MS4 NPDES Permit
Pollution Reduction Plan (PRP)

FOR

West Easton Borough
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West Easton, PA
18042

Prepared by
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Date: July 27, 2017

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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
NPDES	National Pollutant Discharge Elimination System
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 sytems, 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 storwmater 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 *General Permit PAG-13 Authorization to Discharge Under the National Pollutant Discharge Elimination System (NPDES).* This general 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.

West Easton Borough discharges stormwater into the Lehigh River, which has been listed by DEP as being impaired due to sediment and organic enrichment (See Appendix A). In accordance with West Easton Borough's MS4 permit, this PRP has been developed to address water quality initiatives within the drainage areas of this impaired stream.

This Pollution Reduction Plan (PRP) may be evaluated by West Easton Borough at any time for its effectiveness in reducing pollutant loads from its stormwater discharges. If West Easton 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 West Easton 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 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 West Easton 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.

West Easton Borough held a public meeting on June 27th, 2017 to receive a verbal commentary on the contents of the PRP. A copy of the public notice for the meeting is included as Appendix Item A.

The public was given 30 days to provide commentary on the contents of the PRP. A copy of all written public comments is included in Appendix Item B. TO BE ADDED AT END OF REVIEW PERIOD.

West Easton Borough used the public comments to update the draft PRP in the following ways:
TO BE ADDED AT END OF REVIEW PERIOD

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 identify land uses and/or impervious/pervious surfaces and the storm sewershed boundary associated with each MS4 outfall.

Use of this 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 PAG-13 General Permit, with the addition of land use and/or impervious/pervious surfaces, the storm sewershed boundary, and locations of proposed BMPs, or may be a different map'.* The map 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 February 8, 2017 (See Table 2). The map also needed to be able to demonstrate 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 Borough Engineer's office using the information and 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.

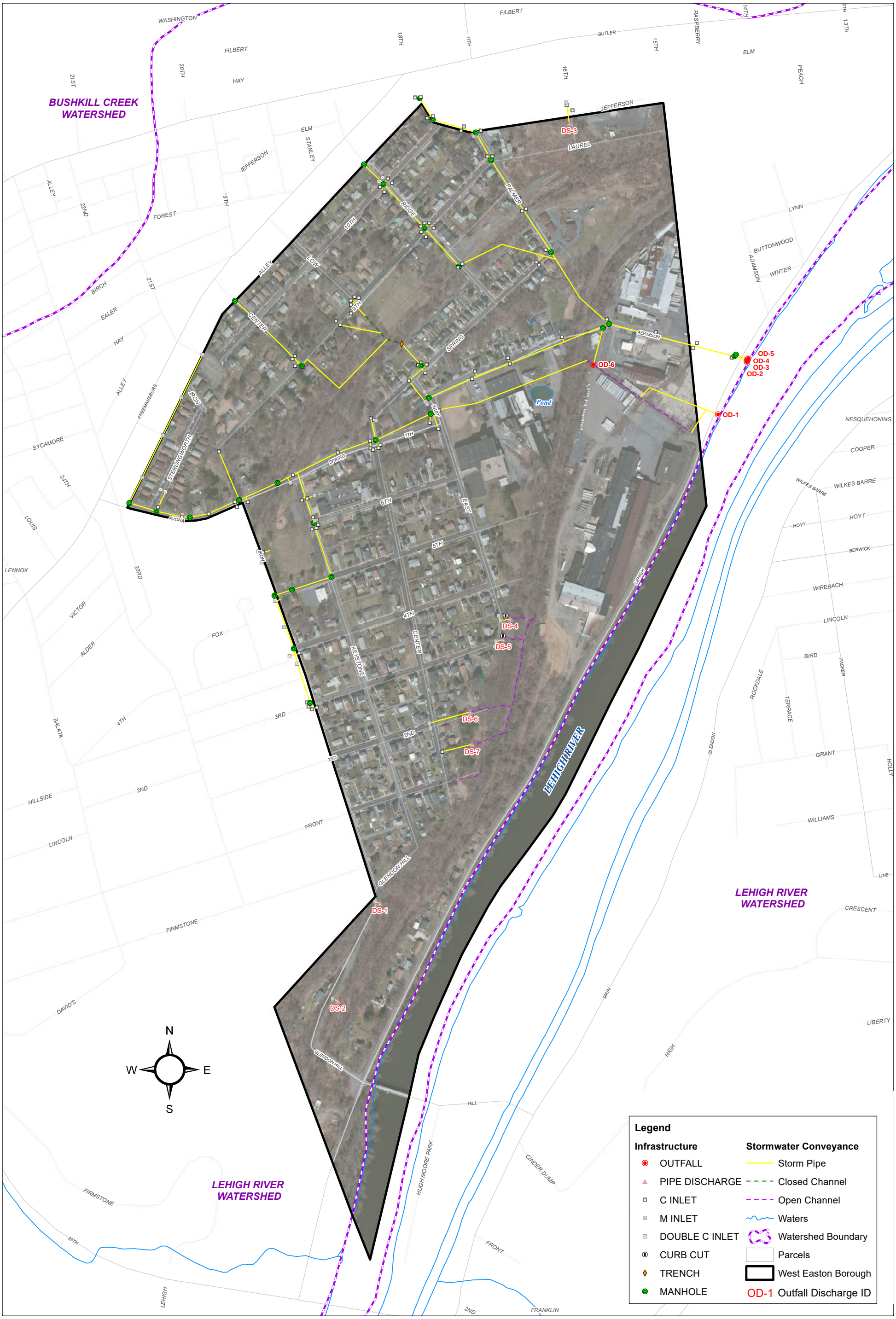
4. Impairment Area Map – after the drainage areas were outlined, a storm sewershed boundary was delineated. This boundary shows which areas of the Borough drain to and have impact on the impaired stream, specifically the Lehigh River. The areas draining to the non-impaired streams are not included in the PRP calculations.

5. Land Use Map – land uses were evaluated within the storm sewershed for Lehigh River. Determining land use for a property is a primary objective for calculating the pervious and impervious areas within drainage areas. Different types of land uses will have different levels of impervious coverage.

6. Parsing – the map may show areas that are to be "parsed" from the planning area. At the MS4's discretion, certain areas may be shown on the map that are within the storm sewershed but are not included in the calculation of land area or the existing pollution loading. These areas are already covered by an NPDES permit for the control of stormwater. If, however, the land is removed from the planning area, BMPs implemented on that land may not be used as credit toward meeting the MS4's pollutant loading reduction requirements.

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

   West Easton Borough did not parse out any properties during the analysis and development of this PRP report.



Last Update: July 2017

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BARRY ISETT & associates INC

WEST EASTON BOROUGH STORM SEWER MAP

Northampton County, Pennsylvania
Lehigh River Watershed

STORM SEWER & AERIAL MAP

0 200 400 800 1,200 Feet

BUSHKILL CREEK WATERSHED

LEHIGH RIVER WATERSHED

LEHIGH RIVER WATERSHED

DS-1
DS-2
DS-3
DS-4
DS-5
DS-6
DS-7

OD-1
OD-2
OD-3
OD-4
OD-5
OD-6

Pond

LEHIGH RIVER

N
W
E
S

Floodplain Legend

FEMA Flood Zones

- Floodway
- Zone A
- 0.2 % Annual Chance

Legend

Infrastructure	Stormwater Conveyance
OUTFALL	Storm Pipe
PIPE DISCHARGE	Closed Channel
C INLET	Open Channel
M INLET	West Easton Borough
DOUBLE C INLET	Watershed Boundary
CURB CUT	Waters
TRENCH	Impaired Waters
MANHOLE	OD-1 Outfall Discharge ID

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WEST EASTON BOROUGH STORM SEWER MAP

Northampton County, Pennsylvania
Lehigh River Watershed

TOPO, IMPAIRED STREAM & FLOODPLAIN MAP

0 200 400 800 1,200 Feet

BUSHKILL CREEK WATERSHED

LEHIGH RIVER WATERSHED

LEHIGH RIVER WATERSHED

LEHIGH RIVER

Pond

N

W E

S

Legend

Infrastructure	Stormwater Conveyance
OUTFALL	Storm Pipe
PIPE DISCHARGE	Closed Channel
C INLET	Open Channel
M INLET	Waters
DOUBLE C INLET	**Drainage Areas**
CURB CUT	Inlet Drainage
TRENCH	Watershed Boundary
MANHOLE	Parcels
	West Easton Borough

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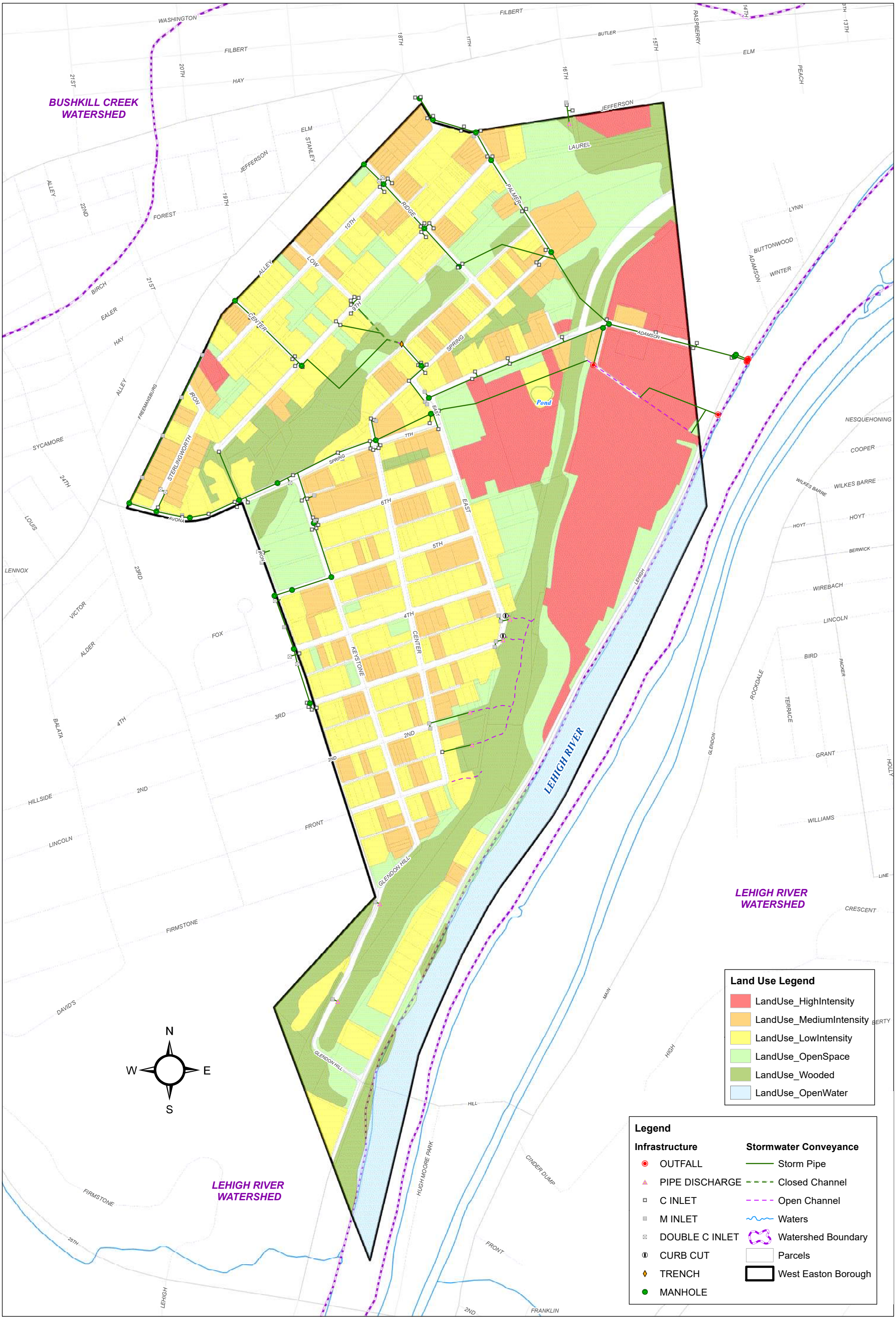
WEST EASTON BOROUGH STORM SEWER MAP

Northampton County, Pennsylvania
Lehigh River Watershed

TOPOGRAPHY & DRAINAGE MAP

0 200 400 800 1,200 Feet



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WEST EASTON BOROUGH STORM SEWER MAP

Northampton County, Pennsylvania
Lehigh River Watershed

LAND USE MAP

0 200 400 800 1,200 Feet

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 West Easton Borough as having impaired stream waters for the Lehigh River. The river is impaired due to sediment, organic enrichment and other causes. 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 2/8/17)

MS4 Name	NPDES ID	Individual Permit Required?	Reason	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)	Other Cause(s) of Impairment
West Easton Borough	PAG 132236	No		Lehigh River	Appendix E – Organic Enrichment, Low D.O., Siltation, Suspended Solids	
				Delaware River		Mercury (5)

The EPA defines sediment as '*the loose sand, clay, silt and other soil particles that settle at the bottom of a body of water. Sediment can come from soil erosion or from the decomposition of plant and animals. Wind, water and ice help carry these particles to rivers, lakes and streams*.' Sediment is a pollution of concern due to its degradation of water quality, which impacts sources of drinking water; increases water turbidity (cloudiness) causing impacts to aquatic habitat and fish health; and alters the depth and direction of drainage areas which can result in flooding issues.

The EPA notes that nitrogen pollution is *'one of America's most widespread, costly and challenging environmental problems, and is caused by excess nitrogen and phosphorous in the air and water'.* Although Nitrogen and Phosphorous are natural elements and support both animal and plant life, too much of either can impact our air quality, alter plant growth, decrease aquatic habitat and impact our food and drinking sources.

For all PRPs, the MS4 shall calculate the existing loading of the pollutant(s) of concern in pounds per year (lbs/yr). West Easton utilized the mapping information to determine its existing contribution of sediment and Phosphorous being discharged into Lehigh River.

West Easton Borough is required to reduce the amount of sediment discharge by 10% and Phosphorous by 5%. 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.

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.

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
Low Intensity	20 - 49
Open Space (Developed)	0 – 19
Forested/ Wooded	0
Roads *	100 *

*Note: In addition to the land use categories as defined by the WikiWatershed program, Barry Isett & Associates Inc added the category of 'Roads' to account for the remaining non-land uses contributing to runoff. The Roads category would have an impervious coverage of 100%.

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 Borough Engineer's office utilized the WikiWatershed online tool from the Stroud Water Research Center. Use of this GIS platform and WikiWatershed were approved methods by PA DEP. Since different land uses have different impacts on impervious coverage, the WikiWatershed model was determined to give the Borough more accurate pollution loading calculations. The following land cover categories and impervious rates were provided by the Model My Watershed: Site Storm Model function of the WikiWatershed program.

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

The existing loading estimates were calculated on September 15, 2017 (date of NOI submission) using Attachment B of the PRP Instructions - DEP's BMP Effectiveness Values. Table 3 shows the calculation method and breakdown of land uses for determining the existing loading rates within the impaired sewershed. The highest percentage of impervious coverage was used in calculating the each of the land uses' contribution for sediment and Phosphorous pollutants.

Table 3: Land Uses, Impervious Coverage and Loading Rates

LAND USE CATEGORY [1]	AREA (SF)	ACRES (AC)	STROUD TOOL IMPERVIOUS (%) [1]	IMPERVIOUS AREA (AC)	LOADING RATE (LB/AC) [2]	EXISTING LOAD (LBS)	LOADING RATE (LB/AC) [3]	EXISTING LOAD (LBS)
FOREST/ WOODED	1,514,651.34	34.77	0.00	0.00	241.88	0.00	0.327	0.00
DEVELOPED, OPEN SPACE	1,335,487.72	30.66	0.19	5.83	241.88	1408.98	0.327	1.90
DEVELOPED, LOW INTENSITY	2,153,577.14	49.44	0.49	24.23	241.88	5859.61	0.327	7.92
DEVELOPED, MEDIUM INTENSITY	1,143,369.07	26.25	0.79	20.74	241.88	5015.63	0.327	6.78
DEVELOPED, HIGH INTENSITY	1,298,542.13	29.81	1.00	29.81	241.88	7210.55	0.327	9.75
STREETS/ROADS	1,934,825.60	44.42	1.00	44.42	241.88	10743.70	0.327	14.52
				TOTAL:		30238.5		40.88

1 - Wiki Watershed, Model My Watershed Online Tool, Site Storm Model Scenario

2 - Wiki Watershed, Stream Reach Assessment Tool, Total Catchment Stats for Lehigh River, (Sediment) TSS: 241.88 lb/ac,
3 - Wiki Watershed, Stream Reach Assessment Tool, Total Catchment Stats for Lehigh River (Phosphorous) TP: 0.327 lb/ac

Table 4 shows what the total contribution of sediment and Phosphorous the Borough of West Easton is estimated to be contributing to Lehigh River. The pollutant load is shown in pounds per year.

Table 4: Existing Pollution Load to Lehigh River

LEHIGH RIVER WATERSHED			
West Easton Borough	Existing Load	Minimum Reduction	Required Reduction
Total Sediment	30,238.5 lb/yr	10 %	3,024 lb/yr
Total Phosphorous	40.88 lb/yr	5%	2.04 lb/yr

Whatever tool or approach that is used to estimate existing loading from the PRP planning area must also be used to estimate existing loading to planned BMPs. Providing consistent methodologies avoids errors in percent pollutant removal calculations that would result if different methods were used. Later BMP efforts will usually apply a more sophisticated method than used in the planning process to calculate load to a BMP.

MS4's may claim "credit" for structural BMPs installed and implemented prior to development of this PRP to reduce the Borough's existing loading estimates.

MS4s may not claim credit for street sweeping or other non-structural BMPs implemented in the past in order to meet its reduction requirement. Instead, the MS4 may claim pollutant reduction credit in the form of reducing the existing loading being discharged by the MS4 into the stream. In order for the structural BMPs to be credited, the stromwater BMP must have been continually operated and maintained.

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, the Borough could then identify areas within the municipality to be studied for BMP improvements. The proposed implementation of BMPs or land use changes must be within the storm sewershed that will result in meeting the minimum required reductions. For example, this means the municipality can not install a wetland in Zone B's planning area and use those pollution reduction amounts to satisfy reductions needed in Zone A's sewershed.

These BMPs shall be implemented within five (5) years of DEP's approval date for coverage under the PAG-13 General 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 sewershed 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 have been a seasonal task and should not be considered in calculating credit for future BMP practices. The method and frequency of street sweeping has changed in order to be used as credit. If street sweeping is conducted at least 25 times a year, the municipality can only count the streets that have been swept 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.

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 or elsewhere within the storm sewershed 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.

STUDY AREAS

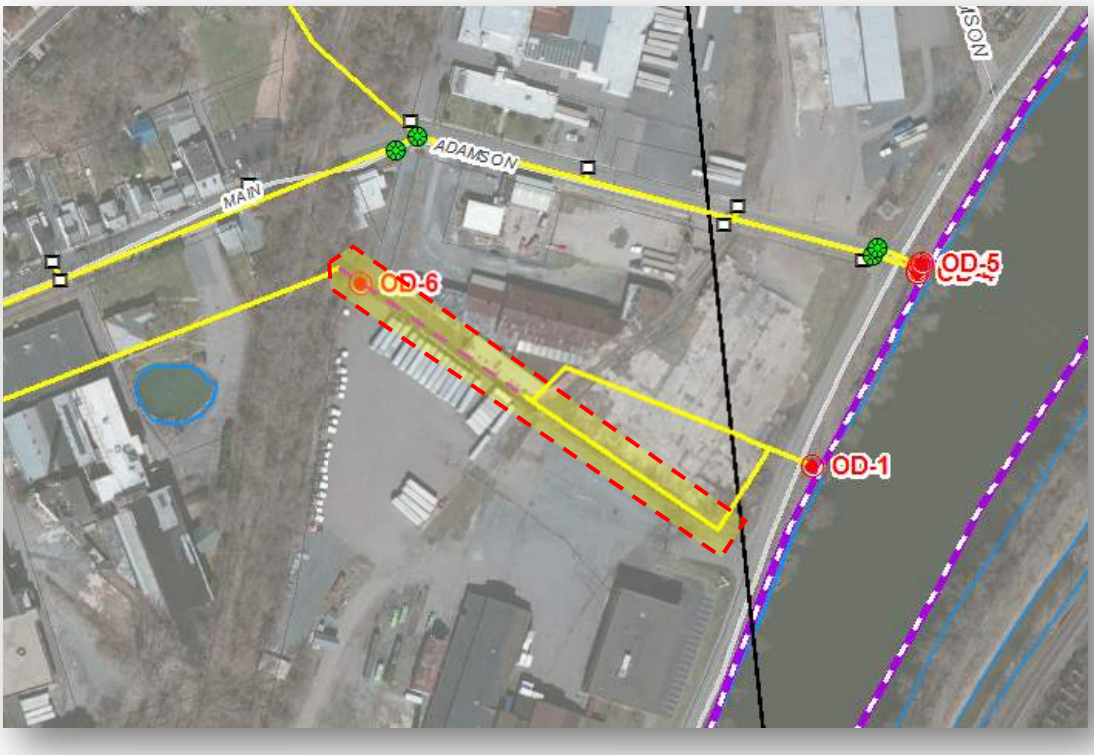
Borough staff and the Engineer's office developed a list of priority areas for initial evaluation. These areas either had a previous history of illegal dumping complaints or areas of existing drainage concerns. The goal was to identify and assess a BMP's potential for addressing multiple concerns and opportunities for the municipality.

BMP OPTION 1 – OPEN CHANNEL RESTORATION

Located on private property and currently used an industrial lot for storage of truck trailers and equipment, the drainage channel bisects through the eastern side of the property between

buildings and edge of the paved parking lot. The channel conveys run off from 30 acres of residential neighborhoods and wooded areas along Spring, Avona, Iron, Keystone and Center Streets. The collected runoff is piped underneath the old railroad easement and daylights to the open channel, traveling 690 feet before crossing underneath Lehigh Drive to the Lehigh River.

The channel is minimally vegetated and the banks are a combination of stone boulders and piled screenings. Sediment has been permitted to build up along the floor reducing its hydraulic capacity. At the top of the bank, vegetation has been removed so that runoff from the off street parking area has been permitted to enter the channel. Removing the sediment, restoring the banks, and then revegetating the channel will improve the channel's effectiveness in treating water quality.



Mapping: The open channel runs from the base of the railroad embankment to the Lehigh Drive entrance to the property. The channel enters a storm pipe at the driveway where it gets discharged to outfall #4 at the Lehigh River.

Photo (Left): View of the open channel at bridge crossing looking south towards the Lehigh River.

Photo: View from the bridge at outfall #6. Image shows sediment accumulated along channel floor

Table 5: BMP Option 1 – Channel Restoration Sediment Reduction

LAND USE CATEGORY [1]	AREA (SF)	ACRES (AC)	STROUD TOOL IMPERVIOUS (%) [1]	IMPERVIOUS AREA (AC)	LOADING RATE (LB/AC) [2]	EXISTING LOAD (LBS)	LOADING RATE (LB/AC) [2]	EXISTING LOAD (LBS)
DEVELOPED, WOODED	193,663.56	4.45	0.00	0.00	241.88	0.00	241.88	0.00
DEVELOPED, OPEN SPACE	42,699.02	0.98	0.19	0.19	241.88	45.05	241.88	0.06
DEVELOPED, LOW INTENSITY	447,710.09	10.28	0.49	5.04	241.88	1218.16	241.88	1.65
DEVELOPED, MEDIUM INTENSITY	363,763.23	8.35	0.79	6.60	241.88	1595.72	241.88	2.16
STREETS/ROADS	294,512.71	6.76	1.00	6.76	241.88	1635.37	241.88	2.21
				TOTAL:		4494.31		6.08
				BMP Effectiveness Value:	(A/B Soils)	70%		45%
				Sediment/Phosphorous Removed:	(lbs/yr)	3146		2.73

With the selection of this BMP, the sediment and Phosphorous reduction requirement would be met.

BMP OPTION 2 – KEYSTONE AVENUE BIORETENTION AND RIDGE STREET PROPERTY

KEYSTONE AVENUE BIORETENTION

Gerald Gross Community Park is located along Iron Street, which is the municipal boundary with Wilson Borough to the west and bordered by Keystone Avenue along the park's eastern edge. The existing street inlets on Keystone Ave convey a drainage area of 5.8 acres of medium to low intensity land uses, and street runoff. The Borough of West Easton could make road improvements to the designated 'no parking' area on Keystone Avenue from 5th Street to 6th Street by installing a bioretention area where sheet flow is directed into a vegetated area through curb cuts. The runoff would be filtered and treated through the planting before entering the storm sewer system. Residents would not lose any on-street parking as none is currently permitted on Keystone Avenue by the community park. The existing curb inlets shall remain and be incorporated into the planting areas to function as overflow controls. The width of the bioretention area could provide additional safety measure for park users as this installation would expand the buffer distance between the existing sidewalk and street traffic.

Mapping: Aerial view showing location of the bump out curb to provide a bioswale along the community park on Keystone Ave.

Photo: Example of street bioswale area. Curb cuts channel runoff to the vegetated areas for filtering out sediment and pollutants.

Table 6: BMP Option 2a – Bioretention areas along Keystone Avenue

LAND USE CATEGORY [1]	AREA (SF)	ACRES (AC)	STROUD TOOL IMPERVIOUS (%) [1]	IMPERVIOUS AREA (AC)	LOADING RATE (LB/AC) [2]	PROPOSED LOAD (LBS)	LOAD RATE (LB/AC) [3]	PROPOSED LOAD (LBS)
DEVELOPED, OPEN SPACE	19,756.85	0.45	0.19	**0.09**	241.88	20.84	0.327	0.00
DEVELOPED, LOW INTENSITY	101,413.19	2.33	0.49	**1.14**	241.88	275.93	0.327	0.03
DEVELOPED, MEDIUM INTENSITY	65,955.79	1.51	0.79	**1.20**	241.88	289.33	0.327	0.37
STREETS/ROADS	66,995.49	1.54	1.00	**1.54**	241.88	372.01	0.327	0.39
				TOTAL:		958.12		1.30
				BMP Effectiveness Value:		80%		85%
				Sediment/Phosphorous Removed:	(lbs/yr)	766.49		1.10

RIDGE STREET RAIN GARDENS

West Easton Borough owns 7.96 acres of property between Palmer Street and Ridge Street, which was previously railroad property. The existing storm sewer system travels south, down Ridge Street to the railroad property where it turns east and passes through the site. The proposed BMP includes uncovering and daylight the stormwater from the piped system on Ridge Street and pass it through a bioswale or a connected system of rain gardens on the municipal owned property, before the runoff gets discharged back into the pipe system towards Palmer Street.

There are two design factors that will impact the feasibility of this BMP:

1) the pipe's depth from Ridge Street entering the property, and
2) the site's future intended use by the Borough for a new maintenance building.

It is anticipated that the site should be able to accommodate both installations of the MS4 water quality BMP and the site design for the maintenance building, which will require supplemental parking and additional stormwater management facilities. The proposed maintenance building is intended to be located above the location of the MS4 BMP, and therefore should not limit the building footprint. The MS4 BMP shall not be used to satisfy any site requirements for Chapter 102, NPDES permitting, however the MS4 BMP can connect to and be in addition to any stormwater management installations required for site development.

Mapping: Aerial view showing location of rain garden area within the Ridge Street property. A bioswale may be suited to accommodate the maintenance building footprint and site layout.

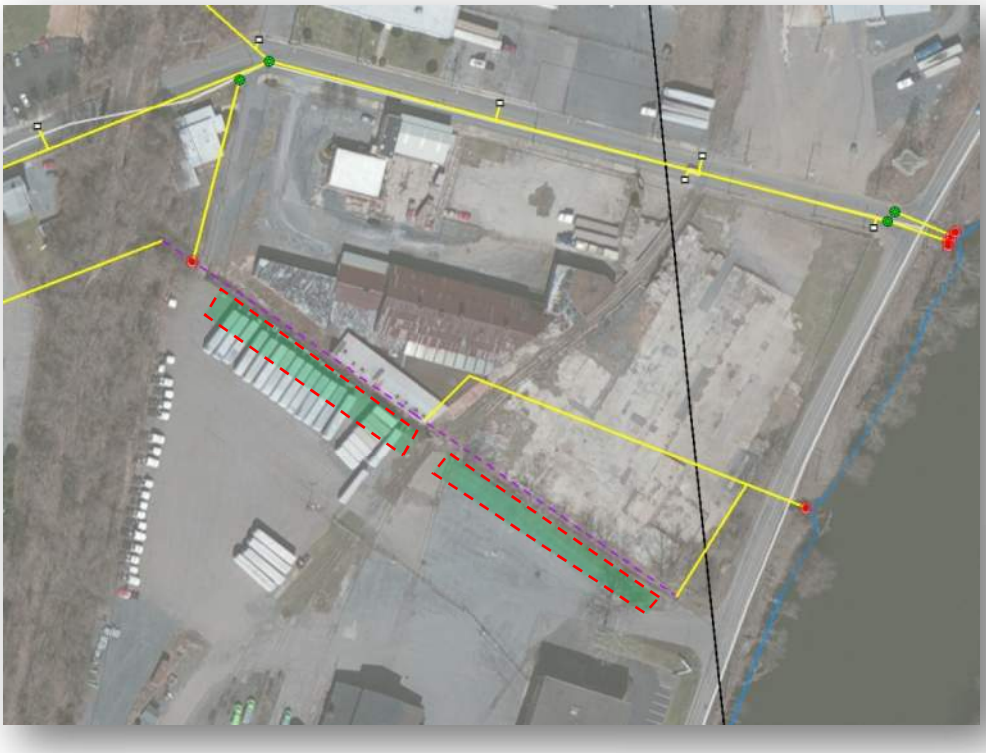
Photo: Example of a linear string of BMPs, including temporary storage.

Table 6: BMP Option 2b – Ridge Street Rain Gardens on Borough Property

LAND USE CATEGORY [1]	AREA (SF)	ACRES (AC)	STROUD TOOL IMPERVIOUS (%) [1]	IMPERVIOUS AREA (AC)	LOADING RATE (LB/AC) [2]	PROPOSED LOAD (LBS)	LOAD RATE (LB/AC) [3]	PROPOSED LOAD (LBS)
DEVELOPED, WOODED	1,449.86	0.03	0.00	0.00	241.88	0.00	0.327	0.00
DEVELOPED, OPEN SPACE	38,078.13	0.87	0.19	0.17	241.88	40.17	0.327	0.05
DEVELOPED, LOW INTENSITY	233,232.61	5.35	0.49	2.62	241.88	634.60	0.327	0.86
DEVELOPED, MEDIUM INTENSITY	128,137.01	2.94	0.79	2.32	241.88	562.10	0.327	0.76
STREETS/ROADS	78,450.91	1.80	1.00	1.80	241.88	435.62	0.327	0.59
				TOTAL:		1672.49		2.26
				BMP Effectiveness Value:		80%		75%
				Sediment/Phosphorous Removed:	(lbs/yr)	1337.99		1.70

BMP OPTION 3 –RIDGE STREET PROPERTY AND INDUSTRIAL PROPERTY

As an alternative to the Keystone Avenue BMP, the Borough also reviewed another location for a BMP in the commercial use property on Main Street and Lehigh Drive. With the high intensity land use along the open channel swale, the Borough reviewed the beneficial impacts of installing a vegetated filter strip along the top of the drainage channel in order to collect and filter run off from the parking lot. The parking lot is used as tractor trailer parking, storage and container storage. The filter strip would remove a section of the macadam asphalt surface, excavate the soil to a recommended minimum depth of 24 inches and install vegetation that would be tolerant of salt and air pollution. As plants can absorb and process many air pollutants, such as sulfur dioxide, soils are capable of being a carbon sink for the plants by absorbing nitrogen oxide and hydrocarbons.



Mapping: Aerial view showing location of the vegetated filter strips above the open channel. Sections of impervious pavement shall be removed for the filter strip installation.

Table 7: BMP Option 3 – Truck Parking Filter Strip

LAND USE CATEGORY [1]	AREA (SF)	ACRES (AC)	STROUD TOOL IMPERVIOUS (%) [1]	IMPERVIOUS AREA (AC)	LOADING RATE (LB/AC) [2]	PROPOSED LOAD (LBS)	LOAD RATE (LB/AC) [3]	PROPOSED LOAD (LBS)
DEVELOPED, WOODED	34,615.17	0.79	0.00	0.00	241.88	0.00	0.327	0.00
DEVELOPED, OPEN SPACE	16,285.85	0.37	0.19	0.07	241.88	17.18	0.327	0.02
DEVELOPED, HIGH INTENSITY	125,924.70	2.89	0.49	2.89	241.88	699.23	0.327	0.95
				TOTAL:		716.42		0.97
				BMP Effectiveness Value:		80%		60%
				Sediment/Phosphorous Removed:	(lbs/yr)	573		0.58

Table 8: BMP Option 4 – Storm Inlet Filter Bags

Depending upon the stormwater BMP installations chosen by the Borough of West Easton, the Engineer reviewed the option of using inlet filter bags. These are bag inserts that get permanently installed in existing street inlets to collect sediment and prevent that debris from entering the storm system. The bags can only be used in drainage areas under 0.5 acres, and need continued maintenance to ensure the filter material does not get clogged.

The Borough may take up to 50% sediment reduction credit by using the filter bags (max 1512 lb/yr reduction). For analysis in this report, the filter bag basis of design used was a 2'x4' PennDOT approved model (62PENNMHDFX) from Filtrexx.

Photo (Left): Image of Filtrexx inlet filter bag

Table 8: BMP Option 4 – Storm Inlet Filter Bags

LAND USE CATEGORY [1]	AREA (SF)	ACRES (AC)	STROUD TOOL IMPERVIOUS (%) [1]	IMPERVIOUS AREA (AC)	LOADING RATE (LB/AC) [2]	PROPOSED LOAD (LBS)
DEVELOPED, OPEN SPACE	147,015	3.38	0.19	0.64	241.88	155.11
DEVELOPED, LOW INTENSITY	235,224	5.40	0.49	2.65	241.88	640.01
DEVELOPED, MEDIUM INTENSITY	147,015	3.38	0.79	2.67	241.88	644.91
ROADS	58,806	1.35	1.00	1.35	241.88	326.54
				TOTAL:		1766.57
26 INLET BAGS				BMP Effectiveness Value:		80%
				Sediment/Phosphorous Removed:	(lbs/yr)	1413.25

Table 9: Summary of Proposed BMPs

LEHIGH RIVER – REQUIRED REDUCTIONS						
SEDIMENT		3,024 lb/yr				
PHOSPHOROUS		2.04 lb/yr				
LEHIGH RIVER – PROPOSED BMP SUMMARY						
BMP	BMP PROPOSED	Proposed Load	BMP Effectiveness Value	Sediment Reduction	BMP Effectiveness Value	Phosphorous Reduction
#1	**Open Channel Improvements**	**4494 lb/yr**	**70%**	**3146 lb/yr**	**45%**	**2.73 lb/yr**
#2a	Keystone Avenue Bioretention	958 lb/yr	80%	766 lb/yr	85%	1.10 lb/yr
#2b	Ridge Street Rain Gardens	1672 lb/yr	80%	1338 lb/yr	75%	1.70 lb/yr
#3	Truck Parking Filter Strip	716 lb/yr	80%	573 lb/yr	65%	0.58 lb/yr
#4	Inlet Filter Bags (27)	1766 lb/yr	80%	1413 lb/yr	-	-

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

F. IDENTIFY FUNDING MECHANISMS

Once the Borough has identified the types of BMPs being proposed, then the municipality shall identify the types of funding needed 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 PAG-13 NPDES permit coverage. DEP will analyze the applicant's proposed method(s) by which these BMPs shall be funded. DEP does not expect that guaranteed sources are identified in the PRP, but does expect that applicants propose their preferred funding options with alternatives in the event the preferred options do not materialize.

In identifying funding sources and potential 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 protection of watershed resources.

West Easton Borough shall use the following five years of the PAG-13 General Permit to determine the best funding source for each proposed BMP project, and to review new opportunities as other partnerships and funding sources become available.

The following tables are a summary of potential funding sources.

Table 10: Summary of Funding Sources for BMP Option 1

Source/ Group	Type
BMP OPTION 1 – Vegetated Open Channel	
DEP – Growing Greener Grant	Conservation & Environmental Projects focused on water quality, requires 15% match
PENNDOT – Stormwater Management Grant	Funding & Planning Source – Stream channel stabilization projects eligible, in addition to mitigating hazards in flood prone areas
PENN VEST – Green Initiatives	Funding Source – encourage innovative green solutions for water quality management, including projects to reduce sediment and nutrient contamination
Fry's Run Watershed Association	Planning & Educational Outreach Source – Work with the watershed association in achieving goals outlined in their comprehensive plan; utilize watershed staff for educational handouts and materials on the project
Private Property Owner and West Easton Borough	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
Borough of West Easton	Budget funds

Table 11: Summary of Funding Sources for BMP Option 2

	Type
BMP OPTION 2 – Keystone Avenue and Ridge Street	
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
PENN VEST – Green Initiatives	Funding Source – encourage innovative green solutions for water quality management, including projects to reduce sediment and nutrient contamination
Chamber Foundation MSLV	Founding Source – Maximum Grant $2000, for the visual improvements to traditional neighborhoods, including landscaping
Northampton County Conservation District Resource Tech Committee	Funding Source & Planning – work with the County's Watershed Specialist to discuss retro fit projects that include improvements to stormwater management, grant amounts typically around $2000 which can be used towards planning and design
Lehigh Valley Mater Watershed Steward Program Volunteers	Labor Source – Volunteers to assist with the installation of plantings
Boy Scouts and Girl Scout Troops	Labor Source – Volunteers to assist with the installation of plantings
Business/Company Sponsorships	Fundraising Source – opportunity for local businesses and organizations to donate towards plantings for the Keystone Avenue planting beds near the Community Park
Borough of West Easton	Budget funds

Table 12: Summary of Funding Sources for BMP Option 3

	Type
BMP OPTION 3 –Ridge Street and Filter Beds in Parking Lot	
PENN VEST – Green Initiatives	Funding Source – encourage innovative green solutions for water quality management, including projects to reduce sediment and nutrient contamination
Chamber Foundation MSLV	Founding Source – Maximum Grant $2000, for the visual improvements to traditional neighborhoods, including landscaping
Northampton County Conservation District Resource Tech Committee	Funding Source & Planning – work with the County's Watershed Specialist to discuss retro fit projects that include improvements to stormwater management, grant amounts typically around $2000 which can be used towards planning and design
Private Property Owner and West Easton Borough	Planning & Maintenance Resource – Preparation of a stormwater management agreement and easement between the property owner and the Borough
Lehigh Valley Mater Watershed Steward Program Volunteers	Labor Source – Volunteers to assist with the installation of plantings
Fry's Run Watershed Association	Planning & Educational Outreach Source – Work with the watershed association in achieving goals outlined in their comprehensive plan; utilize watershed staff for educational handouts and materials on the project
Boy Scouts and Girl Scout Troops	Labor Source – Volunteers to assist with the installation of plantings
Business/Company Sponsorships	Fundraising Source – opportunity for local businesses and organizations to donate towards plantings for the Keystone Avenue planting beds near the Community Park
Borough of West Easton	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, ad 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 purchase/negotiation – Purchase of easements on private property can increase costs or delay construction activities. Access easements are often required across private property during construction.
- 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 the following for each selected BMP:

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

MS4 permittees will need to identify actual O&M activities in Annual MS4 Status Reports submitted under the PAG-13 General Permit.

All stormwater BMPs installed under this PRP are subject to the municipality's stormwater management ordinance. The operation and maintenance activities for each BMP are included in the PRP. If the BMP is located on private land, the landowner must convey an easement to West Easton Borough to allow for access for periodic inspections and maintenance, as needed. Operation and maintenance activities conducted by the Borough on the BMPs shall be listed in its annual report.

Table 13: Responsible Parties for Operation and Maintenance of BMPs

BMP Option	Parties Responsible for O&M	O&M Activities	Frequency of Activities
Vegetated Open Channel	Borough of West Easton, Public Works Dept	Vegetation Inspection Inspect for signs of erosion concerns along the embankments and areas of pooling water that need corrective actions	First 6 months: Twice a month inspections Months 6-18: Once a month After 18 months: Annually and after every major storm event with rainfall greater than 1”
Vegetated Open Channel	Borough of West Easton Public Works Dept and/or Borough Engineer	Illicit Discharge Inspections	Annually
Vegetated Open Channel	Borough of West Easton, Public Works Dept	Sediment Removal from Channel	5 Years or As Needed – when greater than 3” depth
Vegetated Open Channel	Property Owner	Adjacent Parking Lot Inspections & Maintenance	Quarterly: owner to inspect parking lot along stream channel; repair areas of gravel displacement washing into the channel; inspect storage areas along the channel for signs of leaking containers or contaminated runoff from storage areas Annually: Provide West Easton Borough with copy of completed inspection sheets conducted during the year to include in annual report to DEP
BMP Option	Parties Responsible for O&M	O&M Activities	Frequency of Activities
Rain Garden (Ridge St)	West Easton Borough	Visually inspect the area for signs of erosion; Clear accumulation of debris at pipe openings and discharge points	As Needed following construction

Rain Garden (Ridge St)	West Easton Borough	Initial watering program to get plantings established	As Needed following construction
		Prune and weed swale to maintain appearance; Remove trash and debris	Monthly – when school is in session
Rain Garden (Ridge St)	Fry's Run Watershed Association	Organize educational event/ demonstration event on how the rain gardens work	Goal is to have this be a planned event coordinated with West Easton Borough every other year to target different audience groups Minimum: 1 event during the permit cycle
Bioswale Area (Keystone Ave)	West Easton Borough	Visually inspect the area for signs of erosion; Clear accumulation of debris around inlet areas	As Needed following construction
Bioswale Area (Keystone Ave)	West Easton Borough & Safety First Volunteer Fire Dept of West Easton (located on Keystone Ave)	Initial watering program to get plantings established	First 18 months – supplemental watering schedule After 18 months – As Needed
Bioswale Area (Keystone Ave)	West Easton Borough & DUI Center Community Service program	Prune and weed swale to maintain appearance; Remove trash and debris	Monthly
Bioswale Area (Keystone Ave)	Borough of West Easton Public Works Dept and/or Borough Engineer	Illicit Discharge Inspections	Annually
Bioswale Area (Keystone Ave)	Wilson Area Intermediate School	Organize educational event/ demonstration event on how the bioswale works	Goal is to have this be a planned event coordinated with West Easton Borough every other year to target different audience groups Minimum: 1 event during the permit cycle

BMP Option	Parties Responsible for O&M	O&M Activities	Frequency of Activities

Vegetated Filter Strip	Borough of West Easton, Public Works Dept	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 West Easton Public Works Dept and/or Borough Engineer	Illicit Discharge Inspections	Annually
Vegetated Filter Strip	Property Owner	Adjacent Parking Lot Inspections & Maintenance	Quarterly: owner to inspect parking lot repair areas of gravel displacement washing into vegetation; inspect storage areas along the strip for signs of leaking trailers, containers or runoff; contain, clean up, and remove contaminated areas Annually: Provide West Easton Borough with copy of completed inspection sheets conducted during the year to include in annual report to DEP
		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

H. GENERAL INFORMATION

Volunteer Community Garden Clubs Sponsoring the Maintenance of a Stormwater BMP

In West Easton Borough, the location of the Keystone Street Bioswale, Main Street Improvements, and the Ridge Street Rain Gardens are within residential developments. Their locations provide an opportunity to work with homeowners to assist in maintaining these best management practices in their neighborhood. The proposed stormwater BMPs improvements can be used as demonstration areas, where desirable plants and designs can be viewed. Since poorly maintained planting areas can discourage residents from replicating this plan in their own neighborhoods, the community garden clubs would provide the occasional yet necessary maintenance to have the planting beds look their best. The most typical maintenance task would be weeding, and the Borough of West Easton can provide annual training sessions to the garden clubs through the Fry's Run Watershed Association and/or the 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 Facebook posts about the on-going work of the volunteers. Educational hand outs and materials can be made available for 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.

It is encouraged to have the West Easton Borough work with the local Wastershed Steward, and garden club to develop an Operations and Procedural Guideline Manual. The manual shall provide guidelines for construction of the planting beds, list of encouraged native plantings, non-approved plantings, typical maintenance tasks, frequency of the work and safety information. The manual is to be used by the garden clubs as a resource throughout the Borough.

Photo: Example of interactive educational signage using QR codes

Stormwater Fee

The Borough has informally discussed the actions taken by other Pennsylvania municipalities to implement a fee to provide a long term sustainable funding source to cover the increasing maintenance and programming tasks required by its NPDES MS4 permit. The fee would be based on the area of impervious surface associated with each tax parcel. Properties that are exempt from school tax or properties taxes would not be exempt from the stormwater fee. The property owners could be eligible for credits to offset the fee by installing on-site BMPs that would reduce the rate and volume of stormwater runoff from their property.

The Borough has not moved forward on this topic as more information is needed, especially when addressing rental properties and how the installations would be maintained properly. Additional information is needed on how other municipalities have implemented the ordinance,

how fees are managed and if the region would be establishing a joint municipal partnership to manage the entire watershed area and share resources.

PRP Implementation and Final Report

Under the PAG-13 General 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 means the Borough of West Easton is required to submit a summary report by September 30, 2023 to DEP. This summary will review the work completed by the municipality between the years 2018 and 2023, and how the required pollution load reduction was satisfied. Report submission dates shall be verified once the municipality receives its approved coverage dates, which is listed on the PAG-13 NPDES permit.

West Easton Borough shall submit the PRP in accordance with the above requirements.