



Doylestown Township Total Maximum Daily Load Plan (TMDL Plan) and Pollutant Reduction Plan (PRP)

Doylestown Township
425 Wells Road
Doylestown, PA 18901

NPDES Permit No. PAG130007

GHD | 1240 N Mountain Road Harrisburg PA 17112

11144171 | 01 | Report No 1 | September 2017 | Revised April 2019



Table of Contents

Introduction.....	1
A. Public Participation.....	1
B. Map.....	1
C. Pollutants of Concern.....	1
D. Determination of Existing Loading for Pollutants of Concern.....	2
E. Selection of BMPs to Achieve the Minimum Required Reductions in Pollutant Loading.....	4
F. Funding Mechanism.....	11
G. Operation and Maintenance (O&M) of BMPs.....	11

Table Index

Table D.1	Base Existing Sediment Load Calculations
Table D.2	Existing BMP Pollutant Reduction Credits
Table D.3	Adjusted Sediment Loads and Minimum Required Reductions in Pollutant Loading
Table E.1	Sediment Reduction Provided by Selected BMPs
Table G.1	BMP O&M Requirements

Attachment Index

Attachment A-1	Public Notice and Proof of Publication (to be inserted)
Attachment A-2	Public Comments and Township Response (to be inserted)
Attachment B-1	Storm Sewer Outfall Map
Attachment D-1	Load Calculation Summaries
Attachment D-2	Detailed Output from Wiki Watershed Model
Attachment D-3	Structural BMPs to be Utilized to Reduce Existing Loading
Attachment E-1	Photographs – Selected BMPs



Introduction

Doylestown Township (Township) has a population of 17,565 people as reported in the 2010 Census and is located in Bucks County, Pennsylvania.

Discharges from the Township's small municipal separate storm sewer system (MS4) are currently regulated under NPDES Permit No. PAG130007.

Surfaces within the Township's Urbanized Area (UA) drain to four (4) surface watersheds, as defined by the HUC-12 watershed classification system: Neshaminy Creek, Pine Run, Cooks Run, and Mill Creek. Pine Run, Cook Run and Mill Creek all drain into the Neshaminy Creek. All four watersheds are listed on DEP's MS4 Requirements Tables as being impaired for nutrients, and therefore have Appendix E load reduction requirements. The Township's Planning Area consists of the delineated storm sewersheds of outfalls discharging to the streams.

The Neshaminy Creek has an EPA-approved Total Maximum Daily Load (TMDL). Of the four watersheds within Doylestown Township, only the Pine Run and Mill Creek watersheds have identified Waste Load Allocations (WLAs) for sediment.

As a condition of the continuation to discharge under this permit, the Township must develop a Total Maximum Daily Load Plan (TMDL Plan) and Pollutant Reduction Plan (PRP) to address reduction of their existing sediment, Total Phosphorus (TP), Total Nitrogen (TN) to local surface waters that are impaired for sediment and/or nutrients. This combined report will satisfy both requirements for both the Township's TMDL and PRP.

A. Public Participation

A copy of this combined report was available for review at the Doylestown Township municipal office. A public notice advertising the availability of the plan was published in the Intelligencer newspaper. A copy of the public notice and proof of publication was included as Attachment A-1 to this plan. Comments on the PRP were also accepted at the April 2019 Township Supervisors meeting. Attachment A-2 will include all comments received from the public during the public comment period. The Township's response to the comment will immediately follow each comment. The Township's response will note changes to the combined plan because of the comments, if applicable.

B. Map

All of the required mapping information can be found on the Storm Sewer Outfall Map, and Pollution Reduction & TMDL Plans Parsed Area Map, which are shown on Attachment B-1.

C. Pollutants of Concern

The four watersheds located within Doylestown Township are identified as being impaired for nutrients. The Pollutant Reduction Plan (PRP) requirements listed in Appendix E of the NPDES PAG-13 Authorization



instructions list the pollutants of concern for discharges to watersheds impaired by nutrients as being total nitrogen (TN) and total phosphorus (TP). However, for this permit cycle, Doylestown Township is going to take a presumptive approach. For the four (4) impaired watersheds, the pollutant of concern will be sediment. In accordance with DEP's PRP guidance, it will be presumed that if a 10% reduction of sediment can be met, then the required reductions in nitrogen and phosphorus will also be met.

As described in the Introduction, Neshaminy Creek has an EPA-approved TMDL. However, only Pine Run and Mill Creek have WLAs for sediment. The long-term TMDL requirements for sediment reduction for Pine Run is 52.5% for Doylestown Township. The long-term TMDL requirements for Mill Creek is a 28.4% reduction in sediment. The short-term goal for sediment reduction in these two watersheds is 10%. The Township intends to develop the required network of funding, planning, and construction professionals to meet the 10% sediment reduction goal, at a minimum, over the upcoming 5-year construction cycle. Any sediment reduction that is achieved beyond 10%, in this permit term, will be credited towards the TMDL long-term reduction requirements. By developing multiple projects during this first permit cycle, the Township will be well equipped to efficiently implement additional projects in subsequent permit cycles. Doylestown Township will strive to work efficiently with DEP and EPA regulators to develop a realistic timeline for meeting the long-term reduction goals for the Pine Run and Mill Creek watersheds. Funding opportunities at the state and local level will help the Township to expedite meeting these long-term requirements.

D. Determination of Existing Loading for Pollutants of Concern

The existing pollutant loads for Doylestown Township were developed by using modeling at the local watershed scale. The land uses that make up each drainage area/sewershed to each regulated outfall were determined by utilizing the Stroud Water Research Center Wiki Watershed Tool. The sediment loading for each land use identified in the Wiki Watershed model was developed by using the literature loading rates identified in the Neshaminy Creek TMDL report. These loading rates were then calibrated for Doylestown Township based on the percentage of pervious and impervious cover in the Township provided by the National Land Cover Database 2011.

Each storm sewershed's sediment loads were then added together to provide the combined total sediment loads for each watershed. Table D.1 below presents the base existing sediment load calculations, not including existing BMP credits. A more thorough of each watershed's load calculation can be found in Attachment D-1. Detailed output from the Wiki Watershed models can be found in Attachment D-2.



Table D.1: Base Existing Sediment Load Calculations

Watershed	TMDL WLA?	MS4 Planning Area Total Acres	Wiki Watershed Load Calculations for TSS (lbs)
Neshaminy Creek	N	3,454	1,597,562
Pine Run	Y	996	449,292
Cooks Run	N	596	443,868
Mill Creek	Y	199	66,452
Entire Planning Area		5,245	2,557,174

Pollutant reduction credits for the PRP baseline sediment load were taken for only BMPs installed after March 10, 2003. Attachment D-3 lists the existing BMPs that the Township has elected to utilize to reduce the existing pollutant load. The BMP ID number listed in the worksheet corresponds to the location of each BMP as depicted on Attachment B-3. The Operation and Maintenance (O&M) of all BMPs installed since March 10, 2003 has been incorporated into the Township's BMP Inventory under MCM #5 of the Township's Stormwater Management Program under their existing NPDES permit. As such, the Township has assessed the O&M of these BMPs in accordance with the Township's BMP Inspection Program and noted the completion of the required O&M activities for each BMP in the Township's annual reports.

To determine the amount of sediment reduction that is credited to each BMP, individual drainage areas were calculated using GIS data and information provided by the Township Engineer. The drainage areas were then multiplied by the sediment loading ratios (i.e. lbs/acre) that were calculated in the calibrated base sediment load Wiki Watersheds models. This resulted in the sediment, in lbs, that is delivered to each BMP. A sediment reduction effectiveness value was then calculated for each BMP using the hydrologic soil group classification and DEP's BMP Effectiveness Values document. The calculated sediment that is delivered to each BMP was then multiplied by the BMP sediment reduction effectiveness value to produce the pounds of sediment that are removed by each BMP.

Table D.2 summarizes the existing BMP credits that were calculated for each watershed. Attachment D-3 includes the calculated credits for each individual BMP.



Table D.2: Existing BMP Pollutant Reduction Credits

Watershed	Existing BMP Sediment Reduction Credits (lbs)
Neshaminy Creek	57,842
Pine Run	25,020
Cooks Run	47,233
Mill Creek	183

To calculate the minimum load reduction that is required, the base existing sediment load calculated in the Wiki Watershed model (Table D.1) was decreased by the existing BMP pollutant reduction credits (Table D.2) for each watershed. The adjusted sediment load was then multiplied by 10% to yield the required minimum reduction in pollutant loading. Table D.3 below presents these calculations for all the Township's watersheds.

Table D.3: Adjusted Sediment Loads and Minimum Required Reductions in Pollutant Loading

Watershed	Base Existing Sediment (TSS) Load from Calibrated BayFast Model (lbs)	Existing BMP Sediment Reduction Credits (lbs)	Adjusted Sediment (TSS) Load (lbs)	Minimum Required Sediment Reduction (lbs)
Neshaminy Creek	1,597,562	57,842	1,539,720	153,972
Pine Run	449,292	25,020	424,272	42,427
Cooks Run	443,868	47,233	396,635	39,664
Mill Creek	66,452	183	66,269	6,627
Entire Planning Area	2,557,174	130,278	2,426,896	242,690

E. Selection of BMPs to Achieve the Minimum Required Reductions in Pollutant Loading

BMPs have been selected to achieve the minimum required reductions in sediment loading that are shown in Table D.3. The 10% sediment reduction required for each watershed will be met by installing stream restoration projects and two (2) retrofitting projects that will convert dry detention basins into dry extended detention basins.



E.1 Neshaminy Creek Watershed

The Neshaminy Creek watershed has a minimum sediment reduction requirement of 153,972 pounds. This reduction will be met by developing one project. BMP-A is the UNT Neshaminy Creek Stream Restoration project.

E.1.1 BMP-A: UNT Neshaminy Creek Stream Restoration

An unnamed tributary of the Neshaminy Creek is located to the north of the Doylestown Township administration building on Wells Road. Of the 3300 feet of channel that was examined, it was determined that approximately 2000 feet would qualify for a stream restoration project.

E.1.1.1 Qualifying criteria-Siting

- Total qualifying stream length of approximately 2,000 feet
- Bank erosion/Channel migration, as seen in Appendix A Photos
- Mid channel gravel bar development (indicates active channel widening)
- Lack of woody riparian zone

E.1.1.2 BMP Summary

The majority of the proposed reach is located on Doylestown Township property, which will facilitate survey, detailed site investigations and construction access. In general, the restoration would maintain the existing channel plan form. Stabilization design should utilize natural channel design principles to restore proper channel size and shape. Some minor profile adjustments may be required at some locations to enhance floodplain connectivity. This can be accomplished with rock or log grade control structures. Restoration activities to reduce sediment loading would include the following:

- Bank grading
- Channel shaping
- Rock or log toe armoring at bottom of eroding stream banks and vegetating the upper stream banks
- Removal of shallow rooted invasive vegetation within riparian zone
- Grade control and minor channel uplift where needed to provide floodplain connectivity
- Protection of existing undermined large woody root mats
- Possible expansion of existing wetlands or creation of new wetlands/vernal pools
- Planting of 35' permanent riparian zone along both stream banks using live stakes and potted trees

E.1.1.3 Sediment Reduction Credit

In accordance with DEP's PRP Instructions and the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects, the 2,000 linear feet of stream restoration will provide 230,000 pounds of sediment reduction per year.



E.2 Pine Run Watershed

The Pine Run watershed has a minimum sediment reduction requirement of 42,427 pounds. Two BMPs are proposed to provide this reduction. BMP-B will be the Ridings at Covered Bridge BMP Retrofits and BMP-C will be the Swamp Road Stream Restoration project.

E.2.1 BMP-B: Ridings at Covered Bridge BMP Retrofits

The Ridings at Covered Bridge neighborhood was developed in 1992. As part of the project, three (3) basins were installed. One of the basins functions very well and has established vegetation and hydrology supporting a robust wetland. The other two basins function as dry detention basins and do not provide any meaningful stormwater runoff management other than decreasing the discharge rates. As visible in the photos found in Attachment E-1, both dry detention basins have outlet pipes positioned at the bottom of the basins. One basin has a concrete channel that quickly conveys water through the basin and out the discharge pipe before any treatment can be applied to the runoff. For this series of BMPs, the Township proposes to reconfigure the outlet structures to promote infiltration of the stormwater within the basins and increase the detention time of the stormwater in the BMP. Increasing the detention time will, as described in the BMP Effectiveness Values Table (3800-PM-BCW0100m), theoretically improve the treatment effectiveness. The current 10% BMP Effectiveness Value for the dry detention basins will be increased to 60% for the basins after they are retrofitted to be dry extended detention basins.

The two BMPs treat a combined 80 acres of drainage area. The annual sediment loading to these BMPs, 38,663 lbs, was calculated based on the average loading per acre determined in the Wiki Watershed model. Increasing the BMP effectiveness value by 50% will result in 19,331 lbs of additional sediment removal capacity. The stormwater management for the Ridings at Covered Bridge will be evaluated as a whole during the design phase of this project. Other possible improvements to the system could include removing the concrete channel from one basin, grading level spreaders to help existing flat areas act as filter strips, and/or modifying the underlying soils to provide additional filtering capacity.

E.2.2 BMP-C: Swamp Road Stream Restoration

This reach is located on Pine Run immediately downstream of the Swamp Road bridge. The stream is fairly large with a drainage area of approximately 7 square miles. Several hundred feet of the channel was examined. There is a riparian buffer along both banks which consists of mature trees however the understory is dominated with shallow rooted multiflora rose. The entire reach is impaired with eroding stream banks and undermined trees with exposed tree roots as shown on the photos included in Appendix B. Over time the large trees will continue to fall across the channel. The channel appears to be entrenched with limited access to a bankfull floodplain.

E.2.2.1 Qualifying criteria-Siting

- Total qualifying stream length of over 2000 feet between Swamp Road and Old Dublin Pike
- Bank erosion/Channel migration (Appendix E.2 Photos)
- Entrenched channel and limited access to floodplain.
- Lack of woody riparian zone immediately adjacent to the stream



E.2.2.2 BMP Summary

The existing channel plan form could be maintained. The degree of channel entrenchment would need to be determined. There appears to be an opportunity to improved floodplain connectivity by raising the channel invert with instream rock grade control structures and or floodplain grading. Stabilization design should utilize natural channel design principles to restore proper channel size and shape. Background data suggests a bankfull width of 35 feet and an average bankfull depth of 1.7 feet. Restoration activities to reduce sediment loading would include the following:

- Bank grading
- Channel shaping
- Rock or log toe armoring at bottom of eroding stream banks and vegetating the upper stream banks
- Removal of shallow rooted invasive vegetation within riparian zone
- Grade control and minor channel uplift where needed to provide floodplain connectivity
- Protection of existing undermined large woody root mats
- Planting of 35' permanent riparian zone along both stream banks using live stakes and potted trees

E.2.2.3 Sediment Reduction Credit

To meet the sediment removal requirements in this watershed, only 250 linear feet of stream restoration would need to be performed. This length of stream restoration would result in 28,750 pounds of sediment reduction per year. The remain reach of the stream that is available for stream restoration will be held in reserve as a potential “spare tire” if there becomes a need for additional credits.

E.3 Cooks Run Watershed

The Cooks Run watershed has a minimum sediment reduction requirement of 39,664 pounds. Three projects are proposed to provide this reduction. BMP-D will be the Cottonwood Court BMP Retrofit project and BMP-E is the Cooks Run at North Broad Street Stream Restoration project. BMP-F is a “spare tire” that will only be used if needed. BMP-F is identified as the Cooks Run at Limekiln Road Stream Restoration project.

E.3.1 BMP-D: Cottonwood Court BMP Retrofit

Similar to the Ridings at Covered Bridge BMP Retrofit described in Section E.2.1. of this report, the proposed Cottonwood Court BMP Retrofit will upgrade a large dry detention basin into a dry extended detention basin. By upgrading the basin’s outlet structure, grading level spreaders to better distribute high frequency storms across the basin, and adding plantings, the upgraded basin will be more efficient at removing sediment than it currently is. As can be seen in Attachment E-1, a concrete channel directs stormwater runoff straight through the existing dry detention basin and through the outlet structure. The basin functions only to manage the stormwater runoff rate for larger storms and provides minimal water quality enhancement.

The BMP treats 50 acres of drainage area. The annual sediment loading to this BMP is 35,296 lbs. Increasing the BMP effectiveness value by 50% will result in 17,648 lbs of additional sediment removal capacity.

E.3.2 BMP-E: Cooks Run at North Broad Street Stream Restoration

This reach of Cooks Run begins at the North Broad Street crossing and extends several hundred feet downstream. The drainage area to this reach is approximately one square mile. Several hundred feet of the



channel was examined. The stream appears to be slightly entrenched but may have limited connection to the adjacent floodplain. Stream bank erosion and some channel migration was noted throughout (See photos 1, 2, 3 & 4 in Appendix E.3). There is a limited riparian buffer along both banks which consists of scattered mature trees however, the majority of the riparian zone is mowed to the top of the stream banks. Many of the large trees are undermined and will likely fall across the channel over time.

E.3.2.1 Qualifying criteria-Siting

- Total qualifying stream length of over 500 feet downstream of North Broad Street
- Bank erosion/Channel migration (Appendix E.3 Photos 1, 2, 3 & 4)
- Slightly entrenched channel and limited access to floodplain
- Sparsely vegetated riparian zone and regular mowing immediately adjacent to the stream

E.3.2.2 BMP Summary

The property along the stream is privately owned and construction access is good. The existing channel plan form could be maintained. The degree of channel entrenchment would need to be determined. There appears to be an opportunity to improve floodplain connectivity by raising the channel invert with instream rock grade control structures and or floodplain grading. Stabilization design should utilize natural channel design principles to restore proper channel size and shape. Background data suggests a bankfull width of 15 feet and an average bankfull depth of 0.9 feet. Restoration activities to reduce sediment loading would include the following:

- Bank grading
- Channel shaping
- Rock or log toe armoring at bottom of eroding stream banks and vegetating the upper stream banks
- Protection of existing exposed tree roots with large rocks and covering of tree roots with soil and adding vegetation (live stakes)
- Grade control and minor channel uplift where needed to provide floodplain connectivity
- Planting of 35' permanent riparian zone along both stream banks using live stakes and potted trees. Persuade property owner to limit mowing near stream.

E.3.2.3 Sediment Reduction Credit

In accordance with DEP's PRP Instructions and the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects, the 500 linear feet of stream restoration will provide 57,500 pounds of sediment reduction per year.

E.3.1 BMP-F: Cooks Run at Limekiln Road Stream Restoration (Spare Tire)

This reach of Cooks Run is located upstream of the Limekiln Road bridge and extends several hundred feet upstream. The drainage area to this reach is approximately 1.1 square mile. The upper end of the reach flows through a forested area however, there is very little riparian vegetation on the stream banks which are near vertical and eroding. Cooks Run makes an abrupt turn to the northwest where it flows parallel to Limekiln Road for 180 feet before passing under the bridge. The stream banks continue sparsely vegetated and are eroding (See photos 5, 6, 7 & 8 in Appendix E.3). The north stream bank is on commercial property which is mowed to the top of the stream bank. There is evidence that this area does get inundated during higher flow events (flood debris drift line).



E.3.1.1 Qualifying criteria-Siting

- Total qualifying stream length of over 500 feet upstream of Limekiln Road
- Bank erosion/Channel migration (Appendix E.3 Photos 5, 6, 7, & 8)
- Slightly entrenched channel and limited access to floodplain.
- Sparsely vegetated riparian zone and regular mowing along the north stream bank

E.3.1.2 BMP Summary

The property along the stream is privately owned and construction access is good. The lower end of the reach lies within the Limekiln Road Right of Way (ROW) which makes construction difficult with limited opportunity for riparian plantings. The existing channel plan form could be maintained. The degree of channel entrenchment would need to be determined. The north bank and floodplain area are open and there may be an opportunity to excavate the floodplain area to increase the frequency of floodplain storage. Stabilization design should utilize natural channel design principles to restore proper channel size and shape. Background data suggests a bankfull width of 15 feet and an average bankfull depth of 0.9 feet. Restoration activities to reduce sediment loading would include the following:

- Bank grading and floodplain excavation on the north side
- Channel shaping
- Rock or log toe armoring at bottom of eroding stream banks and vegetating the upper stream banks
- Protection of existing exposed tree roots with large rocks and covering of tree roots with soil and adding vegetation (live stakes)
- Planting of 35' permanent riparian zone along both stream banks using live stakes except along Limekiln Road. Persuade property owner to limit mowing near stream.

E.3.1.3 Sediment Reduction Credit

The 500 linear feet of potential stream restoration that is available within the "spare tire" project, could provide up to 57,500 pounds of sediment reduction per year.

E.4 Mill Creek Watershed

The Mill Creek watershed has a minimum sediment reduction requirement of 6,627 pounds. Only one stream restoration project is needed to provide this reduction, but there are two available projects. BMP-G will be the Old New Road Stream Restoration project. BMP-H should be considered a "spare tire" project and is identified as the Lower State Road Stream Restoration project.

E.4.1 BMP-G: Old New Road Stream Restoration

A section of an unnamed tributary to Mill Creek has been identified as impaired and a source of sediment loading. This reach begins at the Old New bridge and extends 60 feet downstream to the confluence with another unnamed tributary to Mill Creek. The project would extend another 40 feet beyond the confluence. As shown on Photos 1 and 2 in Appendix E.4, the stream banks are eroding and the concrete splash apron downstream of the road culvert is undermined. Over time this apron could collapse and cause additional bank erosion and channel scour. Stream bank vegetation is also limited.



E.4.1.1 Qualifying criteria-Siting

- Total qualifying stream length of 100 feet downstream of Old New Road culvert crossing
- Bank erosion (Appendix E.4 Photos 1 & 2)
- Slightly entrenched channel and limited access to floodplain
- Sparsely vegetated riparian zone

E.4.1.2 BMP Summary

The eroding stream banks can be graded and the toe of these banks armored with rock. Rock should also be worked under the splash apron to protect from future scour. The channel could be raised slightly with in-stream rock grade control to eliminate the hydraulic drop and prevent channel bed scour. This BMP could also provide the added benefit of providing aquatic organism passage through the culvert. The existing pool could be maintained which would dissipate energy during higher storm flows. Restoration activities to reduce sediment loading would include the following:

- Bank grading and revegetating with live stakes
- Channel shaping
- Rock armoring at bottom of eroding stream banks and under concrete splash apron
- Planting of 35' permanent riparian zone along both stream banks using live stakes

E.4.1.3 Sediment Reduction Credit

In accordance with DEP's PRP Instructions and the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects, the 100 linear feet of stream restoration will provide 11,500 pounds of sediment reduction per year.

E.4.1 BMP-H: Lower State Road Stream Restoration

A section of another unnamed tributary to Mill Creek has been identified as impaired and a source of sediment loading. This reach begins at the Lower State Road bridge crossing, as shown on the map found as Attachment B, and extends 100 feet downstream to the confluence with Mill Creek. As shown on Appendix E.4, Photo 3, there is a large mid-channel gravel which has formed downstream of the bridge and has caused stream bank erosion as the channel widened. Photo 4 shows the widened channel and exposed tree roots. Stream bank vegetation is also limited.

E.4.1.1 Qualifying criteria-Siting

- Total qualifying stream length of 100 feet downstream of Lower State Road bridge crossing
- Bank erosion (Appendix E.4 Photos 3 & 4)
- Slightly entrenched channel and limited access to floodplain
- Sparsely vegetated riparian zone

E.4.1.2 BMP Summary

The channel should be restored to the proper size and shape by removing the mid channel gravel bar. The drainage area to this reach is 2.14 square miles. Regional regression curves suggest a bankfull width of 20' and an average bankfull depth of 1.2'. Then left descending stream bank should be built out to the proper width. Rock armoring should be added to the toe of the bank. The left stream bank will need to be backfilled to create the restored stream bank, vegetated and planted with live stakes. All exposed tree roots should be covered and stabilized with vegetation. Restoration activities to reduce sediment loading would include the following:



- Removal of the mid-channel gravel bar and minor grading to restore proper channel size and shape
- Add soil cover to all exposed tree roots and revegetate
- Rock armoring at bottom of eroding stream
- Planting of 35' permanent riparian zone along both stream banks using live stakes

E.4.1.3 Sediment Reduction Credit

In accordance with DEP’s PRP Instructions and the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects, the 100 linear feet of stream restoration will provide 11,500 pounds of sediment reduction per year.

E.5 Summary

Table E.5.a below summarized the selected BMPs to achieve the minimum required sediment load reductions.

Table E.5.a: Sediment Reduction Provided by Selected BMPs

Watershed	Minimum Required Sediment Reduction (lbs)	Sediment Reduction Provided (lbs)	SPARE TIRE PROJECTS Additional Sediment Reduction Available (lbs)
Neshaminy Creek	153,972	230,000	
Pine Run	42,427	48,081	200,000+
Cooks Run	39,664	75,148	50,000+
Mill Creek	6,627	11,500	10,000+
Entire Planning Area	242,690	364,729	

F. Funding Mechanism

The Township will utilize money from the Township’s General Fund to finance the BMPs proposed as part of this combined PRP/TMDL plan. The Township will consider and evaluate the feasibility of any grants during the TMDL/PRP implementation period, should any become available.

G. Operation and Maintenance (O&M) of BMPs

As discussed in Section E., the Township is proposing three (3) stream restoration projects and two (2) retrofitting projects that will convert dry detention basins into dry extended detention basins. Doylestown Township will be responsible for completing all ongoing Operation and Maintenance (O&M) for the BMPs listed in Section E. For all BMPs proposed in this TMDL/PRP, a site-specific O&M plan should be prepared by the



designer prior to putting the specific BMP into operation. Recommended O&M activities and frequencies for the stream restoration BMPs are as follows:

Table G.1: Stream Restoration O&M Requirements

Frequency (minimum)	Activity
Annually and after any rain event with localized flooding	<p>Stream restoration O&M activities are design-specific and vary greatly depending upon protocol or methodology used. Possible activities include:</p> <ul style="list-style-type: none"> • Regular inspection and watering of vegetation until vegetation is established • Annual inspection of stream bank • Annual photographs to monitor stream migration

Table G.2: Dry Extended Detention Basin O&M Requirements

Frequency (minimum)	Activity
Annually and within 48 hours of >1" storm	Inspect/correct erosion, damaged vegetation; remove debris covering vegetation or >3" in depth
	Inspect side slopes for erosion and formation of rills/gullies; correct if needed
	Inspect for pools of standing water; dewater and discharge to approved location, restore design grade
	Inspect for uniformity in cross-section and longitudinal slope; correct if needed
	Inspect swale inlet and outlet for signs of erosion or blockage; correct if needed
	Inspect for litter; remove prior to mowing
	Mow and trim vegetation when swale is dry; mow/trim to a height to allow proper swale operation
As needed	Plant alternative grass species in event of unsuccessful establishment
	Reseed bare areas; install erosion control if needed
	Rototill and replant swale if draw down time > 48 hours



	Inspect and correct check dams if signs of altered water flow are identified
Frequency (minimum)	Activity
During winter de-icing activities	Use nontoxic, organic de-icing agents, applied either as blended, magnesium chloride-based liquid products or pretreated salt if roadside or parking lot runoff is directed toward swale
Spring	Remove residuals from de-icing; replace damaged vegetation if needed
	Mulch and/or aerate soil to restore soil structure and moisture capacity

DRAFT

Attachments

Attachment A-1

Public Notice and Proof of Publication

PUBLIC NOTICE AND PROOF OF PUBLICATION TO BE INSERTED

Attachment A-2

Public Comments and Township Response

**Doylestown Township
Total Maximum Daily Load / Pollution Reduction Plan
Public Involvement and Participation Process**

July 26, 2017 – The notice of the public comment period for the Doylestown Township Total Maximum Daily Load Plan (TMDL) and Pollution Reduction Plan (PRP) was published in The Intelligencer.

July 26, 2017 – August 25, 2017 - Doylestown Township Total Maximum Daily Load Plan and Pollution Reduction Plan public comment period. A copy of the draft Plan was available for review Monday thru Friday, 8:30 a.m. – 4:30 p.m. at the Township Office and 24/7 on the Township website.

No written comments were received during the public comment period.

August 15, 2017 – The Doylestown Township Total Maximum Daily Load Plan and Pollution Reduction Plan was an agenda item at the regularly scheduled Board of Supervisors Meeting and was explained to the public by the Township Engineer. One (1) public comment was received during the meeting. The applicable pages (12 and 13) from the of the Meeting Minutes are included in this Attachment. Also included is the one (1) public comment and the Township's reponse.

committees on a job well done. A presentation was submitted to the Pension Committee and is scheduled for Board review during a Budget Work Session with recommendations.

VII. UNFINISHED BUSINESS

A. Stormwater Plan Update

Mr. Canales reported: for the 2017 MS4 renewal permit process, the township is required to prepare a total maximum load and pollution reduction plan. The plan was prepared in conjunction with Pennoni & Associates by GHD Engineering Consulting firm. Another requirement is to present the draft plan for public review and comments. The Stormwater plan was advertised in the Intelligencer newspaper on July 26, 2017 and provides a thirty (30) day comment period until August 25, 2017.

GHD Engineer; Patrick Boggs reported; four watersheds along the township is noted as polluted or impaired by the Department of Environmental Protection (DEP). They are identified as Neshaminy Creek, Pine Run, Cook Run and Mill Creek. Along with Mr. Canales, Mr. Boggs determined the amount of pollutants developed along the watersheds. A capital improvement plans was then designed to determine pollutant reduction at ten percent (10%). Mr. Boggs recommends completing five specialization and extreme restoration projects to conduct as many projects in house without having to send out to bid.

The five projects are outlined as the Neshaminy Creek with a section of approximately 700 to 800 linear feet recommended to be restored. Riding at Covered Bridge development has existing basins, where a Best Management Practice (BMP) retrofit project is recommended. Currently, there is a concrete channel and water flows through the basin. The idea is to remove the channel and conduct minor grading. The Pine Run Road stream restoration, where a stream runs along the road causes recurring issues. For maintenance, it's recommended to fold the stream in. For the Cotton Wood Court project, another BMP retrofit is recommended. A basin was installed in the 1980s or 90s and the township will be able to make repairs. For Old New Road Stream restoration, there is a pipe that discharges water and it's eroding away the channel. It's proposed to also fold the stream in.

Mr. Garton questioned; all issue noted are mostly silt. Mr. Boggs agreed. He continued; part of the MS4 program, the outfalls should be monitored for fecal matter. There are three main pollutants as silt or sediment, total suspended solids, nitrogen and phosphorus. For this cycle, if the silt or sediment is handled first, the rest will be taken care of. There is a five (5) year time line to submit the permit application to DEP, prior the thirty day public comment period. It will take DEP approximately six (6) months to approve the permit. Upon approval, the township will have five (5) years to implement the projects. If any development issues arise, the projects can be adjusted. Mr. Boggs suggested beginning with smaller projects and work up to larger ones.

Mr. Colello questioned; by what date should the Board submit their approval. Mr. Canales answered; the permit application is due September 16, 2017 and after the thirty day comment period between July 26th and August 25th. Tonight's task is to present the plan for public comment. Once comments are presented and responded to, details are to be included with the Township's response noting changes in the plan from the comments.

Bike and Hike and Planning Commission member; Thomas Kelso questioned; can the Township take credit from improvements by Delaware Valley University. Mr. Canales answered; the township can take credit if the improvements were received from one of the public outfalls. Any self-contained improvements from the University cannot be credited. The Township will not be including the University's land due to the sheet flowing directly into the stream. The land will not be included in the calculations due to the township not being responsible for the load.

Mr. Canales reported; the plan is available on the township's website at www.doylestownpa.org and a hard copy can be obtained at the Administrative offices. He then noted two items as payment of \$2,500.00 to the Commonwealth of Pennsylvania is needed when the application is submitted. Mr. Canales then requested Board authorization the Chairman sign the application when completed. This should be completed prior to the September 19, 2017 Board of Supervisors Regular meeting due to being passed the September 16th MS4 renewal deadline.

Mr. Snyder questioned; when will the estimates be available. Mr. Canales answered; an estimate was submitted approximately one week prior and will be built into the township budget process. The estimate for all five projects, including an engineering contingency is in the amount of two million dollars.

Mr. Touhill made a MOTION; seconded by Mr. Colello the Doylestown Township Board of Supervisor authorize the Chairperson sign the permit application and approve payment of \$2,500.00 be forwarded to the Commonwealth of Pennsylvania as per the Department of Environmental Protection requirement under the 2017 MS4 renewal permit process.

MOTION CARRIED 5 to 0.

VIII. NEW BUSINESS

A. Authorization to Advertise – Inter-Municipal Agreement Authorizing Hough Assoc. to Collect Recycling Data and Prepare Grant Applications

Ms. Manion made a MOTION; seconded by Mr. Colello the Doylestown Township Board of Supervisors authorize advertisement of the Inter-Municipal Agreement between Hough Associates to collect the 2017 through 2021 Residential and Commercial Recycling Data and prepare a Multi-Municipal PA DEP 904 Recycling grant application for Doylestown Borough, Doylestown Township, Chalfont Borough, New Britain Borough, New Britain Township, Warrington Township and Warwick Township.

MOTION was ADOPTED 5 to 0.

Mr. Snyder questioned; how is the payment split calculated. Ms. Mason answered; the township will receive additional funds from recycling.

B. Disposition of Township Records

Mr. Touhill made a MOTION; seconded by Ms. Manion the Doylestown Township Board of Supervisors authorize the disposition of public records as noted on the agenda and in accordance with ACT 428 of 1968 and by virtue of Resolution No. 1626, adopted on May 1, 2012.

MOTION CARRIED 5 to 0.

C. TruMark Financial Credit Union

Mr. Touhill made a MOTION; seconded by Ms. Manion the Doylestown Township Board of Supervisors approve TruMark Financial Credit Union schedule a meeting with the Township Staff for additional benefits at no cost to the Township.

MOTION CARRIED 5 to 0.

D. 2017 Trash Hauler Permits – Amendment

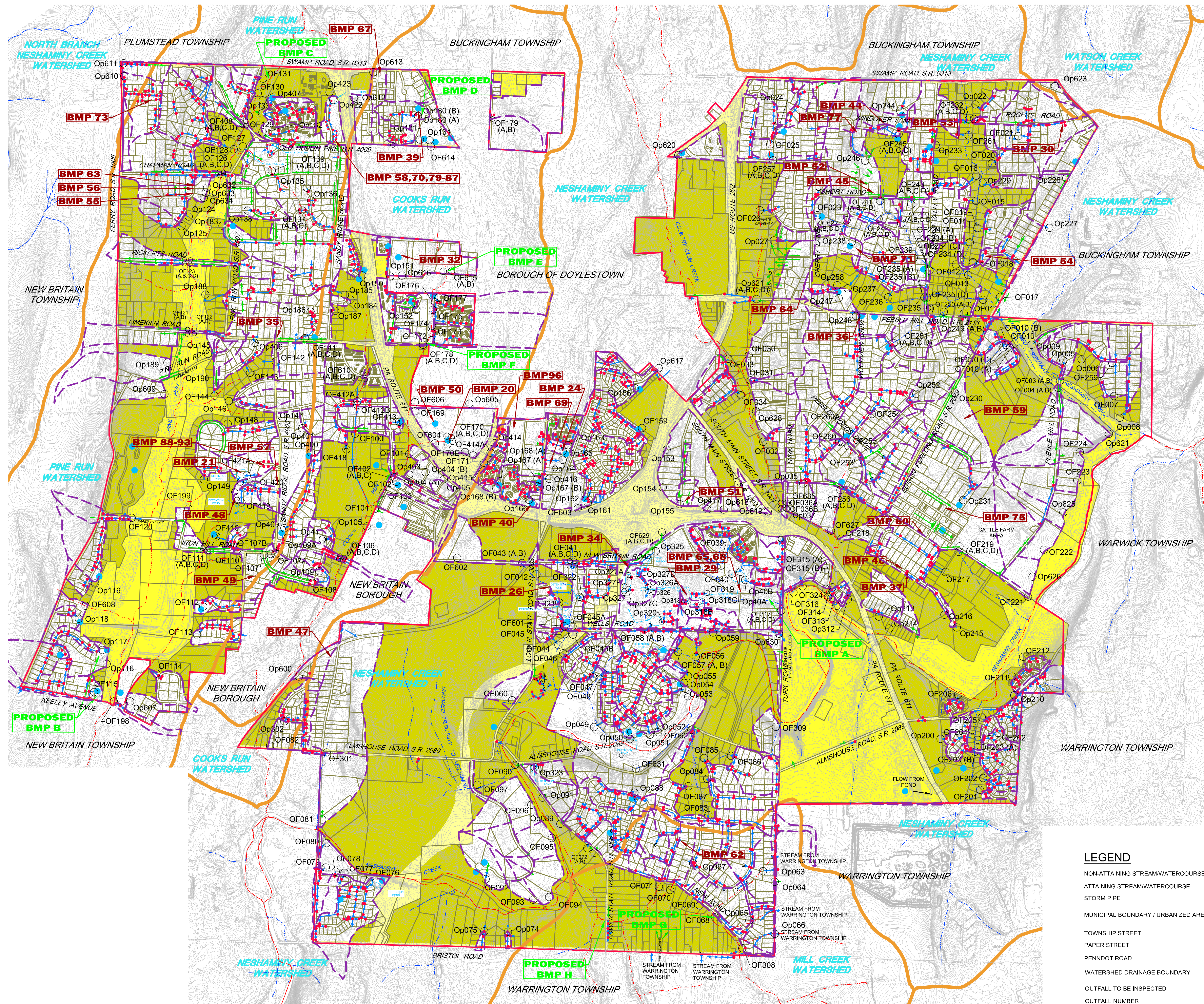
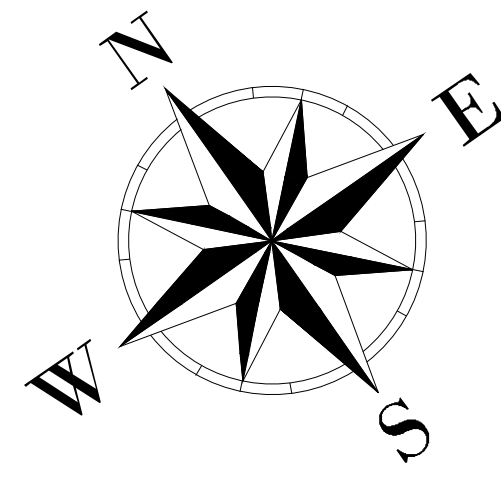
Ms. Manion made a MOTION; seconded by Mr. Snyder the Doylestown Township Board of Supervisors approve the 2017 Trash Hauler Permit service list be amended to include Whitetail

Question from Tom Kelso at the August 15, 2107 Board of Supervisors Meeting:

Can the Township take any credit for improvements made by, say, Delaware Valley College? They have a pretty extensive program there over the years. Can we take credit there?

We can take credit if the drainage area goes to a public outfall. If it is self-contained within the College then we could not take credit. If their land sheet flows directly to a stream we would not include their land in our calculations because the Township would not be responsible for that load.

Attachment B-1
Storm Sewer Outfall Map
Pollution Reduction & TMDL Plans Parsed Area Map



PARSED AREA LEGEND

- PENNDOT ROAD
- COUNTY OF BUCKS LANDS
- AREAS DIRECT TO STREAM AND/OR PENNDOT

TOTAL TOWNSHIP AREA (PER DEP)	9927 ACRES
NESHAMINY CREEK WATERSHED AREA	6668.6 ACRES
PENNDOT ROADS	453.9 ACRES
COUNTY OF BUCKS LANDS	566.5 ACRES
AREAS DIRECT TO STREAMS	2193.9 ACRES
PROPOSED NESHAMINY CREEK PLANNING AREA	3454.3 ACRES
PINE RUN WATERSHED AREA	1961.9 ACRES
PENNDOT ROADS	70.2 ACRES
COUNTY OF BUCKS LANDS	380.3 ACRES
AREA DIRECT TO STREAMS	515.6 ACRES
PROPOSED PINE RUN PLANNING AREA	995.8 ACRES
COOKS RUN WATERSHED AREA	913.9 ACRES
PENNDOT ROADS	95.8 ACRES
COUNTY OF BUCKS LANDS	17.9 ACRES
AREA DIRECT TO STREAMS	204.4 ACRES
PROPOSED COOKS RUN PLANNING AREA	595.8 ACRES
MILL CREEK WATERSHED AREA	382.6 ACRES
PENNDOT ROADS	10.9 ACRES
COUNTY OF BUCKS LANDS	0 ACRES
AREA DIRECT TO STREAMS	173.0 ACRES
PROPOSED MILL CREEK PLANNING AREA	198.7 ACRES

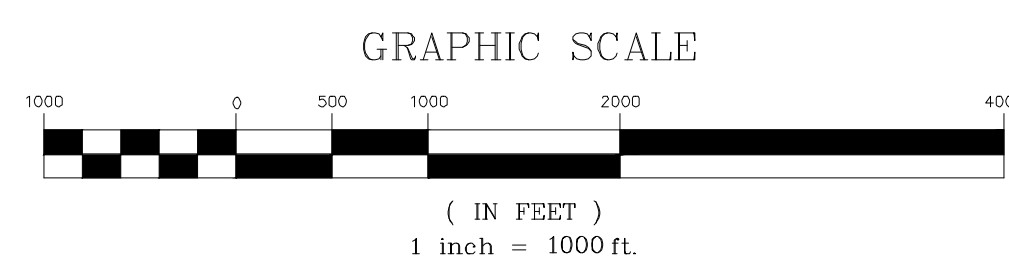
NOTES:

1. PORTIONS OF SPRINGS DRIVE, NEW ROAD AND SHADY RETREAT ROAD ARE LOCATED WITHIN 300 FEET OF A WATERCOURSE.

LEGEND

- NON-ATTAINING STREAM/WATERCOURSE
- ATTAINING STREAM/WATERCOURSE
- STORM PIPE
- MUNICIPAL BOUNDARY / URBANIZED AREA
- TOWNSHIP STREET
- PAPER STREET
- PENNDOT ROAD
- WATERSHED DRAINAGE BOUNDARY
- OUTFALL TO BE INSPECTED
- OUTFALL NUMBER
- OBSERVATION POINT NUMBER
- CATCH BASIN
- POND / BASIN
- WATER FLOW DIRECTION
- SWALE / DITCH FLOW DIRECTION
- STORM SEWERSHED BOUNDARY

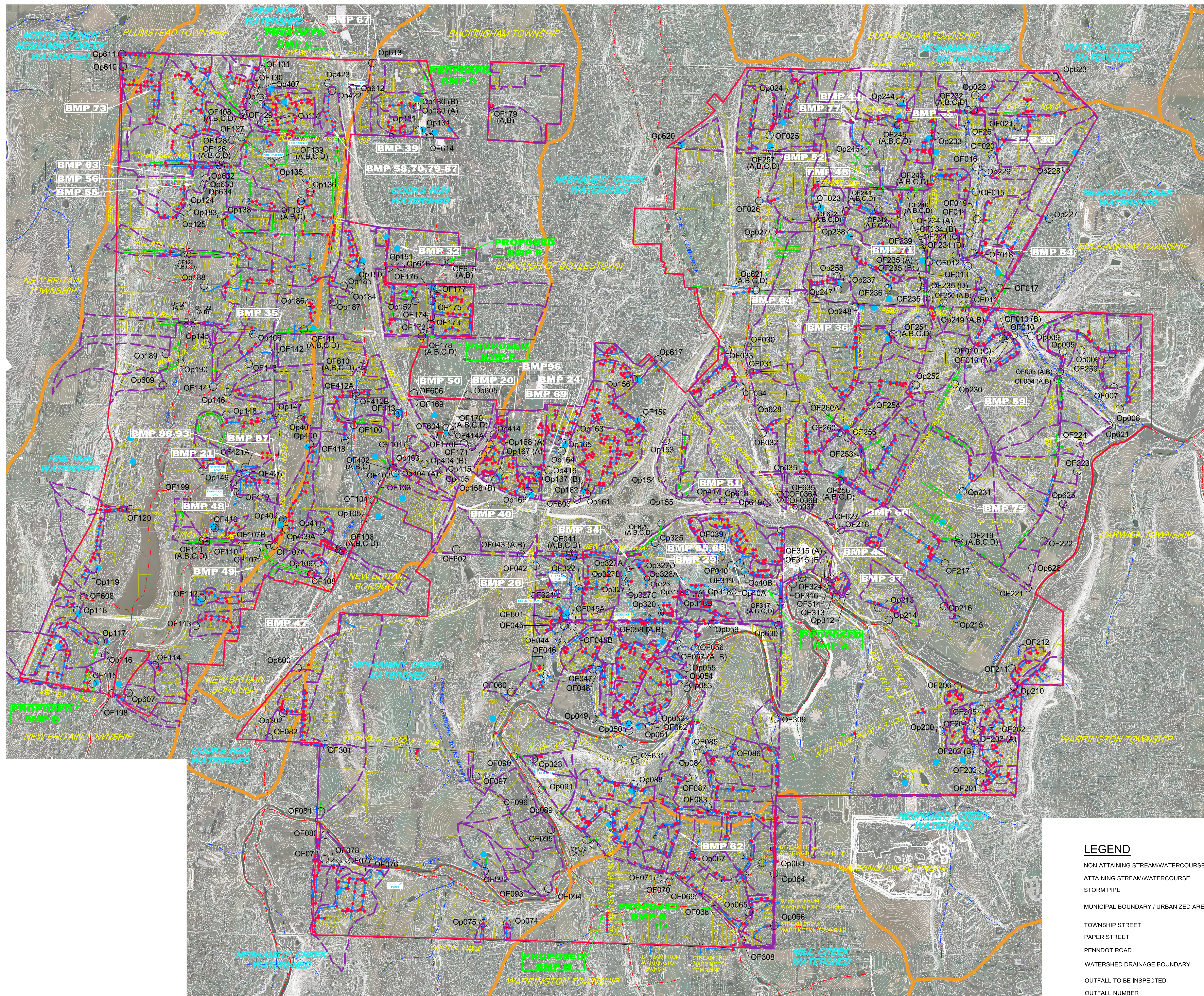
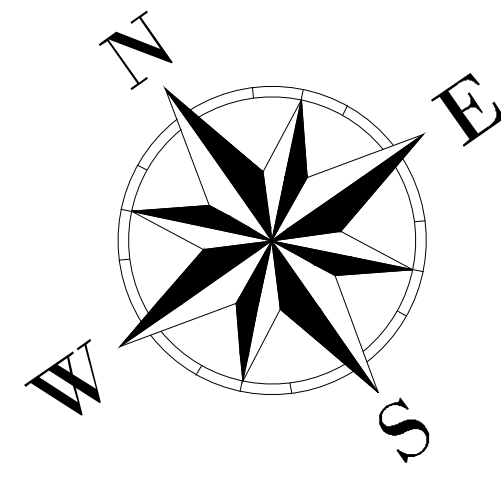
Prepared By:
PCS Pickering
 Corts &
 Summerson
 Consulting Engineers & Land Surveyors



**Doylestown Township
 Pollutant Reduction & TMDL Plans
 Parsed Area Map**

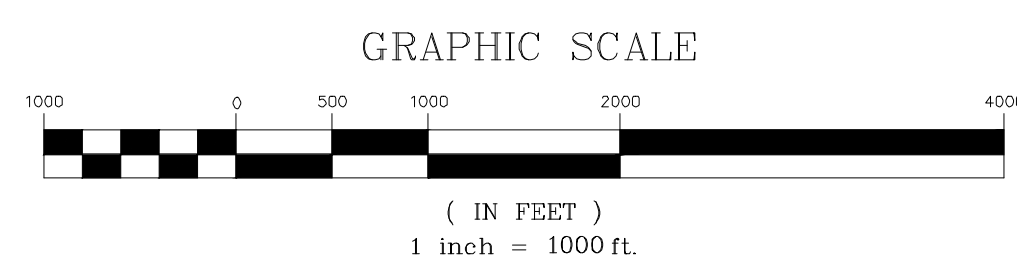
Doylestown Township, Bucks County, Pennsylvania
 January 2019

Revision Description



LEGEND

- NON-ATTAINING STREAM/WATERCOURSE
- ATTAINING STREAM/WATERCOURSE
- STORM PIPE
- MUNICIPAL BOUNDARY / URBANIZED AREA
- TOWNSHIP STREET
- PAPER STREET
- PENNDOT ROAD
- WATERSHED DRAINAGE BOUNDARY
- OUTFALL TO BE INSPECTED
- OUTFALL NUMBER
- OBSERVATION POINT NUMBER
- CATCH BASIN
- POND / BASIN
- WATER FLOW DIRECTION
- SWALE / DITCH FLOW DIRECTION
- STORM SEWERSHED BOUNDARY



**Doylestown Township
Storm Sewer & Outfall Map
With Storm Sewersheds and Land Uses**
Doylestown Township, Bucks County, Pennsylvania
January 2017

Prepared By:
**PCS Pickering
Corts &
Summerson**
Consulting Engineers & Land Surveyors

Jan 2019
Revision
Revised Stormwater
Sheds and Outfalls
Description

Attachment D-1

Load Calculation Summaries

Doylestown Township Land Use from 2011 National Land Cover Database (NLCD 2011)

Total Neshaminy Creek Watershed

Land Use	Urbanized Area (m2)	Parced Area (m2)	Planning Area (m2)	Planning Area (acres)	Coverage (%)	Unit Area Sediment Load (lb/acre/year)	Annual Lbs of Sediment
Developed, Open Space	8,600,000	4,119,971	4,480,029	1,107	32	410	453,870
Developed, Low Intensity	2,930,000	1,404,281	1,525,719	377	11	1,260	475,020
Developed, Medium Intensity	1,030,000	495,796	534,204	132	4	1,881	248,292
Developed, High Intensity	190,000	88,825	101,175	25	1	2,502	62,550
Barren Land (Rock/Sand/Clay)	160,000	75,013	84,987	21	1	380	7,980
Deciduous Forest	6,180,000	2,958,588	3,221,412	796	23	30	23,880
Evergreen Forest	70,000	33,577	36,423	9	0	30	270
Mixed Forest	150,000	73,107	76,893	19	1	30	570
Shrub/Scrub	960,000	462,219	497,781	123	4	20	2,460
Grassland/Herbaceous	70,000	33,577	36,423	9	0	440	3,960
Pasture/Hay	3,890,000	1,866,500	2,023,500	500	14	380	190,000
Cultivated Crops	900,000	434,595	465,405	115	3	1,100	126,500
Woody Woodlands	1,720,000	825,613	894,387	221	6	10	2,210
Total	26,850,000	12,871,662	13,978,338	3,454	100.00		1,597,562

Doylestown Township Land Use from 2011 National Land Cover Database (NLCD 2011)

Total Pine Run Watershed

Land Use	Urbanized Area (m2)	Parced Area (m2)	Planning Area (m2)	Planning Area (acres)	Coverage (%)	Unit Area Sediment Load (lb/acre/year)	Annual Lbs of Sediment
Developed, Open Space	2,920,000	1,463,080	1,456,920	360	35	410	147,600
Developed, Low Intensity	720,000	376,005	343,995	85	9	1,260	107,100
Developed, Medium Intensity	200,000	102,872	97,128	24	2	1,881	45,144
Developed, High Intensity	30,000	13,812	16,188	4	0	2,502	10,008
Barren Land (Rock/Sand/Clay)	0	0	0	0	0	380	0
Deciduous Forest	1,530,000	801,540	728,460	180	18	30	5,400
Evergreen Forest	50,000	25,718	24,282	6	1	30	180
Mixed Forest	50,000	25,718	24,282	6	1	30	180
Shrub/Scrub	400,000	209,791	190,209	47	5	20	940
Grassland/Herbaceous	0	0	0	0	0	440	0
Pasture/Hay	1,610,000	832,976	777,024	192	19	380	72,960
Cultivated Crops	460,000	241,462	218,538	54	6	1,100	59,400
Woody Woodlands	320,000	166,214	153,786	38	4	10	380
Total	8,290,000	4,259,188	4,030,812	996	100.00		449,292

Doylestown Township Land Use from 2011 National Land Cover Database (NLCD 2011)

Total Cooks Run Watershed

Land Use	Urbanized Area (m2)	Parced Area (m2)	Planning Area (m2)	Planning Area (acres)	Coverage (%)	Unit Area Sediment Load (lb/acre/year)	Annual Lbs of Sediment
Developed, Open Space	1,109,843	357,101	752,742	186	31.26	410	76,260
Developed, Low Intensity	780,569	250,412	530,157	131	21.99	1260	165,060
Developed, Medium Intensity	420,789	133,452	287,337	71	11.85	1881	133,551
Developed, High Intensity	93,309	28,557	64,752	16	2.63	2502	40,032
Barren Land (Rock/Sand/Clay)	0	0	0	0	0.00	380	0
Deciduous Forest	751,858	241,936	509,922	126	21.18	30	3,780
Evergreen Forest	897	897	0	0	0.03	30	0
Mixed Forest	17,047	4,906	12,141	3	0.48	15	45
Shrub/Scrub	108,562	35,716	72,846	18	3.06	10	180
Grassland/Herbaceous	0	0	0	0	0.00	440	0
Pasture/Hay	149,833	48,658	101,175	25	4.22	380	9,500
Cultivated Crops	86,132	29,474	56,658	14	2.43	1100	15,400
Woody Woodlands	31,402	7,120	24,282	6	0.88	10	60
Total	3,550,241	1,138,229	2,412,012	596	100.00		443,868

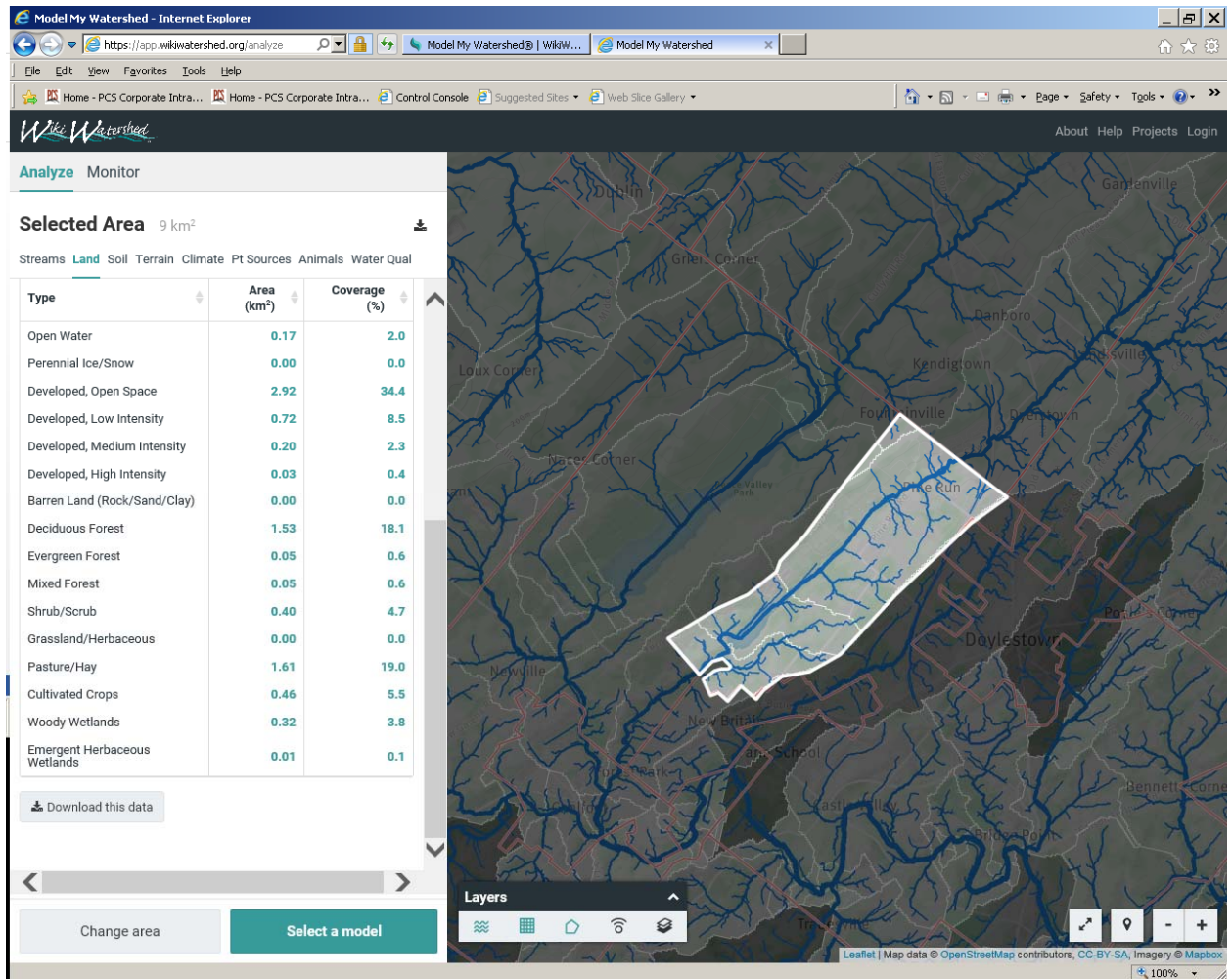
Doylestown Township Land Use from 2011 National Land Cover Database (NLCD 2011)

Total Mill Creek Watershed

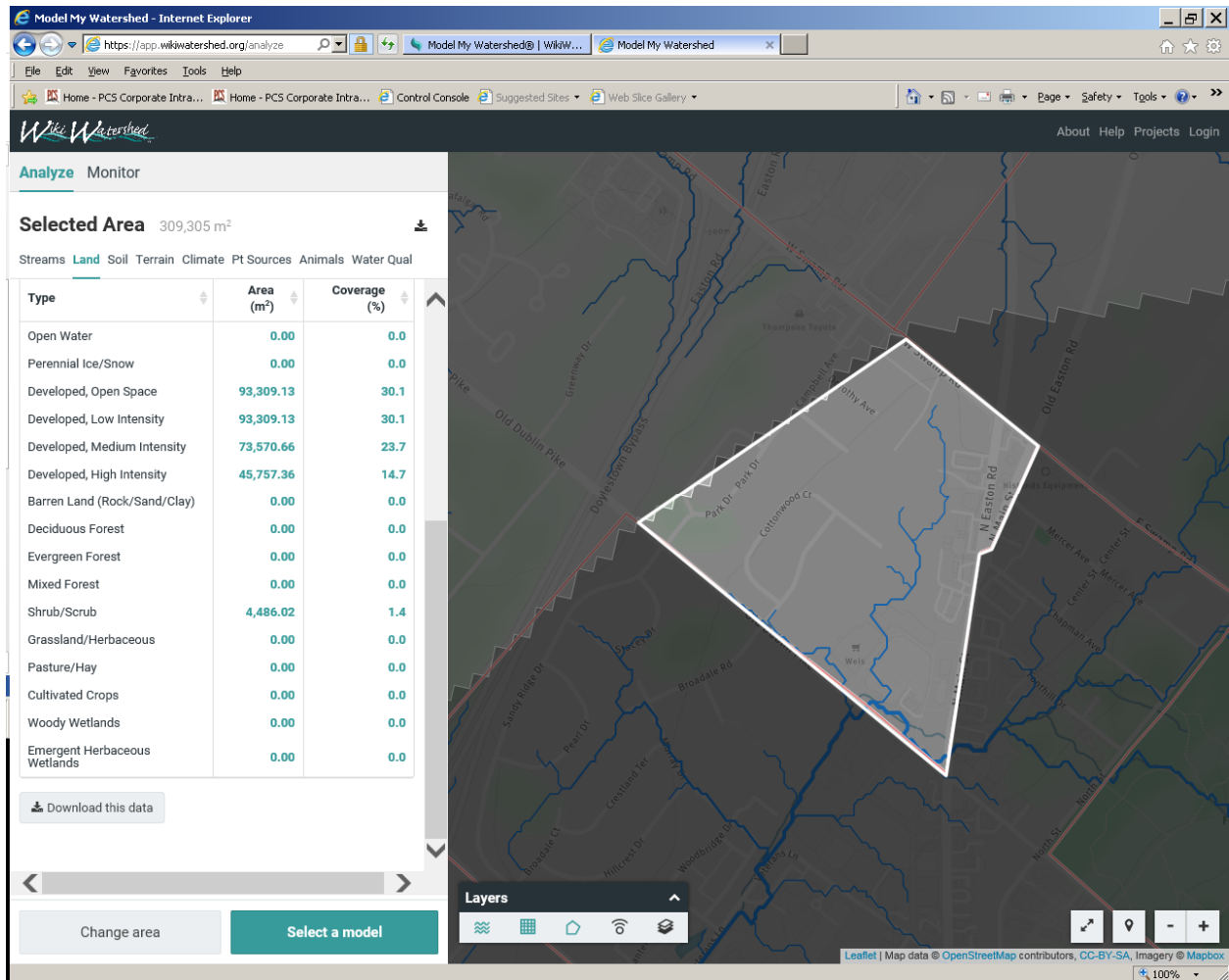
Land Use	Urbanized Area (m2)	Parced Area (m2)	Planning Area (m2)	Planning Area (acres)	Coverage (%)	Unit Area Sediment Load (lb/acre/year)	Annual Lbs of Sediment
Developed, Open Space	635,225	242,666	392,559	97	49	410	39,770
Developed, Low Intensity	77,160	28,596	48,564	12	6	1,260	15,120
Developed, Medium Intensity	13,458	5,364	8,094	2	1	1,881	3,762
Developed, High Intensity	897	897	0	0	0	2,502	0
Barren Land (Rock/Sand/Clay)	0	0	0	0	0	380	0
Deciduous Forest	275,444	105,470	169,974	42	21	30	1,260
Evergreen Forest	0	0	0	0	0	30	0
Mixed Forest	0	0	0	0	0	30	0
Shrub/Scrub	106,768	42,016	64,752	16	8	20	320
Grassland/Herbaceous	0	0	0	0	0	440	0
Pasture/Hay	104,076	39,324	64,752	16	8	380	6,080
Cultivated Crops	0	0	0	0	0	1,100	0
Woody Woodlands	88,824	32,166	56,658	14	7	10	140
Total	1,301,852	496,499	805,353	199	100	Total Load	66,452

Attachment D-2

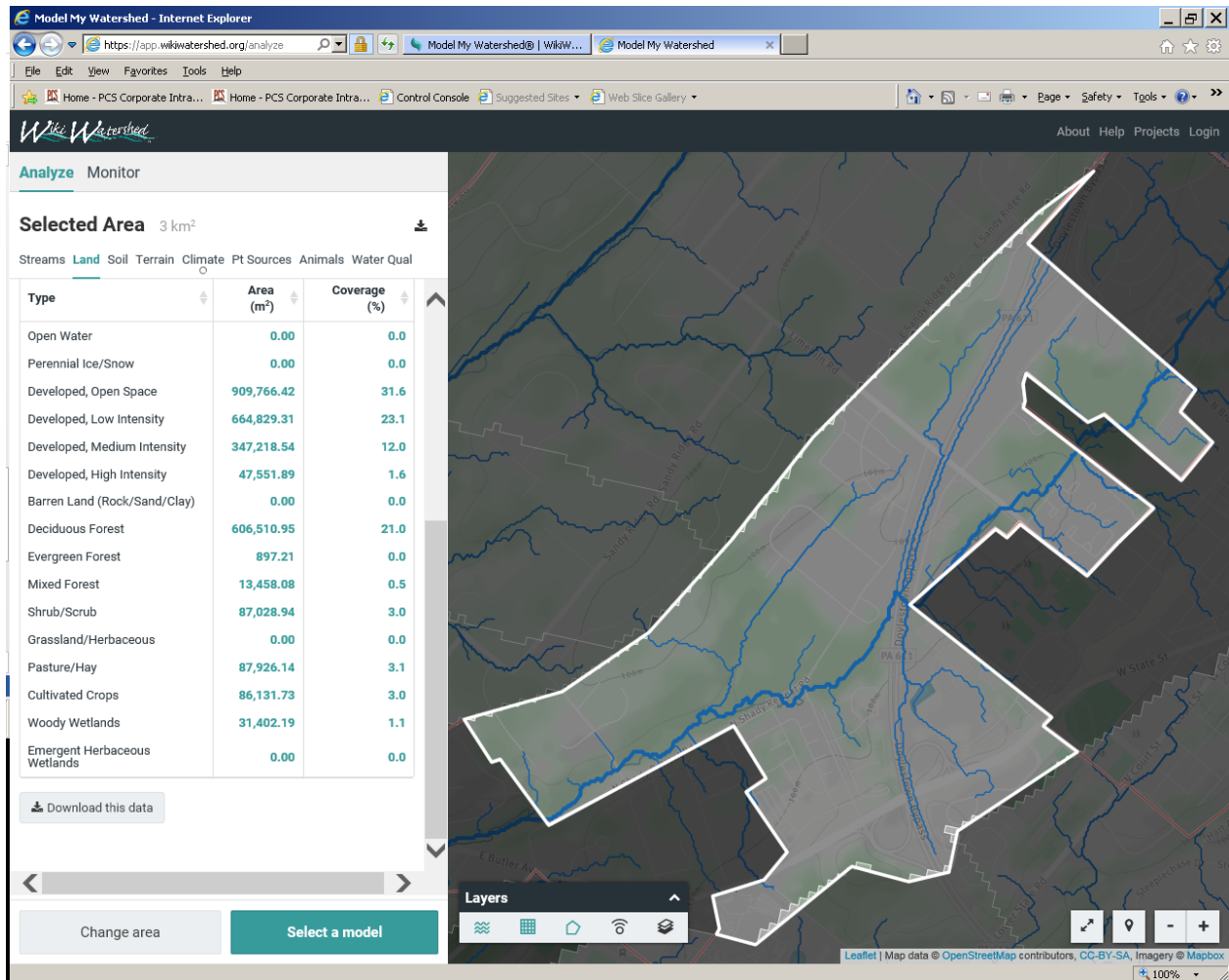
Detailed Output from Wiki Watershed Model



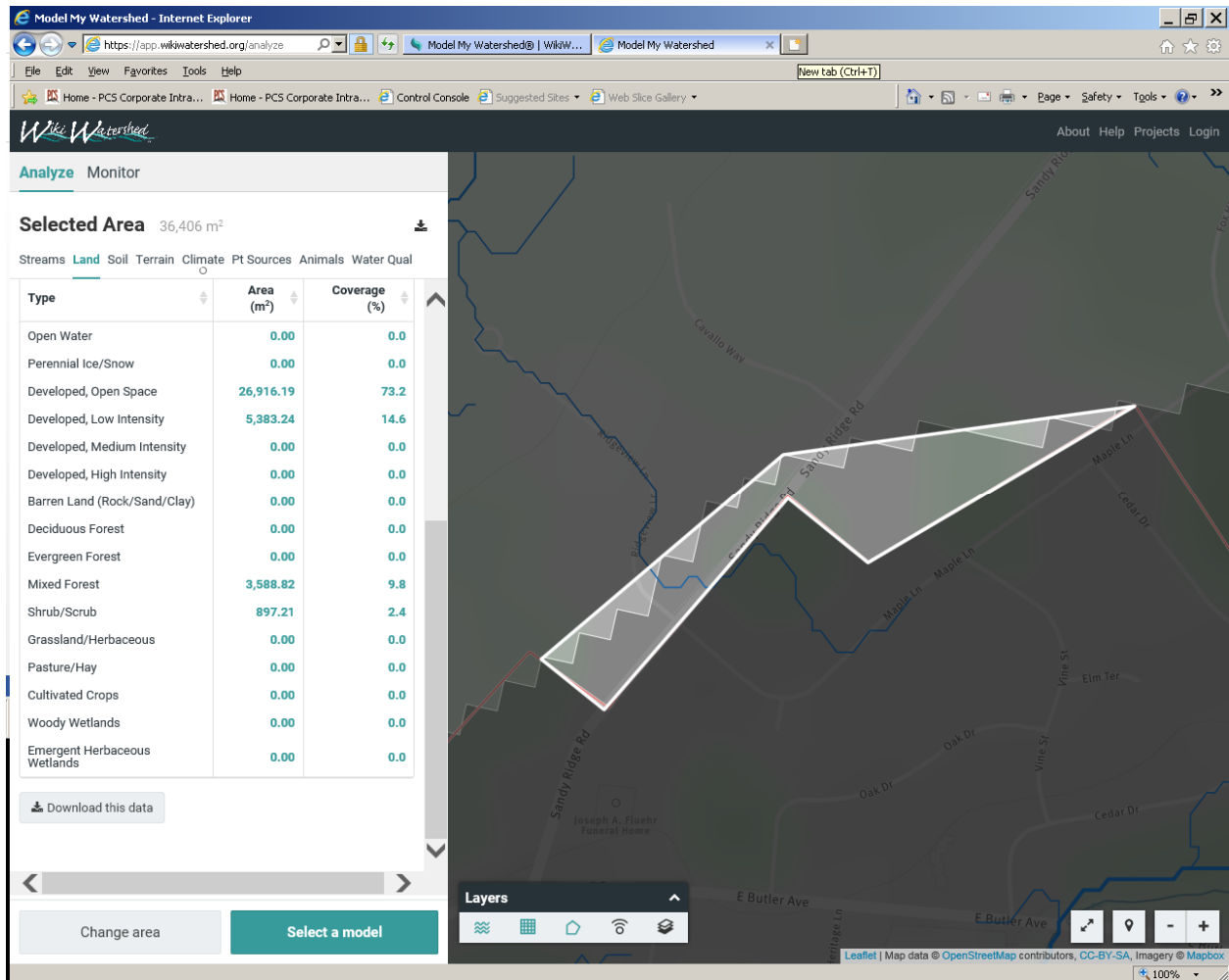
Pine Run Watershed



Cooks Run Subwatershed 1



Cooks Run Subwatershed 2



Cooks Run Subwatershed 3

Model My Watershed - Internet Explorer

https://app.wikiwatershed.org/analyze

Model My Watershed | Wikiwatershed

Home - PCS Corporate Intra... Home - PCS Corporate Intra... Control Console Suggested Sites Web Slice Gallery

Wiki Watershed

About Help Projects Login

Analyze Monitor

Selected Area 323,678 m²

Streams Land Soil Terrain Climate Pt Sources Animals Water Qual

Type	Area (m ²)	Coverage (%)
Open Water	0.00	0.0
Perennial Ice/Snow	0.00	0.0
Developed, Open Space	79,851.15	24.9
Developed, Low Intensity	17,046.87	5.3
Developed, Medium Intensity	0.00	0.0
Developed, High Intensity	0.00	0.0
Barren Land (Rock/Sand/Clay)	0.00	0.0
Deciduous Forest	145,347.04	45.4
Evergreen Forest	0.00	0.0
Mixed Forest	0.00	0.0
Shrub/Scrub	16,149.67	5.0
Grassland/Herbaceous	0.00	0.0
Pasture/Hay	61,907.07	19.3
Cultivated Crops	0.00	0.0
Woody Wetlands	0.00	0.0
Emergent Herbaceous Wetlands	0.00	0.0

Download this data

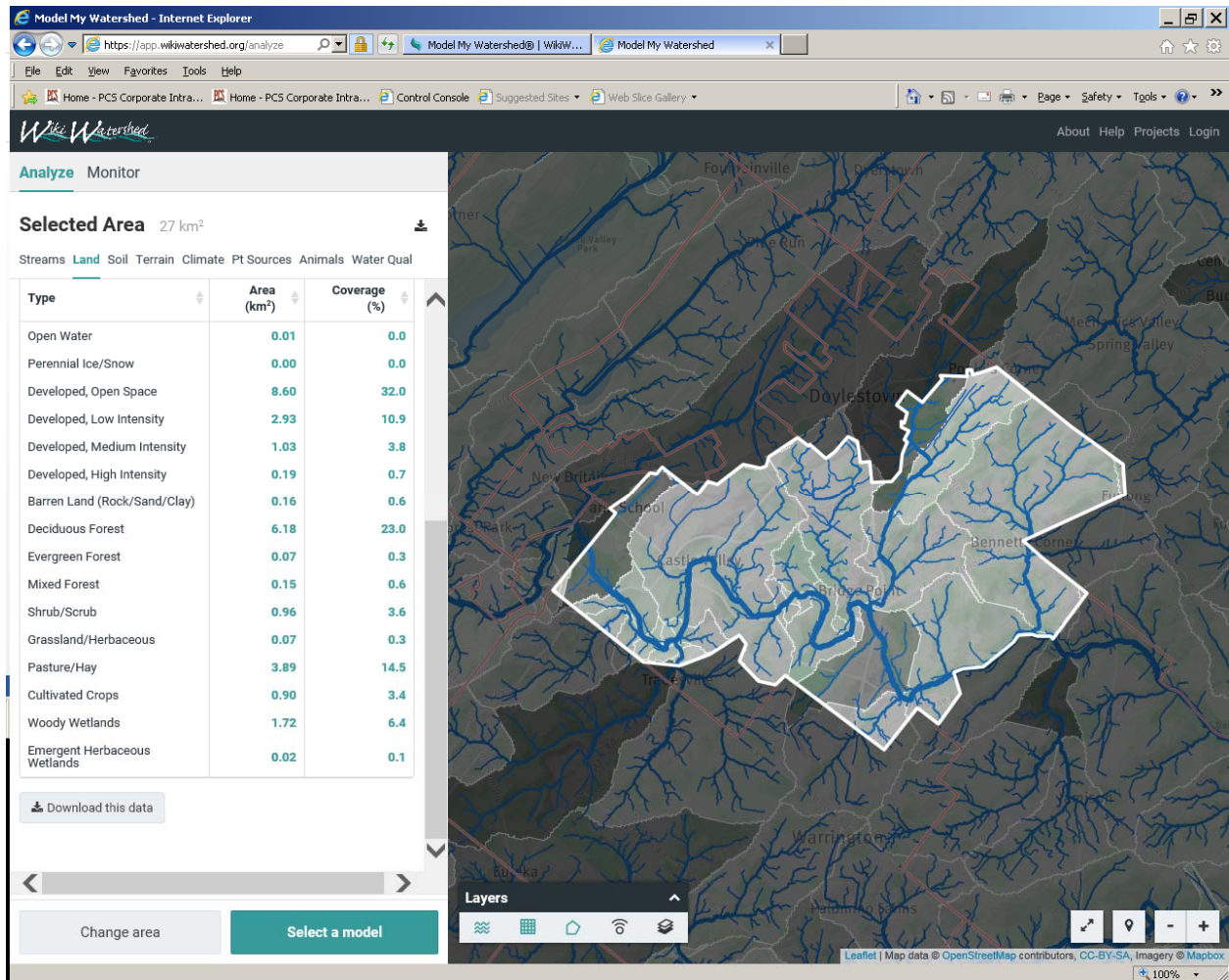
Change area Select a model

Layers

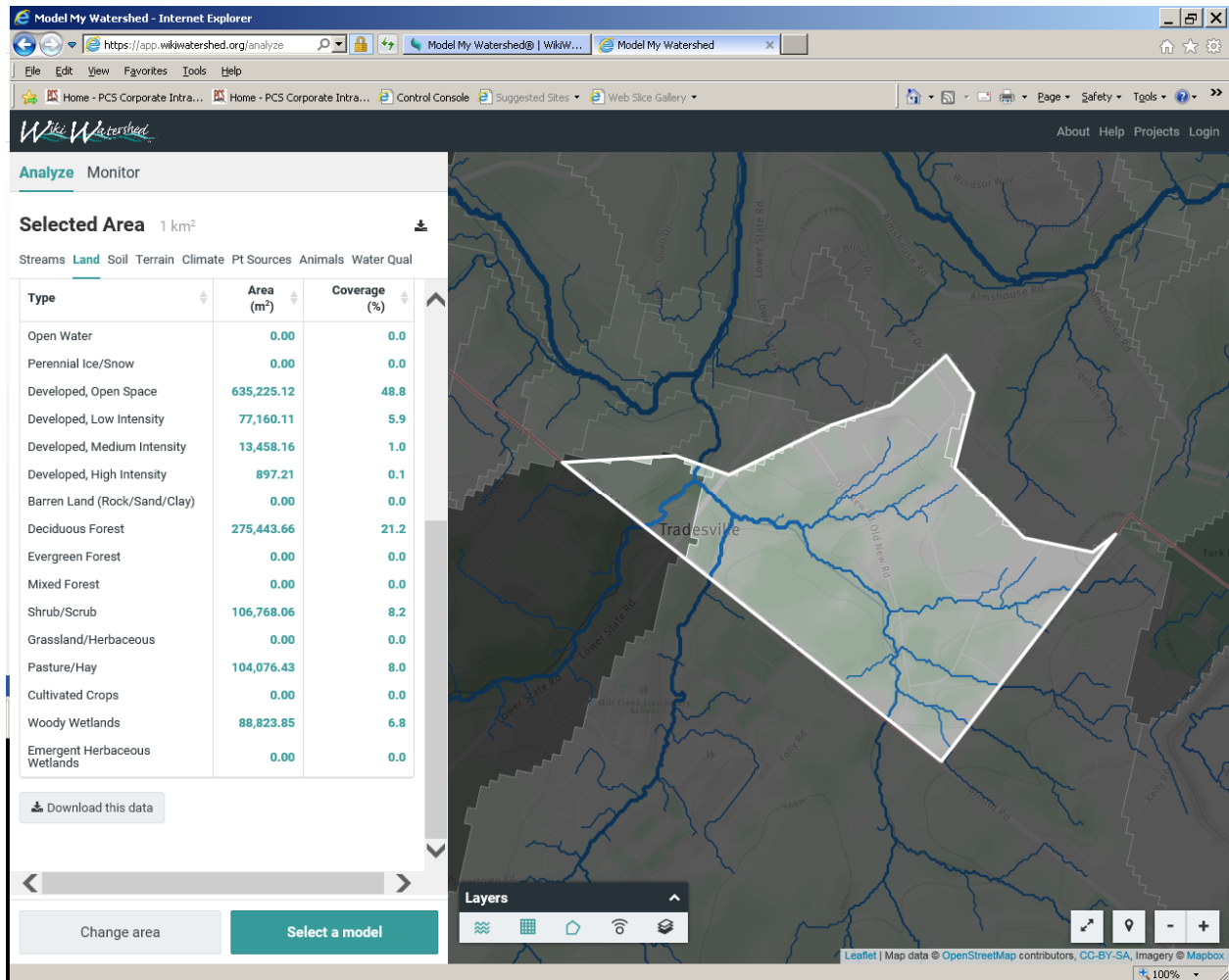
Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

100%

Cooks Run Subwatershed 4



Neshaminy Creek Watershed



Mill Creek Watershed