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The Town of McCandless

Pollutant Reduction Plan
Little Pine Creek HUC-12 Watershed

Municipal Separate Storm Sewer System

Kelley R. Harrington, E.I.T.
Project Manager
Ashley A. Neptune, P.E.
Adam J. Isenberg, GIS Technician
Daniel S. Deiseroth, P.E.
Town Engineer

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ACRONYMS

BMP	Best Management Practice
HUC	Hydraulic Unit Code
MCM	Minimum Control Measure
MS4	Municipal Separate Storm Sewer
NPDES	National Pollutant Discharge Elimination System
PADEP	Pennsylvania Department of Environmental Protection
PRP	Pollutant Reduction Plan
TP	Total Phosphorus

GLOSSARY OF TERMS

Impaired Waters - surface waters that fail to attain one or more of its designated uses under 25 Pa. Code Chapter 93 and as listed in Categories 4 and 5 of Pennsylvania's Integrated Water Quality Monitoring and Assessment Report.

Integrated Water Quality Monitoring and Assessment Report - the report published every other year by PADEP to report on the conditions of Pennsylvania's surface waters to satisfy sections 305(b) and 303(d) of the CWA.

Nutrients – refers to total nitrogen and total phosphorus

Outfall - a point source as defined by 40 CFR § 122.2 at the point where a municipal separate storm sewer discharges to surface waters and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream or other surface waters and are used to convey surface waters. (25 Pa. Code § 92a.32(a) and 40 CFR § 122.26(b)(9))

Outfall Sewershed - the land area that drains to an individual MS4 outfall, observation point, or discharge point from within the jurisdiction of the MS4 permittee.

Parsing - a process in which land area is removed from a Planning Area in order to calculate the actual or target pollutant loads that are applicable to an MS4. Land area which can be parsed includes areas that do not drain to the MS4's system or land that is already covered by an NPDES permit for control of stormwater.

Planning Area – the area used to calculate existing loads and plan load reductions for.

Sediment – refers to siltation and suspended solids; all of which are inorganic solids.

Structural Best Management Practices - means stormwater storage and management practices including, but not limited to, wet ponds and extended detention outlet structures; filtration practices such as grassed swales, sand filters and filter strips; infiltration practices such as infiltration basins and infiltration trenches; and other BMPs as referenced in Chapter 6 of the Pennsylvania Stormwater BMP Manual (363-0300-002).

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. (25 Pa. Code § 92a.2)

Urbanized Area - land area comprising one or more places (central place(s)) and the adjacent densely settled surrounding area (urban fringe) that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile, as defined by the United States Bureau of the Census and as determined by the latest available decennial census. The urbanized area outlines the extent of automatically regulated areas.

Chapter 1. Introduction

1.1 Purpose

Municipalities throughout the country are under a federal mandate requiring a stormwater management program for reducing pollution impacts from stormwater runoff. In 2003, the Town of McCandless was issued a Municipal Separate Storm Sewer System (MS4) Permit through the Pennsylvania Department of Environmental Protection (PADEP) and the Environmental Protection Agency. The Town is regulated under PADEP's General NPDES Permit (PAG-136140). Implemented through the Clean Water Act, the permit's numerous requirements are through six Minimum Control Measures (MCMs). In addition, PADEP is requiring MS4s that discharge to an impaired stream prepare a Pollutant Reduction Plan (PRP) for sediment, nitrogen, and/or phosphorus. The goal of the PRP is to reduce pollution caused by sediment and/or nutrients in impaired streams.

1.2 Little Pine Creek Watershed Background

Little Pine Creek Watershed is considered the Hydrologic Unit Code (HUC) 12 watershed. Within the Southwestern region of Pennsylvania, these HUC-12 watersheds are tributaries to either the Ohio, Monongahela, Allegheny, or Youghiogheny Rivers. Little Pine Creek is tributary to the Allegheny River.

Once every two years, PADEP publishes a report entitled "Pennsylvania Integrated Water Quality Monitoring and Assessment Report" that summarizes the various water quality management programs including water quality standards. The PRP was assigned for each MS4 based on the 2014 report. If a stream was assigned as impaired from siltation, organic enrichment, low dissolved oxygen, or nutrients then a PRP is required. Little Pine Creek-Pine Creek Watershed is primarily impacted by pathogens, however, Little Pine Creek is a tributary to Pine Creek, which is polluted by nutrients and siltation from small residential runoff and land development.

Chapter 2. Outfall Sewersheds & Planning Areas

Before beginning the calculations of the pollutant loads, the outfall sewersheds are delineated and the PRP planning area is identified.

2.1 Delineation Procedures

As part of the PRP process, outfall sewersheds are required to be delineated. An outfall sewershed is an area of land in which stormwater flows into a storm sewer system and is discharged into a stream, lake, or waterway. Accurate outfall sewersheds were drawn based on topography (2020), aerial (2021), and stream layers in ESRI ArcMap. By following these layers and the storm sewer network, all outfalls were assigned a sewershed. Aside from being a requirement of the PRP, delineation of the outfall sewersheds is useful if any parsing is implemented. Parsing is the term used by PADEP to convey detailed and analysis with the purpose of assigning responsibility.

2.2 Planning Area

The planning area is defined as the area used to calculate existing loads and plan load reductions. PADEP offered several options for how to define the planning area for each impaired water. The options vary from using a combination of the storm sewersheds to using watershed boundaries. The Town of McCandless plans to utilize the HUC-12 watershed boundary as its planning area with some additional parsing that is described in the next section.

2.3 Parsing

Once the preliminary planning area was defined; additional parsing within the area was performed to remove area that either does not drain to the MS4's system or is already covered by an NPDES permit for the control of stormwater. Parsing reduces the MS4's area of responsibility and therefore the pollutant loads. The Town of McCandless parsed out all state and county owned roads and sheet flow on private property. Appendix A illustrates the final planning area for the MS4 by displaying the HUC-12 watershed boundaries and the planning area.

Chapter 3. Existing Loading without BMPs

The PADEP provides several suggested methods that are scientifically-supported for estimating the existing loads. The approved methods for calculating the loads include PADEP Simplified Method land use loading rates, MapShed, or other watershed models that reflect both overland flow and in-stream erosion components. For the purpose of this PRP, WikiWatershed Model My Watershed (MMW) was chosen as the most appropriate method. The loads generated within this PRP were calculated in August 2022.

3.1 WikiWatershed Modeling Overview

WikiWatershed MMW is a free and publicly available software developed by the Stroud Water Research Center. Within MMW there are two options for modeling water quality and quantity; Site Storm Model and Watershed Multi-Year Model. For the purposes of the PRP, the Watershed Multi-Year Model was used. This program "simulates 30-years of daily water, nutrient, and sediment fluxes using the Generalized Watershed Loading Function Enhanced (GWLF-E) model that was developed for the MapShed desktop modeling application by Barry M. Evans, Ph.D., and his group at Penn State University." The GWLF-E model takes into account hydrology, land cover, soils, weather, topography and other environmental data to calculate sediment and nutrient loads. The model utilizes well known soil and hydrologic equations to model surface runoff and soil erosion.

For modeling surface runoff and streamflow, the GWLF-E model uses the National Resources Conservation Service Curve Number (NRCS-CN) combined with daily precipitation and temperature data. Evapotranspiration is calculated using the daily weather data and a land cover dependent factor. To model monthly erosion and sediment loss, the Universal Soil Loss Equation is applied. Nitrogen, phosphorus, and total suspended solids are modeled for each type of land cover using export coefficients for both the dissolved and solid phases. Overall, the software uses geographic data, land use runoff coefficients, daily weather, and the universal soil loss equations to calculate pollutant loads in terms of mass and concentration. Additional information on the layers and methods used in WikiWatershed MMW can be found at https://wikiwatershed.org/documentation/mmw-tech/.

3.2 WikiWatershed Modeling Methodology

In order for WikiWatershed MMW to perform these hydrologic calculations, an area of interest is needed. The area of interest for this PRP includes the boundaries of the HUC-12 watersheds. Once the sediment and phosphorus loads are calculated in the Multi-Year Model, the MMW Spreadsheet Tool developed by Barry Evans, Anthony Aufdenkampe, and Mike Hickman is utilized for estimating the pollutant loads in the planning areas. The land cover and sediment and phosphorus loads previously obtained from WikiWatershed MMW are entered into the spreadsheet in order to generate loading rates as pounds per year per acre. The planning area is imported into WikiWatershed MMW as the area of interest to obtain the land cover distribution data. This data is entered into the spreadsheet where it calculates the sediment and phosphorus loads from each type of land cover within the planning area.

To better estimate erosion from streambanks, coordination with the Department permitted accounting for piped streams. Piped streams do not result in eroded streambanks that contribute to sediment and nutrient loads. As a result, the MMW Spreadsheet Tool was modified to account for piped streams in the Little Pine Creek Watershed. The length of piped streams in the watershed was determined with the same stream data that is utilized by WikiWatershed. Aerial imagery was then used to determine the approximate limits of piped stream segments. These piped stream segments and the WikiWatershed streams are illustrated in the Appendix A Planning Area Map. Approximately 12 kilometers of piped streams were measured and accounted for in the MMW Spreadsheet Tool. The total length of piped streams was used to determine a percentage of the total streams in the watershed with natural streambanks. Previously calculated total Stream Bank Erosion loads for sediment, nitrogen, and phosphorus were then reduced proportionally to the percentage of natural streams in the HUC-12 watershed.

3.3 WikiWatershed Modeling Results

The results from WikiWatershed MMW and the MMW Spreadsheet Tool can be found in Appendix B.

3.3.1 Little Pine Creek HUC-12 Watershed Results

The PRP comprised in this report is focused on load reductions on a HUC-12 watershed basis. Little Pine Creek watershed is about 27,247 acres in size, with only 2,575 of those total acres located within the Town of McCandless. However, after parsing, the total planning area within the MS4 boundary is 901 acres. Table 3-1 shows the amount of sediment and phosphorus pollution from developed land cover and undeveloped land cover.

Table 3-1: HUC-12 Existing Pollutant Load Results without BMPs

SOURCE	SEDIMENT (lbs/yr)	PHOSPHORUS (lbs/yr)
Developed Land Cover	673,670.57	236.02
Undeveloped Land Cover	39,899.60	17.48
Total	**713,570.17**	**253.51**

3.4 Final Existing Loading and Required Reductions

The final existing loading and required reduction is illustrated in Table 3-2. The required reduction is based on a 10% reduction for sediment and 5% for phosphorus. The MS4 plans to take a presumption approach that a 10% reduction of sediment will also accomplish a 5% phosphorus reduction.

Table 3-2 Final Existing Loads and Required Reductions

POLLUTANT	FINAL EXISTING LOAD (lbs/yr)	REQUIRED REDUCTION (lbs/yr)
Sediment	713,570.17	**71,357.02**
Phosphorus	253.51	**N/A***

*In accordance with PADEP guidance, the Town plans to take a presumption approach that a 10% reduction of sediment will also accomplish a 5% phosphorus reduction.

Chapter 4. Existing Structural BMPs

The existing loads calculated in Chapter 3 do not account for any reductions of existing stormwater BMPs. PADEP is allowing communities to reduce their existing load by taking credit for only Chapter 102 permitted stormwater BMPs. The locations of the existing permitted BMPs are located on the Planning Area Map in Appendix A.

4.1 BMP Performance Calculation Overview

PADEP provides several suggested methods that are scientifically supported for estimating the pollution reduction potential of BMPs. These methods include the Expert Panel New Development Performance Standards Report and DEP's BMP Effectiveness Values Table. McCandless plans to calculate the efficiency of the existing BMPs through the PADEP BMP Effectiveness Values Table.

For calculating the pollutant loads generated within the BMP's drainage area, the MMW Spreadsheet Tool was used. The MMW Spreadsheet Tool developed by Barry Evans, Anthony Aufdenkampe, and Mike Hickman is utilized for estimating the pollutant loads in the planning areas. The land cover and sediment and phosphorus loads previously obtained from WikiWatershed are entered into the spreadsheet in order to generate loading rates as pounds per year per acre. These loading rates for the HUC-12 watershed were already calculated and depicted in Appendix B. The drainage area to each BMP is then imported into WikiWatershed as the area of interest to obtain the land cover distribution data. This data is entered into the spreadsheet where it calculates the sediment and phosphorus loads from each type of land cover within the drainage area. The spreadsheet for each analyzed BMP drainage area is located in Appendix C. Appendix D is an overall table detailing the existing loads, the percent removals, and the load reductions of each existing BMP.

4.2 Existing Loadings from Stormwater BMPs

For the Little Pine Creek Watershed, 2 existing permitted BMPs were utilized to reduce the existing load. All permitted BMPs that were used as credit to reduce the existing loading estimates continue to function as they were originally designed. The BMPs will be frequently inspected by the Town's Engineer or the property owner to ensure appropriate operation and maintenance is being implemented. Each BMP has its own operation and maintenance plan that closely follows the applicable structural BMP located in the PADEP Stormwater BMP Manual. Information on the type of BMP, permit number, geographic location, and the installation date can be found in Appendix D.

4.3 Final Existing Loading and Required Reductions

After incorporating all the permitted existing BMPs, the final existing load for sediment and phosphorus within the PRP planning area was determined and is illustrated in Table 4-1. The required reduction is based on a 10% reduction for sediment and 5% for phosphorus. The MS4 plans to take a presumption approach that a 10% reduction of sediment will also accomplish a 5% phosphorus reduction.

Table 4-1 Final Existing Loads and Required Reductions

POLLUTANT	FINAL EXISTING LOAD (lbs/yr)	REQUIRED REDUCTION (lbs/yr)
Sediment	699,746.89	**69,974.69**
Phosphorus	251.87	**N/A***

*In accordance with PADEP guidance, the Town plans to take a presumption approach that a 10% reduction of sediment will also accomplish a 5% phosphorus reduction.

Chapter 5. Achieving Load Reductions

Based on the PRP requirements, the final existing load calculated in Chapter 4 needs to be reduced by implementing proposed structural and non-structural BMPs. At the time of this submission, the Town of McCandless is proposing structural BMPs that include existing BMP retrofits, tree planting and stream restoration throughout the PRP planning area. Appendix E entails maps of the proposed BMP locations and associated drainage areas. There are various methods used to determine the removal rates of each type of BMP. These approved methods are discussed in further detail below.

McCandless' stormwater ordinance goes above and beyond the Chapter 102 NPDES permit requirements for stormwater associated with construction activities, such as requiring stormwater management on projects disturbing less than 1 acre. As a result, the MS4 can take credit for those pollution reductions that will occur from exceeding PADEP regulatory requirements.

In addition to taking credit for new stormwater BMPs from development and redevelopment projects that do not require an NPDES permit, the Town is planning to propose load reductions with existing BMP retrofits through its stormwater BMP Maintenance Program. The Town of McCandless will investigate ways to achieve the required sediment reduction through its Stormwater BMP Maintenance Program. The program was initiated to sustain the performance of stormwater detention facilities within the Town. Although the program focuses on enhancing performance in facilities designed for flood control, McCandless intends to integrate sediment and phosphorus removal as well into its maintenance program.

There are three types of retrofits that can be performed: enhancement, restoration, or conversion. The type of retrofit being done to the BMP determines if a full or an incremental percent removal is utilized. BMP enhancement utilizes the original stormwater treatment mechanism but improves removal by increasing storage volume or hydraulic residence time. Enhanced BMPs will utilize an incremental removal rate. BMP conversions involve retrofit of older existing stormwater ponds, such as converting a dry pond into a constructed wetland or a wet pond. Restoration of a BMP applies to major maintenance upgrades to BMPs which have either failed or lost their original stormwater treatment capacity. Typical major maintenance items include dredging ponds, replanting all vegetation, replacing contaminated soil, or complete rehabilitation. For restoration of existing BMPs, the full percent removal can be credited for the PRP. These approved methods for calculating the reductions are the PADEP BMP Effectiveness Values Table and the Expert Panel Removal Rates for Urban Stormwater Retrofit Projects. The Town of McCandless plans to calculate the efficiency of the existing BMP retrofits through the PADEP'S BMP Effectiveness Values Table.

The Town of McCandless also has a tree planting program. The tree planting initiative encourages residential and commercial property owners to report the planting of trees on their property. This will serve as an outreach and educational mechanism as well. The program would

expand the tree canopy throughout the Town and therefore reduce stormwater runoff. Trees are beneficial for reducing stormwater pollution by taking up nutrients and various pollutants through their root systems. Though tree planting is not a requirement to residents and businesses, the Town will tabulate the number of trees planted within this 5-year cycle and add the result to the amount of sediment removed, which will be determined based on guidance from PADEP. The Town also intends to ask the Environmental Advisory Committee to incorporate a tree canopy investigation as part of its green space inventory.

Though stream restoration projects are classified as structural BMPs, the method used to calculate their reduction efficiency is slightly different then the previously discussed methods. For simplicity purposes, a default effectiveness rate of 115 lb/ft/yr for sediment load will be used for each proposed stream restoration project. To obtain the phosphorus loading rate, a default value of 1.05 pounds of phosphorus per ton of sediment is used.

For calculating the pollutant loads generated within the BMP's drainage area, the same method that was used in Chapter 4 of the report was utilized. Appendix F contains the existing load calculation spreadsheets for proposed BMP projects. Appendix G contains an overall table detailing the existing loads, the percent removals, and the load reductions of each proposed BMP.

OPERATION AND MAINTENANCE OF POTENTIAL BMPS

Each situation for which a potential BMP is considered will be evaluated based on merits (listed in no particular order) such as documented areas of historical flooding, portions of watersheds in floodplains, estimated degradation of a stream greater than or equal to 10% of sediment in the stream where the BMP is proposed, areas of general streambank erosion, the type of BMP/retrofit proposed, and portions of watersheds without stormwater management BMPs. The Town may assume maintenance responsibility for BMPs that detain or retain stormwater with the approval of Town Council. All other situations will remain the responsibility of the private property owner. Operation and maintenance for all BMPs on Town property are the responsibility of the Town.

FUNDING OF POTENTIAL BMPS

Potential BMPs have been identified for permitting purposes in Section 5.1 Potential Structural BMPs. The approval of and funding for each BMP is subject to the Town's budgeting process. Grant opportunities (public and private) will be researched and pursued to buttress local funding.

5.1 Structural BMPs

Park Ridge Detention Basin Retrofit (P01)

- *Location*: N40° 35' 11.06", W80° 00' 05.72”
- *Description*: The Town restored and converted the Park Ridge Detention Basin into a dry extended detention basin. The treated drainage area is approximately 15 acres.
- *Estimated Reductions:* The project reduced 6,204.68 lbs/year of sediment from Little Pine Creek.
- *Operation & Maintenance*: Operation and maintenance of the stormwater facility will be performed by the Town in accordance with the PA Stormwater BMP Manual for the applicable type of BMP.
- *Funding*: Town’s Capital Budget, grant opportunities, and other watershed-based funding opportunities.

Brittany Place Stream Restoration (P02)

- *Location*: Start: N40° 33' 24.3135", W80° 00' 19.9390"
  End: N40° 33' 24.2409", W80° 00’ 18.2560"
- *Description*: Approximately 135 LF of Little Pine Creek was rehabilitated near Brittany Place.
- *Estimated Reductions:* The project reduced 15,525 lbs/year of sediment from Little Pine Creek.
- *Operation & Maintenance*: Operation and maintenance of the restored stream will be performed by the Town of McCandless.
- *Funding*: Town’s Capital Budget, grant opportunities, and other watershed-based funding opportunities.

MTSA Longvue Stream Restoration (P03)

- *Location*: Start: N40° 33' 42.61", W80° 00' 42.69"
  End: N40° 33' 39.85", W80° 00’ 40.01"
- *Description*: Approximately 420 LF of Little Pine Creek will be rehabilitated on the McCandless Township Sanitary Authority property.
- *Estimated Reductions:* The project will reduce 48,300 lbs/year of sediment from Little Pine Creek.
- *Operation & Maintenance*: Operation and maintenance of the restored stream will be performed by the Town of McCandless.
- *Funding*: Town’s Capital Budget, grant opportunities, and other watershed-based funding opportunities.

5.2 Summary of Proposed BMPs

The proposed BMPs discussed previously will collectively meet the required sediment and phosphorus reductions. The Town plans to select, design, and construct enough of the proposed BMPs to meet the required reduction. Due to unforeseen circumstances, McCandless may not be able to construct enough of the proposed BMPs prior to the March 15, 2023 deadline; however, the Town is working diligently to implement these projects in a timely matter that is financially possible and reasonably attainable. McCandless recognizes the importance of these PRP projects in addressing sediment and nutrient pollution in stormwater runoff and intends to construct the proposed BMPs for the Little Pine Creek watershed. Table 5-1 illustrates the existing load, required reduction, and anticipated reduction. The MS4 will achieve its load reduction requirement for the HUC-12 watershed through the implementation of the proposed BMPs.

Table 5-1: Expected Load Reductions from Proposed BMPs

POLLUTANT	FINAL EXISTING LOAD (lbs/yr)	REQUIRED REDUCTION (lbs/yr)	ACHIEVED REDUCTION (lbs/yr)
Sediment	699,746.89	69,974.69	**70,029.68**
Phosphorus	251.87	N/A*	**N/A***

*In accordance with PADEP guidance, the Town plans to take a presumption approach that a 10% reduction of sediment will also accomplish a 5% phosphorus reduction.

Appendix A – Planning Area Map

SUNRISE EXTENDED DETENTION POND (002)

MCCANDLESS CROSSING PLAN NO. 8 (001)

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Job No: C-35419-K024
Date October 5, 2022

Scale
0 400 800 1,600 Feet

Township of McCandless

Little Pine Creek Planning Area Map

- 2022-10-04 LPC Revised Parsing
- Storm Network Structures
- Storm Sewer Manholes
- Storm Sewer Inlets
- Storm Sewer Discharge Point
- Storm Clean Outs
- Storm Sewer Lines
- Storm Detention Area
- Streams and Rivers
- Road Centerlines
- Municipal Boundaries
- HUC12 Watersehds
- Existing BMPs
- Piped Streams

Date: October 05, 2022

National Land Cover Database 2011

- Open Water
- Perennial Ice/Snow
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land (Rock/Sand/Clay)
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

File Path: G:\Projects\85000 Upper St Clair\8-2022 MS4 TMDL 2022\MS4\GIS\Planning Area Maps\Little Pine Planning Area Map.mxd

Appendix B – Existing Loads without BMPs

Look-Up Table for MMW Land Use Loading Rates
Watershed: Little Pine Creek-Pin
Year: 2022

Section 3: MMW Model Output

This page is where the output data from a mult-year MMW model run is to be copied and pasted into this workbook and is the source data for calculations throughout the workbook.

1. Source File Name - User-specified filename for the output file from MMW (optional).
2. Watershed Name - User-specified name of a watershed for which land use loading rates are being calculated (optional).
3. Source file - The annual pollutant data, in English Units, is copied directly from the MMW output file to the table below.
4. Year - the year modeled (optional).

Data Entered By: *User Specified*
Date Data Entered: *2022-06-02*
Source File Name: *User Specified*
Watershed: *Little Pine Creek-Pine Creek*
Year: *2022*

Model My Watershed OUTPUT DATA

Source	Area	Sediment	Tot N	Tot P
Units	*acres*	*tons/year*	*lbs/year*	*lbs/year*
Hay/Past	474.07	75.22	494.38	254.57
Cropland	170.37	25.59	414.25	109.65
Forest	10,392.59	12.12	573.45	57.97
Wetland	4.94	0.00	1.43	0.09
Disturbed	-	-	-	-
Turfgrass	-	-	-	-
Open_Land	96.30	6.15	77.51	16.56
Bare_Rock	7.41	0.01	1.98	0.09
Sandy_Areas	-	-	-	-
Unpaved Road	-	-	-	-
Ld_Mixed	12,782.72	33.43	1,858.95	195.43
Md_Mixed	2,464.20	86.49	3,610.62	368.96
Hd_Mixed	854.32	29.96	1,250.90	127.82
Ld Residential	-	-	-	-
Md_Residential	-	-	-	-
Hd Residential	-	-	-	-
Farm Animals		-	751.44	201.12
Tile Drainage		-	-	-
Stream Bank		9,972.66	11,352.45	6,311.60
Groundwater		-	21,476.88	911.33
Point Source		-	415,607.22	48,699.63
Septic Systems		-	7,830.81	-
Totals	*27,246.91*	*10,241.63*	*465,302.28*	*57,254.82*

STREAM LENGTHS*

	KM*	FEET	Sed lb/ft	TN lb/ft	TP lb/ft
Total Length	133.41	437696.9	45.6	0.03	0.01
Ag Streams	1.36	4461.9			
Non-Ag Streams	132.05	433234.9			
Hardened Streams	11.95	39202.9			
Percent	91.0%				

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

FARM ANIMAL DATA

TYPE*	NUMBER*	AVG WT KG	TOTAL KG	TOTAL AEU	KG N/AEU/DAY	KG P/AEU/DAY	TOTAL N/DAY	TOTAL P/DAY
Chickens, Broilers	20	0.9	18	0.018	1.07	0.3	0.01926	0.0054
Chickens, Layers	240	1.8	432	0.432	0.85	0.29	0.3672	0.12528
Cows, Beef	0	360	0	0	0.31	0.09	0	0
Cows, Dairy	0	640	0	0	0.44	0.07	0	0
Horses	79	500	39500	39.5	0.28	0.06	11.06	2.37
Pigs/Hogs/Swine	11	61	671	0.671	0.48	0.15	0.32208	0.10065
Sheep	78	50	3900	3.9	0.37	0.1	1.443	0.39
Turkeys	0	6.8	0	0	0.59	0.2	0	0
					Daily Totals		13.21	2.99
					Poultry Totals		0.39	0.13
					Livestock Totals		12.83	2.86
					Poultry Fraction		0.03013	0.04568
					Livestock Fraction		0.97075	0.95631

* These values can be obtained from the "Animal" tab in the "Analyze" section of a Model My Watershed run

MMW NLCD Land Cover Categories for Watershed (from "Analyze" csv file)

TYPE	AREA (km^2)	AREA (acres)
Open Water	0.03	7.41
Perennial Ice/Snow	0	-
Developed, Open Space	27.65	6,827.16
Developed, Low Intensity	24.12	5,955.56
Developed, Medium Intensity	9.98	2,464.20
Developed, High Intensity	3.46	854.32
Barren Land (Rock/Sand/Clay)	0.03	7.41
Deciduous Forest	30.41	7,508.64
Evergreen Forest	0.08	19.75
Mixed Forest	11.51	2,841.98
Shrub/Scrub	0.09	22.22
Grassland/Herbaceous	0.39	96.30
Pasture/Hay	1.92	474.07
Cultivated Crops	0.69	170.37
Woody Wetlands	0.02	4.94
Emergent Herbaceous Wetlands	0	-
Totals	*110.35*	*27,246.91*

Pollutant Load Conversion from Metric to Standard Units (from "Model" csv file)

SOURCE	SEDIMENT (kg)	TOTAL N (kg)	TOTAL P (kg)	SEDIMENT (tons)	TOTAL N (lbs)	TOTAL P (lbs)
Hay/Pasture	68,224.04	224.21	115.45	75.2170041	494.38305	254.56725
Cropland	23,213.67	187.87	49.73	25.59307118	414.25335	109.65465
Wooded Areas	10,995.57	260.07	26.29	12.12261593	573.45435	57.96945
Wetlands	4.33	0.65	0.04	0.004773825	1.43325	0.0882
Open Land	5,576.29	35.15	7.51	6.147859725	77.50575	16.55955
Barren Areas	4.86	0.90	0.04	0.00535815	1.9845	0.0882
Low-Density Mixed	30,324.44	843.06	88.63	33.4326951	1858.9473	195.42915
Medium-Density Mixed	78,448.17	1,637.47	167.33	86.48910743	3610.62135	368.96265
High-Density Mixed	27,178.03	567.30	57.97	29.96377808	1250.8965	127.82385
Other Upland Areas	34,749.75	966.08	101.57	38.31159938	2130.2064	223.96185
Farm Animals	0.00	340.79	91.21	0	751.44195	201.11805
Stream Bank Erosion	9,045,493.56	5,148.50	2,862.40	9972.656654	11352.44782	6311.599635
Subsurface Flow	0.00	9,740.08	413.30	0	21476.8764	911.3265
Point Sources	0.00	188,484.00	22,086.00	0	415607.22	48699.63
Septic Systems	0.00	3,551.39	0.00	0	7830.81495	0
Totals	*9,324,212.71*	*211,987.52*	*26,067.47*	*10,279.94*	*467,432.49*	*57,478.78*

Note: The information below is only used for allocation of "urban" loads within a larger watershed boundary

MMW NLCD Land Cover Categories for Urban Area (from second, smaller "Analyze" csv file)

TYPE	AREA (km^2)	AREA (acres)	TN (lb/yr)	TP (lb/yr)	Sediment (lb/yr)
Open Water	0	-			
Perennial Ice/Snow	0	-			
Developed, Open Space	0.94	232.10	120.69	58.02	172,677.55
Developed, Low Intensity	2.04	503.70	261.93	125.93	374,747.03
Developed, Medium Intensity	0.36	88.89	205.33	47.11	113,507.97
Developed, High Intensity	0.03	7.41	20.37	4.96	12,738.02
Barren Land (Rock/Sand/Clay)	0	-	0.00	0.00	0.00
Deciduous Forest	0.25	61.73	22.84	11.11	34,033.88
Evergreen Forest	0	-	0.00	0.00	0.00
Mixed Forest	0	-	0.00	0.00	0.00
Shrub/Scrub	0	-	0.00	0.00	0.00
Grassland/Herbaceous	0.01	2.47	2.74	0.84	1,670.87
Pasture/Hay	0	-	0.00	0.00	0.00
Cultivated Crops	0.02	4.94	19.31	5.53	4,194.85
Woody Wetlands	0	-	0.00	0.00	0.00
Emergent Herbaceous Wetlands	0	-	0.00	0.00	0.00
Totals	*3.65*	*901.23*	*653.21*	*253.51*	*713,570.17*

(Note: The values below only pertain to the smaller target area)

STREAM LENGTH	KM*	FEET
Total Length	1.44	4724.4
Ag Streams	0	0.0
Non-Ag Streams	1.44	4724.4

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

TYPE	AREA (m^2)*	AREA (acres)			
Open Water	0	0.00			
Perennial Ice/Snow	0	0.00			
Developed, Open Space	0	0.00	0.00	0.00	0.00
Developed, Low Intensity	0	0.00	0.00	0.00	0.00
Developed, Medium Intensity	0	0.00	0.00	0.00	0.00
Developed, High Intensity	0	0.00	0.00	0.00	0.00
Barren Land (Rock/Sand/Clay)	0	0.00	0.00	0.00	0.00
Deciduous Forest	0	0.00	0.00	0.00	0.00
Evergreen Forest	0	0.00	0.00	0.00	0.00
Mixed Forest	0	0.00	0.00	0.00	0.00
Shrub/Scrub	0	0.00	0.00	0.00	0.00
Grassland/Herbaceous	0	0.00	0.00	0.00	0.00
Pasture/Hay	0	0.00	0.00	0.00	0.00
Cultivated Crops	0	0.00	0.00	0.00	0.00
Woody Wetlands	0	0.00	0.00	0.00	0.00
Emergent Herbaceous Wetlands	0	0.00	0.00	0.00	0.00
Totals	*0*	*0.00*	-	-	-

*Only use this input block if land cover distribution is given in square meters (m^2).
This occurs when AOI is less than about 2 square kilometer2.

TOTAL LOADS **653.21** **253.51** **713,570.17**

Look-Up Table for MMW Loading Rates
Watershed: Little Pine Creek-Pine Creek
Year: 2022
Source File: User Specified

Section 2: Landcover Loading Rates Look-Up Table

TOTAL WATERSHED ANNUAL LOADS

ANNUAL LAND USE LOADING RATES (lbs/acre)

MapShed Land Use Categories

Source	Area	Sediment	Total Nitrogen	Total Phosphorus		SEDIMENT: From Land Use	SEDIMENT: From Stream Banks ①	SEDIMENT: TOTAL SEDIMENT LOADING RATE		NITROGEN: From Land Use	NITROGEN: From Stream Banks ①	NITROGEN: From Farm Animals ②	NITROGEN: TOTAL NITROGEN LOADING RATE		PHOSPHORUS: From Land Use	PHOSPHORUS: From Stream Banks ①	PHOSPHORUS: From Farm Animals ②	PHOSPHORUS: TOTAL PHOSPHORUS LOADING RATE	
Units	*Acres*	*Tons*	*Pounds*	*Pounds*		lbs/acre	lbs/acre	lbs/acre		lbs/acre	lbs/acre	lbs/acre	lbs/acre		lbs/acre	lbs/acre	lbs/acre	lbs/acre	
Source	*area_ac*	*sediment_tons*	*TN_lbs*	*TP_lbs*	*Colum*	*TSS_LoadRateLa*	*TSS_LoadRateBar*	*TSS_LoadRate_lbPerAc*	*Colum*	*TN_LoadRateLa*	*TN_LoadRateBa*	*TN_LoadRateAi*	*TN_LoadRate_lbPerAcP*	*Column6*	*TP_LoadRateLand*	*TP_LoadRateBanks*	*TP_LoadRateAnimal*	*TP_LoadRate_lbPerAcF*	
Hay/Past	474.07	75.22	494.38	254.57		317.32	549.02	**866.34**		1.04	0.31	1.17	**2.52**		0.54	0.17	0.31	**1.02**	Hay/Past
Cropland	170.37	25.59	414.25	109.65		300.44	549.02	**849.46**		2.43	0.31	1.17	**3.91**		0.64	0.17	0.31	**1.12**	Cropland
Forest	10,392.59	12.12	573.45	57.97		2.33	549.02	**551.35**		0.06	0.31	n/a	**0.37**		0.01	0.17	n/a	**0.18**	Forest
Wetland	4.94	0.00	1.43	0.09		1.93	549.02	**550.95**		0.29	0.31	n/a	**0.60**		0.02	0.17	n/a	**0.19**	Wetland
Disturbed	0.00	0.00	0.00	0.00		0.00	0.00	**0.00**		0.00	0.00	n/a	**0.00**		0.00	0.00	n/a	**0.00**	Disturbed
Turfgrass	0.00	0.00	0.00	0.00		0.00	0.00	**0.00**		0.00	0.00	n/a	**0.00**		0.00	0.00	n/a	**0.00**	Turfgrass
Open_Land	96.30	6.15	77.51	16.56		127.69	549.02	**676.70**		0.80	0.31	n/a	**1.11**		0.17	0.17	n/a	**0.34**	Open_Land
Bare_Rock	7.41	0.01	1.98	0.09		1.45	549.02	**550.46**		0.27	0.31	n/a	**0.58**		0.01	0.17	n/a	**0.18**	Bare_Rock
Sandy_Areas	0.00	0.00	0.00	0.00		0.00	0.00	**0.00**		0.00	0.00	n/a	**0.00**		0.00	0.00	n/a	**0.00**	Sandy_Areas
Unpaved_Road	0.00	0.00	0.00	0.00		0.00	0.00	**0.00**		0.00	0.00	n/a	**0.00**		0.00	0.00	n/a	**0.00**	Unpaved_Road
Ld_Mixed	12,782.72	33.43	1,858.95	195.43		5.23	738.75	**743.98**		0.15	0.37	n/a	**0.52**		0.02	0.23	n/a	**0.25**	Ld_Mixed
Md_Mixed	2,464.20	86.49	3,610.62	368.96		70.20	1,206.77	**1,276.96**		1.47	0.84	n/a	**2.31**		0.15	0.38	n/a	**0.53**	Md_Mixed
Hd_Mixed	854.32	29.96	1,250.90	127.82		70.15	1,649.49	**1,719.63**		1.46	1.29	n/a	**2.75**		0.15	0.52	n/a	**0.67**	Hd_Mixed
Ld_Residential	0.00	0.00	0.00	0.00		0.00	0.00	**0.00**		0.00	0.00	n/a	**0.00**		0.00	0.00	n/a	**0.00**	Ld_Residential
Md_Residential	0.00	0.00	0.00	0.00		0.00	0.00	**0.00**		0.00	0.00	n/a	**0.00**		0.00	0.00	n/a	**0.00**	Md_Residential
Hd_Residential	0.00	0.00	0.00	0.00		0.00	0.00	**0.00**		0.00	0.00	n/a	**0.00**		0.00	0.00	n/a	**0.00**	Hd_Residential
						Tons * 2000 lbs/ton acres of a land use		Sum of previous two sources		Tons * 2000 lbs/ton acres of a land use			Sum of previous three sources		Tons * 2000 lbs/ton acres of a land use			Sum of previous three sources	

Addt'l Sources

Source	Sediment	Total Nitrogen	Total Phosphorus
Units	*Tons*	*Pounds*	*Pounds*
Farm Animals	0.00	751.44	201.12
Tile Drainage	0.00	0.00	0.00
Stream Bank ①	9,972.66	11,352.45	6,311.60
Groundwater	0.00	21,476.88	911.33
Point Source	0.00	415,607.22	48,699.63
Septic Systems	0.00	7,830.81	0.00

Notes:

① - Separate worksheets are used to calculate and apportion the loading rates from the Stream Bank source loads (for sediment, total nitrogen, and total phosphorus) from the MMW Output file into each land use category, using methodology provided by Dr. Barry Evans (Pennsylvania State University), the author of MapShed, and with concurrence from Mr. Bill Brown (PADEP).

② - A separate worksheet is used to calculate and apportion the "Total Nitrogen" and "Total Phosphorus" loading rates from the Farm Animals source load from the MMW Output file into the two agricultural land uses, Hay/Pasture and Cropland, based on area weighting. The methodology was provided by Dr. Barry Evans (Pennsylvania State University), the author of MapShed, and with concurrence from Mr. Bill Brown (PADEP). Additionally, since the Farm Animals source loads do not apply to other land use catergories, the values in those cells are "n/a".

Groundwater	0.0	21,476.9	911.3
Point Source	0.0	415,607.2	48,699.6
Septic Systems	0.0	7,830.8	0.0

Appendix C – Existing BMPs Load Calculations

Look-Up Table for MMW Land Use Loading Rates
Watershed: Little Pine Creek-Pin
Year: 2022

Section 3: MMW Model Output

This page is where the output data from a mult-year MMW model run is to be copied and pasted into this workbook and is the source data for calculations throughout the workbook.

1. Source File Name - User-specified filename for the output file from MMW (optional).
2. Watershed Name - User-specified name of a watershed for which land use loading rates are being calculated (optional).
3. Source file - The annual pollutant data, in English Units, is copied directly from the MMW output file to the table below.
4. Year - the year modeled (optional).

Data Entered By: *User Specified*
Date Data Entered: *2022-06-02*
Source File Name: *Crossing Plan No. 8*
Watershed: *Little Pine Creek-Pine Creek*
Year: *2022*

Model My Watershed OUTPUT DATA

Source	Area	Sediment	Tot N	Tot P
Units	*acres*	*tons/year*	*lbs/year*	*lbs/year*
Hay/Past	474.07	75.22	494.38	254.57
Cropland	170.37	25.59	414.25	109.65
Forest	10,392.59	12.12	573.45	57.97
Wetland	4.94	0.00	1.43	0.09
Disturbed	-	-	-	-
Turfgrass	-	-	-	-
Open_Land	96.30	6.15	77.51	16.56
Bare_Rock	7.41	0.01	1.98	0.09
Sandy_Areas	-	-	-	-
Unpaved Road	-	-	-	-
Ld_Mixed	12,782.72	33.43	1,858.95	195.43
Md_Mixed	2,464.20	86.49	3,610.62	368.96
Hd_Mixed	854.32	29.96	1,250.90	127.82
Ld Residential	-	-	-	-
Md_Residential	-	-	-	-
Hd Residential	-	-	-	-
Farm Animals		-	751.44	201.12
Tile Drainage		-	-	-
Stream Bank		10,004.39	11,388.57	6,331.68
Groundwater		-	21,476.88	911.33
Point Source		-	415,607.22	48,699.63
Septic Systems		-	7,830.81	-
Totals	*27,246.91*	*10,273.37*	*465,338.40*	*57,274.90*

STREAM LENGTHS* **KM*** **FEET**

			Sed lb/ft	TN lb/ft	TP lb/ft
Total Length	133.41	437696.9	45.7	0.03	0.01
Ag Streams	1.36	4461.9			
Non-Ag Streams	132.05	433234.9			
Hardened Streams	11.56	37934.9			
Percent	91.3%				

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

FARM ANIMAL DATA

TYPE*	NUMBER*	AVG WT KG	TOTAL KG	TOTAL AEU	KG N/AEU/DAY	KG P/AEU/DAY	TOTAL N/DAY	TOTAL P/DAY
Chickens, Broilers	20	0.9	18	0.018	1.07	0.3	0.01926	0.0054
Chickens, Layers	240	1.8	432	0.432	0.85	0.29	0.3672	0.12528
Cows, Beef	0	360	0	0	0.31	0.09	0	0
Cows, Dairy	0	640	0	0	0.44	0.07	0	0
Horses	79	500	39500	39.5	0.28	0.06	11.06	2.37
Pigs/Hogs/Swine	11	61	671	0.671	0.48	0.15	0.32208	0.10065
Sheep	78	50	3900	3.9	0.37	0.1	1.443	0.39
Turkeys	0	6.8	0	0	0.59	0.2	0	0
					Daily Totals		13.21	2.99
					Poultry Totals		0.39	0.13
					Livestock Totals		12.83	2.86
					Poultry Fraction		0.03013	0.04568
					Livestock Fraction		0.97075	0.95631

* These values can be obtained from the "Animal" tab in the "Analyze" section of a Model My Watershed run

MMW NLCD Land Cover Categories for Watershed (from "Analyze" csv file)

TYPE	AREA (km^2)	AREA (acres)
Open Water	0.03	7.41
Perennial Ice/Snow	0	-
Developed, Open Space	27.65	6,827.16
Developed, Low Intensity	24.12	5,955.56
Developed, Medium Intensity	9.98	2,464.20
Developed, High Intensity	3.46	854.32
Barren Land (Rock/Sand/Clay)	0.03	7.41
Deciduous Forest	30.41	7,508.64
Evergreen Forest	0.08	19.75
Mixed Forest	11.51	2,841.98
Shrub/Scrub	0.09	22.22
Grassland/Herbaceous	0.39	96.30
Pasture/Hay	1.92	474.07
Cultivated Crops	0.69	170.37
Woody Wetlands	0.02	4.94
Emergent Herbaceous Wetlands	0	-
Totals	*110.35*	*27,246.91*

Pollutant Load Conversion from Metric to Standard Units (from "Model" csv file)

SOURCE	SEDIMENT (kg)	TOTAL N (kg)	TOTAL P (kg)	SEDIMENT (tons)	TOTAL N (lbs)	TOTAL P (lbs)
Hay/Pasture	68,224.04	224.21	115.45	75.2170041	494.38305	254.56725
Cropland	23,213.67	187.87	49.73	25.59307118	414.25335	109.65465
Wooded Areas	10,995.57	260.07	26.29	12.12261593	573.45435	57.96945
Wetlands	4.33	0.65	0.04	0.004773825	1.43325	0.0882
Open Land	5,576.29	35.15	7.51	6.147859725	77.50575	16.55955
Barren Areas	4.86	0.90	0.04	0.00535815	1.9845	0.0882
Low-Density Mixed	30,324.44	843.06	88.63	33.4326951	1858.9473	195.42915
Medium-Density Mixed	78,448.17	1,637.47	167.33	86.48910743	3610.62135	368.96265
High-Density Mixed	27,178.03	567.30	57.97	29.96377808	1250.8965	127.82385
Other Upland Areas	34,749.75	966.08	101.57	38.31159938	2130.2064	223.96185
Farm Animals	0.00	340.79	91.21	0	751.44195	201.11805
Stream Bank Erosion	9,074,276.15	5,164.88	2,871.51	10004.38945	11388.57108	6331.683022
Subsurface Flow	0.00	9,740.08	413.30	0	21476.8764	911.3265
Point Sources	0.00	188,484.00	22,086.00	0	415607.22	48699.63
Septic Systems	0.00	3,551.39	0.00	0	7830.81495	0
Totals	*9,352,995.30*	*212,003.90*	*26,076.58*	*10,311.68*	*467,468.61*	*57,498.86*

Note: The information below is only used for allocation of "urban" loads within a larger watershed boundary

MMW NLCD Land Cover Categories for Urban Area (from second, smaller "Analyze" csv file)

TYPE	AREA (km^2)	AREA (acres)	TN (lb/yr)	TP (lb/yr)	Sediment (lb/yr)
Open Water		-			
Perennial Ice/Snow		-			
Developed, Open Space		-	0.00	0.00	0.00
Developed, Low Intensity		-	0.00	0.00	0.00
Developed, Medium Intensity		-	0.00	0.00	0.00
Developed, High Intensity		-	0.00	0.00	0.00
Barren Land (Rock/Sand/Clay)		-	0.00	0.00	0.00
Deciduous Forest		-	0.00	0.00	0.00
Evergreen Forest		-	0.00	0.00	0.00
Mixed Forest		-	0.00	0.00	0.00
Shrub/Scrub		-	0.00	0.00	0.00
Grassland/Herbaceous		-	0.00	0.00	0.00
Pasture/Hay		-	0.00	0.00	0.00
Cultivated Crops		-	0.00	0.00	0.00
Woody Wetlands		-	0.00	0.00	0.00
Emergent Herbaceous Wetlands		-	0.00	0.00	0.00
Totals	-	-	-	-	-

(Note: The values below only pertain to the smaller target area)

STREAM LENGTH **KM*** **FEET**

Total Length	0	0.0
Ag Streams	0	0.0
Non-Ag Streams	0	0.0

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

TYPE	AREA (m^2)*	AREA (acres)			
Open Water	0	0.00			
Perennial Ice/Snow	0	0.00			
Developed, Open Space	0	0.00	0.00	0.00	0.00
Developed, Low Intensity	3588.68	0.89	0.46	0.22	661.32
Developed, Medium Intensity	10766.05	2.66	6.14	1.41	3,404.74
Developed, High Intensity	5383.02	1.33	3.66	0.89	2,292.61
Barren Land (Rock/Sand/Clay)	0	0.00	0.00	0.00	0.00
Deciduous Forest	89717.05	22.15	8.20	3.99	12,252.37
Evergreen Forest	0	0.00	0.00	0.00	0.00
Mixed Forest	0	0.00	0.00	0.00	0.00
Shrub/Scrub	0	0.00	0.00	0.00	0.00
Grassland/Herbaceous	0	0.00	0.00	0.00	0.00
Pasture/Hay	0	0.00	0.00	0.00	0.00
Cultivated Crops	0	0.00	0.00	0.00	0.00
Woody Wetlands	0	0.00	0.00	0.00	0.00
Emergent Herbaceous Wetlands	0	0.00	0.00	0.00	0.00
Totals	*109454.8*	*27.03*	*18.45*	*6.51*	*18,611.05*

*Only use this input block if land cover distribution is given in square meters (m^2).
This occurs when AOI is less than about 2 square kilometer2.

TOTAL LOADS		**18.45**	**6.51**	**18,611.05**
			0.33	1,861.10

Look-Up Table for MMW Land Use Loading Rates
Watershed: Little Pine Creek-Pin
Year: 2022

Section 3: MMW Model Output

This page is where the output data from a mult-year MMW model run is to be copied and pasted into this workbook and is the source data for calculations throughout the workbook.

1. Source File Name - User-specified filename for the output file from MMW (optional).
2. Watershed Name - User-specified name of a watershed for which land use loading rates are being calculated (optional).
3. Source file - The annual pollutant data, in English Units, is copied directly from the MMW output file to the table below.
4. Year - the year modeled (optional).

Data Entered By: *User Specified*
Date Data Entered: *2022-06-02*
Source File Name: *Sunrise*
Watershed: *Little Pine Creek-Pine Creek*
Year: *2022*

Model My Watershed OUTPUT DATA

Source	Area	Sediment	Tot N	Tot P
Units	*acres*	*tons/year*	*lbs/year*	*lbs/year*
Hay/Past	474.07	75.22	494.38	254.57
Cropland	170.37	25.59	414.25	109.65
Forest	10,392.59	12.12	573.45	57.97
Wetland	4.94	0.00	1.43	0.09
Disturbed	-	-	-	-
Turfgrass	-	-	-	-
Open_Land	96.30	6.15	77.51	16.56
Bare_Rock	7.41	0.01	1.98	0.09
Sandy_Areas	-	-	-	-
Unpaved Road	-	-	-	-
Ld_Mixed	12,782.72	33.43	1,858.95	195.43
Md_Mixed	2,464.20	86.49	3,610.62	368.96
Hd_Mixed	854.32	29.96	1,250.90	127.82
Ld Residential	-	-	-	-
Md_Residential	-	-	-	-
Hd Residential	-	-	-	-
Farm Animals		-	751.44	201.12
Tile Drainage		-	-	-
Stream Bank		10,004.39	11,388.57	6,331.68
Groundwater		-	21,476.88	911.33
Point Source		-	415,607.22	48,699.63
Septic Systems		-	7,830.81	-
Totals	*27,246.91*	*10,273.37*	*465,338.40*	*57,274.90*

STREAM LENGTHS* **KM*** **FEET**

			Sed lb/ft	TN lb/ft	TP lb/ft
Total Length	133.41	437696.9	45.7	0.03	0.01
Ag Streams	1.36	4461.9			
Non-Ag Streams	132.05	433234.9			
Hardened Streams	11.56	37934.9			
Percent	91.3%				

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

FARM ANIMAL DATA

TYPE*	NUMBER*	AVG WT KG	TOTAL KG	TOTAL AEU	KG N/AEU/DAY	KG P/AEU/DAY	TOTAL N/DAY	TOTAL P/DAY
Chickens, Broilers	20	0.9	18	0.018	1.07	0.3	0.01926	0.0054
Chickens, Layers	240	1.8	432	0.432	0.85	0.29	0.3672	0.12528
Cows, Beef	0	360	0	0	0.31	0.09	0	0
Cows, Dairy	0	640	0	0	0.44	0.07	0	0
Horses	79	500	39500	39.5	0.28	0.06	11.06	2.37
Pigs/Hogs/Swine	11	61	671	0.671	0.48	0.15	0.32208	0.10065
Sheep	78	50	3900	3.9	0.37	0.1	1.443	0.39
Turkeys	0	6.8	0	0	0.59	0.2	0	0
				Daily Totals			13.21	2.99
				Poultry Totals			0.39	0.13
				Livestock Totals			12.83	2.86
				Poultry Fraction			0.03013	0.04568
				Livestock Fraction			0.97075	0.95631

* These values can be obtained from the "Animal" tab in the "Analyze" section of a Model My Watershed run

MMW NLCD Land Cover Categories for Watershed (from "Analyze" csv file)

TYPE	AREA (km^2)	AREA (acres)
Open Water	0.03	7.41
Perennial Ice/Snow	0	-
Developed, Open Space	27.65	6,827.16
Developed, Low Intensity	24.12	5,955.56
Developed, Medium Intensity	9.98	2,464.20
Developed, High Intensity	3.46	854.32
Barren Land (Rock/Sand/Clay)	0.03	7.41
Deciduous Forest	30.41	7,508.64
Evergreen Forest	0.08	19.75
Mixed Forest	11.51	2,841.98
Shrub/Scrub	0.09	22.22
Grassland/Herbaceous	0.39	96.30
Pasture/Hay	1.92	474.07
Cultivated Crops	0.69	170.37
Woody Wetlands	0.02	4.94
Emergent Herbaceous Wetlands	0	-
Totals	*110.35*	*27,246.91*

Pollutant Load Conversion from Metric to Standard Units (from "Model" csv file)

SOURCE	SEDIMENT (kg)	TOTAL N (kg)	TOTAL P (kg)	SEDIMENT (tons)	TOTAL N (lbs)	TOTAL P (lbs)
Hay/Pasture	68,224.04	224.21	115.45	75.2170041	494.38305	254.56725
Cropland	23,213.67	187.87	49.73	25.59307118	414.25335	109.65465
Wooded Areas	10,995.57	260.07	26.29	12.12261593	573.45435	57.96945
Wetlands	4.33	0.65	0.04	0.004773825	1.43325	0.0882
Open Land	5,576.29	35.15	7.51	6.147859725	77.50575	16.55955
Barren Areas	4.86	0.90	0.04	0.00535815	1.9845	0.0882
Low-Density Mixed	30,324.44	843.06	88.63	33.4326951	1858.9473	195.42915
Medium-Density Mixed	78,448.17	1,637.47	167.33	86.48910743	3610.62135	368.96265
High-Density Mixed	27,178.03	567.30	57.97	29.96377808	1250.8965	127.82385
Other Upland Areas	34,749.75	966.08	101.57	38.31159938	2130.2064	223.96185
Farm Animals	0.00	340.79	91.21	0	751.44195	201.11805
Stream Bank Erosion	9,074,276.15	5,164.88	2,871.51	10004.38945	11388.57108	6331.683022
Subsurface Flow	0.00	9,740.08	413.30	0	21476.8764	911.3265
Point Sources	0.00	188,484.00	22,086.00	0	415607.22	48699.63
Septic Systems	0.00	3,551.39	0.00	0	7830.81495	0
Totals	*9,352,995.30*	*212,003.90*	*26,076.58*	*10,311.68*	*467,468.61*	*57,498.86*

Note: The information below is only used for allocation of "urban" loads within a larger watershed boundary

MMW NLCD Land Cover Categories for Urban Area (from second, smaller "Analyze" csv file)

TYPE	AREA (km^2)	AREA (acres)	TN (lb/yr)	TP (lb/yr)	Sediment (lb/yr)
Open Water		-			
Perennial Ice/Snow		-			
Developed, Open Space		-	0.00	0.00	0.00
Developed, Low Intensity		-	0.00	0.00	0.00
Developed, Medium Intensity		-	0.00	0.00	0.00
Developed, High Intensity		-	0.00	0.00	0.00
Barren Land (Rock/Sand/Clay)		-	0.00	0.00	0.00
Deciduous Forest		-	0.00	0.00	0.00
Evergreen Forest		-	0.00	0.00	0.00
Mixed Forest		-	0.00	0.00	0.00
Shrub/Scrub		-	0.00	0.00	0.00
Grassland/Herbaceous		-	0.00	0.00	0.00
Pasture/Hay		-	0.00	0.00	0.00
Cultivated Crops		-	0.00	0.00	0.00
Woody Wetlands		-	0.00	0.00	0.00
Emergent Herbaceous Wetlands		-	0.00	0.00	0.00
Totals	-	-	-	-	-

(Note: The values below only pertain to the smaller target area)

STREAM LENGTH **KM*** **FEET**

Total Length	0	0.0
Ag Streams	0	0.0
Non-Ag Streams	0	0.0

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

TYPE	AREA (m^2)*	AREA (acres)			
Open Water	0	0.00			
Perennial Ice/Snow	0	0.00			
Developed, Open Space	8074.53	1.99	1.04	0.50	1,487.97
Developed, Low Intensity	897.17	0.22	0.12	0.06	165.33
Developed, Medium Intensity	7177.36	1.77	4.09	0.94	2,269.83
Developed, High Intensity	897.17	0.22	0.61	0.15	382.10
Barren Land (Rock/Sand/Clay)	0	0.00	0.00	0.00	0.00
Deciduous Forest	897.17	0.22	0.08	0.04	122.52
Evergreen Forest	0	0.00	0.00	0.00	0.00
Mixed Forest	0	0.00	0.00	0.00	0.00
Shrub/Scrub	0	0.00	0.00	0.00	0.00
Grassland/Herbaceous	0	0.00	0.00	0.00	0.00
Pasture/Hay	0	0.00	0.00	0.00	0.00
Cultivated Crops	0	0.00	0.00	0.00	0.00
Woody Wetlands	0	0.00	0.00	0.00	0.00
Emergent Herbaceous Wetlands	0	0.00	0.00	0.00	0.00
Totals	*17943.4*	*4.43*	*5.94*	*1.68*	*4,427.75*

*Only use this input block if land cover distribution is given in square meters (m^2).
This occurs when AOI is less than about 2 square kilometer2.

TOTAL LOADS **5.94** **1.68** **4,427.75**

Appendix D – Existing BMPs Load Reduction Table

Lower Chartiers Creek Existing BMPs Table

BMP ID	BMP Type	Latitude	Longitude	Permit Number	Installation Year
88A	Crossing Plan No. 8 - Dry Extended Detention Basin	N 40° 21' 33.62"	W 80° 05' 34.42"	PAG2000208073-1	2014
9761	Sunrise Senior Living - Extended Detention Pond	N 40° 21' 33.85"	W 80° 05' 11.53"	PAC02304	2008

Little Pine Creek Existing BMPs Load Reduction Table

BMP ID	BMP Type	Removal Efficiency Determination Method	Existing Sediment Load (lb/yr)	Existing TP Load (lb/yr)	Sediment Removal Efficiency	TP Removal Efficiency	Sediment Load Reduction (lb/yr)	TP Load Reduction (lb/yr)
E01	Crossing Plan No. 8 - Dry Extended	BMP Effectiveness Tables	18,611.05	6.51	60%	20%	11,166.63	1.30
E02	Sunrise - Extended Detention Pond	BMP Effectiveness Tables	4,427.75	1.83	60%	20%	2,656.65	0.37
Total							**13,823.28**	**1.67**

Appendix E – Proposed Structural BMPs Maps

Township of McCandless
Little Pine Creek Watershed

Proposed BMP Locations

Project Number: C-35419-K024

N
W E
S

Date: 11/10/2022
Scale: 1" = 300'

Park Ridge
Basin Retrofit
P01

- Storm Network Structures
- Storm Sewer Manholes
- Storm Sewer Inlets
- Storm Sewer Discharge Point
- Storm Clean Outs
- Storm Sewer Lines
- Storm Detention Area
- Tax Parcels
- Municipal Boundaries
- Road Centerlines
- Streams and Rivers
- Stream Restoration
- ParkRidge Basin

100 McMorris Road
Pittsburgh, PA 15205
Phone: 412-921-4030
Fax 412-921-9960

GATEWAY
On Call. On Time. On Target.

Path: G:\Projects\85000 Upper St Clair\85374 MS4 & TMDL-2017 MS4\PRP\GIS\Potential BMP Mapbook\Brush_Run_BMP_Mapbook_11x17.mxd

Township of McCandless
Little Pine Creek Watershed

Proposed BMP Locations

Project Number: C-35419-K024

Date: 11/10/2022
Scale: 1" = 300'

MTSA Longvue Stream Restoration P03

Brittany Place Stream Restoration P02

WINCHESTER DRIVE
PEEBLES ROAD
REMINGTON DRIVE
TANGLEWOOD ROAD
ELAINE DRIVE
VIVIAN DRIVE
HAZLETT ROAD
GIBSON ROAD
BINGAY DRIVE
HILL VISTA DRIVE
PATRICIA DRIVE
DORMAR DRIVE
BRAMBLE LANE
BALMORAL DRIVE
SHERRAY DRIVE
BRITTANY PLACE
DORMAR COURT
WINDMILL COURT
WINDMILL LANE
PIN OAK DRIVE
REGENCY DRIVE

Storm Network Structures
Storm Sewer Manholes
Storm Sewer Inlets
Storm Sewer Discharge Point
Storm Clean Outs
Storm Sewer Lines
Storm Detention Area
Tax Parcels
Municipal Boundaries
Road Centerlines
Streams and Rivers
Stream Restoration
ParkRidge Basin

100 McMorris Road
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GATEWAY
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Path: G:\Projects\65000 Upper St Clair\65374 MS4 & TMDL\2017 MS4\PRP\GIS\Potential BMP Mapbook\Brush_Run_BMP_Mapbook_11x17.mxd

Appendix F – Proposed BMPs Load Calculations

Look-Up Table for MMW Land Use Loading Rates
Watershed: Little Pine Creek-Pin
Year: 2022

Section 3: MMW Model Output

This page is where the output data from a mult-year MMW model run is to be copied and pasted into this workbook and is the source data for calculations throughout the workbook.

1. Source File Name - User-specified filename for the output file from MMW (optional).
2. Watershed Name - User-specified name of a watershed for which land use loading rates are being calculated (optional).
3. Source file - The annual pollutant data, in English Units, is copied directly from the MMW output file to the table below.
4. Year - the year modeled (optional).

Data Entered By:	*User Specified*
Date Data Entered:	*2022-06-02*
Source File Name:	*User Specified*
Watershed:	*Little Pine Creek-Pine Creek*
Year:	*2022*

Model My Watershed OUTPUT DATA

Source	Area	Sediment	Tot N	Tot P
Units	*acres*	*tons/year*	*lbs/year*	*lbs/year*
Hay/Past	474.07	75.22	494.38	254.57
Cropland	170.37	25.59	414.25	109.65
Forest	10,392.59	12.12	573.45	57.97
Wetland	4.94	0.00	1.43	0.09
Disturbed	-	-	-	-
Turfgrass	-	-	-	-
Open_Land	96.30	6.15	77.51	16.56
Bare_Rock	7.41	0.01	1.98	0.09
Sandy_Areas	-	-	-	-
Unpaved Road	-	-	-	-
Ld_Mixed	12,782.72	33.43	1,858.95	195.43
Md_Mixed	2,464.20	86.49	3,610.62	368.96
Hd_Mixed	854.32	29.96	1,250.90	127.82
Ld Residential	-	-	-	-
Md_Residential	-	-	-	-
Hd Residential	-	-	-	-
Farm Animals		-	751.44	201.12
Tile Drainage		-	-	-
Stream Bank		10,004.39	11,388.57	6,331.68
Groundwater		-	21,476.88	911.33
Point Source		-	415,607.22	48,699.63
Septic Systems		-	7,830.81	-
Totals	*27,246.91*	*10,273.37*	*465,338.40*	*57,274.90*

STREAM LENGTHS*

	KM*	FEET	Sed lb/ft	TN lb/ft	TP lb/ft
Total Length	133.41	437696.9	45.7	0.03	0.01
Ag Streams	1.36	4461.9			
Non-Ag Streams	132.05	433234.9			
Hardened Streams	11.56	37934.9			
Percent	91.3%				

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

FARM ANIMAL DATA

TYPE*	NUMBER*	AVG WT KG	TOTAL KG	TOTAL AEU	KG N/AEU/DAY	KG P/AEU/DAY	TOTAL N/DAY	TOTAL P/DAY
Chickens, Broilers	20	0.9	18	0.018	1.07	0.3	0.01926	0.0054
Chickens, Layers	240	1.8	432	0.432	0.85	0.29	0.3672	0.12528
Cows, Beef	0	360	0	0	0.31	0.09	0	0
Cows, Dairy	0	640	0	0	0.44	0.07	0	0
Horses	79	500	39500	39.5	0.28	0.06	11.06	2.37
Pigs/Hogs/Swine	11	61	671	0.671	0.48	0.15	0.32208	0.10065
Sheep	78	50	3900	3.9	0.37	0.1	1.443	0.39
Turkeys	0	6.8	0	0	0.59	0.2	0	0
					Daily Totals		13.21	2.99
					Poultry Totals		0.39	0.13
					Livestock Totals		12.83	2.86
					Poultry Fraction		0.03013	0.04568
					Livestock Fraction		0.97075	0.95631

* These values can be obtained from the "Animal" tab in the "Analyze" section of a Model My Watershed run

MMW NLCD Land Cover Categories for Watershed (from "Analyze" csv file)

TYPE	AREA (km^2)	AREA (acres)
Open Water	0.03	7.41
Perennial Ice/Snow	0	-
Developed, Open Space	27.65	6,827.16
Developed, Low Intensity	24.12	5,955.56
Developed, Medium Intensity	9.98	2,464.20
Developed, High Intensity	3.46	854.32
Barren Land (Rock/Sand/Clay)	0.03	7.41
Deciduous Forest	30.41	7,508.64
Evergreen Forest	0.08	19.75
Mixed Forest	11.51	2,841.98
Shrub/Scrub	0.09	22.22
Grassland/Herbaceous	0.39	96.30
Pasture/Hay	1.92	474.07
Cultivated Crops	0.69	170.37
Woody Wetlands	0.02	4.94
Emergent Herbaceous Wetlands	0	-
Totals	*110.35*	*27,246.91*

Pollutant Load Conversion from Metric to Standard Units (from "Model" csv file)

SOURCE	SEDIMENT (kg)	TOTAL N (kg)	TOTAL P (kg)	SEDIMENT (tons)	TOTAL N (lbs)	TOTAL P (lbs)
Hay/Pasture	68,224.04	224.21	115.45	75.2170041	494.38305	254.56725
Cropland	23,213.67	187.87	49.73	25.59307118	414.25335	109.65465
Wooded Areas	10,995.57	260.07	26.29	12.12261593	573.45435	57.96945
Wetlands	4.33	0.65	0.04	0.004773825	1.43325	0.0882
Open Land	5,576.29	35.15	7.51	6.147859725	77.50575	16.55955
Barren Areas	4.86	0.90	0.04	0.00535815	1.9845	0.0882
Low-Density Mixed	30,324.44	843.06	88.63	33.4326951	1858.9473	195.42915
Medium-Density Mixed	78,448.17	1,637.47	167.33	86.48910743	3610.62135	368.96265
High-Density Mixed	27,178.03	567.30	57.97	29.96377808	1250.8965	127.82385
Other Upland Areas	34,749.75	966.08	101.57	38.31159938	2130.2064	223.96185
Farm Animals	0.00	340.79	91.21	0	751.44195	201.11805
Stream Bank Erosion	9,074,276.15	5,164.88	2,871.51	10004.38945	11388.57108	6331.683022
Subsurface Flow	0.00	9,740.08	413.30	0	21476.8764	911.3265
Point Sources	0.00	188,484.00	22,086.00	0	415607.22	48699.63
Septic Systems	0.00	3,551.39	0.00	0	7830.81495	0
Totals	*9,352,995.30*	*212,003.90*	*26,076.58*	*10,311.68*	*467,468.61*	*57,498.86*

Note: The information below is only used for allocation of "urban" loads within a larger watershed boundary

MMW NLCD Land Cover Categories for Urban Area (from second, smaller "Analyze" csv file)

TYPE	AREA (km^2)	AREA (acres)	TN (lb/yr)	TP (lb/yr)	Sediment (lb/yr)
Open Water		-			
Perennial Ice/Snow		-			
Developed, Open Space		-	0.00	0.00	0.00
Developed, Low Intensity		-	0.00	0.00	0.00
Developed, Medium Intensity		-	0.00	0.00	0.00
Developed, High Intensity		-	0.00	0.00	0.00
Barren Land (Rock/Sand/Clay)		-	0.00	0.00	0.00
Deciduous Forest		-	0.00	0.00	0.00
Evergreen Forest		-	0.00	0.00	0.00
Mixed Forest		-	0.00	0.00	0.00
Shrub/Scrub		-	0.00	0.00	0.00
Grassland/Herbaceous		-	0.00	0.00	0.00
Pasture/Hay		-	0.00	0.00	0.00
Cultivated Crops		-	0.00	0.00	0.00
Woody Wetlands		-	0.00	0.00	0.00
Emergent Herbaceous Wetlands		-	0.00	0.00	0.00
Totals	-	-	-	-	-

(Note: The values below only pertain to the smaller target area)

STREAM LENGTH

	KM*	FEET
Total Length	1.44	4724.4
Ag Streams	0	0.0
Non-Ag Streams	1.44	4724.4

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

TYPE	AREA (m^2)*	AREA (acres)			
Open Water	0	0.00			
Perennial Ice/Snow	0	0.00			
Developed, Open Space	9868.84	2.44	1.27	0.61	1,818.63
Developed, Low Intensity	5383.01	1.33	0.69	0.33	991.98
Developed, Medium Intensity	2691.5	0.66	1.54	0.35	851.18
Developed, High Intensity	0	0.00	0.00	0.00	0.00
Barren Land (Rock/Sand/Clay)	0	0.00	0.00	0.00	0.00
Deciduous Forest	32298.03	7.97	2.95	1.44	4,410.84
Evergreen Forest	4485.84	1.11	0.41	0.20	612.62
Mixed Forest	5383.01	1.33	0.49	0.24	735.14
Shrub/Scrub	0	0.00	0.00	0.00	0.00
Grassland/Herbaceous	0	0.00	0.00	0.00	0.00
Pasture/Hay	0	0.00	0.00	0.00	0.00
Cultivated Crops	0	0.00	0.00	0.00	0.00
Woody Wetlands	0	0.00	0.00	0.00	0.00
Emergent Herbaceous Wetlands	0	0.00	0.00	0.00	0.00
Totals	*60110.23*	*14.84*	*7.35*	*3.17*	*9,420.39*

*Only use this input block if land cover distribution is given in square meters (m^2).
This occurs when AOI is less than about 2 square kilometer2.

TOTAL LOADS	**7.35**	**3.17**	**9,420.39**

Appendix G – Proposed BMPs Load Reduction Table

Lower Chartiers Creek Proposed BMPs Load Reduction Table

BMP ID	BMP Type	Removal Efficiency Determination Method	Existing Sediment Load (lb/yr)	Existing TP Load (lb/yr)	Sediment Removal Efficiency	TP Removal Efficiency	Sediment Load Reduction (lb/yr)	TP Load Reduction (lb/yr)
P01	Park Ridge Detention Basin Retrofit	BMP Effectiveness Table	16,739.31	4.10	60%	20%	10,043.59	0.82
P02	Brittany Place Stream Restoration	BMP Effectiveness Table	15,525.00	8.15	100%	100%	15,525.00	8.15
P03	MTSA Longvue Stream Restoration	BMP Effectiveness Table	48,300.00	25.36	100%	100%	48,300.00	25.36
Total							**73,868.59**	**34.33**