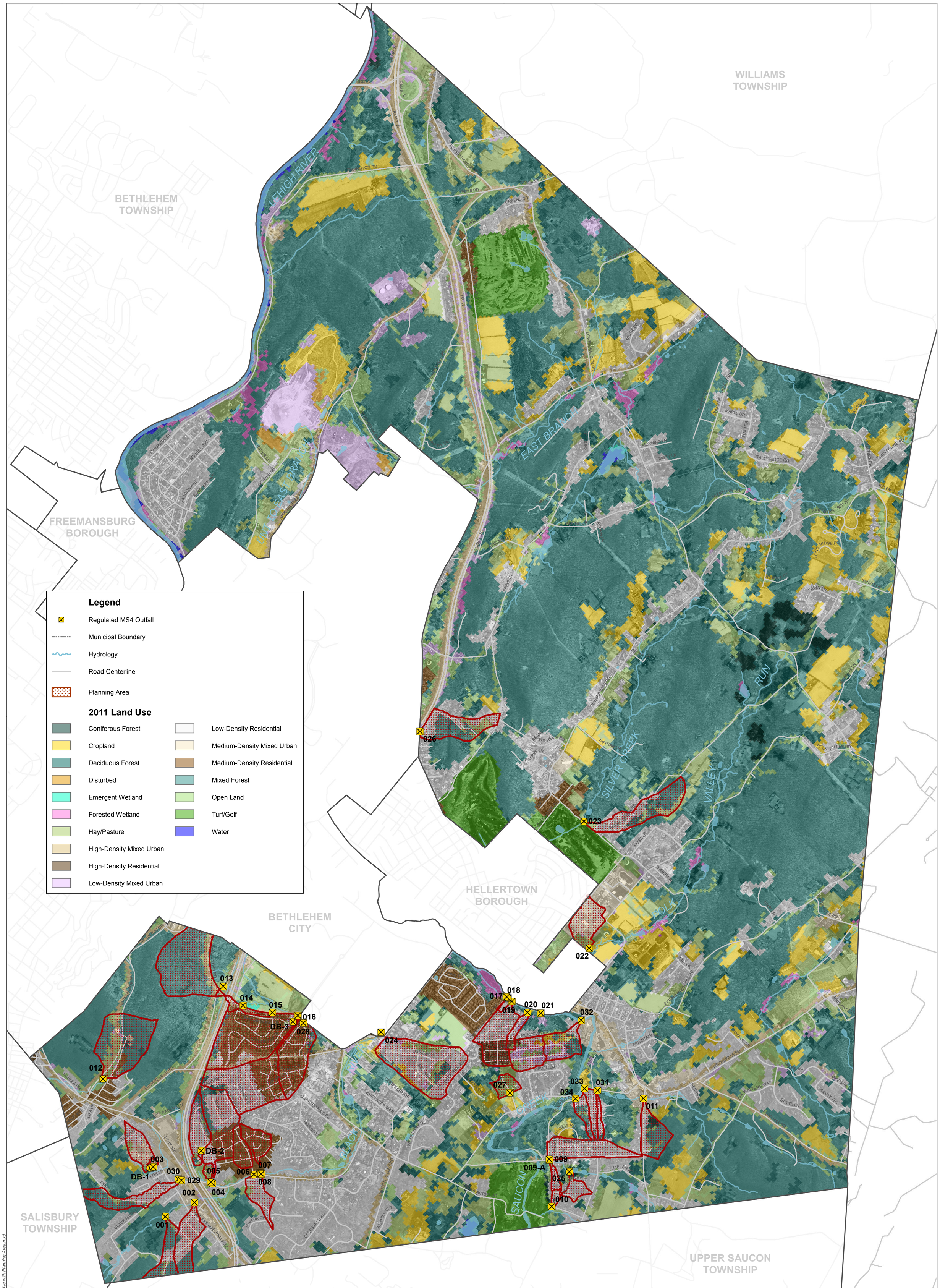
Lower Saucon Township plans to complete the planning and permitting stages of the listed projects during the next two (2) years to help ensure that the projects will be completed within the upcoming 2019 permit term. The Township desires to ensure that the projects will be designed to meet the current and upcoming requirements and reduction goals, which may mean that this PRP will be revised as design and permitting are completed. Additional BMPs will be added to the plan, as necessary or as opportunities present, to improve stormwater management within the Township. Updates on each of the proposed BMPs and the implementation status of the PRP will be included in all future MS4 reporting submitted to PA DEP. The Township is currently preparing to implement a stormwater fee to fund the installation of all proposed BMPs. Whenever practicable, the Township will apply for available funding for stormwater improvements. Fee revenues may serve as matching funds for potential grant funding where required.

Appendix A

Public Notice

Appendix B

MapShed 2011 Landuse and MS4 Planning Area



Legend

- Regulated MS4 Outfall
- Municipal Boundary
- Hydrology
- Road Centerline
- Planning Area

2011 Land Use

- Coniferous Forest
- Cropland
- Deciduous Forest
- Disturbed
- Emergent Wetland
- Forested Wetland
- Hay/Pasture
- High-Density Mixed Urban
- High-Density Residential
- Low-Density Mixed Urban
- Low-Density Residential
- Medium-Density Mixed Urban
- Medium-Density Residential
- Mixed Forest
- Open Land
- Turf/Golf
- Water

0 1,400 2,800 4,200 5,600

Feet

1 inch = 1,400 feet

MAPSHED 2011 LAND USE AND MS4 PLANNING AREA

MS4 PROGRAM 2018

LOWER SAUCON TOWNSHIP

NORTHAMPTON COUNTY

PENNSYLVANIA

DRAWN BY: MJA	PROJECT NO. LS18-16
CHECKED BY: JES	
DATE: 3-23-2018	SHEET NO. 1 of 1
SCALE: 1:16,800	

HanoverEngineering
252 Brodhead Road, Suite 100
Bethlehem, PA 18017-8944
610.691.5644
Fax 610.691.6968

Path: X:\Projects\Municipal\MS4\Lower Saucon Township\MXD\Land Use with Planning Area.mxd

Appendix C

Calculations for Proposed BMP Sediment Load Reductions

BMP ID	Area (acres)	Land Use Code	Land Use Description	Coeff (lbs/ac/yr)	Existing Sediment Load - Landuse (lbs/yr)	Existing Total Sediment Load (lbs/yr)	BMP Type	Sediment Load Reduction Coeff (percent)	Sediment Load Reduction (lbs/yr)
003	0.4917877	17	Low-Density Residential	33.0	16.2	224.2	Rain Garden	0.55	123.3
	1.29737823	20	Medium-Density Mixed Urban	160.1	207.7		C/D soil w/Underdrain		
	0.00102631	21	Open Land	255.7	0.3				
004	0.44475594	2	Low-Density Mixed Urban	33.0	14.7	1137.3	Bioretention Basin	0.8	909.9
	2.1226052	8	Deciduous Forest	17.5	37.1		A/B soil w/Underdrain		
	6.07639031	9	Mixed Forest	17.5	106.3				
	23.4264898	17	Low-Density Residential	33.0	772.2				
	0.24980591	18	Medium-Density Residential	160.1	40.0				
	0.01251209	20	Medium-Density Mixed Urban	160.1	2.0				
	0.64558672	21	Open Land	255.7	165.1				
005	0.41492276	2	Low-Density Mixed Urban	33.0	13.7	754.0	Bioretention Basin	0.8	603.2
	0.04014118	17	Low-Density Residential	33.0	1.3		A/B soil w/Underdrain		
	2.89007208	21	Open Land	255.7	739.0				
008	0.7222222	4	Hay/Pasture	146.2	105.6	1020.8	Bioretention Basin	0.8	816.6
	0.15889778	9	Mixed Forest	17.5	2.8		A/B soil w/Underdrain		
	15.8745339	17	Low-Density Residential	33.0	523.3				
	1.52184159	21	Open Land	255.7	389.1				
013	6.47036736	4	Hay/Pasture	146.2	946.3	3236.3	Bioretention Swale	0.9	2912.7
	2.18895809	8	Deciduous Forest	17.5	38.3				
	72.2823575	9	Mixed Forest	17.5	1264.2				
	3.86230761	21	Open Land	255.7	987.6				
016	0.11931047	2	Low-Density Mixed Urban	33.0	3.9	1564.6	Bioretention Basin	0.8	1251.7
	0.98250067	4	Hay/Pasture	146.2	143.7		A/B soil w/Underdrain		
	2.04987147	8	Deciduous Forest	17.5	35.9				
	0.54793922	9	Mixed Forest	17.5	9.6				
	36.9632203	17	Low-Density Residential	33.0	1218.4				
	0.04750472	18	Medium-Density Residential	160.1	7.6				
	0.56909173	21	Open Land	255.7	145.5				
022	0.22237816	2	Low-Density Mixed Urban	33.0	7.3	5469.0	Bioretention Basin	0.8	4375.2
	3.22787943	4	Hay/Pasture	146.2	472.1		A/B soil w/Underdrain		
	0.6205317	5	Cropland	1498.0	929.6				
	24.534542	20	Medium-Density Mixed Urban	160.1	3928.7				
	0.51355854	21	Open Land	255.7	131.3				
024	3.4236976	2	Low-Density Mixed Urban	33.0	112.9	12376.4	Bioretention Basin	0.8	9901.1
	2.433299	4	Hay/Pasture	146.2	355.9		A/B soil w/Underdrain		
	4.6460419	5	Cropland	1498.0	6959.8				

	6.11671672	8	Deciduous Forest	17.5	107.0				
	1.55881445	9	Mixed Forest	17.5	27.3				
	60.0686341	17	Low-Density Residential	33.0	1980.0				
	11.081949	21	Open Land	255.7	2833.6				
025	0.06976586	7	Coniferous Forest	17.5	1.2	407.6	Bioretention Basin	0.8	326.0
	0.45255843	8	Deciduous Forest	17.5	7.9		A/B soil w/Underdrain		
	9.31260554	17	Low-Density Residential	33.0	307.0				
	0.35765666	21	Open Land	255.7	91.4				
027	4.34108559	4	Hay/Pasture	146.2	634.9	2023.3	Bioretention Swale	0.9	1821.0
	0.00018698	5	Cropland	1498.0	0.3				
	0.69405562	8	Deciduous Forest	17.5	12.1				
	0.04316754	9	Mixed Forest	17.5	0.8				
	0.7207072	17	Low-Density Residential	33.0	23.8				
	5.28553367	21	Open Land	255.7	1351.5				
032	6.05721711	2	Low-Density Mixed Urban	33.0	199.7	2244.4	Bioretention Basin	0.8	1795.5
	0.87806456	5	Cropland	1498.0	1315.4		A/B soil w/Underdrain		
	0.01862344	8	Deciduous Forest	17.5	0.3				
	0.59679377	9	Mixed Forest	17.5	10.4				
	0.00451852	17	Low-Density Residential	33.0	0.1				
	2.8098837	21	Open Land	255.7	718.5				
DB-1	0.18477419	9	Mixed Forest	17.5	3.2	2444.3	Bioretention Basin	0.8	1955.4
	7.71502185	17	Low-Density Residential	33.0	254.3		A/B soil w/Underdrain		
	10.4155684	20	Medium-Density Mixed Urban	160.1	1667.8				
	2.02943021	21	Open Land	255.7	518.9				
DB-2	1.25478821	2	Low-Density Mixed Urban	33.0	41.4	1278.2	Bioretention Basin	0.8	1022.5
	1.51928344	8	Deciduous Forest	17.5	26.6		A/B soil w/Underdrain		
	3.30231964	9	Mixed Forest	17.5	57.8				
	17.6215059	17	Low-Density Residential	33.0	580.9				
	0.2953268	18	Medium-Density Residential	160.1	47.3				
	0.00859475	20	Medium-Density Mixed Urban	160.1	1.4				
	2.04527921	21	Open Land	255.7	523.0				
DB-3	1.95661	2	Low-Density Mixed Urban	33.0	64.5	13579.9	Bioretention Basin	0.8	10864.0
	6.50967	4	Hay/Pasture	146.2	952.0		A/B soil w/Underdrain		
	1.111833	8	Deciduous Forest	17.5	19.4				
	2.374754	9	Mixed Forest	17.5	41.5				
	5.72835	17	Low-Density Residential	33.0	188.8				
	71.284294	18	Medium-Density Residential	160.1	11414.7				
	0.963683	20	Medium-Density Mixed Urban	160.1	154.3				
	2.912186	21	Open Land	255.7	744.6				

Appendix D

Proposed BMP Locations and Watersheds

PROPOSED BMP LOCATIONS AND WATERSHEDS

MS4 PROGRAM 2018

LOWER SAUCON TOWNSHIP

NORTHAMPTON COUNTY

PENNSYLVANIA

DRAWN BY: MJA	PROJECT NO. LS18-16
CHECKED BY: JES	
DATE: 03-23-2018	SHEET NO. 1 of 1
SCALE: 1:16,800	

HanoverEngineering
252 Brodhead Road, Suite 100
Bethlehem, PA 18017-8944
610.691.5644
Fax 610.691.6968

LEGEND

- REGULATED MS4 OUTFALL
- MUNICIPAL BOUNDARY
- STATE ROAD
- LOCAL ROAD
- HYDROLOGY
- 10FT LIDAR CONTOUR
- PARK LAND
- URBANIZED AREA - 2010 CENSUS
- APPROXIMATE BMP WATERSHED
- PLANNING AREA

0 1,400 2,800 4,200 5,600

Feet

1 inch = 1,400 feet

Path: X:\Projects\Municipal\MS4\Lower Saucon Township\MXD\Lower Saucon Township - Proposed BMP Locations.mxd

Appendix E

Project Designs

(to be updated as prepared)