

MS4 NPDES Permit Pollution Reduction Plan (PRP)

FOR

Hellertown Borough
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Date: February 28, 2019
Updated: August 1, 2022



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List of Acronyms

BMP	Best Management Practices
CBW	Chesapeake Bay Watershed
CWA	Clean Water Act
DEP	Department of Environmental Protection
GIS	Geographic Information System
IDDE	Illicit Discharge Detection and Elimination
MCM	Minimum Control Measure
MS4	Municipal Separate Storm Sewer System
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
PRP	Pollution Reduction Plan
SOP	Standard Operating Procedure
TMDL	Total Maximum Daily Load
UA	Urbanized Area

Common Terms related to Stormwater Management

(As defined by PA Code 25, Chapter 92a. and Chapter 96 *)

Best Management Practice (BMP) – schedules of activities, prohibitions of practices, maintenance procedures and other management practices to prevent or reduce pollutant loading to surface waters of the Commonwealth.

Buffer (Vegetated) – A permanent strip of dense perennial vegetation established parallel to the contours of and perpendicular to the dominant slope of the field for purposes that include slowing water runoff, enhancing water infiltration and minimizing risk of any potential pollutants from leaving the field and reaching surface waters.

Intermittent Stream – A body of water flowing in a channel or bed composed primarily of substrates associated with flowing water, which, during period of the year, is below the local water table and obtains its flow from both surface runoff and groundwater discharges.

Loading Capacity * - the greatest amount of loading that a surface water can receive without violating a water quality standard

MS4 – Municipal Separate Storm Sewer System – A separate storm sewer (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels or storm drains) which is all of the following:

- (i) Owned or operated by a State, City, town, Borough, County District association or other public body (created by or under State Law) having jurisdiction over disposal of sewage, industrial wastes, stormwater or other wastes, including special districts under state law such as a sewer district, flood control district or drainage district, or similar entity, or a designated and approved management agency under section 208 of the Federal Act (33 U.S.C.A. 1288) that discharges surface waters of this Commonwealth.
- (ii) Designed or used for collecting or conveying stormwater
- (iii) Not a combined sewer
- (iv) Not part of a POTW (Publicly Owned Treatment Works)

Perennial Stream – A body of water flowing in a channel or bed composed primarily of substrates associated with flowing waters and capable, in the absence of pollution or other manmade stream disturbances, of supporting benthic macroinvertebrate community which is composed of two or more recognizable taxonomic groups of organisms which are large enough to be seen by the unaided eye and can be retained by a United States Standard No. 30 sieve and live at least part of their life cycles within or upon available substrates in a body of water or water transport system.

Separate Storm Sewer – A conveyance or system of conveyances including pipes, conduits, ditches and channels, primarily used for collecting and conveying stormwater runoff.

Storm Sewershed – The land area which drains to the municipal separate storm sewer system from within the jurisdiction of the MS4 permittee.

Stormwater – runoff from precipitation, snow melt runoff and surface runoff and drainage.

Surface Waters – Perennial and intermittent streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps and estuaries, excluding water at facilities approved for wastewater treatment such as wastewater treatment impoundments, cooling water ponds and constructed wetlands used as part of a wastewater treatment process.

Purpose

The submission of this Pollution Reduction Plan (PRP) is in accordance with the requirements as defined in the *Individual Permit PAI-13 Authorization to Discharge Under the National Pollutant Discharge Elimination System (NPDES)*. This individual permit, issued by the PA Department of Environmental Protection (DEP), grants municipalities the authority to discharge its stormwater into Waters of the Commonwealth under a *Stormwater Discharges from Small Municipal Storm Sewer Systems (MS4)* permit.

Hellertown Borough covers four (4) watersheds: Saucon Creek, Silver Creek, Polk Valley Run, and the Lehigh River. DEP has listed the Creeks as being impaired due to sediment, and the Lehigh River impaired due to sediment, organic enrichment and low oxygen (See Appendix A). In accordance with Hellertown Borough's MS4 permit, this PRP has been developed to address water quality initiatives within these drainage areas of impaired streams.

This Pollution Reduction Plan (PRP) may be evaluated by Hellertown Borough at any time for its effectiveness in reducing pollutant loads from its stormwater discharges. If Hellertown Borough believes the PRP should be revised or best management practices (BMP) updated, the Borough shall work with the Northeast Regional Office of DEP for review and approval of any revisions and/or updates.

Pollution Prevention

By developing guidelines to help Hellertown Borough manage its stormwater objectives, the 'front end' planning and design process becomes an important tool to assist in the thoughtful prevention of additional pollutants discharging into the Borough's impaired waters. Controls and management solutions shall be reviewed in order to limit cases of removing pollutants from one location and medium, only to transfer them and their possible liabilities to another location. A proactive approach to addressing water quality and pollution concerns at the beginning of a project can decrease the cost, risks and environmental concerns that come from having to manage a problem after its already been created.

Implementation of Hellertown Borough 's PRP shall be a multimedia approach, in that program requirements shall integrate educational materials, opportunities for the public to participate, operation and maintenance measures, and training events, whenever possible.

POLLUTION REDUCTION PLAN ELEMENTS

A. PUBLIC PARTICIPATION

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

On December 3, 2018 Hellertown Borough scheduled a kick off presentation by the Engineer's office to provide an overview on the MS4 NPDES permit, background on how storm sewer drainage areas were being mapped and developed, initial sediment loads and a discussion on the PRP process.

On February 14, 2019 Hellertown Borough scheduled its formal meeting and MS4 presentation at Borough Hall. This public meeting reviewed the Pollution Reduction Plan (PRP), specifically the proposed BMPs anticipated to address the sediment reductions. The meeting was publicly advertised on Thursday January 3rd, and notifications posted to the Borough's webpage.

An electronic copy of the PRP report and presentation were uploaded to the Borough's website for public download and review. Hard copies of the report were available for public review at Borough Hall. The public was given 30 days to provide commentary on the report's contents. The public were able to submit comments directly to the Borough in writing, or by email to the Borough office. A copy of the public comments received

[UPDATE: On August 1, 2022 Hellertown Borough scheduled another public meeting to discuss the Borough's Pollution Reduction Plan \(PRP\), its current status of installed BMPs and review any other minor changes since 2019. The meeting was publicly advertised in the Express Times newspaper on July 25, 2022 in both printed and online format. Meeting announcement was also provided on the Hellertown Borough website. As with the previous PRP report, a printed and electronic copy was provided to the public for review and comments for 30 days.](#)

B. MAPPING

In order to determine how much existing sediment was being contributed by the municipality to its receiving streams, the Borough needed to first examine how stormwater runoff was entering its boundaries, how the stormwater runoff was being impacted once inside its boundaries, and how the stormwater was then collected and discharged from the municipality. The Borough had an existing storm sewer map for its MS4 permit, showing the locations of storm outfalls, inlets, manholes, pipes, swales and pipe discharge locations. This map was used as a base to then identify land uses and the impervious/pervious surfaces throughout the municipality. The storm sewershed boundaries associated with each MS4 outfall was overlaid onto a separate map.

Use of the Borough's base map was permitted as described in the NPDES PRP Instructions: *The map may be the same as that used to satisfy MCM #3 of the PAI-13 Individual Permit, with the addition of land use and/or impervious/pervious surfaces, the storm sewershed boundary, and locations of proposed MS4 Pollution Reduction Plan (PRP) Report*

BMPs, or may be a different map'. The map needed to be sufficiently detailed to identify the "planning area" relevant to satisfying the requirements of Appendix D and/or Appendix E in the *Municipal Requirements MS4 Table* published by PA DEP and last updated on November 11, 2018 (See Table 2). The map also needed to be able to demonstrate that the proposed BMPs were located in appropriate storm sewersheds to meet the requirements.

The following GIS platform maps were used for analysis and development of the Borough's PRP.

1. Storm Sewer & Street Map – existing basemap showing the municipal storm sewer system with outfall locations, streams and drainage channels.
2. Topo & Impaired Stream Map – contour information was provided by LIDAR shapefile information downloaded from Pennsylvania Spatial Data Access (PASDA) website. The contours provide information on the general grading and how stormwater is directed through the Borough. The impaired stream information was provided by PA DEP online GIS mapping service eMAP. The DEP site provides information on the reach extent, and location of impaired streams.
3. Storm Drainage Areas Map – drainage areas to each MS4 outfall were evaluated by the Engineer's office assessing how the stormwater runoff entered and traveled through the storm sewer system by street inlets and pipes. The drainage areas also include 'dispersed discharges' where runoff is not piped, but allowed to flow across the surface into a receiving body of water, such as quarry pits, ponds or tributary stream.
4. Impairment Area Map – after the drainage areas were outlined, a storm sewershed boundary was delineated. This boundary shows which areas of the Borough drain and have impact on the impaired stream, specifically the four impaired streams listed by DEP. Any areas draining to non-impaired streams are not included in the PRP calculations.
5. Land Use Map – land uses were evaluated within each of the watersheds. Determining land use for a property is a primary objective for calculating the pervious and impervious areas within each sewershed. Different types of land uses will have different levels of impervious coverage.

C. POLLUTANTS OF CONCERN

The Borough shall identify the pollutants of concern for each storm sewershed or the overall PRP planning area. DEP’s MS4 Requirements Table identified Hellertown Borough as having impaired stream waters for three (3) streams. The terms “sediment”, “siltation” and “suspended solids” all refer to inorganic solids.

The table below shows each of the impaired waters receiving discharges from the Borough, and the pollutant(s) that are of concern to that stream.

Table 1: DEP MS4 Requirements Table (last revised 11/8/18)

MS4 Name	NPDES ID	Individual Permit Required?	Reason	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)
Hellertown Borough	PAI 132223	Yes	IP	Saucon Creek	Appendix E – Siltation
				Silver Creek	Appendix E – Siltation
				Polk Valley Run	Appendix E - Siltation
				Lehigh River *	Appendix E – Organic Enrichment/ Low Dissolved Oxygen, Siltation, Suspended Solids

*Lehigh River – Hellertown Borough does not discharge directly to the Lehigh River. Flows from Saucon Creek must travel approximately 16,000 feet (0.36 mi) downstream, before it combines with the Lehigh River in the City of Bethlehem. By reducing the pollutants entering the three upstream sources, the amounts of sediment, nitrogen and phosphorous reaching the Lehigh River will also be reduced.

Hellertown Borough calculated the existing loading of the pollutant(s) in pounds per year (lbs/yr). The Borough utilized their mapping information to determine its contribution of sediment being discharged to the Creeks.

Hellertown Borough is required to reduce the amount of sediment discharge by 10% for the Saucon Creek, Silver Creek and Polk Valley Run watersheds.

If the impairment is based on nutrients only or other surrogates for nutrients, which is often the direct result of human activity, such as fertilizers, pesticides, and soap detergents, then a minimum 5% reduction of Phosphorous is required. If the impairment is due to both sediment and nutrients, then both 10% reduction in sediment and 5% reduction in total Phosphorous must be addressed. PRP’s may use a presumptive approach in which it is assumed that a 10%

sediment reduction will also accomplish a 5% Phosphorous reduction. However, MS4s may not presume that a reduction in nutrients will accomplish a commensurate reduction in sediment.

***Due to Hellertown Borough not directly discharging to the Lehigh River, the presumptive approach was used. The required 10% Sediment and 5% Phosphorous reductions for the Lehigh River is met by the three upstream creeks (Saucon Creek, Silver Creek, and Polk Valley Run) meeting and/or exceeding their 10% sediment reduction requirements.**

The municipality shall select the Best Management Practices (BMPs) suited to reduce this pollution loading. The PRP shall demonstrate that the selected BMPs will achieve the minimum reductions required by DEP.

D. DETERMINE EXISTING LOADING FOR POLLUTANTS OF CONCERN

There are several possible methods to estimating the existing load, ranging from the simplistic to the complex. One method to estimate existing loading is the Simplified Method. This method determines the percent of impervious and pervious surface within the urbanized area of the storm sewershed and calculates the existing loading by multiplying those land areas (acres) by pollutant loading rates (lbs/acre/yr). This method does not take into consideration the different types of land uses within the storm sewershed.

Use of the simplified method is not required. Any methodology that uses the following factors based on sound science may be considered acceptable:

- calculates existing pollutant loading in terms of pounds per year, and
- evaluates BMP-based pollution reductions utilizing DEP's BMP Effectiveness Values contained in 3800-PM-BCW0100m, or
- evaluates BMP -based pollution reduction utilizing Chesapeake Bay Program expert panel reports, and
- uses average annual precipitation conditions, and
- considers both overland flow and stream erosion

The Engineer's office utilized the National Land Cover Database 2011 (NLCD2011), which breaks down the different types of land cover and their corresponding impervious coverage rates. To map out the different land uses within each of the impaired watersheds, the Engineer's office used ArcMap, a GIS tool for displaying and calculating the square footage of each land use type. Since different land uses have different impacts on impervious coverage, the Land Cover Database model was determined to give the Borough more accurate pollution loading calculations than the simplified method. The following land cover categories and impervious rates were used.

Table 2: Land Categories Used for Determining Pollutant Loads

LAND USE CATEGORY	% IMPERVIOUS COVERAGE
Rock/ Barren (Developed)	80 - 100
High Intensity	80 - 100
Medium Intensity	50 - 79
Agricultural	50 - 79
Low Intensity	20 - 49
Open Space (Developed)	0 - 19
Forested/ Wooded	0
Roads	100

Aerial photography was utilized through GIS to outline the various land use boundaries within each of the drainage areas. The square footage of each land use was then calculated by the GIS program and then compiled into a spreadsheet to get the total square footage of each land use.

After having each of the land uses calculated, the Boroughs then needed to apply the pollution loading rates, to find the MS4’s total pollutant contribution. The pollution loading rate was taken from Attachment B in DEP’s PRP Instruction manual – Developed Land Loading Rates for PA Counties.

MS4’s may claim “credit” for structural BMPs installed and implemented prior to development of this PRP to reduce the Borough’s existing load amounts, however, the existing structural BMP must have been continually operated and maintained since its installation. The MS4 may claim credit in the form of reducing the existing load being discharged and not towards the proposed reductions.

Credits for Existing BMPs being maintained by Owner:

Table 3A – Saucon Creek

Name	Owner	Year Install	Latitude	Longitude	MS4 Map ID#	Pollutant Reduction Credit
Tumminello Park Riparian Buffer	Hellertown Borough	2011	40°34’4”	75°20’29”	A-4	2192.67 lbs/yr
Water Street Park Vegetated Swales & Rain Garden	Hellertown Borough	2015	40°34’46” 40°34’48” 40°34’47” 40°34’38”	75°20’40” 75°20’39” 75°20’41” 75°20’40”	A-5, A-6, A-7, A-8	3791.80 lbs/yr

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Table 3B – Silver Creek

Name	Owner	Year Install	Latitude	Longitude	MS4 Map ID#	Pollutant Reduction Credit
Borough Hall Rain Garden	Hellertown Borough	2013	40°34'47" 40°34'47"	75°20'26" 75°20'26"	B-2	618.22 lbs/yr

Table 3C – Polk Valley Run

Name	Owner	Year Install	Latitude	Longitude	MS4 Map ID#	Pollutant Reduction Credit
Service Elec. Detention Basin	Service Electric				C-1	1784.71 lbs/yr

Table below provides a summary of the required pollution reductions, shown in pounds per year.

Table 4: Hellertown Borough Required Pollution Reduction

WATERSHEDS			
Hellertown Borough	Existing Load	Minimum Reduction	Required Reduction
SAUCON CREEK			
Total Sediment	424,979.28 lb/yr	10 %	42,498 lb/yr
SILVER CREEK			
Total Sediment	455,262.18 lb/yr	10 %	45,526 lb/yr
POLK VALLEY RUN			
Total Sediment	70,571.60 lb/yr	10 %	7,057 lb/yr
TOTAL SEDIMENT REQUIREMENT			95,081 LBS/YR

Whatever tool or approach that is used to estimate existing loading from the PRP planning area must also be used to estimate proposed loading to the planned BMPs. Providing consistent methodologies avoids errors in percent pollutant removal calculations that would result if different methods were used.

E. SELECT BMPS TO ACHIEVE THE MINIMUM REQUIRED REDUCTIONS IN POLLUTANT LOADING

Once the Borough identified the amount of pollution load required to be reduced for each watershed area, the Borough could then identify areas within the community to be studied for installing BMP improvements.

The BMPs shall be implemented within five (5) years of DEP's approval date for coverage under the PAI-13 Individual Permit. The BMPs may be located on public or private property. If the applicant is aware of BMPs that will be installed by others, either in cooperation with the applicant or otherwise, and it will be located within the watershed that will result in net pollutant loading reductions, then the applicant may propose those BMPs in this PRP.

As part of the Borough's annual cleaning and maintenance practices for streets, sweeping has been used to remove sediment, debris and other potential sources of pollution affecting the streams. This practice is well suited for urban environments with little land available for the installation of structural controls. However, historic street sweeping practices with mechanical broom equipment have been a seasonal task and should not be considered in calculating PRP reduction credits. The method and frequency of street sweeping required to count for PRP credit requires a single street being swept at least 25 times a year by a vacuum sweeper. At this time, the cost of renting a machine or contracting with a third party company for services, with the added labor and hauling costs, is not practical for the 9% pollution reduction efficiency allotted by DEP. Seasonal street sweeping activities with mechanical broom equipment may remain a housekeeping task (MCM#6) as part of the Borough's annual MS4 reporting, but not as a practice to satisfy PRP requirements.

[UPDATE: The Borough of Hellertown may decide re-examine the use of street sweeping as a BMP measure towards the Pollution Reduction Plan should the Municipality purchase their own equipment, identify specific roads best suited for 25 sweepings a year, and compare the sediment reductions gained against the additional cost of sweeping.](#)

In calculating future pollutant loading, the Borough must be cognizant of planned changes to land uses or BMPs. For example, if a tract of land (<1 acre) currently in pasture will be converted within the next few years to residential land use, and there are no ordinances in place to control the rate, volume or quality of stormwater draining from the tract, the potential net increase in pollutant loading must be factored into the future loading estimates. This means that BMPs must be implemented on the tract to compensate for this change.

During the five (5) year permit, the MS4 can take credit for BMPs that are under 1 acre and are not being used to meet regulatory requirements, such as a Chapter 102 NPDES permit for construction activities. However in cases where there is a Chapter 102 NPDES permit, the MS4 may take credit for stormwater BMPs that go above and beyond the minimum requirements. For example, a land development project was required to install a stormwater BMP as part of its Chapter 102 NPDES permit requirement. The BMP was designed and installed to exceed the minimum requirements of the permit. The MS4 may elect to take credit for the additional pollution reduction provided by that BMP. It is the responsibility of the MS4 to demonstrate that

the BMP exceeds its regulatory requirements. The MS4 may take credit for only those additional reductions that result from exceeding the regulatory requirements.

[UPDATE: As of September 30, 2022, Hellertown Borough has not taken credit for any additional stormwater management BMPs under 1 acre, located on private properties.](#)

STUDY AREAS

Borough staff and the Engineer's office developed a list of priority areas for initial BMP evaluation. These areas were reviewed against the inventory list of installed BMPs. The goal was to identify BMPs that have not been maintained properly, BMPs with the potential for retrofit improvements to increase its efficiency filtering out pollutants, or existing drainage concerns that could be remedied by a new stormwater BMP.

Calculation tables showing the estimated pollution removal for both the existing stormwater BMPs for credit, and the proposed BMPs to meet the required reductions, can be found in the Appendix.

SAUCON CREEK

BMP OPTION #1 – THOMAS IRON SITE

Outfall #3 is a 52 inch reinforced concrete pipe that discharges to Saucon Creek at the west end of Clark Street. This large diameter pipe conveys a drainage area of 93 acres through a storm pipe system stretching over 5200 linear feet. Run off is collected from neighborhoods as far east as Delaware Avenue. The proposed BMP would utilize an existing storm sewer manhole at the intersection of Bachman and Whitaker Streets to connect a new storm pipe and redirect storm run off to the Thomas Iron Site, which is owned by the Borough of Hellertown.

By directing the pipe into the Thomas Iron Site, run off can be filtered, treated and retained for a longer period of time, settling out solids and sediment before the stormwater reaches Saucon Creek. The outfall (#3) at Clark Street will remain and continue to convey runoff from the remaining drainage area west of Main Street, a drainage area of 19.6 acres.

The Thomas Iron Site property is currently being reviewed and studied by the Borough for future recreational use projects. The proposed stormwater management area for the Pollutant Reduction Plan can be an educational area, which would be incorporated into the overall project design. Soil tests and storm pipe capacity shall determine the most appropriate BMP type , such as a constructed wetland versus rain garden use, however the location being within the property shall remain the same.



Photo : Google Earth aerial image showing potential location for stormwater BMP

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The Thomas Iron site also offers the Borough of Hellertown the potential for a water quality research project. The site retains piles of slag from its former industrial use in the early 1900's. There has been research on the use of uncontaminated slag as a filter layer in constructed wetlands, for example the case study of the Ford Motor Company Rouge River Plant in Detroit Michigan¹. The slag layer in constructed wetlands has also been studied as having an increased ability to help capture Phosphorous in the wetland soils and is being reviewed for the use in remediating Acid Mine Drainage (AMD)². Both of these reactions help to increase water quality by removing nutrients and raising the pH of the runoff.



The slag and soils at the Thomas Iron Site property would need to be tested and reviewed for their potential use as recyclable material, and that groundwater filtration through its soil will not impede water quality. Hellertown Borough had a Phase 1 Environmental Site Assessment conducted in 2010 by an independent third party, and in 2011, a section of slag was tested by a lab agency for levels of trace chemicals. The initial summaries found the material to be below the allowable chemical limits by PA DEP. The previous testing was conducted to determine if the material could be removed and hauled off site. Installation of a stormwater management BMP on the Thomas Iron site will require a Phase 2 Environmental Site Assessment to determine suitability of the site for recreational and stormwater uses.



*Photo (Top) : View of site interior looking west towards Saucon Creek
Photo (Bottom): View in northwest of site at slag piles*

Table 5a: Saucon Creek – Thomas Iron Site BMP Option 1

LOCATION	TYPE	EFFICIENCY RATE	SEDIMENT REDUCTION
Thomas Iron Site	Constructed Wetland	60%	57,429 lbs/yr

Table 5b: Saucon Creek – Thomas Iron Site BMP Option 2

LOCATION	TYPE	EFFICIENCY RATE	SEDIMENT REDUCTION
Thomas Iron Site	Rain Garden	80%	76,572 lbs/yr

With the selection of either BMP, the sediment reduction requirement would be met for the Lehigh River drainage area.

SILVER CREEK

BMP OPTION 3 – DIMMICK PARK VEGETATED SWALE

The asphalt lined swale runs approximately 975 feet from the ballfield parking lot on Tobias Drive to Durham Street. The storm runoff continues underneath the roadway via a pipe culvert. The swale carries storm runoff from residential neighborhoods of mixed low to medium density. Once the pipe discharge enters the park swale, additional surface runoff is then collected from the park’s lawns and walkways. The east side parking lots currently do not drain to the swale.

The recommendation is to remove the asphalt, which acts as a hard armor and moves the runoff quickly to the Durham Drive culvert. The swale would be converted into a vegetated swale with check dams to slow the progression of water being released downstream. The slower release time would also increase the time water has to infiltrate back into the surround ground. The check dams would also reduce drought conditions for the plantings between rain events.



Photo : View of swale from Durham Drive looking south towards the pavilion.

The swale improvements could be coordinated with the intended replacement of pedestrian bridges that cross the swale from the East side parking lot to the Band Shell and Picnic Pavilion.

Table 6: Silver Creek – Vegetated Swale at Dimmick Park

LOCATION	TYPE	EFFICIENCY RATE	SEDIMENT REDUCTION
Dimmick Park	Open Vegetated Swale	70%	11,564 lbs/yr

UPDATE: The Dimmick Park Vegetated Swale BMP was installed and completed in Spring 2020.

BMP OPTION 4 – VEGETATED SWALE TO OUTFALL #16

This asphalt and stone lined swale is a continuation of the upstream drainage in Dimmick Park. This portion of the swale begins where the terracotta pipe daylights from underneath Durham Drive, discharges east of the Hellertown Pool and runs for approximately 160 feet to the edge of Silver Creek. The swale carries storm run off from upstream, and collects surface run off from adjacent lawn areas, and outside drains near the Hellertown Pool building. The terminating end of the asphalt swale is deteriorated due to erosion of the Silver Creek embankment.



The recommendation is to remove the asphalt and stone areas, to convert into a vegetated swale. Soil amendments may be necessary to increase the infiltration exchange of the soils. The swale is located in the Silver Creek floodplain. Design may review the need to widen and flatten portions of the swale.



*Photo (top): Beginning of swale
Photo (bottom): View of swale looking north to Silver Creek.*

Table 7: Silver Creek – Vegetated Swale to Outfall #16

LOCATION	TYPE	EFFICIENCY RATE	SEDIMENT REDUCTION
Outfall #16	Open Vegetated Swale	70%	6,752 lbs/yr

BMP OPTION 5 – VEGETATED SWALE TO OUTFALL #13

This asphalt and stone lined swale discharges on the north side of Silver Creek, opposite of outfall #16. The swale begins at Milford Alley, where it takes run off from the street, nearby residential lots and run off from the surrounding lawn areas of the park. The swale runs approximately 160 feet from the alley to the edge of Silver Creek.

The amount of pollutant removal is lower for this section of swale replacement due to the smaller size of drainage area that is conveyed by Milford Alley and surrounding lawn. However if BMP options 1 and 2 are selected, they would create a continuous path of vegetation to the Creek. This section from Milford Alley could mirror that appearance across both embankments.

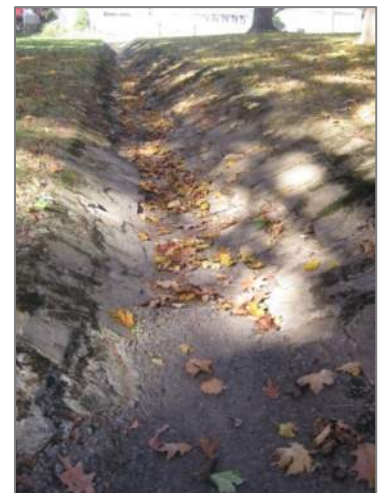


Photo: View of swale from Silver Creek looking north to Milford Alley

Table 8: Silver Creek – Vegetated Swale to Outfall #13

LOCATION	TYPE	EFFICIENCY RATE	SEDIMENT REDUCTION
Outfall #13	Open Vegetated Swale	70%	964 lbs/yr

BMP OPTION 6 – BAFFLE BOX AT OUTFALL #20

Outfall #20 is located at the terminating end of Cherry Street, on the south side of Silver Creek, opposite of the Post Office. Cherry Street has access to Delaware Avenue and is not a through street. The storm system is located within the street’s right of way and conveys a drainage area of 46.5 acres. The pipe system branches out to Saucon Street and Magnolia Road, but the pipes also receive street runoff as far as Spruce Street.

Due to the width of right of way, and surrounding residential homes, the recommendation is to install a baffle box type device upstream of Outfall #20. The box size would fit within the right of way and the limited access to the street would reduce damage to the manhole lids from large trucks or heavy traffic volumes. The street would also provide an accessible means for a vacuum truck in order to conduct regular maintenance tasks.

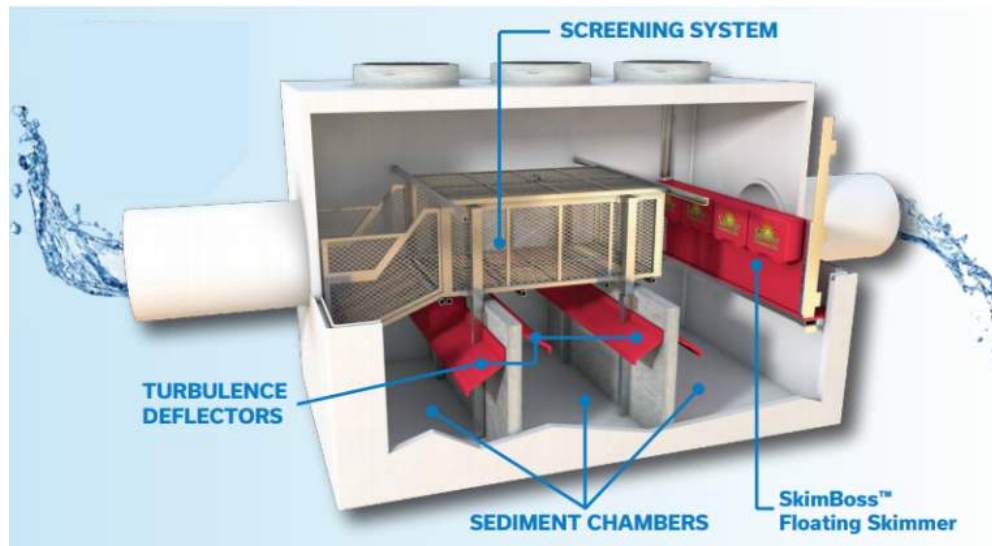


Photo : View of outfall #20 discharging to Silver Creek

The baffle box should be sized appropriately for the volume of stormwater being conveyed and for the sediment and nutrient removals required. The box system has three chambers where sediment is deposited and collected. Each collection chamber can hold several cubic yards of material, depending on the model and size of the equipment. A metal screen system acts as a basket to collect debris and trash. There are booms within each of the chambers that act as skimmers and remove the nutrients and hydrocarbons and improve the water quality before being discharged. Structural BMPs such as the baffle box, or a similar filtration device such as the Vortechs® by Contech, are options to meet water quality requirements in urban areas with limited open space.

Maintenance tasks would be similar to typical storm drain cleaning with access viable through the top manhole lids. Lids are removed and staff can utilize vacuums to remove the debris from the basket and sediment from the lower chambers. Filters would need replacing after a period of time, as recommended by the manufacturer. The use of this type of baffle box has been approved for Stormwater Design and Quality Control Credits through LEED Certification. The box has also been certified by the New Jersey DEP. Approval of this type of structural BMP would require pre-Approval by DEP before the Borough would begin field design tasks.

Photo: Brochure diagram by Suntree Technologies Inc. of the Nutrient Separating Baffle Box® (NSBB) for a self contained treatment system.



Due to the need for maintenance, Pennsylvania DEP requires a reduced efficiency value be applied if using this type of stormwater BMP. The box may not work as effectively as intended due to unforeseen circumstances when installing or lack of routine maintenance after its installation; all of which may impede its performance for water quality. Therefore, the recommended effective value has been reduced to 80% to accommodate for unknown conditions.

Table 9: Silver Creek – Baffle Box to Outfall #20

LOCATION	TYPE	EFFICIENCY RATE	SEDIMENT REDUCTION
Outfall #20	Baffle Box	80%	46,866 lbs/yr

BMP OPTION 7 – BIORETENTION AREA AT MAGNOLIA ROAD

There is an existing storm pipe in Magnolia Road that runs along Rentzheimer Drive and then turns 90 degrees to the west, sending storm sewer along Saucon Street. This stormwater runoff is further upstream to BMP option #6, which discharges to outfall #20. Should the location of the baffle box not be suitable for Cherry Street, the Borough has another option to treat the stormwater further upstream.

The BMP would be located on Borough owned property where it can filter runoff from Magnolia Road and be located parallel to Rentzheimer Drive. However the feasibility of this BMP is dependent upon the storm sewer being able to daylight runoff from the existing pipes and inlets at Magnolia Drive and Rentzheimer intersection into a bioretention garden area on the east side

of the Borough owned property. This property is being reviewed for development of a new Public Works building.

Table 10: Silver Creek – Bioretention Area treating Magnolia Drive

LOCATION	TYPE	EFFICIENCY RATE	SEDIMENT REDUCTION
Magnolia Drive (future Public Works)	Bioretention	80%	23,326 lbs/yr

BMP OPTION 8 – RAIN GARDEN AT OUTFALL #10

There is an opportunity for the Borough of Hellertown to partner with the Saucon Valley Country Club for installation of a stormwater BMP at a pipe discharge location (outfall #10). The pipe discharge occurs on the Country Club property, but the pipe collects drainage from the residential areas along Willow, Elm and Maple roads. The discharge flows into an unkempt, overgrown area, which is not in the active playing area of the golf course greens. The discharge area travels less than 50 feet before reaching the west bank edge of Silver Creek.

The area is not maintained and is overgrown with tree saplings and brambles. Even though the area has existing vegetation, the scavenger type plants provide little to no water quality benefits. In addition to the vegetation, without a designated apron or collection area for the runoff to settle before entering the stream, the volume of water being discharged from the pipe can loosen native soils and cause erosion.

The proposed rain garden BMP would be located on the western outside of the course area. Amended soils within the rain absorb and filter the runoff of rainwater, and prevent erosion of with deep roots will help to stabilize the soil, trap sediment from and take up the nitrogen and phosphorous for plant benefits will increase the water quality from outfall #10



Photo : View of outfall #10 area during heavy rain events

side of Silver Creek, garden will collect, native soil. Plantings entering the stream, development. These discharges_

Table 11: Silver Creek – Rain Garden at Outfall #10

LOCATION	TYPE	EFFICIENCY RATE	SEDIMENT REDUCTION
Outfall #10	Rain Garden	80%	20,503 lbs/yr

As a side note, there are a number of water quality improvements and goals for Golf Courses discussed in the *GCSSAA Best Management Practices Planning Guide & Template*. This document was funded in part by the US Golf Association through the Environmental Institute for Golf.³ This guide provides a roadmap for golf organizations to develop and implement BMP programs for their facilities. These strategies not only help to reduce pollutant loads to impaired streams, but work to reduce maintenance and operational tasks for the golf course staff.

The Borough of Hellertown shall continue to work with the Saucon Valley Country Club to find sustainable solutions for the continued reduction of sediment, sand trap material and chemical treatments, such as fertilizers, from entering Silver Creek.

BMP OPTION 9 – SILVER CREEK TREAMBANK RESTORATION

Options for improving the drainage area of Silver Creek can not overlook the direct improvements to the stream itself. Restoration of Silver Creek and its embankments remains an option for reducing sediment loads and improving the water quality reaching Saucon Creek.

Silver Creek has the potential for flooding during significant rain events and hurricanes, such as Hurricane Irene in 2011. Saucon Creek can ‘back up’ into Silver Creek during these large rain events, however at the same time, Silver Creek is receiving washout and flows from further upstream. Sediment and debris carried by the change in water volume combines, depositing itself along the creek’s embankments, within its channel, and inside many culverts.



Photo : View of Silver Creek looking upstream towards Hellertown Pool stream. By

An initial thought would be to dredge the sediment out of the scooping out and removing the material, then the stream channel would be deeper and the rainwater wouldn’t expand over its banks as often, however this thought process is not entirely correct. Dredging just to remove material, without any planned stream restoration, can create more damage from channel instability, increased bank erosion and nuisance flooding. The construction activity itself could increase sediment within the stream channel by use of vehicles, the equipment accessing the streambank and the rearrangement of sediment within the stream. An alternative to dredging is natural stream restoration.

This restoration approach can include channel modifications, but it also addresses the entire stream reach and not individual pieces. By examining the entire stream and applying multiple restoration practices, the erosive effects of high flows during storm events can be reduced.

To meet the requirements for stream restoration as a proposed BMP, both sides of the streambank would need to be repaired. The use of rip rap and other hard armoring installations for erosion control would not be credited towards the BMP. These erosion control measures can

be used if the design dictates the need, however the areas would be deducted before calculating any sediment reduction amount. DEP emphasizes the use of Pennsylvania Fish & Boat’s manual *Habitat Improvements for Trout Streams* when designing stream restoration projects.⁴

UPDATE

In 2021, Hellertown Borough and its Engineer prepared a Silver Creek Flood Hazard Mitigation Report. This report was prepared to identify the causes of flooding issues and determine the short-term and long-term evaluations. The recommendations included structural and non-structural mitigation measures. This report was also used to request funding assistance from FEMA and other state and local agencies.

Table 12: Silver Creek – Stream Restoration

LOCATION	TYPE	EFFICIENCY RATE	LENGTH (MIN.)	SEDIMENT REDUCTION
Upstream Point: Culvert at Hellertown Pool Downstream Point: Main Street	Stream Restoration	44.88 lbs/yr/lf	1020 lf	45,777 lbs/yr

The minimum stream restoration length of 1020 feet refers to this BMP as a stand alone project, being the only pollution reduction measure installed for Silver Creek. The Borough has the option of reducing the length of stream restoration, for example focusing on the 500 linear foot section located on Borough property from the Hellertown Pool to Rentzheimer Drive. Additional stormwater BMPs would need to be installed with a reduced length of stream restoration.

UPDATE

BMP OPTION 10 – SAUCON CREEK STREAMBANK RESTORATION

Saucun Creek has a known history of flooding and over topping its banks. As the flood waters recede back to its typical channel flows, the water’s edge scours the streambank. This has caused sections of embankment to be cleared of vegetation as the soils have been eroded, loosened and then flushed downstream – leaving sections of streambank unstabilized.

Wildlands Conservancy has met with the Borough and worked with identifying sections of Saucun Creek needing streambank restoration through re-vegetation. The Borough of Hellertown is especially concerned for the 1000 linear feet of bank south (upstream) of Walnut Street, along Grist Mill Park.

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The measurement of 1000 linear feet of stream restoration takes the project from the Grist Mill Parking Lot at Walnut Street and continues upstream to the end of the mowed and maintained section of the park. As noted in the picture, this area of embankment is typically overtopped with flood water as the creek’s elevation rises and spread across the open field (park area).



Mowed grass is maintained to the Creek’s edge. Streambank would be restabilized with deep rooted grasses and plantings for re-establishment of a filter strip. A full riparian buffer may not be suited for this public use area, and would need to be evaluated by the Borough. It should be noted that the streambank restoration has the potential to extend further upstream to the Saucon Rail Trail (1700LF).

Table 13: Saucon Creek – Stream Restoration

LOCATION	TYPE	EFFICIENCY RATE	LENGTH (MIN.)	SEDIMENT REDUCTION
Upstream Point: Mowed end of Grist Mill Park lawn	Stream Restoration	22.44 ** lbs/yr/lf	1000 lf	22,440 lbs/yr
Downstream Point: Walnut Street Bridge				

** The efficiency rate was reduced to a reduction factor of 22.44 pounds per year per linear foot of restoration to account for 1 side of Saucon Creek embankment. The other side of Saucon Creek is in Lower Saucon Township. To achieve the full 44.88 efficiency credit, both sides of the stream would need to be restored.

POLK VALLEY RUN

BMP OPTION 11 – FILTER STRIP ALONG POLK VALLEY RUN

The Borough has been reviewing opportunities for trail connections with the Saucon Valley Middle School and High School. Currently the students have limited walkability to and from the property. There is an existing dead end trail at Polk Valley Park and the Borough proposes a trail connection from the existing at the park to Main Street. The trail would follow the path of the impaired stream (Polk Valley Run). At Main Street a pedestrian crosswalk would permit students to cross into Tummenillo Park and eventually tie into the Saucon Rail Trail. The linked trails would provide an alternative route for both students and faculty.



Photo: Aerial of agricultural fields and Polk Valley Run. Easement area and proposed trail outlined in red

The Engineer’s office is reviewing options for expanding the proposed trail link into a greenway, which would include riparian buffer and filter strips for interceding run off from the adjacent agricultural fields. Agricultural practices, such as the tilling of the fields, results in significant amounts of sediment laden runoff due to soils being disturbed and loosened. The use of filter strips at the end of the fields before runoff enters the stream would allow for sediment and debris to be filtered and captured. The use and preservation of riparian buffer would allow for mature trees and vegetation to stabilize the streambanks, reduce erosional effects from surface flows, and roots to uptake and process the nutrients being flushed from the fields.

The recommendation is to work with the property owner to secure a conservation easement along Polk Valley Run. The easement would preserve vegetation and buffer space along the creek, while also providing an easement for the trail connection with the Saucon Valley schools. The easement would prevent the removal of vegetation in the future should the agricultural fields be developed, which is limited to cemetery use.

The sediment reduction shown accounts for filter strip and conservation easement on both sides of Polk Valley Run.

Table 14: Polk Valley Run – Filter Strip & Conservation Easement

LOCATION	TYPE	EFFICIENCY RATE	SEDIMENT REDUCTION
Polk Valley Run corridor	Filter Strip Riparian Buffer Conservation Easement	56%	13,906 lbs/yr

BMP OPTION 12 – BAFFLE BOX IN THE SHOPPES AT HELLERTOWN PARKING LOT

With over 70% of Polk Valley Run’s drainage area being covered by property owned by the cemetery, there remains limited opportunities for alternative stormwater management locations. The second largest land use area is the Shoppes at Hellertown, a shopping plaza that makes up 14% of the Polk MS4 Pollution Reduction Plan (PRP) Report

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Valley Run drainage area. The shopping plaza has a significant area of paved, impervious coverage. The use of winter salts, sediment transfer from vehicle tires, and drippings of oils, grease and fuels from vehicles makes the parking lot a viable option for a water quality BMP.

The parking lot has a limited number and location of storm inlets. The lot is graded to drain to a central point, where an existing storm inlet located within a traffic aisle collects the run off. There are no parking islands within the lot, and additional green space is limited to the exterior of the lot. Therefore, it is recommended that the Borough work with the property owner to install a baffle box at the central collection point. A subsurface BMP treatment was determined to be more suitable for this location so that the number of parking spaces would remain the same; the manhole lids for maintenance would be easily accessible; and the appearance of the Shoppes at Hellertown and visibility of the storefronts would not change. These are concerns for installation of a BMP on non-municipal owned property.

The Borough of Hellertown and the property owner will need a Maintenance Agreement between to the two parties to call out long term maintenance tasks, responsibilities and efficiency of the device.

Table 15: Polk Valley Run – Baffle Box at the Shoppes in Hellertown

LOCATION	TYPE	EFFICENCY RATE	SEDIMENT REDUCTION
Shoppes at Hellertown Parking Lot	Baffle Box	80%	7,867 lbs/yr

With the selection of either BMP, the sediment reduction requirement would be met for the Lehigh River drainage area.

BMP OPTION 13 – STORM INLET FILTER BAGS

Depending upon the stormwater BMP installations chosen by Hellertown Borough, the option of using inlet filter bags can assist in providing additional sediment reduction. These are bag inserts that get permanently installed in existing street inlets to collect sediment and prevent debris from entering the storm system. The bags can only be used on streets for inlets with drainage areas under 0.5 acre. Inlet filter bags also require continued maintenance to ensure the filter material does not get clogged from the captured sediment.

Use of inlet filter bags may be necessary to reach required sediment reductions in any of the sewersheds, but they are not recommended as the main stormwater BMP choice.

The organic litter and sediment collected in the filter bags must be collected, dried and weighed throughout the year in order to receive PRP load reduction. With the required maintenance tasks, the Engineer does not recommend use of filter bags on any PennDOT road unless its deemed necessary. PennDOT has their own MS4 NPDES permit with DEP and must perform maintenance tasks on their roads. If needed, the Engineer



Photo (Above): Image of Filtrex inlet filter bag

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recommends a maintenance agreement be signed between the Borough and PennDOT for the installation of the filters in their roadway, and assign clear maintenance duties to each of the parties.

The Borough may take up to 50% sediment reduction credit by using the filter bags (max 3,528 lb/yr reduction for Polk Valley Run). For analysis in this report, the filter bag basis of design used was a 2'x4' PennDOT approved model (62PENNMHDFX) from Filtrexx.

Table 16: Summary of Proposed BMPs

SAUCON CREEK – REQUIRED REDUCTIONS				
BMP	BMP PROPOSED	RECEIVING WATERS	BMP Effectiveness Value	Sediment Reduction (lbs/yr)
#1	Rain Gardens	Saucon Creek	80%	76,562
#2	Wetlands	Saucon Creek	80%	57,421
#3	Vegetated Swale at Dimmick Park	Silver Creek	70%	11,564
#4	Vegetated Swale to Outfall #16	Silver Creek	70%	6,752
#5	Vegetated Swale to Outfall #13	Silver Creek	70%	964
#6	Baffle Box at Outfall #20	Silver Creek	80%	29,291
#7	Bioretention Magnolia Dr	Silver Creek	80%	23,326
#8	Rain Garden at Outfall #10	Silver Creek	80%	20,503
#9	Streambank Restoration	Silver Creek	44.88	44,880 lb/yr/lf
#10	Streambank Restoration	Saucon Creek	22.88	22,440 lb/yr/lf
#11	Filter Strip/ Easement	Polk Valley Run	56%	13,906
#12	Baffle Box in Shoppes parking lot	Polk Valley Run	80%	7,867
#13	Storm Inlet Filter Bags	Polk Valley Run	50%	3,528

F. IDENTIFY FUNDING MECHANISMS

Once the Borough has identified the types of BMPs being proposed, then the municipality will identify the types of funding sources available to install these projects during the five (5) year permit. DEP shall review the feasibility and implementation of the Borough’s PRP prior to DEP approving PAI-13 NPDES permit coverage. DEP does not expect that guaranteed sources be identified in the PRP, but expects that applicants propose their preferred funding options with alternatives in the event the preferred options do not materialize.

In identifying funding sources and potential community partnerships for the proposed BMP projects, the Borough reviewed its list of target audiences in their MS4 Stormwater Management Program - groups that the MS4 has been working with during its previous permit who have a general understanding and interest in the protection of watershed resources.

Hellertown Borough shall use the following five years of the PAI-13 Individual Permit to determine the best funding source for each proposed BMP project, and continue reviewing new opportunities as other partnerships and funding sources become available. The following tables are a summary of potential funding sources.

Table 17: Summary of Funding Sources

Source/ Group	Type
DCED – CFA Watershed Restoration Protection Program (WRPP)	Funding Source for Joint Municipal Programs – goal is to restore and maintain stream reaches impaired by uncontrolled discharges. This is a Watershed Group and Conservancy based grant award, rarely is an individual municipality awarded. Requires 15% match. Potential Funding through the Saucon Creek Watershed MS4 Committee
DEP – Growing Greener Grant	Conservation & Environmental Projects focused on water quality, requires 15% match
DCED - Act 13 program	Flood Mitigation Assistance Program – funds construction projects for municipalities in high flood prone areas.
FEMA – Flood Mitigation Assistance Grant	Funding Source – for projects that reduce or eliminates long-term risk of flood damage. Project for Thomas Iron Site improvements and restoration of the Saucon Creek floodplain.
LVEDC – Land Recycling Initiative Grant	Funding Source – funding for conducting Phase II environmental site assessment. Focus on reuse of abandoned industrial property
PENN VEST – Green Initiatives	Funding Source – encourage innovative green solutions for water quality management, including projects to reduce sediment and nutrient contamination

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DCNR C2P2 – Rivers Conservation Program	Funding Source – the program supports initiatives the benefit all types of waterways, including public access, riparian buffers and greenways. Requires a 50% match
Northampton County Stormwater Educational Grant	Educational Funding – supplemental funding for educational signage for a project site. Maximum amount of \$5000.
Lehigh River Stocking Association	Monitoring & Educational Outreach Source – Work with the local River association in achieving goals outlined in their Mission Statement; work with LRSA to prepare and distribute educational information on local efforts to reduce water pollution
Hellertown Borough	Budget funds

PENNDOT – TAP Grant Transportation Alternatives Program	Funding Source – Eligible projects include improvements to pedestrian and bicycle facilities, promoting safety and mobility, environmental mitigation and stormwater improvements
FEMA – Flood Mitigation Assistance Grant	Funding Source – for projects that reduce or eliminates long-term risk of flood damage. Project for Silver Creek floodplain restoration and streambank restoration
PENN VEST – Green Initiatives	Funding Source – encourage innovative green solutions for water quality management, including projects to reduce sediment and nutrient contamination
Lehigh Valley Mater Watershed Steward Program Volunteers	Labor Source – Volunteers to assist with the installation of plantings
Business/Company Sponsorships	Fundraising Source – opportunity for local businesses and organizations to donate towards the purchasing of plantings and/or materials
Boy Scouts and Girl Scout Troops	Maintenance – Volunteers to assist with the installation of plantings and educational signage
Chamber Foundation MSLV	Funding Source – Maximum Grant \$2000 for the visual improvements to traditional neighborhoods, including cost of landscaping
Private Property Owner and The Borough of Hellertown	Planning & Maintenance Resource – Preparation of a stormwater management agreement between the property owner and the Borough
Lehigh Valley Greenways Conservation Landscape (D&L National Heritage Corridor)	Funding Source – Mini Grant for restoring stream buffers and best management practices, requires 1:1 match
Hellertown Borough	Budget funds

DCNR Riparian Forest Buffers	Funding Source – to install buffers along waterways, includes trees, shrubs and grasses along the water banks. Requires 50% match, max amount \$50,000 Requires landowner agreement for a minimum of 25 years. Conservation easements can also be a form of land owner agreement.
Northampton County – Environmental Services Assistance Program	Funding Source – allocates funds for land acquisition and environmental restoration efforts within the County’s natural areas. Assists municipalities to acquire and protect lands where resources are found.
Private Property Owner and The Borough of Hellertown	Planning & Maintenance Resource – Preparation of a stormwater management agreement between the property owner and the Borough
Hellertown Borough	Budget funds

Every project requires some level of assessment and design. Depending on the complexity and location of the project, a stream and/or channel design may contain any of the following components:

- Geomorphic Assessments and Stream Classification
- Site Surveys
- Hydrologic and Hydraulic Modeling
- Sediment Transport Assessment and Modeling
- Conceptual through final design development, including plans and specifications
- Environmental Permit development and coordination

As the permittee develops estimates on the amount of funding needed for a project, the costs are typically impacted by a variety of factors, many of which can be identified during the initial planning level. Factors that can impact a project include:

- Stream Size – larger streams require greater quantities of earthwork, stone and other materials, and more stream flow maintenance.
- Urban Watersheds – typically have more constraints to construction access, require outfall repairs, and often involve pedestrian considerations such as foot bridges and/or trails. Larger planting materials are often required for a more mature landscape than in rural areas.
- Relocation of Utilities – The presence of utilities that have to be relocated adds an additional level of construction cost to any given project
- Easement agreements – Easement agreements on private property can delay construction activities. Access easements are often required across private property during construction, and maintenance easements for long term sustainability.
- Weather – Harder to anticipate and plan for during a project, excessive rainfall or snowfall can delay projects and add costs to construction.

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 anticipated maintenance tasks for the BMPs, including:

- The party(ies) responsible for ongoing O&M;
- The activities involved with O&M the 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 their Individual Permit.

All stormwater BMPs installed under this PRP are subject to the Hellertown Borough stormwater management ordinances. If the BMP is located on private land, the landowner must convey an easement to Hellertown Borough to allow for access and periodic inspections and maintenance, as needed. Operation and maintenance activities conducted by the Borough shall be listed in its annual report to DEP.

Table 18: Saucon Creek - Responsible Parties for Operation and Maintenance of BMPs

BMP Option	Parties Responsible for O&M	O&M Activities	Frequency of Activities
Rain Garden (Saucon Creek)	Borough of Hellertown	Visually inspect the area for signs of erosion; Clear accumulation of debris at pipe openings and discharge points	As Needed following construction
Rain Garden (Saucon Creek)	Borough of Hellertown & Community Volunteers (College/Univ. Groups, Saucon Valley student clubs)	Initial watering program to get plantings established	As Needed following construction
		Prune and weed garden to maintain appearance; Remove trash and debris	Monthly
Rain Garden (Saucon Creek)	Borough of Hellertown & Engineer	Inspect each BMP location using PCSM form and provide summary report of BMPs for MS4 annual report to DEP	Annual
Rain Garden (Saucon Creek)	Local College Students (Lehigh University, DeSales University, Muhlenberg University)	Monitoring & Research Opportunity for students to use the BMP for data collection and research	As Needed for course study and research
		Provide copy of collected and sampled data to the Borough for submission with MS4 annual report	Annual submission of data points to Borough

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Rain Garden (Saucon Creek)	Watershed Coalition of the Lehigh Valley Northampton County Watershed Stewards	Organize educational event/ demonstration event on how the BMP functions	Goal is to have this be a planned event coordinated with Borough of Hellertown every other year to target different audience groups
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Table 19: Silver Creek - Responsible Parties for Operation and Maintenance of BMPs

BMP Option	Parties Responsible for O&M	O&M Activities	Frequency of Activities
Vegetated Filter Strip	Borough of Hellertown	Vegetation Inspection Inspect for signs of erosion concerns along the embankments and areas of pooling water that need corrective actions	Months 1-18: Once a month After 18 months: Annually and after every major storm event with rainfall greater than 1"
Vegetated Filter Strip	Borough of Hellertown & Engineer	Illicit Discharge Inspections	Annually
Vegetated Filter Strip	Borough of Hellertown & Engineer	Vegetation Inspection	Quarterly: owner to inspect vegetation, replace dead or damaged plant material, repair displaced mulch and soil areas
		Debris Removal	As Needed – keep inlet grates and overflow areas clear of debris to maintain flows
		Annual Task form To submit with MS4 report	Annually: copy of completed inspections sheets and tasks during the year
Rain Garden	Borough of Hellertown	Visually inspect the area for signs of erosion; Clear accumulation of debris at pipe openings and discharge points	As Needed following construction
Rain Garden	Borough of Hellertown & Community Volunteers (College/Univ. Groups, Saucon Valley student clubs)	Initial watering program to get plantings established	As Needed following construction
		Prune and weed garden to maintain appearance; Remove trash and debris	Monthly

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Rain Garden	Borough of Hellertown & Engineer	Inspect each BMP location using PCSM form and provide summary report of BMPs for MS4 annual report to DEP	Annual
Rain Garden	Watershed Coalition of the Lehigh Valley Northampton County Watershed Stewards	educational event demonstration event	Every 2 Years - target different audience group
Baffle Box	Public Works Department	Inspect	Quarterly
Baffle Box	Public Works Department Or contracted 3rd party	Remove debris Remove sediment	Every 6 months Cleaned manually or by vacuum truck
Stream Restoration Silver Creek	Public Works Dept	Visually inspect the bank and any installed structures	Quarterly
		Note and photograph any structures, rocks, banks for accelerated weathering, displacement or significant changes since the original construction	Annually
		Inspect the bank and structures after major storm events with rainfall greater than 1"	As Needed
Stream Restoration Silver & Saucon Creek	Hellertown Borough Saucon Creek Watershed Saucon Valley High School Saucon Valley Middle School Local Scout Troops	Clean Up event to clear debris and trash from the drainage area and from the community park	Annual Event
Stream Restoration Silver & Saucon Creek	Saucon Creek Watershed Group Northampton County Watershed Stewards Local Environmental Clubs from the Universities	Vegetation Inspection Vegetation Replacement	First 6 months: Twice a month inspections Months 6-18: Once a month for weeding; removal of volunteer plants After 18 months: At least twice a year (spring/fall)

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Stream Restoration Silver & Saucon Creek	Public Works Dept	Repair/ Replace displacement of rip rap or stone areas	As Needed
Stream Restoration Silver & Saucon Creek	Public Works Dept and Engineer's Office	Illicit Discharge Inspections	Annually

Table 20: Polk Valley Run - Responsible Parties for Operation and Maintenance of BMPs

BMP Option	Parties Responsible for O&M	O&M Activities	Frequency of Activities
Baffle Box	Same as mentioned above in Silver Creek Watershed		
Inlet Filters	Public Works Dept	<p>When removing the filter bag to dispose of the collected sediment, the following steps must be taken to get PRP credit:</p> <ol style="list-style-type: none"> 1) Remove refuse, debris and floatables from the bag (bottles, trash, cigarettes, wrappers, etc.) They do not count towards materials collected. 2) Measure the weight of solid/organic material collected (lbs.) 3) Sum the total weight of material collected for an annual period. 4) Convert the annual wet weight captured into annual dry weight (lbs) 	<p>First 12 months - inspect inlet filters monthly to determine rate of sediment accumulation for that particular roadway.</p> <p>Based on their accumulation rates, Borough shall prepare a schedule when street inlet bags need to be cleared</p> <p>Annually – Borough to prepare a summary sheet showing the totaled captured weight of sediment for each watershed.</p>

GENERAL INFORMATION

Volunteer Community Garden Clubs Sponsoring the Maintenance of a Stormwater BMP

The proposed BMP improvements to Thomas Iron Site and Dimmick Park are in recreational use areas, surrounded by residential developments, Hellertown Library and near Saucon Valley School District. Their locations provide an opportunity to work with homeowners and park users to assist in the long term maintenance of these best management practices. The proposed stormwater BMPs improvements can be used as demonstration areas, where desirable plants and designs can be viewed by visitors and replicated on their own property.

Since poorly maintained planting areas can discourage residents from replicating the design in their own neighborhoods, the use of community garden clubs would provide the occasional, yet necessary, maintenance support to have the planting beds looking and functioning at their best. The most typical maintenance tasks would be weeding and removing trash. Hellertown Borough can provide annual training sessions to the garden clubs through the Northampton County Watershed Program or through the use of a Lehigh Valley Master Watershed Steward on how to identify different vegetation for removal.

Increased community participation with the stormwater BMPs can provide various newsletter articles and social media posts about the on-going work of the volunteers. Educational hand outs and materials can be made available for public download from the Borough's homepage, whereas educational signage at the BMP locations can include a QR Code enabling walkers to use their cell phones to download educational information on that particular stormwater BMP.



Photo: Example of interactive educational signage using QR codes

Saucon Creek Watershed MS4 Committee

A new opportunity for shall become available in Spring 2019, with the development of the Saucon Creek Watershed group. This committee is intended to bring together stakeholders from the Northampton County Conservation District (NCCD), Lehigh County Conservation District (LCCD), municipalities within the Saucon Creek Watershed, Environmental Advisory Councils (EAC), and the Saucon Creek Watershed Association.

The goals of the committee have not been organized as of the date of this report, however the development of a Saucon Creek Watershed MS4 group would be the first in the County. Potential joint collaborations and partnerships for construction of stormwater BMPs, a consistent monitoring program within the watershed shared by all MS4 communities, or developing a single BMP resource manual for use by volunteers and homeowners within the watershed would be significant.

Stormwater Fee

The Borough has seen the recent actions taken by other Pennsylvania municipalities to implement a stormwater fee to provide a long term funding source to cover the increasing costs for storm sewer maintenance and programming tasks required by the NPDES MS4 permit. The fee may be based on the area of impervious surface associated with each tax parcel, or a flat fee rate. Properties that are exempt from school tax or property taxes would not be exempt from the stormwater fee, thus providing an opportunity for additional funding sources. The fee could also be offset by the individual property owner through the installation of on-site BMPs that would reduce their rate and volume, and improve water quality of stormwater running off from their property.

As with many other Pennsylvania municipalities, the Borough requires more information and guidance on this topic as Borough residents currently have some of the highest tax rates in the County. Some municipalities work with a separate Stormwater Authority to administer the fee program, while other communities look to establishing a joint municipal partnership to manage the entire watershed area in order to share resources. This joint partnership for stormwater fees may be a discussion point with the upcoming Saucon Creek Watershed committee.

PRP Implementation and Final Report

Under the NPDES Individual Permit, the permittee must achieve the required pollutant load reductions within five (5) years following DEP's approval of coverage, 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 coverage.

This summary will review the work completed by the municipality and how the required pollution load reduction was satisfied. Report submission dates shall be verified once Hellertown Borough receives its NPDES Individual permit and approval dates.

Hellertown Borough shall submit the PRP in accordance with the above requirements. This plan shall be dynamic and changing as unforeseen projects may be added as new opportunities arise during the next five years.

REFERENCES

- 1 – From “Case Study 4: Ford Motor Company Rouge River Manufacturing Plant” by Draft PA Pennsylvania Stormwater Management Manual, 2005, Section 7 – Stormwater Management for Urban Areas, Page 7-512
- 2 – From “A Comparison of Charcoal and Slag-based Constructed Wetlands for Acid Mine Drainage Remediation” by C. Sheridan, K. Harding, E. Koller and A. DePretto, 2013, The Water Research Commission, Vol. 39 No 3, WISA Edition (Online Issue 1816-7950)
- 3 – From “Developing Golf Course Best Management Practices: 50 States by 2020” by J. Bryan Unruh, PhD, 2017, Golf Course Management Magazine, January issue.
- 4 – “Habitat Improvement for Trout Streams” by K. Lutz and C. Huber, 2007, Pennsylvania Fish and Boat Commission.

SOURCES

PAI-13 Authorization to Discharge Under the National Pollutant Discharge Elimination System (NPDES) Individual Permit for Stormwater Discharges From Small Municipal Separate Storm Sewer Systems (MS4), by Commonwealth of Pennsylvania Department of Environmental Protection (DEP), Bureau of Clean Water, 2016

National Pollutant Discharge Elimination Systems (NPDES) Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) Pollutant Reduction Plan (PRP) Instructions, by Commonwealth of Pennsylvania Department of Environmental Protection (DEP), Bureau of Clean Water, Revised 2017, Publication 3800-PM-BCW0100k

Phase I Environmental Site Assessment of Former Thomas Iron Works Property, by Moonstone Environmental, 2010

APPENDIX A

MS4 Name	NPDES ID	Individual Permit Required?	Reason	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)	Other Cause(s) of Impairment
Northampton County						
EAST BANGOR BORO	PAG132294*	No		Unnamed Tributaries to Martins Creek	Appendix E-Siltation (5)	Flow Alterations, Other Habitat Alterations (4c)
EASTON CITY	PAI132216	Yes	SP, IP	Delaware River Lehigh River	Appendix C-PCB (5), Appendix E-Organic Enrichment/Low D.O., Siltation, Suspended Solids (5)	Mercury (5)
FORKS TWP	PAI132237	Yes	SP, IP	Delaware River		Mercury (5)
FREEMANSBURG BORO	PAI132207	Yes	IP	Unnamed Tributaries to Delaware River Bushkill Creek	Appendix E-Siltation (5) Appendix B-Pathogens (5)	Water/Flow Variability (4c)
GLENDON BORO	PAG132298*	No		Lehigh River	Appendix C-PCB (5), Appendix E-Organic Enrichment/Low D.O., Siltation, Suspended Solids (5)	
HANOVER TWP	PAI132218	Yes	SP, IP	Delaware River Lehigh River	Appendix C-PCB (5), Appendix E-Organic Enrichment/Low D.O., Siltation, Suspended Solids (5)	Mercury (5)
HELLERTOWN BORO	PAI132223	Yes	IP	Catawauqua Creek Polk Valley Run Saucon Creek Lehigh River Silver Creek	Appendix E-Siltation (5) Appendix E-Siltation (5) Appendix E-Siltation (5) Appendix C-PCB (5), Appendix E-Organic Enrichment/Low D.O., Siltation, Suspended Solids (5) Appendix E-Siltation (5)	
LEHIGH TWP	PAG132239	No		Lehigh River	Appendix A-Metals (5), Appendix E-Organic Enrichment/Low D.O., Siltation (5)	
LOWER MT BETHEL TWP	PAG132255*	Yes	SP	Hokendauqua Creek Delaware River	Appendix E-Siltation, Suspended Solids (5)	Mercury (5)
LOWER NAZARETH TWP	PAI132228	Yes	SP, IP	Bushkill Creek Lehigh River Monocacy Creek East Branch Monocacy Creek Delaware River Shoeneck Creek	Appendix B-Pathogens (5) Appendix C-PCB (5), Appendix E-Organic Enrichment/Low D.O., Siltation, Suspended Solids (5) Appendix E-Siltation (5) Appendix E-Siltation (5)	Other Habitat Alterations (4c) Mercury (5) Water/Flow Variability (4c)

APPENDIX B

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.

APPENDIX C

SAUCON CREEK WATERSHED

EXISTING POLLUTANT LOAD - SEDIMENT

LAND USE CATEGORY ¹	TOTAL AREA (SF)	ACRES (AC)	IMPERVIOUS (%)	TYPE	AREA (AC)	LOADING RATE (LB/AC) ²	EXISTING LOAD (LBS)
DEVELOPED, WOODED	2,585,824	59.36	0.00	IMPERVIOUS	0.00	1839.00	0.00
				PERVIOUS	59.36	264.96	15728.65
DEVELOPED, OPEN SPACE	2,443,613	56.10	0.19	IMPERVIOUS	10.66	1839.00	19601.07
				PERVIOUS	45.44	264.96	12039.54
DEVELOPED, LOW INTENSITY	4,478,747	102.82	0.49	IMPERVIOUS	50.38	1839.00	92650.23
				PERVIOUS	52.44	264.96	13893.74
DEVELOPED, MEDIUM INTENSITY	2,979,363	68.40	0.79	IMPERVIOUS	54.03	1839.00	99367.50
				PERVIOUS	14.36	264.96	3805.71
DEVELOPED, HIGH INTENSITY	2,080,598	47.76	1.00	IMPERVIOUS	47.76	1839.00	87837.90
				PERVIOUS	0.00	264.96	0.00
DEVELOPED, GRAVEL/STONE	221,140	5.08	1.00	IMPERVIOUS	5.08	1839.00	9336.01
				PERVIOUS	0.00	264.96	0.00
REMAINING STREETS/ROADWAYS	1,816,857	41.71	1.00	IMPERVIOUS	41.71	1839.00	76703.41
TOTAL SEDIMENT LOAD							430963.76

EXISTING BMP CREDITS

Name	Owner	MS4 Map ID#	Pollutant Reduction Credit
Tumminello Park Riparian Buffer	Hellertown Borough	A-4	2192.67 lbs/yr
Water Street Park Vegetated Swales & Rain Garden	Hellertown Borough	A-5, A-6, A-7, A-8	3791.80 lbs/yr

REVISED POLLUTANT LOAD – SEDIMENT

$$430,963.76 \text{ lbs/yr} - 5,984.47 \text{ lbs/yr} = \mathbf{424,979.29 \text{ lbs/yr}}$$

Sources:

1 - Land Use Categories taken from Wiki Watershed Online Tool - National Land Cover Database

2 - Existing Loading Rates taken from PA DEP Attachment B Form [3800-PM-BCW0100k] " Developed Land Loading Rates for PA Counties" - All Other Counties (Sediment) 1839.00 lbs/ac/yr Impervious; 264.96 lb/ac/yr Pervious

SILVER CREEK WATERSHED

EXISTING POLLUTANT LOAD - SEDIMENT

LAND USE CATEGORY ¹	TOTAL AREA (SF)	ACRES (AC)	IMPERVIOUS (%)	TYPE	AREA (AC)	LOADING RATE (LB/AC) ²	EXISTING LOAD (LBS)
DEVELOPED, WOODED	913,077	20.96	0.00	IMPERVIOUS	0.00	1839.00	0.00
				PERVIOUS	20.96	264.96	5553.93
DEVELOPED, OPEN SPACE	3,829,049	87.90	0.19	IMPERVIOUS	16.70	1839.00	30714.14
				PERVIOUS	71.20	264.96	18865.50
DEVELOPED, LOW INTENSITY	6,021,138	138.23	0.49	IMPERVIOUS	67.73	1839.00	124557.10
				PERVIOUS	70.50	264.96	18678.46
DEVELOPED, MEDIUM INTENSITY	2,996,329	68.79	0.79	IMPERVIOUS	54.34	1839.00	99933.34
				PERVIOUS	14.45	264.96	3827.38
DEVELOPED, HIGH INTENSITY	1,277,527	29.33	1.00	IMPERVIOUS	29.33	1839.00	53934.17
				PERVIOUS	0.00	264.96	0.00
DEVELOPED, GRAVEL/STONE	27,462	0.63	1.00	IMPERVIOUS	0.63	1839.00	1159.39
				PERVIOUS	0.00	264.96	0.00
REMAINING STREETS/ROADWAYS	2,336,867	53.65	1.00	IMPERVIOUS	53.65	1839.00	98656.98
TOTAL SEDIMENT LOAD							455880.40

EXISTING BMP CREDITS

Name	Owner	MS4 Map ID#	Pollutant Reduction Credit
Borough Hall Rain Garden	Hellertown Borough	B-2	618.22 lbs/yr

REVISED POLLUTANT LOAD – SEDIMENT

$$455,880.40 \text{ lbs/yr} - 618.22 \text{ lbs/yr} = \mathbf{455,262.18 \text{ lbs/yr}}$$

Sources:

1 - Land Use Categories taken from Wiki Watershed Online Tool - National Land Cover Database

2 - Existing Loading Rates taken from PA DEP Attachment B Form [3800-PM-BCW0100k] " Developed Land Loading Rates for PA Counties" - All Other Counties (Sediment) 1839.00 lbs/ac/yr Impervious; 264.96 lb/ac/yr Pervious

SILVER CREEK WATERSHED

EXISTING POLLUTANT LOAD - SEDIMENT

LAND USE CATEGORY ¹	TOTAL AREA (SF)	ACRES (AC)	IMPERVIOUS (%)	TYPE	AREA (AC)	LOADING RATE (LB/AC) ²	EXISTING LOAD (LBS)
DEVELOPED, WOODED	204,371	4.69	0.00	IMPERVIOUS	0.00	1839.00	0.00
				PERVIOUS	4.69	264.96	1243.12
DEVELOPED, OPEN SPACE	431,031	9.90	0.19	IMPERVIOUS	1.88	1839.00	3457.45
				PERVIOUS	8.02	264.96	2123.67
DEVELOPED, LOW INTENSITY	16,576	0.38	0.49	IMPERVIOUS	0.19	1839.00	342.90
				PERVIOUS	0.19	264.96	51.42
DEVELOPED, MEDIUM INTENSITY	175,714	4.03	0.79	IMPERVIOUS	3.19	1839.00	5860.41
				PERVIOUS	0.85	264.96	224.45
DEVELOPED, HIGH INTENSITY	352,974	8.10	1.00	IMPERVIOUS	8.10	1839.00	14901.71
				PERVIOUS	0.00	264.96	0.00
AGRICULTURAL	1,703,911	39.12	1.00	IMPERVIOUS	19.17	1839.00	35248.20
				PERVIOUS	19.95	264.96	5285.79
REMAINING STREETS/ROADWAYS	204,371	1.97	1.00	IMPERVIOUS	1.97	1839.00	3617.20
TOTAL SEDIMENT LOAD							72356.31

EXISTING BMP CREDITS

Name	Owner	MS4 Map ID#	Pollutant Reduction Credit
Service Elec. Detention Basin	Service Electric	C-1	1784.71 lbs/yr

REVISED POLLUTANT LOAD – SEDIMENT

$$72,356.31 \text{ lbs/yr} - 1784.71 \text{ lbs/yr} = \mathbf{70,571.60 \text{ lbs/yr}}$$

Sources:

1 - Land Use Categories taken from Wiki Watershed Online Tool - National Land Cover Database

2 - Existing Loading Rates taken from PA DEP Attachment B Form [3800-PM-BCW0100k] " Developed Land Loading Rates for PA Counties" - All Other Counties (Sediment) 1839.00 lbs/ac/yr Impervious; 264.96 lb/ac/yr Pervious

APPENDIX D

**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 be 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	<p>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.</p> <p>To determine pollutant reductions for this BMP, these steps must be taken:</p> <ol style="list-style-type: none"> 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. <p>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%.</p>

APPENDIX E

APPENDIX F

APPENDIX G