Exhibit 9

2012 Land Use Loading Calculations

Watershed: White Clay Creek East Branch (W09)
Land Use Loading Calculations
Year: 2012 Land Use

Includes Storm Sewershed areas from:
MS4 Outfalls: None
MS4 Observation Points: 6 thru 8

Mapshed Land Use Categories

Cropland	Forest	Wetland/ Water	Disturbed	HD_ Mixed	LD_ Residential	Total
(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)
0.00	1.76	0.00	0.00	0.00	32.20	33.96

Apply 2012 land use loading rates

Land Use	Area	2012 Sediment Loading Rate	2012 Sediment Loading	2012 Nitrogen Loading Rate	2012 Nitrogen Loading	2012 Phosphorus Loading Rate	2012 Phosphorus Loading
	(acres)	(lbs/acre/yr)	(lbs/yr)	(lbs/acre/yr)	(lbs/yr)	(lbs/acre/yr)	(lbs/yr)
Cropland	0.00	1491.81	0.00	5.84	0.00	1.50	0.00
Forest	1.76	163.18	287.74	0.17	0.30	0.05	0.09
Wetland/Water	0.00	148.61	0.00	0.48	0.00	0.05	0.00
Disturbed	0.00	225.70	0.00	0.27	0.00	0.12	0.00
HD_Mixed	0.00	1906.23	0.00	7.56	0.00	1.01	0.00
LD_Residential	32.20	600.45	19332.21	1.57	50.55	0.24	7.73
Total	33.96		19619.94		50.85		7.82

Watershed: White Clay Creek East Branch (W08)
Land Use Loading Calculations
Year: 2012 Land Use

Includes Storm Sewershed areas from:
MS4 Outfalls: 1 thru 6, 10, 11, 88, 89, 91, 95 thru 99, 102
MS4 Observation Points: 1 thru 5

Mapshed Land Use Categories

Cropland	Forest	Wetland/ Water	Disturbed	HD_ Mixed	LD_ Residential	Total
(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)
41.71	21.12	0.49	64.60	0.00	130.96	258.88

Apply 2012 land use loading rates

Land Use	Area	2012 Sediment Loading Rate	2012 Sediment Loading	2012 Nitrogen Loading Rate	2012 Nitrogen Loading	2012 Phosphorus Loading Rate	2012 Phosphorus Loading
	(acres)	(lbs/acre/yr)	(lbs/yr)	(lbs/acre/yr)	(lbs/yr)	(lbs/acre/yr)	(lbs/yr)
Cropland	41.71	1491.81	62229.66	5.84	243.61	1.50	62.57
Forest	21.12	163.18	3446.02	0.17	3.59	0.05	1.06
Wetland/Water	0.49	148.61	73.40	0.48	0.24	0.05	0.02
Disturbed	64.60	225.70	14579.81	0.27	17.44	0.12	7.75
HD_Mixed	0.00	1906.23	0.00	7.56	0.00	1.01	0.00
LD_Residential	130.96	600.45	78635.23	1.57	205.61	0.24	31.43
Total	258.88		158964.12		470.49		102.83

Watershed: White Clay Creek Middle Branch (W03)
Land Use Loading Calculations
Year: 2012 Land Use

Includes Storm Sewershed areas from:
MS4 Outfalls: 12, 15 thru 18, 21, 22, 28 thru 31, 34, 92 thru 94, 100, 101, 103 thru 119, 135, 156
MS4 Observation Points: 9, 10

Mapshed Land Use Categories

Cropland	Forest	Wetland/ Water	Disturbed	HD_ Mixed	LD_ Residential	Total
(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)
144.50	110.64	3.53	21.11	0.00	236.25	516.02

Apply 2012 land use loading rates

Land Use	Area	2012 Sediment Loading Rate	2012 Sediment Loading	2012 Nitrogen Loading Rate	2012 Nitrogen Loading	2012 Phosphorus Loading Rate	2012 Phosphorus Loading
	(acres)	(lbs/acre/yr)	(lbs/yr)	(lbs/acre/yr)	(lbs/yr)	(lbs/acre/yr)	(lbs/yr)
Cropland	144.50	1491.81	215567.44	5.84	843.88	1.50	216.75
Forest	110.64	163.18	18053.58	0.17	18.81	0.05	5.53
Wetland/Water	3.53	148.61	524.22	0.48	1.69	0.05	0.18
Disturbed	21.11	225.70	4764.46	0.27	5.70	0.12	2.53
HD_Mixed	0.00	1906.23	0.00	7.56	0.00	1.01	0.00
LD_Residential	236.25	600.45	141854.51	1.57	370.91	0.24	56.70
Total	516.02		380764.21		1240.99		281.69

Watershed: White Clay Creek West Branch (W01)
Land Use Loading Calculations
Year: 2012 Land Use

Includes Storm Sewershed areas from:
MS4 Outfalls: 26, 40 thru 44, 46 thru 55, 57 thru 69, 73, 74, 120 thru 134, 136 thru 140, 145, 146, 149
MS4 Observation Points: None

Mapshed Land Use Categories

Cropland	Forest	Wetland/ Water	Disturbed	HD_ Mixed	LD_ Residential	Total
(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)
171.99	93.06	0.45	25.02	4.41	374.25	669.18

Apply 2012 land use loading rates

Land Use	Area	2012 Sediment Loading Rate	2012 Sediment Loading	2012 Nitrogen Loading Rate	2012 Nitrogen Loading	2012 Phosphorus Loading Rate	2012 Phosphorus Loading
	(acres)	(lbs/acre/yr)	(lbs/yr)	(lbs/acre/yr)	(lbs/yr)	(lbs/acre/yr)	(lbs/yr)
Cropland	171.99	1491.81	256573.12	5.84	1004.41	1.50	257.98
Forest	93.06	163.18	15185.60	0.17	15.82	0.05	4.65
Wetland/Water	0.45	148.61	66.87	0.48	0.22	0.05	0.02
Disturbed	25.02	225.70	5647.13	0.27	6.76	0.12	3.00
HD_Mixed	4.41	1906.23	8401.90	7.56	33.32	1.01	4.45
LD_Residential	374.25	600.45	224719.85	1.57	587.58	0.24	89.82
Total	669.18		510594.47		1648.10		359.93

Christina Basin Land Use Loading Rates Calculation Tool

Watershed: White Clay Creek **Year: 2012**

prepared by:
Chester County Water Resources Authority (CCWRA)

in consultation with:
Barry Evans, Ph.D., Pennsylvania State University
and
Bill Brown, PA Department of Environmental Protection (PADEP)

Original Publication Date: May 5, 2017
CORRECTED Publication Date: May 12, 2017

PURPOSE AND LIMITATIONS: This Excel workbook tool was developed for use by municipalities that have MS4 discharges and load reduction responsibilities within the PA portion of the Christina Basin. This tool calculates land use pollutant loading rates for TSS, TN and TP using calculations, methodology, assumptions, and data based on and consistent with the desktop Christina Basin MapShed model, and consistent with PADEP's 2017 TMDL and PRP instructions for MS4s. This tool is not recommended for use in other geographic areas or with other load calculation methodologies, or other land use load data. The desktop Christina Basin MapShed model was developed by CCWRA (2012, revised 2017) in conjunction with Dr. Barry Evans (Pennsylvania State University) and in consultation with Mr. Bill Brown (PADEP).

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On behalf of the Christina Watersheds Municipal Partnership, the Chester County Water Resources Authority gratefully acknowledges the assistance provided to this effort by Dr. Barry Evans (Pennsylvania State University) and Mr. Bill Brown, PA Department of Environmental Protection.

Partial Funding for the Christina Watersheds Municipal Partnership and the Brandywine/Christina Water Quality Restoration Collaboration Effort was made available through:
Brandywine Red Clay Alliance by
National Fish and Wildlife Foundation

Funding to provide technical assistance for this Calculation Tool was made available to:
Pennsylvania State University by
PA Department of Environmental Protection
and
Chester County Water Resources Authority by
Chester County Board of Commissioners

Look-Up Table: Christina Basin MapShed Land Use Loading Rates

Christina Basin MapShed Output File Results Converted to Land Use Loading Rates

Watershed: White Clay

Year: 2012

Section 1: Instructions & Overview

INSTRUCTIONS:

Municipalities are to use the Look-Up Table provided herein and copy the loading rates for the applicable watershed, applicable year, and applicable pollutants and use those values in their further calculations. The intention is that the municipality prints out each workbook for the years 1995 and 2012 for each watershed located in their Planning Area(s). It is suggested that these workbooks be placed in an appendix in their PA DEP MS4 submittal as documentation of the source of the loading rates they used in their plans and calculations.

OVERVIEW:

Seperate Look-up Tables have been created for 3 Christina Basin watersheds (Brandywine, White Clay or Red Clay) for the years 1995 and 2012. This workbook is one of six workbook files that have been provided; each file contains loading rates for pollutants Sediment, Nitrogen and Phosphorus.

The Christina Basin MapShed model and the methodology used herein to calcute Chrsitina MapShed Land Use Loading Rates were developed by Chester County Water Resources Authority in conjunction with and direction from Dr. Barry Evans (Penn State) and Bill Brown (PADEP).

Municipalties Do NOT need to enter values into this workbook. This workbook serves as a Look-up Table.

THIS WORKBOOK CONTAINS:

Section 2 (Land Use Loading Rates Look-Up Table) contains the Look-Up Table with final Christina MapShed land use loading rates that incorporate Land Use (upland source), Stream Bank (erosion) and Farm Animal Loads. **The bolded Total (pollutant) Loading Rate values in this Table are to be used by municipalities to calculate their Baseline and Existing loads and urban BMP load reductions. The "From Land Use" values in this Table are to be used to calculate street sweeping load reductions.**

***** In the MapShed model, Stream Bank and Farm Animal loads are modeled as separate sources/outputs, and therefore must be apportioned into the land use loads. This calculation has been completed herein and the results are summarized on the Look-up Table. Stream Bank loads are mostly attributable to developed lands. Farm Animal loads are attributed to Cropland and Hay/Pasture land uses.

***** The Look-Up Table also shows loads calculated by the Christina MapShed model from septic, groundwater and point sources, however, per PA DEP guidance, these loads are NOT included in the land use loading rates presented in the Table. These loads are not loads that enter the MS4 and therefore these loads are not a pollutant load that is required to be addressed in the MS4 program. Please note, when comparing the nitrogen and phosphorus loading rates to other literature values for a watershed, the rates in this workbook may appear lower by land use for nutrients because of these adjustments. Groundwater loading of nitrogen and phosphorus are generally attributed to long-term agricultural practices.

Section 3 (Christina Basin MapShed Output) contains the actual Christina MapShed output file data that are used for calculations throughout this workbook. DO NOT USE THESE DATA. This section is for CCWRA Use only.

Section 4 (Map) Contains a Map of Chester County's portion of the Christina Basin watershed.

Sections 5 through 8 Contain supporting documentation that show how the calculations were performed to arrive at the values for the watershed that were presented in the Look-up Table in Section 2.

Section 9 Contains a table that presents EPA Christina TMDL Baseline Pollutant Loadings, MS4 Wasteload Allocations, and required volume and Percent Reductions for each municipality by watershed. These data were taken from the tables in the EPA TMDL reports by Chester County Water Resources Authority in 2012.

Look-Up Table: Christina Basin MapShed Loading Rates

Watershed: White Clay

Year: 2012

Source File: 2012WCnewrun_noatten-Summary_sum.csv

Section 2: Land Use Loading Rates Look-Up Table

TOTAL WATERSHED ANNUAL LOADS from Christina MapShed

ANNUAL LAND USE LOADING RATES (lbs/acre) based on land use, stream bank and farm animal sources

	Source	Area	Sediment	Total Nitrogen	Total Phosphorus	SEDIMENT			NITROGEN				PHOSPHORUS				
						From Land Use	From Stream Banks ①	TOTAL SEDIMENT LOADING RATE	From Land Use	From Stream Banks ①	From Farm Animals ②	TOTAL NITROGEN LOADING RATE	From Land Use	From Stream Banks ①	From Farm Animals ②	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	
						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	
MapShed Land Use Categories	Hay/Past	111.20	2.02	78.07	25.31	36.33	146.79	**183.12**	0.70	0.07	0.35	**1.12**	0.23	0.03	0.07	**0.33**	Hay/Past
	Cropland	18,953.00	12,746.11	102,651.12	26,516.64	1,345.02	146.79	**1,491.81**	5.42	0.07	0.35	**5.84**	1.40	0.03	0.07	**1.50**	Cropland
	Forest	14,186.30	116.29	1,447.60	216.21	16.39	146.79	**163.18**	0.10	0.07	n/a	**0.17**	0.02	0.03	n/a	**0.05**	Forest
	Wetland	121.10	0.11	49.80	2.71	1.82	146.79	**148.61**	0.41	0.07	n/a	**0.48**	0.02	0.03	n/a	**0.05**	Wetland
	Disturbed	1,583.90	62.49	311.34	137.19	78.91	146.79	**225.70**	0.20	0.07	n/a	**0.27**	0.09	0.03	n/a	**0.12**	Disturbed
	Turfgrass	1,220.70	23.75	1,529.43	822.35	38.91	146.79	**185.70**	1.25	0.07	n/a	**1.32**	0.67	0.03	n/a	**0.70**	Turfgrass
	Open_Land	252.00	19.72	334.97	28.35	156.51	146.79	**303.30**	1.33	0.07	n/a	**1.40**	0.11	0.03	n/a	**0.14**	Open_Land
	Bare_Rock	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**	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	98.80	2.54	117.79	12.65	51.42	543.43	**594.85**	1.19	0.27	n/a	**1.46**	0.13	0.10	n/a	**0.23**	Ld_Mixed
	Md_Mixed	1,171.30	134.03	7,342.66	781.16	228.86	1,124.77	**1,353.62**	6.27	0.56	n/a	**6.83**	0.67	0.20	n/a	**0.87**	Md_Mixed
	Hd_Mixed	2,723.10	315.27	18,308.20	1,944.98	231.55	1,674.68	**1,906.23**	6.72	0.84	n/a	**7.56**	0.71	0.30	n/a	**1.01**	Hd_Mixed
	Ld_Residential	14,888.10	424.43	19,387.10	2,089.12	57.02	543.43	**600.45**	1.30	0.27	n/a	**1.57**	0.14	0.10	n/a	**0.24**	Ld_Residential
	Md_Residential	810.50	90.30	4,685.04	505.41	222.83	1,124.77	**1,347.59**	5.78	0.56	n/a	**6.34**	0.62	0.20	n/a	**0.82**	Md_Residential
	Hd_Residential	239.70	27.67	1,567.73	166.54	230.87	1,674.68	**1,905.55**	6.54	0.84	n/a	**7.38**	0.69	0.30	n/a	**0.99**	Hd_Residential

	Source	Sediment	Total Nitrogen	Total Phosphorus
	Units	*Tons*	*Pounds*	*Pounds*
Addt'l Sources	Farm Animals		6,684.76	1,296.72
	Tile Drainage	0.00	0.00	0.00
	Stream Bank	10,341.22	10,339.67	3,747.85

Notes:

- 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 Christina MapShed Output file into each land use category, using methodology provided from Dr. Barry Evans (Pennsylvania State University), the author of MapShed, and with concurrence from Mr. Bill Brown (PADEP).

- 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 Christina Basin MapShed 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".

Look-Up Table: Christina Basin MapShed Land Use Loading Rates

Watershed: White Clay

Year: 2012

Section 3: Christina Basin MapShed Output

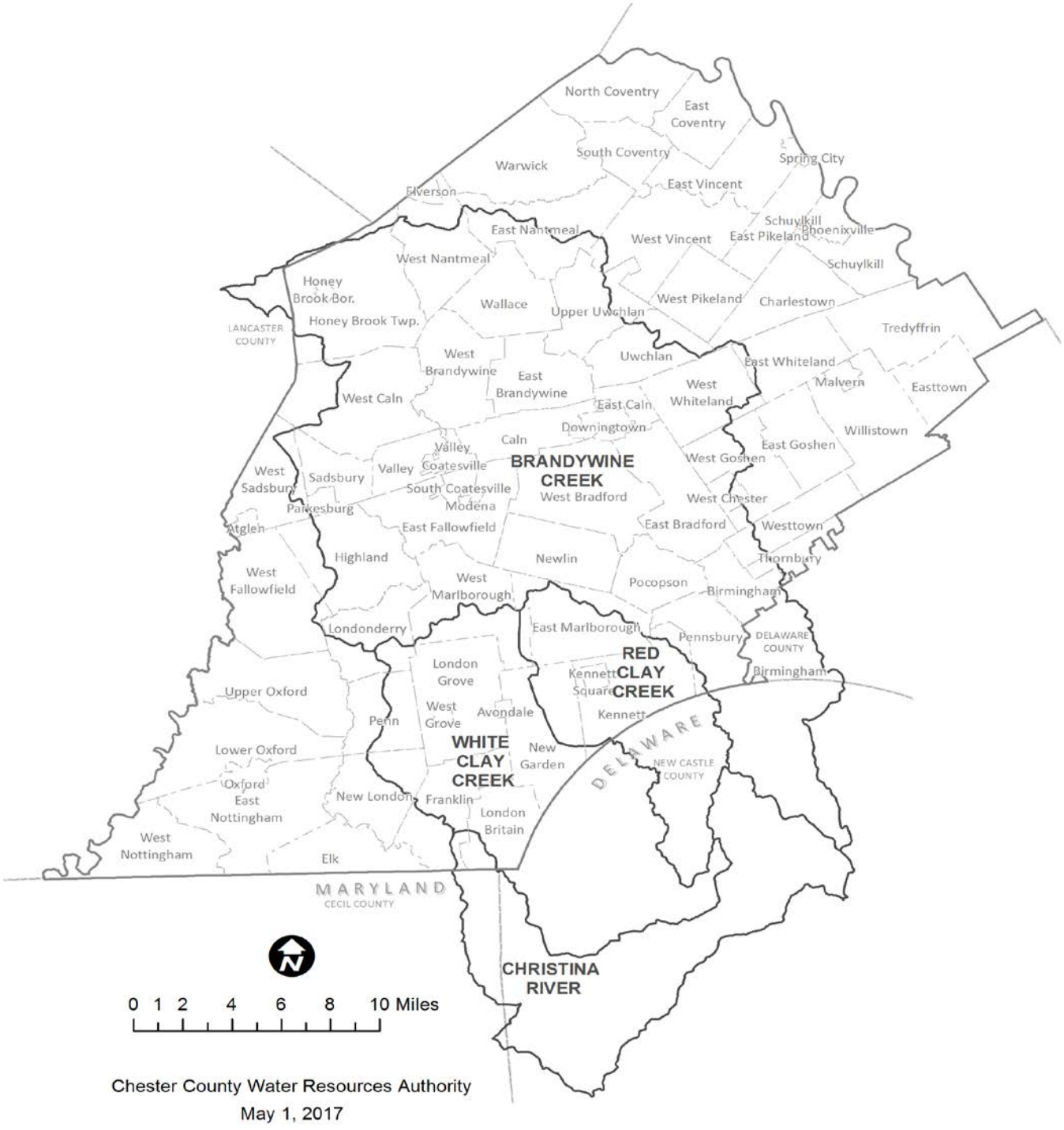
This page is where the output data from Christina Basin MapShed model is entered into this workbook and is the source data for calculations throughout the workbook. DO NOT USE OR CHANGE THE VALUES BELOW.
For use by CCWRA only.
Instructions followed by Chester County Water Resources Authority staff: Enter the data below from the MapShed output file without any modifications. Only enter data in the cells shaded blue.
1. Source File Name - filename for the output file from Christina Basin Version of MapShed.
2. Watershed Name - Name of Watershed for which land use loading rates were calculated (Brandywine Creek, White Clay Creek and Red Clay Creek).
3. Source file - The annual pollutant data, in English Units, is copied directly from the Christina Basin MapShed output file to the table below.
4. Year - the year modeled.

Data Entered By: Chester County Water Resources Authority
Date Data Entered: 5/12/2017
Source File Name: 2012WCnewrun_noatten-Summary_sum.csv
Watershed: White Clay
Year: 2012

CHRISTINA BASIN MapShed OUTPUT DATA

Source	Area	Runoff	Erosion	Sediment	Dis N	Tot N	Dis P	Tot P
Units	*acres*	*inches/year*	*tons/year*	*tons/year*	*lbs/year*	*lbs/year*	*lbs/year*	*lbs/year*
Hay/Past	111.20	3.70	14.82	2.02	70.00	78.07	22.93	25.31
Cropland	18,953.00	4.15	94,426.66	12,746.11	51,666.68	102,651.12	5,547.68	26,516.64
Forest	14,186.30	1.61	855.14	116.29	982.44	1,447.60	51.72	216.21
Wetland	121.10	9.48	0.72	0.11	49.38	49.80	2.60	2.71
Disturbed	1,583.90	8.55	492.42	62.49	61.35	311.34	30.67	137.19
Turfgrass	1,220.70	2.07	175.56	23.75	1,434.37	1,529.43	789.10	822.35
Open_Land	252.00	8.97	144.09	19.72	256.07	334.97	5.11	28.35
Bare_Rock	-	-	-	-	-	-	-	-
Sandy_Areas	-	-	-	-	-	-	-	-
Unpaved_Road	-	-	-	-	-	-	-	-
Ld_Mixed	98.80	4.29	-	2.54	33.09	117.79	4.67	12.65
Md_Mixed	1,171.30	11.10	-	134.03	2,376.21	7,342.66	309.02	781.16
Hd_Mixed	2,723.10	16.35	-	315.27	5,940.48	18,308.20	770.62	1,944.98
Ld_Residential	14,888.10	4.64	-	424.43	5,434.17	19,387.10	773.38	2,089.12
Md_Residential	810.50	6.82	-	90.30	1,498.70	4,685.04	198.70	505.41
Hd_Residential	239.70	9.58	-	27.67	508.16	1,567.73	65.94	166.54
Farm Animals						6,684.76		1,296.72
Tile Drainage				-		-		-
Stream Bank				10,341.22		10,339.67		3,747.85
Groundwater					777,459.57	777,459.57	51,700.54	51,700.54
Point Source					27,414.45	27,414.45	2,686.99	2,686.99
Septic Systems					66,561.35	66,561.35	1,759.29	1,759.29

Section 4: Map of Chester County's portion of the Christina Basin Watersheds



Look-Up Table: Christina Basin MapShed Loading Rates

Watershed: White Clay

Year: 2012

Section 5: Farm Animals TN and TP Loading Rates Worksheet

This worksheet calculates and apportions the "Total Nitrogen" and "Total Phosphorus" loading rates from the "Farm Animals" source load from the Christina Basin MapShed Output file into the two applicable agricultural land uses, Hay/Pasture and Cropland, based on area weighting. The methodology was provided by Dr. Barry Evans (Stroud Water Research Center, Pennsylvania State University), the author of MapShed, and with concurrence from Mr. Bill Brown (PADEP).

The MapShed output file provides the Farm Animals "Total Nitrogen" and "Total Phosphorus" loads in pounds.

Step 1. The Farm Animal "Total Nitrogen" and "Total Phosphorus" load, in pounds, and land areas for each land use category, in acres, from the Christina MapShed Output file are presented below.

Christina MapShed Total Watershed Load

	Total Nitrogen	Total Phosphorus	
Nutrient Load from Farm Animals	6,684.76	1,296.72	pounds

①

Note: The loads are taken from cells G33 and I33 from the Christina Basin MapShed Output worksheet

Land Use Categories from MapShed

Source	Area (acres)
Hay/Pasture	111.20
Cropland	18,953.00

- Since only the 'Hay/Pasture' and 'Cropland' land uses are apportioned Farm Loading Rates, the remaining land use categories are not applicable to this worksheet.

Step 2. Total Acres in "Hay/Pasture" and "Cropland" land uses are summed.

Area of Hay/Pasture & Cropland, acres	19,064.20	acres	=	[111.2 acres + 18953 acres]

Step 3. Calculate the unit area Farm Animals loading rate (lbs/ac) to Total Nitrogen and Total Phosphorus for each land use by dividing the Farm Animal Load by the land use acres.

	Total Nitrogen	Total Phosphorus	
Nutrient Load from Farm Animals	6,684.76	1,296.72	pounds, from Step 1
Area of Hay/Pasture & Cropland	19,064.20	19,064.20	acres, from Step 2
Loading Rate for Hay/Pasture & Cropland	**0.35**	**0.07**	**pounds per acre**

Step 4. Add these Farm Animals loading rates to the Land Use (upland) and Stream Bank loading rates for Hay/Pasture and Cropland to calculate the Toal Nitrogen and Total Phosphorus loading rates as shown on the Land Use Loading Rates Look-Up Table.

Look-Up Table: Christina Basin MapShed Loading Rates

Watershed: White Clay

Year: 2012

Section 6: Stream Bank Sediment Loading Rates Worksheet

This worksheet calculates and apportions the loading rates from the Stream Bank source load for sediment from the Christina MapShed Output file into each land use category, using methodology provided from Dr. Barry Evans (Pennsylvania State University), the author of MapShed, and with concurrence from Mr. Bill Brown (PADEP).

The MapShed output file provides the sediment load in tons, which are converted to pounds to be consistent with the loading rates for Total Nitrogen and Total Phosphorus.

Step 1. The Stream Bank Sediment Load, in tons, and land areas for each land use category, in acres, are presented below.

	Sediment		
Stream Bank	10,341.22	tons	Note: The sediment load is taken from Cell E35 in the Christina Basin MapShed Output worksheet

	Source	Area (acres)
Land Use Categories from MapShed	Hay/Pasture	111.20
	Cropland	18,953.00
	Forest	14,186.30
	Wetland	121.10
	Disturbed	1,583.90
	Turfgrass	1,220.70
	Open_Land	252.00
	Bare_Rock	0.00
	Sandy_Areas	0.00
	Unpaved_Road	0.00
	Ld_Mixed	98.80
	Md_Mixed	1,171.30
	Hd_Mixed	2,723.10
	Ld_Residential	14,888.10
	Md_Residential	810.50
	Hd_Residential	239.70
	Total Acres, Watershed	**56,359.70**

Step 2. Convert the Stream Bank Sediment Load to pounds by multiplying tons by 2,000 pounds per ton.

	Sediment Load, pounds		
Stream Bank	20,682,440.00	pounds	= [10341.22 tons x 2,000 pounds per ton]

Step 3. Sum the total acres in the White Clay watershed.

Total Acres in watershed	56,359.70	acres

Watershed: White Clay

Year: 2012

Step 4. Calculate the total acres in the watershed that are considered "Developed," which includes Low Density Mixed (Ld_Mixed), Medium Density Mixed (Md_Mixed), High Density Mixed (Hd_Mixed); and Low Density Residential (Ld_Residential), Medium Density Residential (Md_Residential), and High Density Residential (Hd_Residential).

Area of Developed Lands	*acres*	*percent*	
Low Density Developed	14,986.90	75%	[Ld_Mixed + Ld_Residential]
Medium Density Developed	1,981.80	10%	[Md_Mixed + Md_Residential]
High Density Developed	2,962.80	15%	[Hd_Mixed + Hd_Residential]
Total	19,931.50	100%	[All "Developed" land use categories]

Step 5. Calculate the portion of the Stream Bank Sediment Load resulting from "Developed" Lands
This is A) 40% of the Stream Bank Sediment Load times the percent of developed lands in the watershed plus B) 60% of the Stream Bank Sediment Load:

Stream Bank Sediment Load	20,682,440.00	pounds		from Step 2
Total Developed Acres	19,931.5	acres		from Step 4
Total Acres in watershed	56,359.7	acres		from Step 3
Percent of Developed lands in watershed	35%		=	[19931.5 acres / 56359.7 acres]
A) 40% x Stream Bank Sediment Load x Percent of Developed Lands	2,925,722.12	pounds	=	[40% x 20682440 pounds x 35%]
B) 60% x Stream Bank Sediment Load	12,409,464.00	pounds	=	[60% x 20682440 pounds]
Load Assigned to Developed Lands	15,335,186.12	pounds		

Step 6. Calculate the portion of the Stream Bank Sediment Load from "Developed" Lands that is assigned to each of the land use categories by calculating relative components from "Impervious" surfaces and from the land use as a whole:

Estimated Percent of Impervious Area for corresponding land use categories (MapShed Values)	
Low Density Developed	15%
Medium Density Developed	52%
High Density Developed	87%

Step 7. Calculate how many acres within the watershed are "Impervious" by multiplying the acres in Step 4 by the percent in Step 6:

Estimated Impervious Surfaces for Developed Lands				
Low Density Developed	2,248.04	acres	=	[14986.9 acres x 15 percent]
Medium Density Developed	1,030.54	acres	=	[1981.8 acres x 52 percent]
High Density Developed	2,577.64	acres	=	[2962.8 acres x 87 percent]
Total Developed Impervious Surface Area	5,856.21	acres		

Watershed: White Clay

Year: 2012

Step 8. Calculate the percent of total developed Impervious Surface for each land use:

Percent of Total Impervious Surfaces			
Low Density Developed	38%	=	[2248.04 acres / 5856.21 acres]
Medium Density Developed	18%	=	[1030.54 acres / 5856.21 acres]
High Density Developed	44%	=	[2577.64 acres / 5856.21 acres]
Total	100%		

Step 9. Assign 60% of the "Total Load Assigned to Developed Lands", from Step 5, as a result of "Impervious" surfaces, and assign 40% based on the percent of land area in the land use category:

Load Assigned to Developed Lands	15,335,186.12	pounds	=	[result of Step 5]
60% of Load assigned to Impervious	9,201,111.67	pounds	=	[15335186.12 pounds x 60%]
40% of Load assigned for total land area	6,134,074.45	pounds	=	[15335186.12 pounds x 40%]

Step 10. Apportion Load Assigned to "Impervious" surfaces to each "Developed" land use category by multiplying the 'Percent of Total Impervious Surfaces' (Step 8) by 9201111.67 pounds (calculated in Step 9):

Stream Bank Sediment Load Assigned to Impervious Surface, pounds		
Low Density Developed	3,532,050.88	= [38 % x 9201111.67 pounds]
Medium Density Developed	1,619,149.87	= [18 % x 9201111.67 pounds]
High Density Developed	4,049,910.92	= [44 % x 9201111.67 pounds]

Step 11. Apportion Load Assigned to Total Land Area to each "Developed" land use category by multiplying the 'Percent of Area of Developed Lands' (from Step 4) by 6134074.45 pounds (calculated in Step 9):

Stream Bank Sediment Load Assigned to Total Developed Land Area, pounds		
Low Density Developed	4,612,335.27	= [75 % x 6134074.45 pounds]
Medium Density Developed	609,914.39	= [10 % x 6134074.45 pounds]
High Density Developed	911,824.79	= [15 % x 6134074.45 pounds]

Step 12. Combine the loads apportioned to "Impervious" surfaces, from Step 10, and the loads apportioned to Total Developed Land Area, from Step 11:

Total Stream Bank Sediment Load per Land Use, pounds		
Low Density Developed	8,144,386.15	= [3532050.88 pounds + 4612335.27 pounds]
Medium Density Developed	2,229,064.27	= [1619149.87 pounds + 609914.39 pounds]
High Density Developed	4,961,735.71	= [4049910.92 pounds + 911824.79 pounds]

Watershed: White Clay

Year: 2012

Step 13. Calculate the Stream Bank Loading Rate for each "Developed" Land Use, in pounds per acre, by dividing the load from Step 12 by the acres in Step 4:

Stream Bank Sediment Land Use Loading Rate	pounds	Land Use area, acres	**Stream Bank Sediment Loading Rate, pounds/acre**
Low Density Developed	8,144,386.15	14,986.90	**543.43** = [8144386.15 lbs / 14986.9 acres]
Medium Density Developed	2,229,064.27	1,981.80	**1,124.77** = [2229064.27 lbs / 1981.8 acres]
High Density Developed	4,961,735.71	2,962.80	**1,674.68** = [4961735.71 lbs / 2962.8 acres]

Step 14. Calculate the Stream Bank Loading Rate for "Undeveloped Land" (all other land use categories):

Total Stream Bank Load	20,682,440.00	pounds =	[from Step 3]
Load assigned to Developed La	15,335,186.12	pounds =	[from Step 5]
Remaining Load assigned to Undeveloped Lands	5,347,253.88	pounds =	[20682440 pounds - 15335186.12 pounds]
Acres of Undeveloped Lands	36,428.20	acres =	[sum of "Undeveloped Land" from Step 1]
Stream Bank Sediment Loading rate for Undeveloped Lands	**146.79**	**pounds per acre**	= [5347253.88 pounds / 36428.2 acres]

Step 15. Add these Stream Bank Sediment Land Use Loading Rates to the Land Use (upland source) Loading Rates for each of the corresponding land uses in the Land Use Loading Rates Look-Up Table to calculate the Total Sediment Loading Rate.

Look-Up Table: Christina Basin MapShed Loading Rates

Watershed: White Clay

Year: 2012

Section 7: Stream Bank Nitrogen Loading Rates Worksheet

This worksheet calculates and apportions the loading rates from the Stream Bank source load for Total Nitrogen from the Christina MapShed Output file into each land use category, using methodology provided from Dr. Barry Evans (Pennsylvania State University), the author of MapShed, and with concurrence from Mr. Bill Brown (PADEP).

The MapShed output file provides the nitrogen load in pounds.

Step 1. The land areas for each land use category, in acres, are presented below.

	Source	Area (acres)
Land Use Categories from MapShed	Hay/Pasture	111.20
	Cropland	18,953.00
	Forest	14,186.30
	Wetland	121.10
	Disturbed	1,583.90
	Turfgrass	1,220.70
	Open_Land	252.00
	Bare_Rock	0.00
	Sandy_Areas	0.00
	Unpaved_Road	0.00
	Ld_Mixed	98.80
	Md_Mixed	1,171.30
	Hd_Mixed	2,723.10
	Ld_Residential	14,888.10
	Md_Residential	810.50
	Hd_Residential	239.70
	Total Acres, Watershed	**56,359.70**

Step 2. The Stream Bank Total Nitrogen Load, in pounds, is presented below:

	Total Nitrogen Load, pounds	
Stream Bank	10,339.67	pounds

Step 3. Sum the total acres in the White Clay watershed.

Total Acres in watershed	56,359.70	acres

Watershed: White Clay

Year: 2012

Step 4. Calculate the total acres in the watershed that are considered "Developed," which includes Low Density Mixed (Ld_Mixed), Medium Density Mixed (Md_Mixed), High Density Mixed (Hd_Mixed); and Low Density Residential (Ld_Residential), Medium Density Residential (Md_Residential), and High Density Residential (Hd_Residential):

Area of Developed Lands	*acres*	*percent*	
Low Density Developed	14,986.90	75%	[Ld_Mixed + Ld_Residential]
Medium Density Developed	1,981.80	10%	[Md_Mixed + Md_Residential]
High Density Developed	2,962.80	15%	[Hd_Mixed + Hd_Residential]
Total	19,931.50	100%	[All "Developed" land use categories]

Step 5. Calculate the portion of the Stream Bank Total Nitrogen (TN) Load resulting from "Developed" Lands
This is A) 40% of the Stream Bank Total Nitrogen Load times the percent of developed lands in the watershed plus B) 60% of the Stream Bank Total Nitrogen Load:

Stream Bank TN Load	10,339.67	pounds		from Step 2
Total Developed Acres	19,931.5	acres		from Step 4
Total Acres in watershed	56,359.7	acres		from Step 3
Percent of Developed lands in watershed	35%		=	[19931.5 acres / 56359.7 acres]
A) 40% x Stream Bank TN Load x Percent of Developed Lands	1,462.64	pounds	=	[40% x 10339.67 pounds x 35%]
B) 60% x Stream Bank TN Load	6,203.80	pounds	=	[60% x 10339.67 pounds]
Load Assigned to Developed Lands	7,666.44	pounds		

Step 6. Calculate the portion of the Stream Bank Total Nitrogen Load from "Developed" Lands that is assigned to each of the land use categories by calculating relative components from "Impervious" surfaces and from the land use as a whole:

Estimated Percent of Impervious Area for corresponding land use categories (MapShed Values)	
Low Density Developed	15%
Medium Density Developed	52%
High Density Developed	87%

Step 7. Calculate how many acres within the watershed are "Impervious" by multiplying the acres in Step 4 by the percent in Step 6:

Estimated Impervious Surfaces for Developed Lands				
Low Density Developed	2,248.04	acres	=	[14986.9 acres x 15 percent]
Medium Density Developed	1,030.54	acres	=	[1981.8 acres x 52 percent]
High Density Developed	2,577.64	acres	=	[2962.8 acres x 87 percent]
Total Developed Impervious Surface Area	5,856.21	acres		

Watershed: White Clay

Year: 2012

Step 8. Calculate the percent of total developed Impervious Surface for each land use:

Percent of Total Impervious Surfaces			
Low Density Developed	38%	=	[2248.04 acres / 5856.21 acres]
Medium Density Developed	18%	=	[1030.54 acres / 5856.21 acres]
High Density Developed	44%	=	[2577.64 acres / 5856.21 acres]
Total	100%		

Step 9. Assign 60% of the "Total Load Assigned to Developed Lands", from Step 5, as a result of "Impervious" surfaces, and assign 40% based on the percent of land area in the land use category.

Load Assigned to Developed Lands	7,666.44	pounds	=	[result of Step 5]
60% of Load assigned to Impervious	4,599.87	pounds	=	[7666.44 pounds x 60%]
40% of Load assigned for total land area	3,066.58	pounds	=	[7666.44 pounds x 40%]

Step 10. Apportion Load Assigned to "Impervious" surfaces to each "Developed" land use category by multiplying the 'Percent of Total Impervious Surfaces' (Step 8) by 4599.87 pounds (calculated in Step 9):

Stream Bank Total Nitrogen Load Assigned to Impervious Surface, pounds		
Low Density Developed	1,765.76	= [38 % x 4599.87 pounds]
Medium Density Developed	809.45	= [18 % x 4599.87 pounds]
High Density Developed	2,024.65	= [44 % x 4599.87 pounds]

Step 11. Apportion Load Assigned to Total Land Area to each "Developed" land use category by multiplying the 'Percent of Area of Developed Lands' (from Step 4) by 3066.58 pounds (calculated in Step 9):

Stream Bank Total Nitrogen Load Assigned to Total Developed Land Area, pounds		
Low Density Developed	2,305.82	= [75 % x 3066.58 pounds]
Medium Density Developed	304.91	= [10 % x 3066.58 pounds]
High Density Developed	455.84	= [15 % x 3066.58 pounds]

Step 12. Combine the loads apportioned to "Impervious" surfaces, from Step 10, and the loads apportioned to Total Developed Land Area, from Step 11:

Total Stream Bank Total Nitrogen Load per Land Use, pounds		
Low Density Developed	4,071.58	= [1765.76 pounds + 2305.82 pounds]
Medium Density Developed	1,114.37	= [809.45 pounds + 304.91 pounds]
High Density Developed	2,480.50	= [2024.65 pounds + 455.84 pounds]

Watershed: White Clay

Year: 2012

Step 13. Calculate the Stream Bank Loading Rate for each "Developed" Land Use, in pounds per acre, by dividing the load from Step 12 by the acres in Step 4:

Stream Bank Total Nitrogen Land Use Loading Rate	pounds	Land Use area, acres	**Stream Bank Total Nitrogen Loading Rate, pounds/acre**
Low Density Developed	4,071.58	14,986.90	**0.27** = [4071.58 lbs / 14986.9 acres]
Medium Density Developed	1,114.37	1,981.80	**0.56** = [1114.37 lbs / 1981.8 acres]
High Density Developed	2,480.50	2,962.80	**0.84** = [2480.5 lbs / 2962.8 acres]

Step 14. Calculate the Stream Bank Loading Rate for "Undeveloped Land" (all other land use categories):

Total Stream Bank Load	10,339.67	pounds	=	[from Step 3]
Load assigned to Developed Lands	7,666.44	pounds	=	[from Step 5]
Remaining Load assigned to Undeveloped Lands	2,673.23	pounds	=	[10339.67 pounds - 7666.44 pounds]
Acres of Undeveloped Lands	36,428.20	acres	=	[sum of "Undeveloped Land" from Step 1]
Stream Bank Total Nitrogen Loading rate for Undeveloped Lands	**0.07**	**pounds per acre**	=	[2673.23 pounds / 36428.2 acres]

Step 15. Add these Stream Bank Total Nitrogen Land Use Loading Rates to the Land Use (upland source) and Farm Animals Loading Rates for each of the corresponding land uses in the Land Use Loading Rates Look-Up Table to calculate the final Total Nitrogen Loading Rate.

Look-Up Table: Christina Basin MapShed Loading Rates

Watershed: White Clay

Year: 2012

Section 8: Stream Bank Phosphorus Loading Rates Worksheet

This worksheet calculates and apportions the loading rates from the Stream Bank source load for Total Phosphorus from the Christina MapShed Output file into each land use category, using methodology provided from Dr. Barry Evans (Pennsylvania State University), the author of MapShed, and with concurrence from Mr. Bill Brown (PADEP).

The MapShed output file provides the Phosphorus load in pounds.

Step 1. The land areas for each land use category, in acres, are presented below.

	Source	Area (acres)
Land Use Categories from MapShed	Hay/Pasture	111.20
	Cropland	18,953.00
	Forest	14,186.30
	Wetland	121.10
	Disturbed	1,583.90
	Turfgrass	1,220.70
	Open_Land	252.00
	Bare_Rock	0.00
	Sandy_Areas	0.00
	Unpaved_Road	0.00
	Ld_Mixed	98.80
	Md_Mixed	1,171.30
	Hd_Mixed	2,723.10
	Ld_Residential	14,888.10
	Md_Residential	810.50
	Hd_Residential	239.70
	Total Acres, Watershed	**56,359.70**

Step 2. The Stream Bank Total Phosphorus Load, in pounds, is presented below:

	Total Phosphorus Load, pounds	
Stream Bank	3,747.85	pounds

Step 3. Sum the total acres in the White Clay watershed.

Total Acres in watershed	56,359.70	acres

Page 2 of Stream Bank ***Total Phosphorus Loading Rates*** worksheet

Watershed: White Clay

Year: 2012

Step 4. Calculate the total acres in the watershed that are considered "Developed," which includes Low Density Mixed (Ld_Mixed), Medium Density Mixed (Md_Mixed), High Density Mixed (Hd_Mixed); and Low Density Residential (Ld_Residential), Medium Density Residential (Md_Residential), and High Density Residential (Hd_Residential):

Area of Developed Lands	*acres*	*percent*	
Low Density Developed	14,986.90	75%	[Ld_Mixed + Ld_Residential]
Medium Density Developed	1,981.80	10%	[Md_Mixed + Md_Residential]
High Density Developed	2,962.80	15%	[Hd_Mixed + Hd_Residential]
Total	19,931.50	100%	[All "Developed" land use categories]

Step 5. Calculate the portion of the Stream Bank Total Phosphorus (TP) Load resulting from "Developed" Lands
This is A) 40% of the Stream Bank Total Phosphorus Load times the percent of developed lands in the watershed plus B) 60% of the Stream Bank Total Phosphorus Load:

Stream Bank TP Load	3,747.85	pounds		from Step 2
Total Developed Acres	19,931.5	acres		from Step 4
Total Acres in watershed	56,359.7	acres		from Step 3
Percent of Developed lands in watershed	35%		=	[19931.5 acres / 56359.7 acres]
A) 40% x Stream Bank TP Load x Percent of Developed Lands	530.17	pounds	=	[40% x 3747.85 pounds x 35%]
B) 60% x Stream Bank TP Load	2,248.71	pounds	=	[60% x 3747.85 pounds]
Load Assigned to Developed Lands	2,778.88	pounds		

Step 6. Calculate the portion of the Stream Bank Total Phosphorus Load from "Developed" Lands that is assigned to each of the land use categories by calculating relative components from "Impervious" surfaces and from the land use as a whole:

Estimated Percent of Impervious Area for corresponding land use categories (MapShed Values)	
Low Density Developed	15%
Medium Density Developed	52%
High Density Developed	87%

Step 7. Calculate how many acres within the watershed are "Impervious" by multiplying the acres in Step 4 by the percent in Step 6:

Estimated Impervious Surfaces for Developed Lands				
Low Density Developed	2,248.04	acres	=	[14986.9 acres x 15 percent]
Medium Density Developed	1,030.54	acres	=	[1981.8 acres x 52 percent]
High Density Developed	2,577.64	acres	=	[2962.8 acres x 87 percent]
Total Developed Impervious Surface Area	5,856.21	acres		

Watershed: White Clay

Year: 2012

Step 8. Calculate the percent of total developed Impervious Surface for each land use:

Percent of Total Impervious Surfaces			
Low Density Developed	38%	=	[2248.04 acres / 5856.21 acres]
Medium Density Developed	18%	=	[1030.54 acres / 5856.21 acres]
High Density Developed	44%	=	[2577.64 acres / 5856.21 acres]
Total	100%		

Step 9. Assign 60% of the "Total Load Assigned to Developed Lands", (from Step 5), as a result of "Impervious" surfaces, and assign 40% based on the percent of land area in the land use category.

Load Assigned to Developed Lands	2,778.88	pounds	=	[result of Step 5]
60% of Load assigned to Impervious	1,667.33	pounds	=	[2778.88 pounds x 60%]
40% of Load assigned for total land area	1,111.55	pounds	=	[2778.88 pounds x 40%]

Step 10. Apportion Load Assigned to "Impervious" surfaces to each "Developed" land use category by multiplying the 'Percent of Total Impervious Surfaces' (Step 8) by 1667.33 pounds (calculated in Step 9):

Stream Bank Total Phosphorus Load Assigned to Impervious Surface, pounds		
Low Density Developed	640.04	= [38 % x 1667.33 pounds]
Medium Density Developed	293.40	= [18 % x 1667.33 pounds]
High Density Developed	733.88	= [44 % x 1667.33 pounds]

Step 11. Apportion Load Assigned to Total Land Area to each "Developed" land use category by multiplying the 'Percent of Area of Developed Lands' (from Step 4) by 1111.55 pounds (calculated in Step 9):

Stream Bank Total Phosphorus Load Assigned to Total Developed Land Area, pounds		
Low Density Developed	835.80	= [75 % x 1111.55 pounds]
Medium Density Developed	110.52	= [10 % x 1111.55 pounds]
High Density Developed	165.23	= [15 % x 1111.55 pounds]

Step 12. Combine the loads apportioned to "Impervious" surfaces, from Step 10, and the loads apportioned to Total Developed Land Area, from Step 11:

Total Stream Bank Total Phosphorus Load per Land Use, pounds		
Low Density Developed	1,475.84	= [640.04 pounds + 835.8 pounds]
Medium Density Developed	403.93	= [293.4 pounds + 110.52 pounds]
High Density Developed	899.11	= [733.88 pounds + 165.23 pounds]

Watershed: White Clay

Year: 2012

Step 13. Calculate the Stream Bank Loading Rate for each "Developed" Land Use, in pounds per acre, by dividing the load from Step 12 by the acres in Step 4:

Stream Bank Total Phosphorus Land Use Loading Rate	pounds	Land Use area, acres	**Stream Bank Total Phosphorus Loading Rate, pounds/acre**
Low Density Developed	1,475.84	14,986.90	**0.10** = [1475.84 lbs / 14986.9 acres]
Medium Density Developed	403.93	1,981.80	**0.20** = [403.93 lbs / 1981.8 acres]
High Density Developed	899.11	2,962.80	**0.30** = [899.11 lbs / 2962.8 acres]

Step 14. Calculate the Stream Bank Loading Rate for "Undeveloped Land" (all other land use categories):

Total Stream Bank Load	3,747.85	pounds =	[from Step 3]
Load assigned to Developed Lands	2,778.88	pounds =	[from Step 5]
Remaining Load assigned to Undeveloped Lands	968.97	pounds =	[3747.85 pounds - 2778.88 pounds]
Acres of Undeveloped Lands	36,428.20	acres =	[sum of "Undeveloped Land" from Step 1]
Stream Bank Total Phosphorus Loading rate for Undeveloped Lands	**0.03**	**pounds per acre**	= [968.97 pounds / 36428.2 acres]

Step 15. Add these Stream Bank Total Phosphorus Land Use Loading Rates to the Land Use (upland source) and Farm Animals Loading Rates for each of the corresponding land uses in the Land Use Loading Rates Look-Up Table to calculate the final Total Phosphorus Loading Rate.

Brandywine-Christina Watershed (HUC # 02040205)
EPA TMDL MS4 Baseline Pollutant Loadings, MS4 Allocations, and Reductions

MUNICIPALITIES LISTED IN TMDL REPORTS	Sediment (tons/year)				Total Nitrogen (kg/day)				Total Phosphorus (kg/day)			
Brandywine Creek Watershed	Baseline MS4 Load[1b.]	MS4 Load Allocation[1b.]	MS4 Load Reduction [1e.]	% Reduction[1b.]	Baseline MS4 Load[2g.]	MS4 Allocation[2a.]	MS4 Load Reduction[2m.]	% Reduction [2m.]	Baseline MS4 Load [2j.]	MS4 Allocation [2d.]	MS4 Load Reduction[2m.]	% Reduction [2m.]
BIRMINGHAM TWP	310.81	130.35	180.46	58.06%								
COATESVILLE CITY	231.29	86.06	145.23	65.52%	16.08	10.86	5.22	32.46%	3.015	2.031	0.984	32.64%
EAST BRADFORD TWP	1185.00	467.17	717.83	60.58%								
EAST BRANDYWINE TWP					54.19	44.44	9.75	17.99%	0.826	0.677	0.149	18.04%
EAST FALLOWFIELD TWP	803.23	426.42	376.81	46.91%	110.54	75.74	34.80	31.48%	22.365	15.348	7.017	31.37%
EAST MARLBOROUGH TWP	366.70	139.44	227.26	61.98%								
HIGHLAND TWP	384.80	238.86	145.94	37.93%								
HONEY BROOK BORO	20.58	13.23	7.35	35.70%	9.61	5.76	3.85	40.06%	0.184	0.11	0.074	40.22%
HONEY BROOK TWP	813.84	558.76	255.08	31.34%	421.64	279.02	142.62	33.83%	7.599	4.956	2.643	34.78%
KENNETT TWP					2.38	2.22	0.16	6.72%	0.213	0.198	0.015	7.04%
MODENA BORO	27.96	12.46	15.50	55.43%	4.80	3.25	1.55	32.29%	0.966	0.656	0.31	32.09%
NEWLIN TWP	144.18	59.59	84.59	58.67%	6.53	4.57	1.96	30.02%	1.337	0.936	0.401	29.99%
PARKESBURG BORO	52.11	32.35	19.76	37.93%								
PENNSBURY TWP	113.98	43.48	70.50	61.85%	47.00	43.71	3.29	7.00%	4.206	3.911	0.295	7.01%
POCOPSON TWP	821.21	320.79	500.42	60.94%								
SADSBURY TWP	289.73	172.13	117.60	40.59%	3.05	2.26	0.79	25.90%	0.329	0.205	0.124	37.69%
THORNBURY TWP	82.17	34.46	47.71	58.06%								
UPPER UWCHLAN TWP					10.92	8.96	1.96	17.95%	0.166	0.137	0.029	17.47%
VALLEY TWP	485.14	164.64	320.50	66.06%	57.57	43.75	13.82	24.01%	6.941	4.726	2.215	31.91%
WALLACE TWP	21.74	17.41	4.33	19.92%	126.53	103.76	22.77	18.00%	1.929	1.582	0.347	17.99%
WEST BRADFORD TWP	283.22	121.6	161.62	57.07%	17.25	12.08	5.17	29.97%	3.532	2.473	1.059	29.98%
WEST BRANDYWINE TWP					136.01	104.78	31.23	22.96%	9.63	8.344	1.286	13.35%
WEST CALN TWP	68.28	43.07	25.21	36.92%	183.72	149.26	34.46	18.76%	9.95	8.649	1.301	13.08%
WEST GOSHEN TWP	461.32	180.51	280.81	60.87%								

Red Clay Creek Watershed	Sediment (tons/year)				Total Nitrogen (kg/day)				Total Phosphorus (kg/day)			
	Baseline MS4 Load[1c.]	MS4 Load Allocation[1c.]	MS4 Load Reduction [1e.]	% Reduction[1c.]	Baseline MS4 Load [2h.]	MS4 Allocation[2b.]	MS4 Load Reduction[2m.]	% Reduction [2m.]	Baseline MS4 Load [2k.]	MS4 Allocation[2e.]	MS4 Load Reduction[2m.]	% Reduction [2m.]
EAST MARLBOROUGH TWP	8791.41	4,193.24	4598.17	52.30%	137.13	68.56	68.57	50.00%	2.742	1.372	1.37	49.96%
KENNETT SQUARE BORO	840.10	405.41	434.69	51.74%	13.26	6.63	6.63	50.00%	0.452	0.151	0.301	66.59%
KENNETT TWP	6751.63	3,312.06	3439.57	50.94%	157.97	97.83	60.14	38.07%	21.517	3.731	17.786	82.66%
NEW GARDEN TWP	4709.65	2,118.72	2590.93	55.01%	77.03	38.52	38.51	49.99%	27.708	2.87	24.838	89.64%
PENNSBURY TWP					4.32	4.32	0.00	0.00%	0.082	0.082	0.00	0.00%

White Clay Creek Watershed	Sediment (tons/year)				Total Nitrogen (kg/day)				Total Phosphorus (kg/day)			
	Baseline MS4 Load[1d.]	MS4 Load Allocation[1d.]	MS4 Load Reduction [1e.]	% Reduction[1d.]	Baseline MS4 Load [2i.]	MS4 Allocation[2c.]	MS4 Load Reduction[2m.]	% Reduction [2m.]	Baseline MS4 Load [2l.]	MS4 Allocation[2f.]	MS4 Load Reduction[2m.]	% Reduction [2m.]
AVONDALE BORO	463.65	140.02	323.63	69.80%	9.16	4.58	4.58	50.00%	0.322	0.135	0.187	58.07%
FRANKLIN TWP	4220.43	2,305.87	1914.56	45.36%	122.01	61.01	61	50.00%	15.219	5.557	9.662	63.49%
KENNETT TWP					2.17	2.17	0.00	0.00%	0.055	0.055	0	0.00%
LONDON BRITAIN TWP	2634.66	1,620.44	1014.22	38.50%	96.47	49.9	46.57	48.27%	15.732	7.333	8.399	53.39%
LONDON GROVE TWP	13616.33	4,842.81	8773.52	64.43%	262.76	128.47	134.29	51.11%	25.875	7.965	17.91	69.22%
NEW GARDEN TWP	6746.50	2,986.66	3759.84	55.73%	167.06	83.83	83.23	49.82%	41.916	13.374	28.542	68.09%
NEW LONDON TWP	1913.97	1,008.60	905.37	47.30%	53.56	26.61	26.95	50.32%	0.65	0.292	0.358	55.08%
PENN TWP	3584.76	1,410.29	2174.47	60.66%	71.23	33.36	37.87	53.17%	0.798	0.359	0.439	55.01%
WEST GROVE BORO	562.29	192.63	369.66	65.74%	9.24	4.36	4.88	52.81%	0.112	0.05	0.062	55.36%

(1) U.S. EPA Region III. 8 April 2005. Total Maximum Daily Loads for Bacteria and Sediment in the Christina River Basin Watershed Pennsylvania, Delaware, and Maryland. Philadelphia, PA.

a. Table 4.2 Fecal coliform TMDL allocations for MS4 municipalities. p 4-5

b. Table 4.8 Sediment allocations for towns in Brandywine Creek Watershed. p 4-16

c. Table 4.9 Sediment allocations for towns in Red Clay Creek Watershed. p 4-16

d. Table 4.10 Preliminary sediment allocations for towns in White Clay Creek Watershed. p 4-16

e. Calculated by CCWRA using Tables listed in 1a.-1d. listed above.
MS4 Reduction = (Baseline MS4 Load) - (MS4 Load Allocation)

(2) U.S. EPA Region III. 26 September 2006. Revisions to Total Maximum Daily Loads for Nutrient and Low Dissolved Oxygen under High-flow Conditions: Christina River Basin Watershed, Pennsylvania, Delaware, and Maryland. Philadelphia, PA.

a. Appendix C -Table C-5b. Total nitrogen MS4 allocations for Brandywine Creek watershed (kg/day) p. C-6

b. Appendix C. Table C-7b. Total nitrogen MS4 allocations for Red Clay Creek watershed (kg/day) p. C-9

c. Appendix C. Table C-9b. Total nitrogen MS4 allocations for White Clay Creek watershed (kg/day) p. C-11

d. Appendix C. Table C-6b. Total phosphorus MS4 allocations for Brandywine Creek watershed (kg/day) p.C-8

e. Appendix C. Table C-8b. Total phosphorus MS4 allocations for Red Clay Creek watershed (kg/day) p. C-10

f. Appendix C. Table C-10b. Total phosphorus MS4 allocations for White Clay Creek watershed (kg/day) p. C-13

g. Appendix C -Table C-5a. Total nitrogen MS4 baseline loads for Brandywine Creek watershed (kg/day) p. C-5

h. Appendix C. Table C-7a. Total nitrogen MS4 baseline loads for Red Clay Creek watershed (kg/day) p. C-8

i. Appendix C. Table C-9a. Total nitrogen MS4 baseline loads for White Clay Creek watershed (kg/day) p. C-10

j. Appendix C. Table C-6a. Total phosphorus MS4 baseline loads for Brandywine Creek watershed (kg/day) p.C-7

k. Appendix C. Table C-8a. Total phosphorus MS4 baseline loads for Red Clay Creek watershed (kg/day) p. C-9

l. Appendix C. Table C-10a. Total phosphorus MS4 baseline loads for White Clay Creek watershed (kg/day) p. C-12

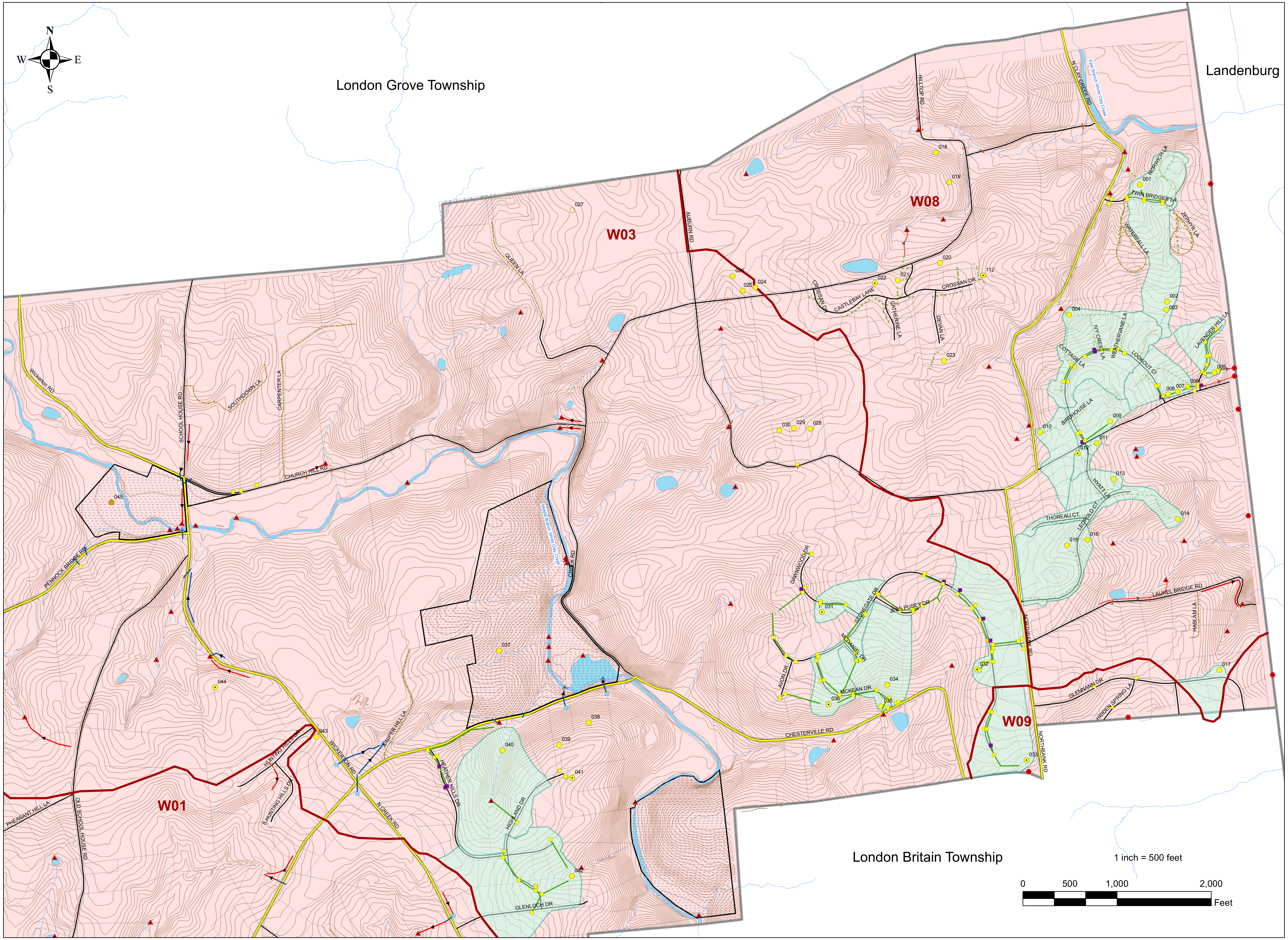
m. Calculated by CCWRA using Tables listed in 2a.-2l. listed above. MS4 Reduction = (MS4 Baseline Load) - (MS4 Allocation);
%Reduction = (MS4 Load Reduction) / (MS4 Baseline Load)

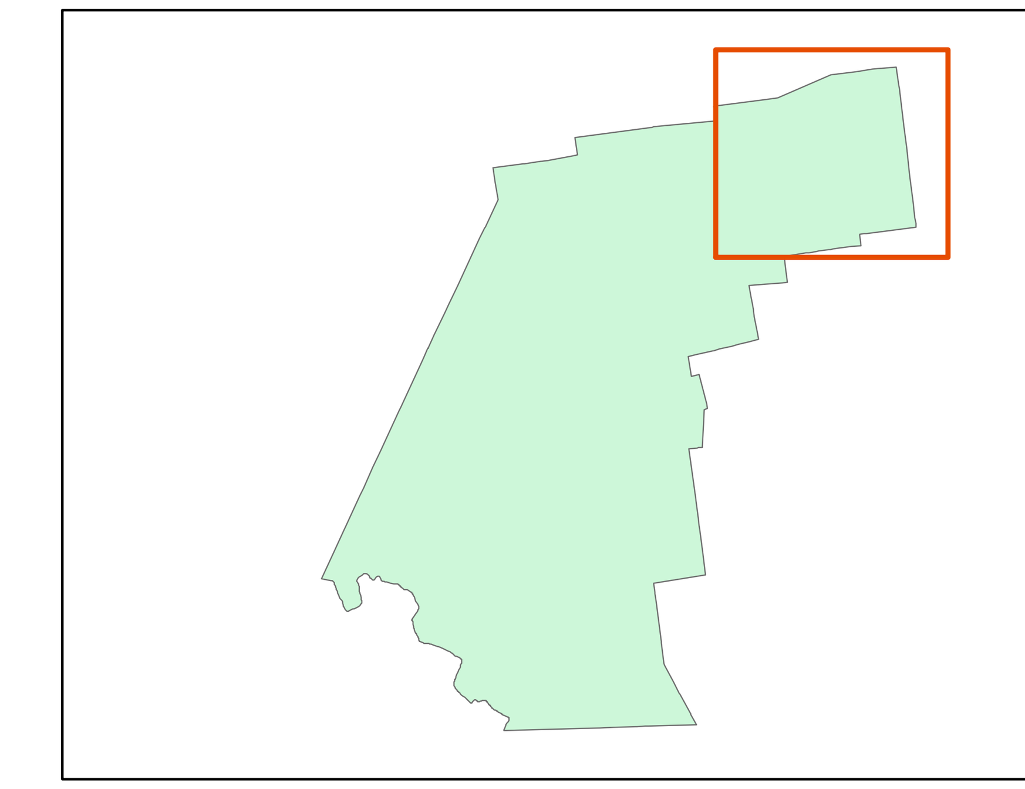
Exhibit 10

Existing BMP Locations and Existing BMP Drainage Areas – Sheets A thru C TMDL

Exhibit 10

Franklin Township Existing BMPs and Existing BMP Drainage Areas Sheet A TMDL





Legend

- MS4 Outfalls
- MS4 Observation Points
- PennDOT Outfalls
- Municipal Inlet
- Double Grate Inlet
- Private Inlets
- PennDOT Inlets
- Junction Box
- Stormwater Pipe
- Crosspipe/Culvert
- PennDOT Stormwater Pipe
- Private Stormwater Pipe

Existing Stormwater BMPs with ID#

- TOWNSHIP, OPEN
- TOWNSHIP, UNDERGROUND
- Private, Proposed
- PRIVATE, OPEN
- PRIVATE, UNDERGROUND
- Swales
- PennDOT Swales
- White Clay Creek Subwatershed Boundary
- Streams
- BMP Drainage Areas
- State Road
- Township Road
- Private Road
- Township Owned Parcels
- Parcels
- Municipal Boundary
- Ponds/Lakes
- Urban Areas 2010
- 10' Contours

Notes:
- All pipe lengths are estimated, not to scale
-Parcel boundaries, Municipal Boundaries, and Roads Data provided by Chester County GIS.
-Storm Sewer System data based on approved subdivision plans and field verified provided by the Township, 2016
-Streams data provided by Chester Couty GIS via Chester County Streams (line Features) -- via 1993 photo interpretation
-2010 Urbanized Areas data provided by EMapGIS, 2016.

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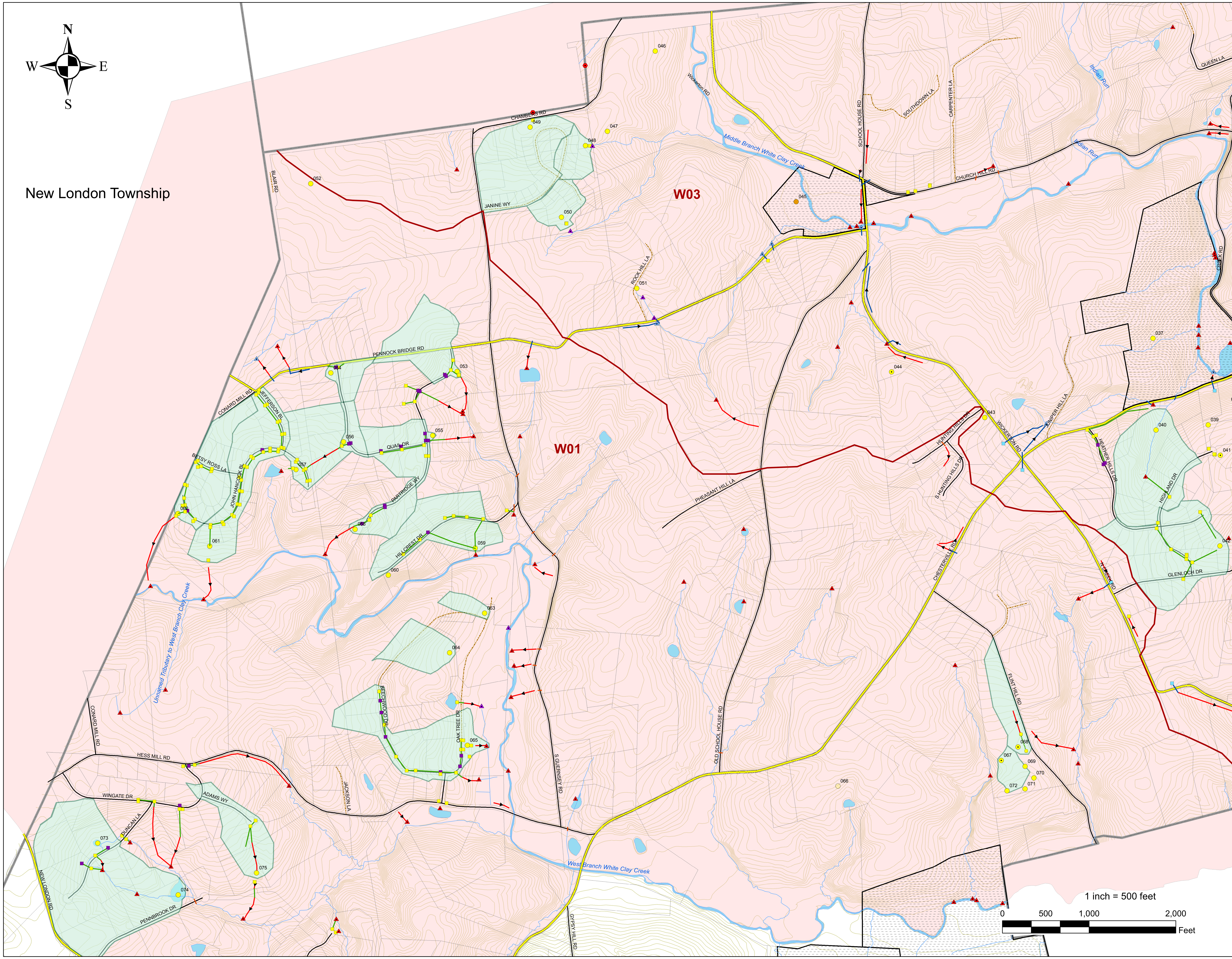
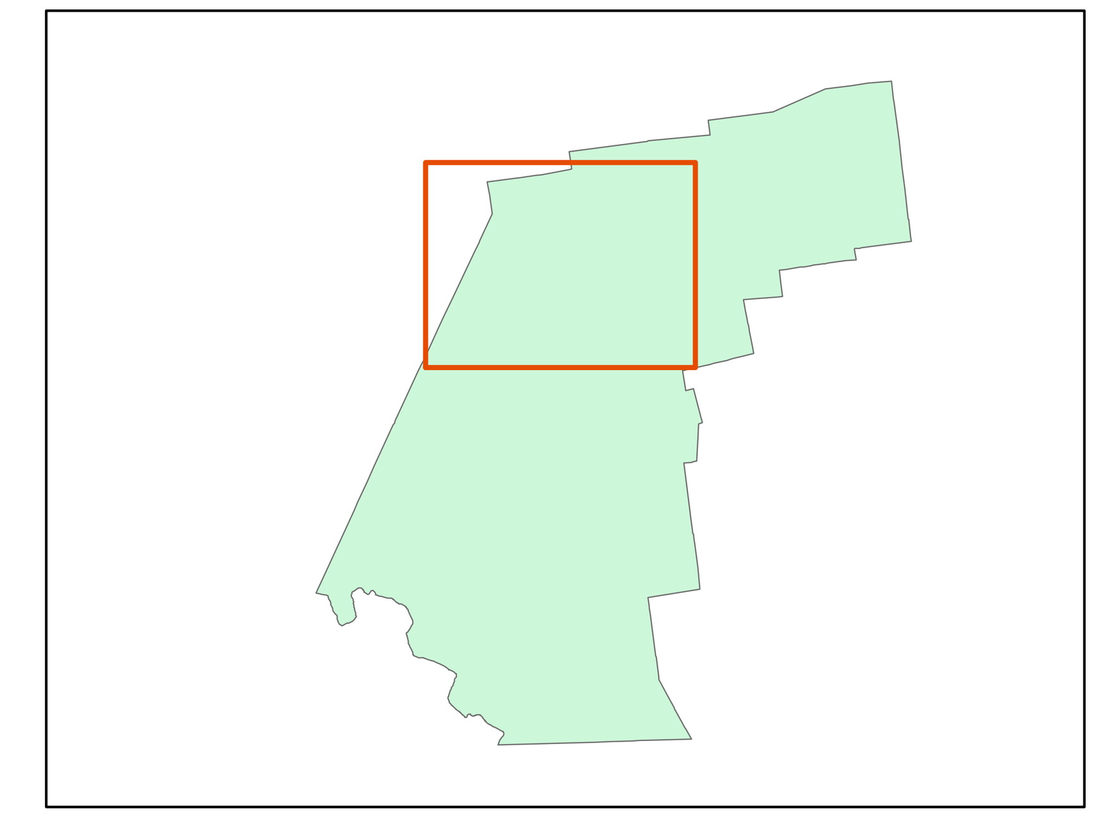
Document Path: E:\Franklin\0205-1508 MS4 Program\2018 MS4\Sheet A TMDL BMP Drainage Areas 020119.mxd

Exhibit 10

Franklin Township Existing BMPs and Existing BMP Drainage Areas Sheet B TMDL





Legend

- MS4 Outfalls
- PennDOT Outfalls
- Private Outfalls
- MS4 Observation Points
- Municipal Inlet
- Double Grate Inlet
- Private Inlets
- PennDOT Inlets
- Junction Box
- Stormwater Pipe
- Crosspipe/Culvert
- PennDOT Stormwater Pipe
- Private Stormwater Pipe

Existing Stormwater BMPs with ID#

- TOWNSHIP, OPEN
- TOWNSHIP, UNDERGROUND
- Private, Proposed
- PRIVATE, OPEN
- PRIVATE, UNDERGROUND
- Swales
- PennDOT Swales
- White Clay Creek Subwatershed Boundary
- Streams
- BMP Drainage Areas
- State Road
- Township Road
- Private Road
- Township Owned Parcels
- Parcels
- Municipal Boundary
- Ponds/Lakes
- Urban Areas 2010
- 10' Contours

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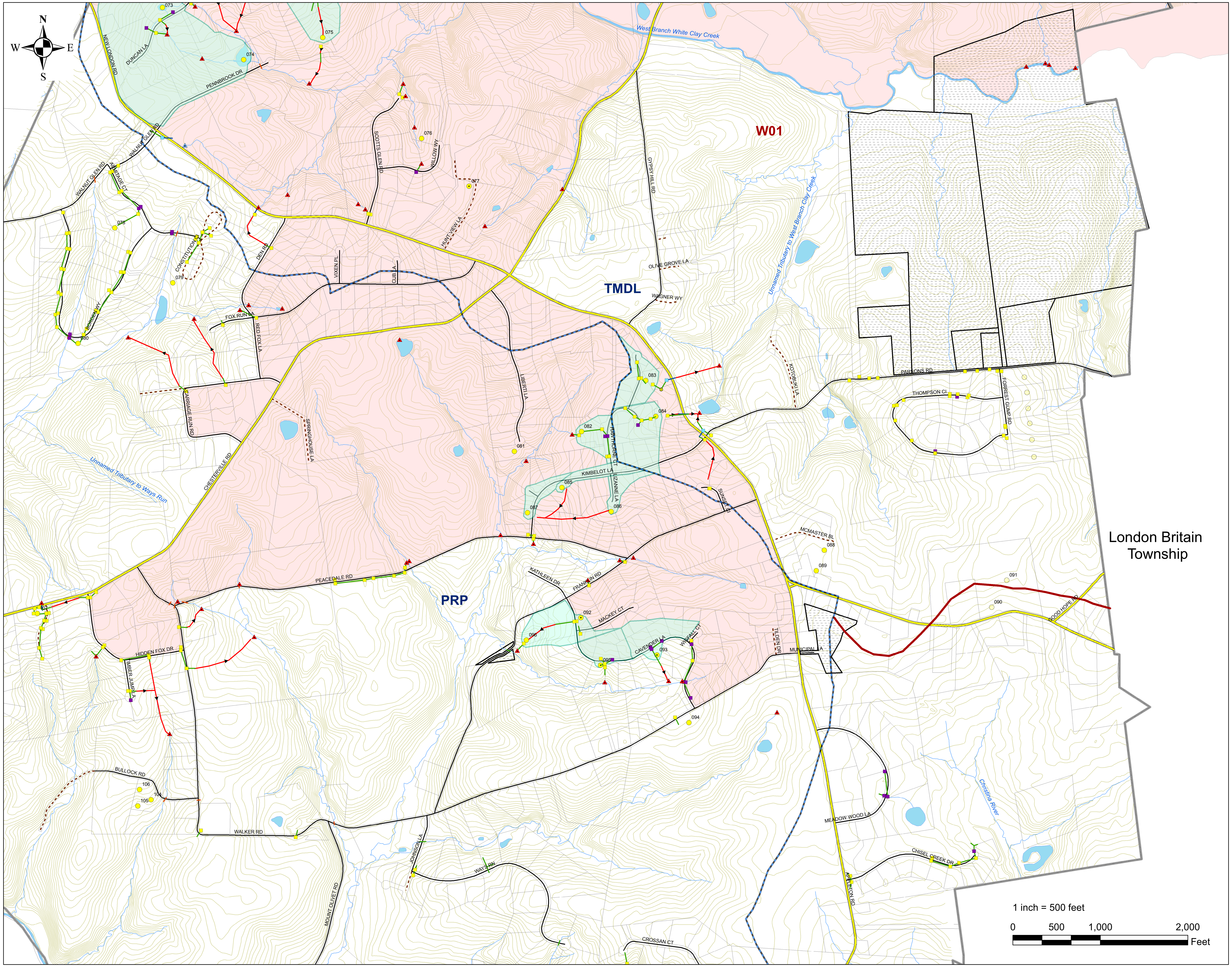
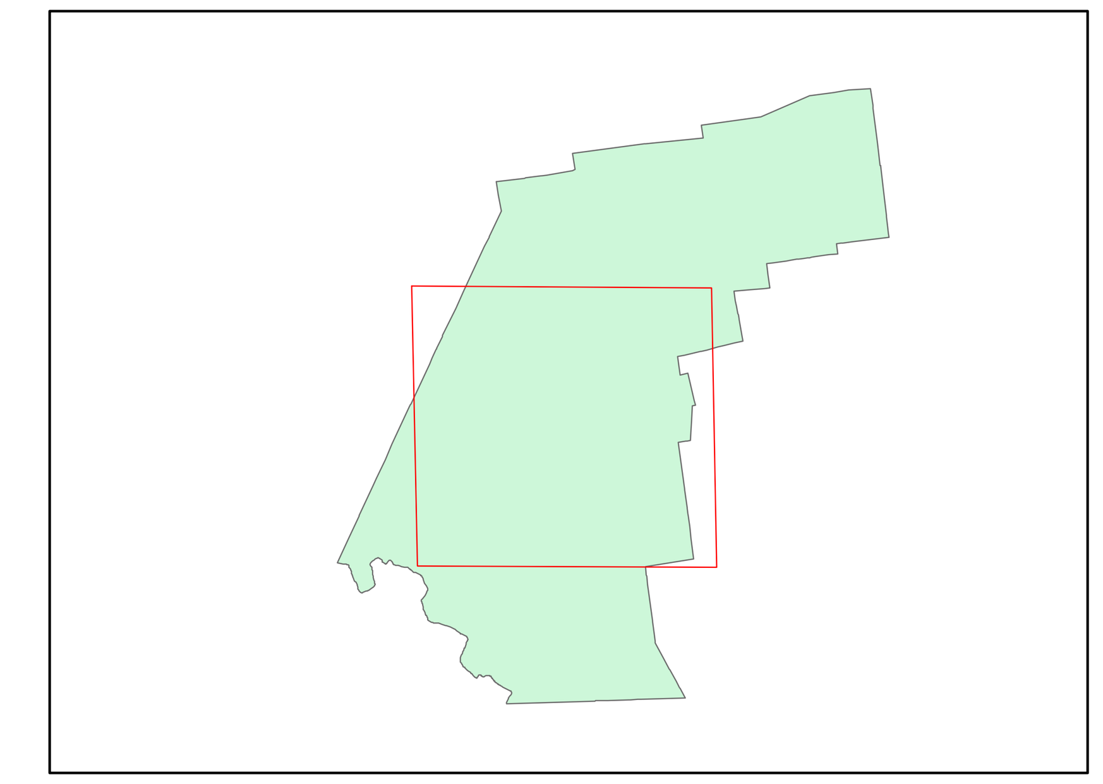
Exhibit 10

Franklin Township Existing BMPs and Existing BMP Drainage Areas Sheet C TMDL





Legend

- MS4 Outfalls
- PennDOT Outfalls
- Private Outfalls
- MS4 Observation Points
- Municipal Inlet
- Double Grate Inlet
- Private Inlets
- PennDOT Inlets
- Junction Box
- Stormwater Pipe
- Crosspipe
- PennDOT Stormwater Pipe
- Private Stormwater Pipe

Existing Stormwater BMPs with ID#

- TOWNSHIP, OPEN
- TOWNSHIP, UNDERGROUND
- Private, Proposed
- PRIVATE, OPEN
- PRIVATE, UNDERGROUND
- Swales
- PennDOT Swales
- Chesapeake Bay Watershed
- White Clay Creek Subwatershed Boundary
- BMP Drainage Areas
- State Road
- Township Road
- Private
- Municipal Boundary
- Streams
- Township Owned Parcels
- Parcels
- Ponds/Lakes
- Urban Areas 2010
- 10' Contours

Notes:
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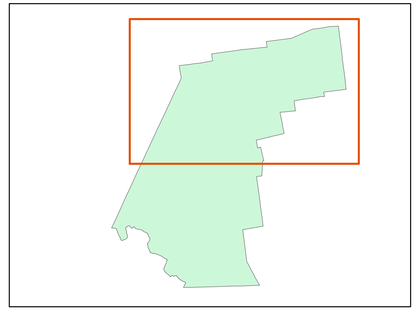
Exhibit 11

BMP Drainage Areas and Mapshed Land Use (Existing Cover) – 1995 TMDL & 2012 TMDL

Exhibit 11

BMP Drainage Areas and Mapshed Landuse 1995 TMDL



London Grove Township

New Garden Township

London Britain Township

W01

W03

W08

W09

1 inch = 1,000 feet

0 1,000 2,000 4,000 Feet

Legend

- MS4 Outfalls
- MS4 Observation Points

OWNERSHIP, OWNER

- Private, Open
- Private, Underground
- Chesapeake Bay Watershed
- White Clay Creek Subwatershed Boundary
- Streams
- BMP Drainage Areas 1995
- State Road
- Township Road
- Private Road
- Parcels
- Municipal Boundary
- Ponds/Lakes
- Cropland
- Disturbed
- Forest
- Hay/Pasture
- High-Density Mixed Urban
- Low-Density Residential
- Medium-Density Residential
- Open Land
- Water
- Wetland

Notes:
- All pipe lengths are estimated, not to scale
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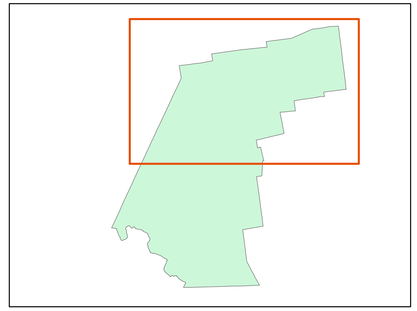
Document Path: E:\Franklin\0205-1508 MS4 Program\2018 MS4\Mapshed Landuse 1995 TMDL drainage areas 020119.mxd

Exhibit 11

Storm Sewersheds and Mapshed Landuse 2012 TMDL



London Grove Township

New Garden Township

London Britain Township

W01

W03

W08

W09

1 inch = 1,000 feet

0 1,000 2,000 4,000 Feet

Legend

- MS4 Outfalls
- MS4 Observation Points

2012 Existing Stormwater BMPs with ID# selection

- Township, Open
- Private, Open
- Private, Underground
- Chesapeake Bay Watershed
- White Clay Creek Subwatershed Boundary
- Streams
- BMP Drainage Areas 2012
- State Road
- Township Road
- Private Road
- Parcels
- Municipal Boundary
- Ponds/Lakes
- Cropland
- Disturbed
- Forest
- High-Density Mixed Urban
- Low-Density Residential
- Water
- Wetland

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Document Path: E:\Franklin\0205-1508 MS4 Program\2018 MS4\Mapshed Landuse BMP Drainage Areas 2012 T

Exhibit 12

Existing BMP Calculations

Exhibit 12

BMP No.	Subdivision	DATE APPROVED	NPDES PERMIT # (if available)	BMP DESCRIPTION	LOCATION	COORDINATES	OWNER (O & M responsible party)	INSPECTION and MAINTENANCE REQUIREMENTS (All inspections of BMPs shall occur after each large storm event or at a minimum of 1 time per year) (All maintenance activities shall occur a minimum of 1 time per year)	BMP STATUS
	WHITE CLAY CREEK								
	East Branch W09 (prior to 1995)								
033	Stonegate	3/2/92		Infiltration Bed #1 plus	SE side of Stonegate Drive cul de sac	39°46'45"N 75°47'09"W	Homeowner's Association	cleanout sediment, debris & trash; monitor dewatering time	Continue to serve the functions BMP was designed for
		3/2/92		Detention Basin #6	SE side of Stonegate Drive cul de sac	39°46'45"N 75°47'09"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
	East Branch W08 (prior to 1995)								
017	Auburn Crest	6/5/79		Detention Basin	NE corner of Glennann Drive circle	39°46'53"N 75°46'42"W	Lot #29 Owner - Palmer & Kay Hossler	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
	Middle Branch W03 (prior to 1995)								
031	Stonegate	3/2/92		Infiltration Bed #4 plus	West side of Dawnwood Drive	39°47'02"N 75°47'37"W	Homeowner's Association	cleanout sediment, debris & trash; monitor dewatering time	Continue to serve the functions BMP was designed for
		3/2/92		Detention Basin #1	West side of Dawnwood Drive	39°47'02"N 75°47'37"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
036		3/2/92		Infiltration Bed #3 plus	West side of McKean Drive	39°46'52"N 75°47'37"W	Homeowner's Association	cleanout sediment, debris & trash; monitor dewatering time	Continue to serve the functions BMP was designed for
		3/2/92		Detention Basin #2	West side of McKean Drive	39°46'52"N 75°47'37"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
035		3/2/92		Detention Basin #3	East side of McKean Drive	39°46'53"N 75°47'27"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
034		3/2/92		Detention Basin #4	NW corner of Chesterville Road/McKean Drive intersection	39°46'50"N 75°47'30"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
032		3/2/92		Infiltration Bed #2 plus	SW corner of Stonegate Drive/Laurel Bridge Road intersection	39°46'55"N 75°47'15"W	Homeowner's Association	cleanout sediment, debris & trash; monitor dewatering time	Continue to serve the functions BMP was designed for
		3/2/92		Detention Basin #5	SW corner of Stonegate Drive/Laurel Bridge Road intersection	39°46'55"N 75°47'15"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
040	Heather Hills	3/8/77		Infiltration Basin #1	South side of Chesterville Road/East side of Heather Hills Drive	39°46'46"N 75°48'23"W	Lot #4 Owner - Wayne G. Dascher	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time, mow/trim vegetation; remove invasive vegetation	Continue to serve the functions BMP was designed for
042		3/8/77		Infiltration Basin #2	East side of Highland Drive/South side of Heather Hills Drive	39°46'34"N 75°48'14"W	Lot #32 - Paul A. & Karen T. Miranda	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time, mow/trim vegetation; remove invasive vegetation	Continue to serve the functions BMP was designed for
	West Branch W01 (prior to 1995)								
059	Hidden Valley Farm	8/25/89		Detention Basin #1	South side of Hill Crest Drive	39°46'35"N 75°50'03"W	Lots #6 & #15 Owner - Darren & Gail L. Talham	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
053	Quail Hill	4/25/89		Infiltration Bed #1	East side of Partridge Way/South side of Pennock Bridge Road	39°46'56"N 75°50'03"W	Lot #26 Owner - John H. & Mary K. Deitz	cleanout sediment, debris & trash; monitor dewatering time	Continue to serve the functions BMP was designed for
055		4/25/89		Infiltration Bed #2	East side of Partridge Way	39°46'48"N 75°50'19"W	Lot #22 Owner - Gildo & Silvana R. Dinardo	cleanout sediment, debris & trash; monitor dewatering time	Continue to serve the functions BMP was designed for
058		4/25/89		Infiltration Bed #3	Southwest side of Partridge Way cul de sac	39°46'38"N 75°50'17"W	Lot #15 Owner - Robert L. & Noelle R. Meyer	cleanout sediment, debris & trash; monitor dewatering time	Continue to serve the functions BMP was designed for
056		4/25/89		Infiltration Bed #4	West side of Quail Drive	39°46'48"N 75°50'19"W	Lot #5 Owner - David F. & Jennifer A. Tillman	cleanout sediment, debris & trash; monitor dewatering time	Continue to serve the functions BMP was designed for
054		4/25/89		Infiltration Bed #5	West side of Partridge Way/South side of Pennock Bridge Road	39°46'56"N 75°50'21"W	Lot #1 Owner - Norman E. & Jayne C. Clough	cleanout sediment, debris & trash; monitor dewatering time	Continue to serve the functions BMP was designed for
073	Windgate Farms	3/3/88		Wet Pond #1	North side of Duncan Lane	39°46'03"N 75°50'57"W	Lot #5 Owner - John J. Jr. & Victoria Knotts	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time; remove invasive vegetation	Continue to serve the functions BMP was designed for
074		3/3/88		Wet Pond #2	North side of Pennbrooke Drive	39°45'57"N 75°50'46"W	Lot #43 Owner - Bruce P. & Valerie J. Herring	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time; remove invasive vegetation	Continue to serve the functions BMP was designed for
075		3/3/88		Detention Basin #3	South side of Adams Way cul de sac	39°45'58"N 75°50'34"W	Lot #22 Owner - Thomas E. & Melissa W. Sarver	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
	East Branch W08 (1995 to 2012)								
001	Twin Bridges	11/5/98	PAR10-G282	Wet Pond A	North side of Twin Bridges Lane	39°47'45"N 75°46'51"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time; remove invasive vegetation	Continue to serve the functions BMP was designed for
005	Auburn Hills	5/16/03		Detention Basin B	East side of Lavender Hill Lane	39°47'25"N 75°46'42"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
008	Landenburg Highlands	1/8/98		Infiltration Basin A1 plus	North side of Auburn Road	39°47'23"N 75°46'47"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time, mow/trim vegetation; remove invasive vegetation	Continue to serve the functions BMP was designed for
007		1/8/98		Infiltration Basin A2 plus	North side of Auburn Road	39°47'23"N 75°46'47"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time, mow/trim vegetation; remove invasive vegetation	Continue to serve the functions BMP was designed for
006		1/8/98		Detention Basin A3	North side of Auburn Road	39°47'23"N 75°46'47"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
009		1/8/98		Infiltration Basin B	North side of Auburn Road	39°47'20"N 75°46'56"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time, mow/trim vegetation; remove invasive vegetation	Continue to serve the functions BMP was designed for
010		1/8/98		Infiltration Basin C	East side of North Clay Creek Road	39°47'19"N 75°47'06"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time, mow/trim vegetation; remove invasive vegetation	Continue to serve the functions BMP was designed for
003		1/8/98		Infiltration Basin D1 plus	Northeast side of Tortoiseshell Lane	39°47'33"N 75°46'48"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time, mow/trim vegetation; remove invasive vegetation	Continue to serve the functions BMP was designed for
002		1/8/98		Detention Basin D2	Northeast side of Tortoiseshell Lane	39°47'33"N 75°46'48"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
004		1/8/98		Detention Basin E	Southeast side of North Clay Creek Road	39°47'31"N 75°47'01"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
012	Laurel View	1/14/05		Infiltration Bed #1A plus	East and West sides of north end of Hyatt Lane	39°47'17"N 75°46'59"W	Lot #4 Owner - Pedro M. & Nilsa Correa	cleanout sediment, debris & trash; monitor dewatering time	Continue to serve the functions BMP was designed for
011		1/14/05		Detention Basin #1B	East and West sides of north end of Hyatt Lane	39°47'17"N 75°46'59"W	Lot #6 Owner - Michael J. & Julianne Bruecks	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
013		1/14/05		Infiltration Basin #2	East side of south end of Hyatt Lane	39°47'13"N 75°46'56"W	Lot #5 Owner - David A. & Shelly M. Tattersal	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time, mow/trim vegetation; remove invasive vegetation	Continue to serve the functions BMP was designed for
016	White Clay Knoll	10/21/05	PAG2001504023	Infiltration Basin A1 plus	East and West sides of Leopold Court	39°47'07"N 75°47'01"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time, mow/trim vegetation; remove invasive vegetation	Continue to serve the functions BMP was designed for
015		10/21/05	PAG2001504023	Detention Basin A2	East and West sides of Leopold Court	39°47'07"N 75°47'01"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
014		10/21/05	PAG2001504023	Infiltration Basin A3	Southeast side of Leopold Court	39°47'10"N 75°46'48"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time, mow/trim vegetation; remove invasive vegetation	Continue to serve the functions BMP was designed for
	Middle Branch W03 (1995 to 2012)								
049	Lexington Point	10/4/07	PAG02001513020	Detention Basin #1	North side of Janine Way	39°47'23"N 75°49'51"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
048		10/4/07	PAG02001513020	Detention Basin #2	East side of Janine Way	39°47'19"N 75°49'44"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
050		10/4/07	PAG02001513020	Detention Basin #3	South side of Janine Way	39°47'15"N 75°49'46"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
	West Branch W01 (1995 to 2012)								
062	Franklin Chase	8/13/04	PAG02001510042	Detention Basin 1	South side of Conard Mill Road	39°46'40"N 75°50'44"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
061		8/13/04	PAG02001510042	Infiltration Basin 2	South side of John Hancock Boulevard	39°46'36"N 75°50'40"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; monitor dewatering time, mow/trim vegetation; remove invasive vegetation	Continue to serve the functions BMP was designed for
057		8/13/04	PAG02001510042	Detention Basin 3	West side of John Hancock Boulevard	39°46'45"N 75°50'26"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
063	Hess Mill Run Phase II	11/13/01	PAR10-G428	Detention Basin #1	East side of Beechwood Drive	39°46'27"N 75°50'00"W	Lot #5 Owner - Robert E., Jr. & Sandra Chester	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
064		11/13/01	PAR10-G428	Detention Basin #2	Southeast side of Beechwood Drive	39°46'23"N 75°50'05"W	Lot #3 Owner - Mark E. & Desiree M. Nickle	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
065		11/13/01	PAR10-G428	Detention Basin #3	East side of Oak Tree Drive	39°46'12"N 75°50'02"W	Lot #6 Owner - Matthew R. Schuster, III	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
068	Paradocx Vineyard	11/15/07		Infiltration Bed A	NW corner of Flint Hill Road/driveway intersection	39°46'11"N 75°48'39"W	Flint Hill Handshake Partners, LP	cleanout sediment, debris & trash; monitor dewatering time	Continue to serve the functions BMP was designed for
067		11/15/07		Infiltration Bed B	North side of building	39°46'09"N 75°49'53"W	Flint Hill Handshake Partners, LP	cleanout sediment, debris & trash; monitor dewatering time	Continue to serve the functions BMP was designed for
083	White Briar	7/19/01	PAS10-G458	Detention Basin #1	East side of Hawthorne Court	39°45'19"N 75°49'48"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin
084		7/19/01	PAS10-G458	Detention Basin #2	East side of Hawthorne Court cul de sac	39°45'15"N 75°49'46"W	Homeowner's Association	cleanout sediment, debris & trash; stabilize disturbed areas; mow/trim vegetation; remove invasive vegetation	Potential Retrofit to Dry Extended Detention Basin

Land Use Loading Rates per Watershed for TSS, TN and TP - INPUT TABLE

MUNICIPALITY: For Urban BMPs, please refer to the Christina MAPSHED Land Use Loading Rates Look-Up Tables for the applicable watershed for the year 2012 , and enter the "Total Land Use Loading Rates" below. EACH WATERSHED (Brandywine, Red Clay and White Clay) HAS ITS OWN LOADING RATES - Be sure to enter data for 2012 for the correct watershed and the correct pollutant. Numbers are shown below FOR DEMONSTRATION PURPOSES ONLY.

For Street Sweeping, the municipality must refer to the Christina MAPSHED Land Use Loading Rates Look-Up Tables for the applicable watershed for the year 2012 , and enter the "From Land Use" loading rates (upland loading rate) into the rows below that reference "Upland"; loads from stream bank and farm animals cannot be included in street sweeping BMP load reduction calculations.

Watershed: White Clay Creek
Municipality: Franklin Township

Source	Sediment (lbs/ac/yr)	TP (lbs/ac/yr)	TN (lbs/ac/yr)	
Hay/Past	183.12	0.33	1.12	For Urban BMPs
Cropland	1491.81	1.50	5.84	
Forest	163.18	0.05	0.17	
Wetland	148.61	0.05	0.48	
Disturbed	225.70	0.12	0.27	
Turfgrass	185.70	0.70	1.32	
Open_Land	303.30	0.14	1.40	
Bare_Rock	0.00	0.00	0.00	
Sandy_Areas	0.00	0.00	0.00	
Unpaved_Road	0.00	0.00	0.00	
Ld_Mixed	594.85	0.23	1.46	
Md_Mixed	1353.62	0.87	6.83	
Hd_Mixed	1906.23	1.01	7.56	
Ld_Residential	600.45	0.24	1.57	
Md_Residential	1347.59	0.82	6.34	
Hd_Residential	1905.55	0.99	7.38	
Ld_Mixed - Upland	51.42	0.13	1.19	For Street Sweeping Only!
Md_Mixed - Upland	228.86	0.67	6.27	
Hd_Mixed - Upland	231.55	0.71	6.72	
Ld_Residential - Upland	57.02	0.14	1.30	
Md_Residential - Upland	222.83	0.62	5.78	
Hd_Residential - Upland	230.87	0.69	6.54	

BMP Load and Efficiencies used in the Load Reduction Calculations (DO NOT ALTER):

Street Sweeping	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	Road Width (ft)
Average	10.0%	10.0%	10.0%	20

Stream Restoration - Protocol 1	TSS (lbs/ft/yr)	TP (lbs/ft/yr)	TN (lbs/ft/yr)
Default	115	0.174	0.192

Exhibit 12

Existing BMP Load Reduction Calculation Table

INSTRUCTIONS TO MUNICIPALITY: Each row in the table below should represent a different BMP drainage area. Choose the dominant land use draining to the BMP.

If a BMP has multiple land uses in the drainage area, these drainage areas should be represented on a subsequent row with the same BMP name. The treatment depth should be the same for a given BMP (even if it has multiple drainage areas).

If one of the drainage areas to the same BMP has NO impervious cover, use the Manual Override column to type in the treatment depth (in/imp. ac) of the primary drainage area containing impervious cover.

The examples below show the various options and should be deleted before tallying reductions. Notice one example demonstrates when a drainage area covers two land uses (see row 15 and 16).

MUNICIPALITY: TO ENTER BMP DATA IN THE ORANGE HIGHLIGHTED CELLS

Watershed: White Clay Creek (prior to 1995)

Municipality: Franklin Township

* See Instructions tab for what qualifies for stream restoration and street sweeping.

Cropland areas excluded from existing BMP calculations.

Existing BMP Load Reduction Calculation Table

East Branch W09

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified projects only	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no impervious area	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
BMP 033 Stonegate - Bed #1	RR	1992	Cropland	11.2	1.09			0.00	#N/A	1.09	1.09	0.0%	16,708.27	16.80	65.41	76.6%	71.5%	61.1%	12,799.94	6.40	12.01	39.96
BMP 033 Stonegate - Basin #6	ST	1992	Cropland	11.2	1.09			0.00	#N/A	1.09	1.09	0.0%	16,708.27	16.80	65.41	71.5%	56.2%	35.7%	11,943.09	5.97	9.44	23.38
Total																			**24,743.03**	**12.37**	**21.44**	**63.34**

East Branch W08

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified projects only	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no impervious area	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
BMP 017 Auburn Crest - Basin #1	ST	1979	Ld_Residential	4.0	0.60			0.60	2.50		2.50	15.0%	2,401.80	0.96	6.28	78.8%	62.0%	39.3%	1,892.90	0.95	0.60	2.47
Total																			**1,892.90**	**0.95**	**0.60**	**2.47**

Middle Branch W03

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified projects only	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no impervious area	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
BMP 031 Stonegate - Bed #4	RR	1992	Cropland	4.7	0.67			0.00	#N/A	0.67	0.67	0.0%	7,011.51	7.05	27.45	64.9%	60.6%	51.9%	4,551.03	2.28	4.27	14.24
BMP 031 Stonegate - Bed #4	RR	1992	Forest	0.3	0.67			0.00	#N/A	0.67	0.67	0.0%	48.95	0.02	0.05	64.9%	60.6%	51.9%	31.78	0.02	0.01	0.03
BMP 031 Stonegate - Basin #1	ST	1992	Cropland	4.7	0.67			0.00	#N/A	0.67	0.67	0.0%	7,011.51	7.05	27.45	60.6%	47.6%	30.3%	4,247.35	2.12	3.36	8.31
BMP 031 Stonegate - Basin #1	ST	1992	Forest	0.3	0.67			0.00	#N/A	0.67	0.67	0.0%	48.95	0.02	0.05	60.6%	47.6%	30.3%	29.65	0.01	0.01	0.02
BMP 036 Stonegate - Bed #3	RR	1992	Ld_Residential	5.8	0.65			0.87	2.50		2.50	15.0%	3,482.61	1.39	9.11	84.9%	78.8%	67.7%	2,956.67	1.48	1.10	6.16
BMP 036 Stonegate - Bed #3	RR	1992	Forest	1.4	0.65			0.00	#N/A	0.65	0.65	0.0%	228.45	0.07	0.24	64.0%	59.8%	51.2%	146.28	0.07	0.04	0.12
BMP 036 Stonegate - Bed #3	RR	1992	Cropland	0.6	0.65			0.00	#N/A	0.65	0.65	0.0%	895.09	0.90	3.50	64.0%	59.8%	51.2%	573.12	0.29	0.54	1.79
BMP 036 Stonegate - Basin #2	ST	1992	Ld_Residential	5.8	0.65			0.87	2.50		2.50	15.0%	3,482.61	1.39	9.11	78.8%	62.0%	39.3%	2,744.71	1.37	0.86	3.58
BMP 036 Stonegate - Basin #2	ST	1992	Forest	1.4	0.65			0.00	#N/A	0.65	0.65	0.0%	228.45	0.07	0.24	59.8%	46.9%	29.9%	136.52	0.07	0.03	0.07
BMP 036 Stonegate - Basin #2	ST	1992	Cropland	0.6	0.65			0.00	#N/A	0.65	0.65	0.0%	895.09	0.90	3.50	59.8%	46.9%	29.9%	534.88	0.27	0.42	1.05
BMP 035 Stonegate - Basin #3	ST	1992	Ld_Residential	5.9	0.65			0.89	2.50		2.50	15.0%	3,542.66	1.42	9.26	78.8%	62.0%	39.3%	2,792.03	1.40	0.88	3.64
BMP 035 Stonegate - Basin #3	ST	1992	Forest	3.9	0.65			0.00	#N/A	0.65	0.65	0.0%	636.40	0.20	0.66	59.8%	46.9%	29.9%	380.30	0.19	0.09	0.20
BMP 035 Stonegate - Basin #3	ST	1992	Cropland	3.3	0.65			0.00	#N/A	0.65	0.65	0.0%	4,922.97	4.95	19.27	59.8%	46.9%	29.9%	2,941.86	1.47	2.32	5.76
BMP 034 Stonegate - Basin #4	ST	1992	Cropland	2.8	0.65			0.00	#N/A	0.65	0.65	0.0%	4,177.07	4.20	16.35	59.8%	46.9%	29.9%	2,496.12	1.25	1.97	4.89
BMP 034 Stonegate - Basin #4	ST	1992	Forest	2.7	0.65			0.00	#N/A	0.65	0.65	0.0%	440.59	0.14	0.46	59.8%	46.9%	29.9%	263.28	0.13	0.06	0.14
BMP 034 Stonegate - Basin #4	ST	1992	Ld_Residential	1.4	0.65			0.21	2.50		2.50	15.0%	840.63	0.34	2.20	78.8%	62.0%	39.3%	662.52	0.33	0.21	0.86
BMP 032 Stonegate - Bed #2	RR	1992	Cropland	13.2	0.65			0.00	#N/A	0.65	0.65	0.0%	19,691.89	19.80	77.09	64.0%	59.8%	51.2%	12,608.68	6.30	11.83	39.45
BMP 032 Stonegate - Bed #2	RR	1992	Ld_Residential	2.0	0.65			0.30	2.50		2.50	15.0%	1,200.90	0.48	3.14	84.9%	78.8%	67.7%	1,019.54	0.51	0.38	2.13
BMP 032 Stonegate - Bed #2	RR	1992	Forest	0.9	0.65			0.00	#N/A	0.65	0.65	0.0%	146.86	0.05	0.15	64.0%	59.8%	51.2%	94.04	0.05	0.03	0.08
BMP 032 Stonegate - Basin #5	ST	1992	Cropland	13.2	0.65			0.00	#N/A	0.65	0.65	0.0%	19,691.89	19.80	77.09	59.8%	46.9%	29.9%	11,767.43	5.88	9.30	23.03
BMP 032 Stonegate - Basin #5	ST	1992	Ld_Residential	2.0	0.65			0.30	2.50		2.50	15.0%	1,200.90	0.48	3.14	78.8%	62.0%	39.3%	946.45	0.47	0.30	1.23
BMP 032 Stonegate - Basin #5	ST	1992	Forest	0.9	0.65			0.00	#N/A	0.65	0.65	0.0%	146.86	0.05	0.15	59.8%	46.9%	29.9%	87.76	0.04	0.02	0.05
BMP 040 Heather Hill - Basin #1	RR	1977	Ld_Residential	14.4	0.43			2.16	2.50		2.50	15.0%	8,646.48	3.46	22.61	84.9%	78.8%	67.7%	7,340.70	3.67	2.72	15.31
BMP 040 Heather Hill - Basin #1	RR	1977	Forest	6.6	0.43			0.00	#N/A	0.43	0.43	0.0%	1,076.99	0.33	1.12	51.2%	47.8%	41.0%	551.57	0.28	0.16	0.46
BMP 042 Heather Hill - Basin #2	RR	1977	Ld_Residential	24.2	0.85			3.63	2.50		2.50	15.0%	14,530.89	5.81	37.99	84.9%	78.8%	67.7%	12,336.45	6.17	4.58	25.72
BMP 042 Heather Hill - Basin #2	RR	1977	Cropland	0.2	0.85			0.00	#N/A	0.85	0.85	0.0%	298.36	0.30	1.17	71.3%	66.5%	56.9%	212.59	0.11	0.20	0.66
Total																			**72,453.30**	**36.23**	**45.68**	**158.98**

West Branch W01

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified projects only	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no impervious area	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
BMP 059 Hidden Valley Farm - Basin #1	ST	1989	Ld_Residential	10.1	0.60			1.52	2.50		2.50	15.0%	6,064.55	2.42	15.86	78.8%	62.0%	39.3%	4,779.58	2.39	1.50	6.23
BMP 059 Hidden Valley Farm - Basin #1	ST	1989	Forest	5.9	0.60			0.00	#N/A	0.60	0.60	0.0%	962.76	0.30	1.00	57.5%	45.2%	28.8%	553.96	0.28	0.13	0.29
BMP 059 Hidden Valley Farm - Basin #1	ST	1989	Wetland	0.4	0.60			0.00	#N/A	0.60	0.60	0.0%	59.44	0.02	0.19	57.5%	45.2%	28.8%	34.20	0.02	0.01	0.06
BMP 053 Quail Hill - Bed #1	RR	1989	Cropland	7.4	1.09			0.00	#N/A	1.09	1.09	0.0%	11,039.39	11.10	43.22	76.6%	71.5%	61.1%	8,457.11	4.23	7.93	26.40
BMP 053 Quail Hill - Bed #1	RR	1989	Open_Land	4.8	1.09			0.00	#N/A	1.09	1.09	0.0%	1,455.84	0.67	6.72	76.6%	71.5%	61.1%	1,115.30	0.56	0.48	4.11
BMP 053 Quail Hill - Bed #1	RR	1989	Forest	0.2	1.09			0.00	#N/A	1.09	1.09	0.0%	32.64	0.01	0.03	76.6%	71.5%	61.1%	25.00	0.01	0.01	0.02
BMP 055 Quail Hill - Bed #2	RR	1989	Open_Land	9.4	0.34			0.00	#N/A	0.34	0.34	0.0%	2,851.02	1.32	13.16	43.9%	40.9%	35.1%	1,250.39	0.63	0.54	4.62
BMP 058 Quail Hill - Bed #3	RR	1989	Forest	3.2	0.25			0.00	#N/A	0.25	0.25	0.0%	522.18	0.16	0.54	34.9%	32.6%	27.9%	182.25	0.09	0.05	0.15
BMP 058 Quail Hill - Bed #3	RR	1989	Open_Land	2.4	0.25			0.00	#N/A	0.25	0.25	0.0%	727.92	0.34	3.36	34.9%	32.6%	27.9%	254.07	0.13	0.11	0.94
BMP 056 Quail Hill - Bed #4	RR	1989	Open_Land	2.8	0.34			0.00	#N/A	0.34	0.34	0.0%	849.24	0.39	3.92	43.9%	40.9%	35.1%	372.46	0.19	0.16	1.38
BMP 054 Quail Hill - Bed #5	RR	1989	Open_Land	3.6	0.34			0.00	#N/A	0.34	0.34	0.0%	1,091.88	0.50	5.04	43.9%	40.9%	35.1%	478.87	0.24	0.21	1.77
BMP 073 Windgate Farms - Basin #1	ST	1988	Ld_Residential	3.4	0.60			0.51	2.50		2.50	15.0%	2,041.53	0.82	5.34	78.8%	62.0%	39.3%	1,608.97	0.80	0.51	2.10
BMP 073 Windgate Farms - Basin #1	ST	1988	Cropland	2.2	0.60			0.00	#N/A	0.60	0.60	0.0%	3,281.98	3.30	12.85	57.5%	45.2%	28.8%	1,888.41	0.94	1.49	3.70
BMP 074 Windgate Farms - Basin #2	ST	1988	Cropland	27.1	1.09			0.00	#N/A	1.09	1.09	0.0%	40,428.05	40.65	158.26	71.5%	56.2%	35.7%	28,898.01	14.45	22.83	56.56
BMP 074 Windgate Farms - Basin #2	ST	1988	Ld_Residential	13.1	1.09			1.97	2.50		2.50	15.0%	7,865.90	3.14	20.57	78.8%	62.0%	39.3%	6,199.26	3.10	1.95	8.09
BMP 074 Windgate Farms - Basin #2	ST	1988	Forest	3.1	1.09			0.00	#N/A	1.09	1.09	0.0%	505.86	0.16	0.53	71.5%	56.2%	35.7%	361.59	0.18	0.09	0.19
BMP 074 Windgate Farms - Basin #2	ST	1988	Wetland	0.3	1.09			0.00	#N/A	1.09	1.09	0.0%	44.58	0.02	0.14	71.5%	56.2%	35.7%	31.87	0.02	0.01	0.05
BMP 074 Windgate Farms - Basin #2	ST	1988	Hay/Past	0.1	1.09			0.00	#N/A	1.09	1.09	0.0%	18.31	0.03	0.11	71.5%	56.2%	35.7%	13.09	0.01	0.02	0.04
BMP 075 Windgate Farms - Basin #3	ST	1988	Ld_Residential	7.2	0.60			1.08	2.50		2.50	15.0%	4,323.24	1.73	11.30	78.8%	62.0%	39.3%	3,407.23	1.70	1.07	4.44
BMP 075 Windgate Farms - Basin #3	ST	1988	Cropland	3.3	0.60			0.00	#N/A	0.60	0.60	0.0%	4,922.97	4.95	19.27	57.5%	45.2%	28.8%	2,832.62	1.42	2.24	5.54
Total																			**62,744.23**	**31.37**	**41.33**	**126.68**

Exhibit 12

Existing BMP Load Reduction Calculation Table

INSTRUCTIONS TO MUNICIPALITY: Each row in the table below should represent a different BMP drainage area. Choose the dominant land use draining to the BMP.

If a BMP has multiple land uses in the drainage area, these drainage areas should be represented on a subsequent row with the same BMP name. The treatment depth should be the same for a given BMP (even if it has multiple drainage areas).

If one of the drainage areas to the same BMP has NO impervious cover, use the Manual Override column to type in the treatment depth (in/imp. ac) of the primary drainage area containing impervious cover.

The examples below show the various options and should be deleted before tallying reductions. Notice one example demonstrates when a drainage area covers two land uses (see row 15 and 16).

MUNICIPALITY: TO ENTER BMP DATA IN THE ORANGE HIGHLIGHTED CELLS
Watershed: White Clay Creek (1995-2012)
Municipality: Franklin Township
* See Instructions tab for what qualifies for stream restoration and street sweeping.
Cropland areas excluded from existing BMP calculations.
No existing BMPs for East Branch W09
East Branch W08

Existing BMP Load Reduction Calculation Table

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified projects only	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no impervious area	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
BMP 001 Twin Bridges - Wet Pond A	ST	1998	Ld_Residential	9.8	0.76			1.47	2.50		2.50	15.0%	5,884.41	2.35	15.39	78.8%	62.0%	39.3%	4,637.61	2.32	1.46	6.05
BMP 001 Twin Bridges - Wet Pond A	ST	1998	Forest	3.7	0.76			0.00	#N/A	0.76	0.76	0.0%	603.77	0.19	0.63	63.8%	50.2%	31.9%	385.41	0.19	0.09	0.20
BMP 001 Twin Bridges - Wet Pond A	ST	1998	Disturbed	2.4	0.76			0.00	#N/A	0.76	0.76	0.0%	541.68	0.29	0.65	63.8%	50.2%	31.9%	345.78	0.17	0.14	0.21
BMP 001 Twin Bridges - Wet Pond A	ST	1998	Wetland	0.4	0.76			0.00	#N/A	0.76	0.76	0.0%	59.44	0.02	0.19	63.8%	50.2%	31.9%	37.95	0.02	0.01	0.06
BMP 005 Auburn Hills - Basin B	ST	2003	Ld_Residential	3.6	1.22			0.54	2.50		2.50	15.0%	2,161.62	0.86	5.65	78.8%	62.0%	39.3%	1,703.61	0.85	0.54	2.22
BMP 005 Auburn Hills - Basin B	ST	2003	Disturbed	0.9	1.22			0.00	#N/A	1.22	1.22	0.0%	203.13	0.11	0.24	73.3%	57.6%	36.7%	148.92	0.07	0.06	0.09
BMPs 007 & 008 Landenberg Highlands - Basins A1 & A2	RR	1998	Ld_Residential	3.7	0.60			0.56	2.50		2.50	15.0%	2,221.67	0.89	5.81	84.9%	78.8%	67.7%	1,886.15	0.94	0.70	3.93
BMP 006 Landenberg Highlands - Basin A3	ST	1998	Ld_Residential	6.7	0.60			1.01	2.50		2.50	15.0%	4,023.02	1.61	10.52	78.8%	62.0%	39.3%	3,170.61	1.59	1.00	4.14
BMP 009 Landenberg Highlands - Basin B	RR	1998	Ld_Residential	6.5	0.60			0.98	2.50		2.50	15.0%	3,902.93	1.56	10.21	84.9%	78.8%	67.7%	3,313.51	1.66	1.23	6.91
BMP 010 Landenberg Highlands - Basin C	RR	1998	Ld_Residential	6.0	0.60			0.90	2.50		2.50	15.0%	3,602.70	1.44	9.42	84.9%	78.8%	67.7%	3,058.62	1.53	1.13	6.38
BMP 003 Landenberg Highlands - Basin D1	RR	1998	Ld_Residential	1.0	1.22			0.15	2.50		2.50	15.0%	600.45	0.24	1.57	84.9%	78.8%	67.7%	509.77	0.25	0.19	1.06
BMP 003 Landenberg Highlands - Basin D1	RR	1998	Disturbed	0.9	1.22			0.00	#N/A	1.22	1.22	0.0%	203.13	0.11	0.24	78.6%	73.3%	62.7%	159.62	0.08	0.08	0.15
BMP 002 Landenberg Highlands - Basin D2	ST	1998	Ld_Residential	1.2	1.22			0.18	2.50		2.50	15.0%	720.54	0.29	1.88	78.8%	62.0%	39.3%	567.87	0.28	0.18	0.74
BMP 002 Landenberg Highlands - Basin D2	ST	1998	Disturbed	1.1	1.22			0.00	#N/A	1.22	1.22	0.0%	248.27	0.13	0.30	73.3%	57.6%	36.7%	182.01	0.09	0.08	0.11
BMP 004 Landenberg Highlands - Basin E	ST	1998	Ld_Residential	12.7	0.90			1.91	2.50		2.50	15.0%	7,625.72	3.05	19.94	78.8%	62.0%	39.3%	6,009.97	3.00	1.89	7.84
BMP 004 Landenberg Highlands - Basin E	ST	1998	Disturbed	5.6	0.90			0.00	#N/A	0.90	0.90	0.0%	1,263.92	0.67	1.51	67.8%	53.2%	33.9%	856.35	0.43	0.36	0.51
BMP 004 Landenberg Highlands - Basin E	ST	1998	Forest	0.2	0.90			0.00	#N/A	0.90	0.90	0.0%	32.64	0.01	0.03	67.8%	53.2%	33.9%	22.11	0.01	0.01	0.01
BMP 012 Laurel View - Basin #1A	RR	2005	Ld_Residential	1.1	0.60			0.17	2.50		2.50	15.0%	660.50	0.26	1.73	84.9%	78.8%	67.7%	560.75	0.28	0.21	1.17
BMP 011 Laurel View - Basin #1B	ST	2005	Ld_Residential	1.7	0.60			0.26	2.50		2.50	15.0%	1,020.77	0.41	2.67	78.8%	62.0%	39.3%	804.48	0.40	0.25	1.05
BMP 013 Laurel View - Basin #2	RR	2005	Ld_Residential	3.6	1.22			0.54	2.50		2.50	15.0%	2,161.62	0.86	5.65	84.9%	78.8%	67.7%	1,835.17	0.92	0.68	3.83
BMP 013 Laurel View - Basin #2	RR	2005	Disturbed	0.2	1.22			0.00	#N/A	1.22	1.22	0.0%	45.14	0.02	0.05	78.6%	73.3%	62.7%	35.47	0.02	0.02	0.03
BMP 016 White Clay Knoll - Basin A1	RR	2005	Disturbed	4.0	1.22			0.00	#N/A	1.22	1.22	0.0%	902.80	0.48	1.08	78.6%	73.3%	62.7%	709.44	0.35	0.35	0.68
BMP 016 White Clay Knoll - Basin A1	RR	2005	Ld_Residential	1.8	1.22			0.27	2.50		2.50	15.0%	1,080.81	0.43	2.83	84.9%	78.8%	67.7%	917.59	0.46	0.34	1.91
BMP 015 White Clay Knoll - Basin A2	ST	2005	Ld_Residential	6.6	1.22			0.99	2.50		2.50	15.0%	3,962.97	1.58	10.36	78.8%	62.0%	39.3%	3,123.29	1.56	0.98	4.07
BMP 015 White Clay Knoll - Basin A2	ST	2005	Disturbed	6.5	1.22			0.00	#N/A	1.22	1.22	0.0%	1,467.05	0.78	1.76	73.3%	57.6%	36.7%	1,075.54	0.54	0.45	0.64
BMP 014 White Clay Knoll - Basin A3	RR	2005	Ld_Residential	4.6	1.22			0.69	2.50		2.50	15.0%	2,762.07	1.10	7.22	84.9%	78.8%	67.7%	2,344.95	1.17	0.87	4.89
BMP 014 White Clay Knoll - Basin A3	RR	2005	Disturbed	1.2	1.22			0.00	#N/A	1.22	1.22	0.0%	270.84	0.14	0.32	78.6%	73.3%	62.7%	212.83	0.11	0.11	0.20
Total																			**38,615.41**	**19.31**	**13.40**	**59.09**

Middle Branch W03

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified projects only	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no impervious area	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
BMP 049 Lexington Point - Basin #1	ST	2007	Disturbed	12.6	1.18			0.00	#N/A	1.18	1.18	0.0%	2,843.82	1.51	3.40	72.8%	57.2%	36.4%	2,070.23	1.04	0.86	1.24
BMP 049 Lexington Point - Basin #1	ST	2007	Ld_Residential	7.4	1.18			1.11	2.50		2.50	15.0%	4,443.33	1.78	11.62	78.8%	62.0%	39.3%	3,501.87	1.75	1.10	4.57
BMP 049 Lexington Point - Basin #1	ST	2007	Cropland	0.3	1.18			0.00	#N/A	1.18	1.18	0.0%	447.54	0.45	1.75	72.8%	57.2%	36.4%	325.80	0.16	0.26	0.64
BMP 048 Lexington Point - Basin #2	ST	2007	Disturbed	4.5	1.05			0.00	#N/A	1.05	1.05	0.0%	1,015.65	0.54	1.22	70.8%	55.6%	35.4%	719.22	0.36	0.30	0.43
BMP 048 Lexington Point - Basin #2	ST	2007	Forest	0.2	1.05			0.00	#N/A	1.05	1.05	0.0%	32.64	0.01	0.03	70.8%	55.6%	35.4%	23.11	0.01	0.01	0.01
BMP 050 Lexington Point - Basin #3	ST	2007	Disturbed	4.6	1.18			0.00	#N/A	1.18	1.18	0.0%	1,038.22	0.55	1.24	72.8%	57.2%	36.4%	755.80	0.38	0.32	0.45
BMP 050 Lexington Point - Basin #3	ST	2007	Cropland	0.6	1.18			0.00	#N/A	1.18	1.18	0.0%	895.09	0.90	3.50	72.8%	57.2%	36.4%	651.60	0.33	0.51	1.28
BMP 050 Lexington Point - Basin #3	ST	2007	Ld_Residential	0.3	1.18			0.05	2.50		2.50	15.0%	180.14	0.07	0.47	78.8%	62.0%	39.3%	141.97	0.07	0.04	0.19
BMP 045 Goodwin Preserve - Tree Planting	RR	2012	Ld_Residential	25.0	0.60			3.75	2.50		2.50	15.0%	15,011.25	6.00	39.25	84.9%	78.8%	67.7%	12,744.27	6.37	4.73	26.57
Total																			**20,933.87**	**10.47**	**8.13**	**35.37**

West Branch W01

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified projects only	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no impervious area	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
BMP 062 Franklin Chase - Basin 1	ST	2004	Disturbed	5.1	1.18			0.00	#N/A	1.18	1.18	0.0%	1,151.07	0.61	1.38	72.8%	57.2%	36.4%	837.95	0.42	0.35	0.50
BMP 062 Franklin Chase - Basin 1	ST	2004	Ld_Residential	5.5	1.18			0.83	2.50		2.50	15.0%	3,302.48	1.32	8.64	78.8%	62.0%	39.3%	2,602.74	1.30	0.82	3.39
BMP 062 Franklin Chase - Basin 1	ST	2004	Cropland	2.1	1.18			0.00	#N/A	1.18	1.18	0.0%	3,132.80	3.15	12.26	72.8%	57.2%	36.4%	2,280.60	1.14	1.80	4.46
BMP 061 Franklin Chase - Basin 2	RR	2004	Ld_Residential	9.6	1.18			1.44	2.50		2.50	15.0%	5,764.32	2.30	15.07	84.9%	78.8%	67.7%	4,893.80	2.45	1.82	10.20
BMP 061 Franklin Chase - Basin 2	RR	2004	Disturbed	6.3	1.18			0.00	#N/A	1.18	1.18	0.0%	1,421.91	0.76	1.70	78.0%	72.8%	62.2%	1,109.47	0.55	0.55	1.06
BMP 061 Franklin Chase - Basin 2	RR	2004	Cropland	2.3	1.18			0.00	#N/A	1.18	1.18	0.0%	3,431.16	3.45	13.43	78.0%	72.8%	62.2%	2,677.22	1.34	2.51	8.36
BMP 057 Franklin Chase - Basin 3	ST	2004	Ld_Residential	13.2	1.22			1.98	2.50		2.50	15.0%	7,925.94	3.17	20.72	78.8%	62.0%	39.3%	6,246.58	3.12	1.96	8.15
BMP 057 Franklin Chase - Basin 3	ST	2004	Disturbed	1.7	1.22			0.00	#N/A	1.22	1.22	0.0%	383.69	0.20	0.46	73.3%	57.6%	36.7%	281.29	0.14	0.12	0.17
BMP 063 Hess Mill Run Phase II - Basin #1	ST	2001	Ld_Residential	2.0	0.85			0.30	2.50		2.50	15.0%	1,200.90	0.48	3.14	78.8%	62.0%	39.3%	946.45	0.47	0.30	1.23
BMP 063 Hess Mill Run Phase II - Basin #1	ST	2001	Cropland	0.5	0.85			0.00	#N/A	0.85	0.85	0.0%	745.91	0.75	2.92	66.5%	52.2%	33.2%	495.97	0.25	0.39	0.97
BMP 064 Hess Mill Run Phase II - Basin #2	ST	2001	Cropland	7.3	0.85			0.00	#N/A	0.85	0.85	0.0%	10,890.21	10.95	42.63	66.5%	52.2%	33.2%	7,241.14	3.62	5.72	14.17
BMP 064 Hess Mill Run Phase II - Basin #2	ST	2001	Ld_Residential	0.5	0.85			0.08	2.50		2.50	15.0%	300.23	0.12	0.79	78.8%	62.0%	39.3%	236.61	0.12	0.07	0.31
BMP 065 Hess Mill Run Phase II - Basin #3	ST	2001	Ld_Residential	16.7	0.85			2.51	2.50		2.50	15.0%	10,027.52	4.01	26.22	78.8%	62.0%	39.3%	7,902.87	3.95	2.48	10.31
BMP 065 Hess Mill Run Phase II - Basin #3	ST	2001	Cropland	1.2	0.85			0.00	#N/A	0.85	0.85	0.0%	1,790.17	1.80	7.01	66.5%	52.2%	33.2%	1,190.32	0.60	0.94	2.33
BMP 068 Paradocx Vineyard - Infiltration Bed A	RR	2007	Cropland	5.8	0.85			0.00	#N/A	0.85	0.85	0.0%	8,652.50	8.70	33.87	71.3%	66.5%	56.9%	6,165.05	3.08	5.78	19.26
BMP 068 Paradocx Vineyard - Infiltration Bed A	RR	2007	Ld_Residential	0.7	0.85			0.11	2.50		2.50	15.0%	420.32	0.17	1.10	84.9%	78.8%	67.7%	356.84	0.18	0.13	0.74
BMP 067 Paradocx Vineyard - Infiltration Bed B	RR	2007	Cropland	2.6	0.67			0.00	#N/A	0.67	0.67	0.0%	3,878.71	3.90	15.18	64.9%	60.6%	51.9%	2,517.59	1.26	2.36	7.88
BMP 067 Paradocx Vineyard - Infiltration Bed B	RR	2007	Forest	0.3	0.67			0.00	#N/A	0.67	0.67	0.0%	48.95	0.02	0.05	64.9%	60.6%	51.9%	31.78	0.02	0.01	0.03
BMP 083 White Briar - Detention Basin #1	ST	2001	Ld_Residential	3.2	0.85			0.48	2.50		2.50	15.0%	1,921.44	0.77	5.02	78.8%	62.0%	39.3%	1,514.32	0.76	0.48	1.98
BMP 083 White Briar - Detention Basin #1	ST	2001	Cropland	1.9	0.85			0.00	#N/A	0.85	0.85	0.0%	2,834.44	2.85	11.10	66.5%	52.2%	33.2%	1,884.68	0.94	1.49	3.69
BMP 084 White Briar - Detention Basin #2	ST	2001	Ld_Residential	8.4	0.85			1.26	2.50		2.50	15.0%	5,043.78	2.02	13.19	78.8%	62.0%	39.3%	3,975.10	1.99	1.25	5.18
BMP 084 White Briar - Detention Basin #2	ST	2001	Cropland	0.4	0.85			0.00	#N/A	0.85	0.85	0.0%	596.72	0.60	2.34	66.5%	52.2%	33.2%	396.77	0.20	0.31	0.78
Total																			**55,785.16**	**27.89**	**31.66**	**105.16**

PROJECT: **Franklin MS4**
LOCATION: **Franklin Twp., Chester County**

Soils:
HSG: **B**

Treatment Depth							
Runoff from 3.2" rainfall in 24 hours - 2 Year Storm							
Land Use	***CN***	***Area***		***CN* Area***	***Vr***	***Vr***	**S**
		SF	***AC***	***AC***	***Inches***	***CF***	***Inches***
Forest	55	1	0.000	0.001	0.251	0	8.18
Open Land/Wetland	58	1	0.000	0.001	0.341	0	7.24
Ld_Residential	65	1	0.000	0.001	0.600	0	5.38
Cropland	75	1	0.000	0.002	1.094	0	3.33
Disturbed	86	1	0.000	0.002	1.835	0	1.63
	Total:	**1**	**0.000**	**0.002**	**1.835**	**0**	**1.63**

Weighted	**P_{24}**	**Volume of runoff Vr**	
CN	**inches**		**CF**
86.0	3.20		0

Exhibit 13

Required Loading Reduction Calculations

Required Short Term Reduction

WHITE CLAY CREEK
East Branch W09

Exhibit 13

1995 Land Use (Revised 1995 TMDL Baseline Load) *

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
East Branch W09	30,330.87	101.83	22.62
TOTAL	30,330.87	101.83	22.62

* Copied from Exhibit 8

2012 Land Use (Existing 2017 Load - no existing BMP load reductions) *

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
East Branch W09	19,619.94	50.85	7.82
TOTAL	19,619.94	50.85	7.82

* Copied from Exhibit 9

2012 Land Use (Existing 2017 Load - deduct existing BMPs)

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
East Branch W09	19,619.94	50.85	7.82
Ex. BMPs (prior to 1995) *	-24,743.03	-63.34	-21.44
Ex. BMPs (1995-2012) *	0.00	0.00	0.00
TOTAL	-5,123.09	-12.49	-13.62

* Copied from Exhibit 9

required short term reductions	10% sediment (lbs/yr)	5% nitrogen (lbs/yr)	5% phosphorus (lbs/yr)
	-512.31	-0.62	-0.68

Required Short Term Reduction

WHITE CLAY CREEK
East Branch W08

Exhibit 13

1995 Land Use (Revised 1995 TMDL Baseline Load) *

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
East Branch W08	288,257.77	1,101.73	283.51
TOTAL	288,257.77	1,101.73	283.51

* Copied from Exhibit 8

2012 Land Use (Existing 2017 Load - no existing BMP load reductions) *

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
East Branch W08	158,964.12	470.49	102.83
TOTAL	158,964.12	470.49	102.83

* Copied from Exhibit 9

2012 Land Use (Existing 2017 Load - deduct existing BMPs)

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
East Branch W08	158,964.12	470.49	102.83
Ex. BMPs (prior to 1995) *	-1,892.90	-2.47	-0.60
Ex. BMPs (1995-2012) *	-38,615.41	-59.09	-13.40
TOTAL	118,455.81	408.93	88.83

* Copied from Exhibit 11

required short term reductions	10% sediment (lbs/yr)	5% nitrogen (lbs/yr)	5% phosphorus (lbs/yr)
	11845.58	20.45	4.44

Required Short Term Reduction

WHITE CLAY CREEK
East Branch W03

Exhibit 13

1995 Land Use (Revised 1995 TMDL Baseline Load) *

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
Middle Branch W03	470,227.20	1,729.62	433.21
TOTAL	470,227.20	1,729.62	433.21

* Copied from Exhibit 8

2012 Land Use (Existing 2017 Load - no existing BMP load reductions) *

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
Middle Branch W03	380,764.21	1,240.99	281.69
TOTAL	380,764.21	1,240.99	281.69

* Copied from Exhibit 9

2012 Land Use (Existing 2017 Load - deduct existing BMPs)

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
Middle Branch W03	380,764.21	1,240.99	281.69
Ex. BMPs (prior to 1995) *	-72,453.30	-158.98	-45.68
Ex. BMPs (1995-2012) *	-20,933.87	-35.37	-8.13
TOTAL	287,377.04	1,046.64	227.88

* Copied from Exhibit 11

required short term reductions	10% sediment (lbs/yr)	5% nitrogen (lbs/yr)	5% phosphorus (lbs/yr)
	28737.70	52.33	11.39

Required Short Term Reduction

WHITE CLAY CREEK
East Branch W01

Exhibit 13

1995 Land Use (Revised 1995 TMDL Baseline Load) *

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
West Branch W01	562,499.05	2,054.44	480.39
TOTAL	562,499.05	2,054.44	480.39

* Copied from Exhibit 8

2012 Land Use (Existing 2017 Load - no existing BMP load reductions) *

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
West Branch W01	510,594.47	1,648.10	359.93
TOTAL	510,594.47	1,648.10	359.93

* Copied from Exhibit 9

2012 Land Use (Existing 2017 Load - deduct existing BMPs)

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
West Branch W01	510,594.47	1,648.10	359.93
Ex. BMPs (prior to 1995) *	-62,744.23	-126.68	-41.33
Ex. BMPs (1995-2012) *	-55,785.16	-105.16	-31.66
TOTAL	392,065.08	1,416.26	286.94

* Copied from Exhibit 11

required short term reductions	10% sediment (lbs/yr)	5% nitrogen (lbs/yr)	5% phosphorus (lbs/yr)
	39206.51	70.81	14.35

Required Short Term Reduction

WHITE CLAY CREEK
Summary of W09, W08, W03 W01

Exhibit 13

1995 Land Use (Revised 1995 TMDL Baseline Load)

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
East Branch W09	30,330.87	101.83	22.62
East Branch W08	288,257.77	1,101.73	283.51
Middle Branch W03	470,227.20	1,729.62	433.21
West Branch W01	562,499.05	2,054.44	480.39
TOTAL	1,351,314.89	4,987.62	1,219.73

2012 Land Use (Existing 2017 Load - no existing BMP load reductions)

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
East Branch W09	19,619.94	50.85	7.82
East Branch W08	158,964.12	470.49	102.83
Middle Branch W03	380,764.21	1,240.99	281.69
West Branch W01	510,594.47	1,648.10	359.93
TOTAL	1,069,942.74	3,410.43	752.27

2012 Land Use (Existing 2017 Load - deduct existing BMPs)

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
TOTAL	1,069,942.74	3,410.43	752.27
Ex. BMPs (prior to 1995)	-161,833.46	-351.47	-109.05
Ex. BMPs (1995-2012)	-115,334.44	-199.62	-53.19
TOTAL	792,774.84	2,859.34	590.03

required short term reductions	10% sediment (lbs/yr)	5% nitrogen (lbs/yr)	5% phosphorus (lbs/yr)
	79277.48	142.97	29.50

Exhibit 14

Riparian Opportunities Map

Wetlands

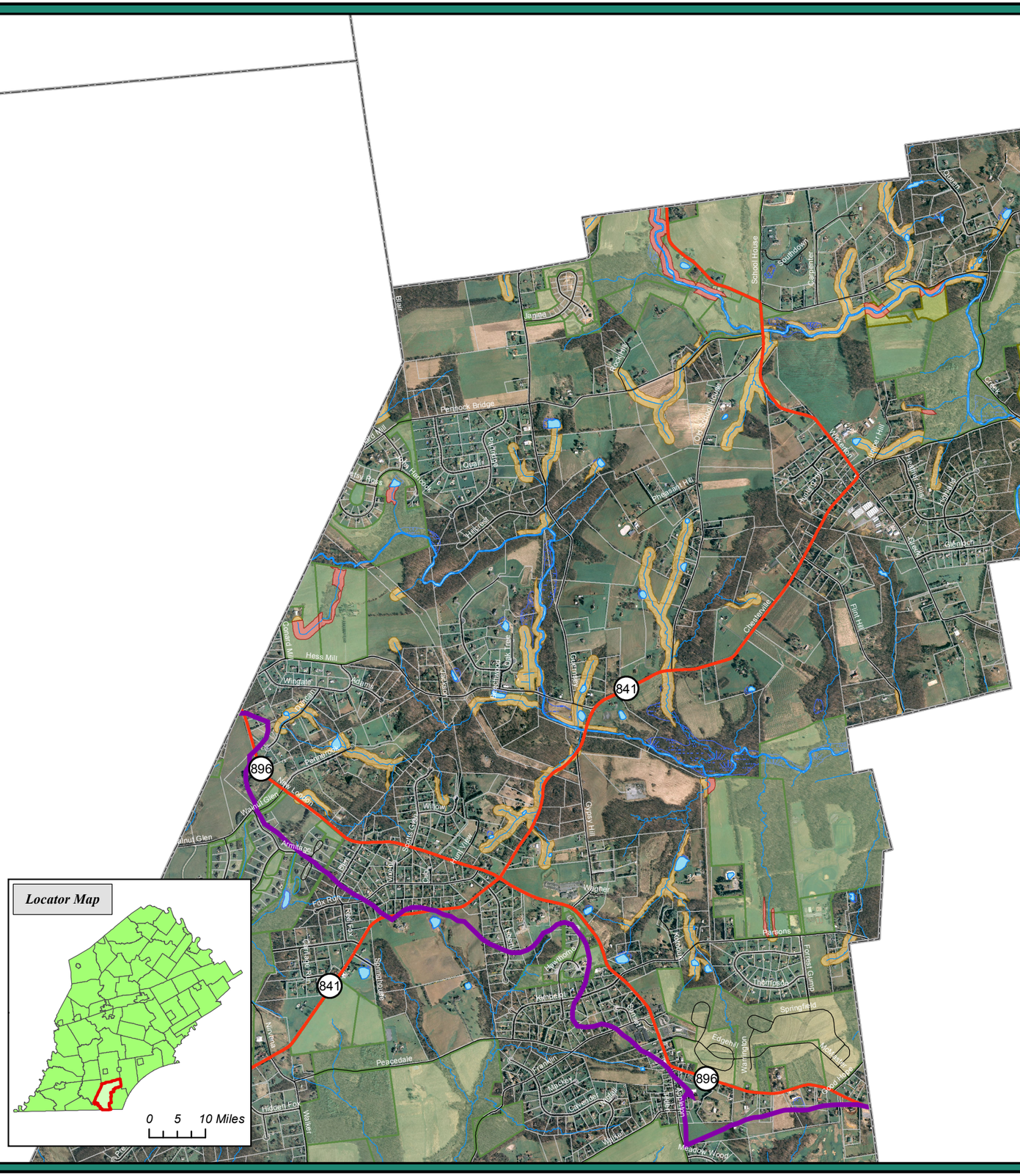
Riparian Opportunities

Franklin
Chester County

Exhibit 14

Legend

- Township boundaries
- White Clay Creek Watershed boundary
- Major roads
- Roads
- Streams
- Water bodies
- Riparian Opportunities on Protected Land
- Riparian Opportunities on Unprotected Land
- Brandywine Conservancy Easements
- Protected Lands
- Tax parcels
- Wetlands



BRANDYWINE CONSERVANCY

N
W E
S

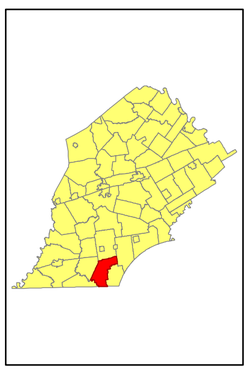
0 0.25 0.5 1 Miles

Data Source: Base data from Chester County GIS Department, 12/2014. Wetlands from NWI, 2009.

Exhibit 15

Proposed BMP Locations

Proposed BMP Locations
Franklin Township
Chester County, Pennsylvania



0 1,000 2,000
Feet
1 inch = 1,000 feet

Legend

- Basin Retrofit
- Stream
- Trees
- State Road
- Township Road
- Private Road
- Ponds / Lakes / Rivers
- Streams
- Chesapeake Bay Watershed (PRP)
- Watershed Boundary
- Parcels
- Township Owned Parcels
- 2010 Urbanized Area
- Municipal Boudary

PRP

OPTION A
-BMP 201 - Plant Trees on UPI # 72-5-40

Option B
-BMP 201 - Plant Trees on UPI # 72-5-40
-BMP 203 - Stream Restoration on private properties

Option C
-BMP 201 - Plant Trees on UPI # 72-5-40
-BMPs 082, 085, 086, 087, 096 - Retrofit 5 existing Detention Basins to Dry Extended Detention Basins on private properties
-Partial BMP 202 or Partial BMP 203.

TMDL

Option A
-BMP 301 - Forest/Riparian Buffer on private properties

Option B
-BMP 302 - Stream restoration on UPI 72-5-17.

Option C
-BMP 002,BMP 004, BMP 005, BMP 006, BMP 011, BMP 015, BMP 017, BMP 031, BMP 032, BMP 033, BMP 034, BMP 035, BMP 036, BMP 048, BMP 049, BMP 050, BMP 057, BMP 059, BMP 062, BMP 063, BMP 064, BMP 065, BMP 075, BMP 083, BMP 084. - Retrofit 25 existing Detention Basins to Dry Extended Detention Basins

DATA SOURCES

Parcel, Boundary, and Roads data by Chester County 2018.

Stream Data by Chester County 2018.

Inventory by LTL Consultants, LTD 2006-2018.

On Lot Infiltration Facilities prior to 2004 may not be shown due to previous stormwater ordinance

Path: E:\Franklin\0205-1508 MS4 Program\2018 MS4\Franklin BMP Improvements Map TMDL.mxd

Exhibit 16

Proposed BMP Calculations

Land Use Loading Rates per Watershed for TSS, TN and TP - INPUT TABLE

MUNICIPALITY: For Urban BMPs, please refer to the Christina MAPSHED Land Use Loading Rates Look-Up Tables for the applicable watershed for the year 2012 , and enter the "Total Land Use Loading Rates" below. EACH WATERSHED (Brandywine, Red Clay and White Clay) HAS ITS OWN LOADING RATES - Be sure to enter data for 2012 for the correct watershed and the correct pollutant. Numbers are shown below FOR DEMONSTRATION PURPOSES ONLY.

For Street Sweeping, the municipality must refer to the Christina MAPSHED Land Use Loading Rates Look-Up Tables for the applicable watershed for the year 2012 , and enter the "From Land Use" loading rates (upland loading rate) into the rows below that reference "Upland"; loads from stream bank and farm animals cannot be included in street sweeping BMP load reduction calculations.

Watershed: White Clay Creek
Municipality: Franklin Township

Source	Sediment (lbs/ac/yr)	TP (lbs/ac/yr)	TN (lbs/ac/yr)	
Hay/Past	183.12	0.33	1.12	For Urban BMPs
Cropland	1491.81	1.50	5.84	
Forest	163.18	0.05	0.17	
Wetland	148.61	0.05	0.48	
Disturbed	225.70	0.12	0.27	
Turfgrass	185.70	0.70	1.32	
Open_Land	303.30	0.14	1.40	
Bare_Rock	0.00	0.00	0.00	
Sandy_Areas	0.00	0.00	0.00	
Unpaved_Road	0.00	0.00	0.00	
Ld_Mixed	594.85	0.23	1.46	
Md_Mixed	1353.62	0.87	6.83	
Hd_Mixed	1906.23	1.01	7.56	
Ld_Residential	600.45	0.24	1.57	
Md_Residential	1347.59	0.82	6.34	
Hd_Residential	1905.55	0.99	7.38	
Ld_Mixed - Upland	51.42	0.13	1.19	For Street Sweeping Only!
Md_Mixed - Upland	228.86	0.67	6.27	
Hd_Mixed - Upland	231.55	0.71	6.72	
Ld_Residential - Upland	57.02	0.14	1.30	
Md_Residential - Upland	222.83	0.62	5.78	
Hd_Residential - Upland	230.87	0.69	6.54	

BMP Load and Efficiencies used in the Load Reduction Calculations (DO NOT ALTER):

Street Sweeping	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	Road Width (ft)
Average	10.0%	10.0%	10.0%	20

Stream Restoration - Protocol 1	TSS (lbs/ft/yr)	TP (lbs/ft/yr)	TN (lbs/ft/yr)
Default	115	0.174	0.192

Exhibit 16

Proposed BMP Load Reduction Calculation Table

INSTRUCTIONS TO MUNICIPALITY: Each row in the table below should represent a different BMP drainage area. Choose the dominant land use draining to the BMP.

If a BMP has multiple land uses in the drainage area, these drainage areas should be represented on a subsequent row with the same BMP name. The treatment depth should be the same for a given BMP (even if it has multiple drainage areas).

If one of the drainage areas to the same BMP has NO impervious cover, use the Manual Override column to type in the treatment depth (in/imp. ac) of the primary drainage area containing impervious

The examples below show the various options and should be deleted before tallying reductions. Notice one example demonstrates when a drainage area covers two land uses (see row 15 and 16).

Proposed BMP Load Reduction Calculation Table

MUNICIPALITY: TO ENTER BMP DATA IN THE ORANGE HIGHLIGHTED CELLS
Watershed: White Clay Creek
Municipality: Franklin Township
OPTION A - Forest/Riparian Buffers East Branch (W09 & W08), Middle Branch (W03) and West Branch (W01)

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified projects only	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no impervious area	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
BMP 301 Property 1 - Buffer Length = 5250 ft.	RR	2019	Ld_Residential	26.6	1.17			3.99	2.50		2.50	15.0%	15,971.97	13.30	133.00	84.9%	78.8%	67.7%	13,559.90	6.78	10.48	90.04
BMP 301 Property 1 - Buffer Length = 5250 ft.	RR	2019	Cropland	15	1.17			0.00	#N/A	1.17	1.17	0.0%	22,377.15	0.00	0.00	77.9%	72.7%	62.1%	17,427.54	8.71	0.00	0.00
BMP 301 Property 1 - Buffer Length = 5250 ft.	RR	2019	Disturbed	14.1	1.17			0.00	#N/A	1.17	1.17	0.0%	3,182.37	0.00	0.00	77.9%	72.7%	62.1%	2,478.46	1.24	0.00	0.00
BMP 301 Property 2 - Buffer Length = 4080 ft.	RR	2019	Cropland	35.1	0.95			0.00	#N/A	0.95	0.95	0.0%	52,362.53	0.00	0.00	73.8%	68.9%	58.9%	38,653.72	19.33	0.00	0.00
BMP 301 Property 2 - Buffer Length = 4080 ft.	RR	2019	Ld_Residential	17.8	0.95			2.67	2.50		2.50	15.0%	10,688.01	8.90	89.00	84.9%	78.8%	67.7%	9,073.92	4.54	7.01	60.25
BMP 301 Property 2 - Buffer Length = 4080 ft.	RR	2019	Forest	7.6	0.95			0.00	#N/A	0.95	0.95	0.0%	1,240.17	0.00	0.00	73.8%	68.9%	58.9%	915.49	0.46	0.00	0.00
BMP 301 Property 2 - Buffer Length = 4080 ft.	RR	2019	Disturbed	0.8	0.95			0.00	#N/A	0.95	0.95	0.0%	180.56	0.00	0.00	73.8%	68.9%	58.9%	133.29	0.07	0.00	0.00
BMP 301 Property 3 - Buffer Length = 950 ft.	RR	2019	Cropland	3.1	0.85			0.00	#N/A	0.85	0.85	0.0%	4,624.61	0.00	0.00	71.3%	66.5%	56.9%	3,295.11	1.65	0.00	0.00
BMP 301 Property 3 - Buffer Length = 950 ft.	RR	2019	Ld_Residential	1.5	0.85			0.23	2.50		2.50	15.0%	900.68	0.75	7.50	84.9%	78.8%	67.7%	764.66	0.38	0.59	5.08
BMP 301 Property 4 - Buffer Length = 1900 ft.	RR	2019	Cropland	26	0.65			0.00	#N/A	0.65	0.65	0.0%	38,787.06	0.00	0.00	64.0%	59.8%	51.2%	24,835.27	12.42	0.00	0.00
BMP 301 Property 4 - Buffer Length = 1900 ft.	RR	2019	Ld_Residential	2.1	0.65			0.32	2.50		2.50	15.0%	1,260.95	1.05	10.50	84.9%	78.8%	67.7%	1,070.52	0.54	0.83	7.11
BMP 301 Property 4 - Buffer Length = 1900 ft.	RR	2019	Forest	0.3	0.65			0.00	#N/A	0.65	0.65	0.0%	48.95	0.00	0.00	64.0%	59.8%	51.2%	31.35	0.02	0.00	0.00
Total																			**112,239.23**	**56.12**	**18.91**	**162.48**

Private Property 1 =	33,465.90	10.48	90.04
Private Property 2 =	48,776.42	7.01	60.25
Private Property 3 =	4,059.77	0.59	5.08
Private Property 4 =	25,937.13	0.83	7.11
Private Property 1 + 2 + 3 =	86,302.09 > 79,277.48	18.09	155.37
Private Properties 1 thru 4 =	112,239.23 > 79,277.48	18.91	162.48

Exhibit 16

Proposed BMP Load Reduction Calculation Table

INSTRUCTIONS TO MUNICIPALITY: Each row in the table below should represent a different BMP drainage area. Choose the dominant land use draining to the BMP.

If a BMP has multiple land uses in the drainage area, these drainage areas should be represented on a subsequent row with the same BMP name. The treatment depth should be the same for a given BMP (even if it has multiple drainage areas).

If one of the drainage areas to the same BMP has NO impervious cover, use the Manual Override column to type in the treatment depth (in/imp. ac) of the primary drainage area containing impervious cover.

The examples below show the various options and should be deleted before tallying reductions. Notice one example demonstrates when a drainage area covers two land uses (see row 15 and 16).

Proposed BMP Load Reduction Calculation Table

MUNICIPALITY: TO ENTER BMP DATA IN THE ORANGE HIGHLIGHTED CELLS

Watershed: White Clay Creek

Municipality: Franklin Township

OPTION B - Basin Retrofits East Branch (W09 & W08), Middle Branch (W03) and West Branch (W01)

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified projects only	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no impervious area	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
BMP 033 RETROFIT	RR	2019	Cropland	11.2	1.09			0.00	#N/A	1.09	1.09	0.0%	16,708.27	0.00	0.00	76.6%	71.5%	61.1%	12,799.94	6.40	0.00	0.00
BMP 017 RETROFIT	RR	2019	Ld_Residential	4.0	0.60			0.60	2.50		2.50	15.0%	2,401.80	2.00	20.00	84.9%	78.8%	67.7%	2,039.08	1.02	1.58	13.54
BMP 031 RETROFIT	RR	2019	Cropland	4.7	0.67			0.00	#N/A	0.67	0.67	0.0%	7,011.51	0.00	0.00	64.9%	60.6%	51.9%	4,551.03	2.28	0.00	0.00
BMP 031 RETROFIT	RR	2019	Forest	0.3	0.67			0.00	#N/A	0.67	0.67	0.0%	48.95	0.00	0.00	64.9%	60.6%	51.9%	31.78	0.02	0.00	0.00
BMP 036 RETROFIT	RR	2019	Ld_Residential	5.8	0.65			0.87	2.50		2.50	15.0%	3,482.61	2.90	29.00	84.9%	78.8%	67.7%	2,956.67	1.48	2.29	19.63
BMP 036 RETROFIT	RR	2019	Forest	1.4	0.65			0.00	#N/A	0.65	0.65	0.0%	228.45	0.00	0.00	64.0%	59.8%	51.2%	146.28	0.07	0.00	0.00
BMP 036 RETROFIT	RR	2019	Cropland	0.6	0.65			0.00	#N/A	0.65	0.65	0.0%	895.09	0.00	0.00	64.0%	59.8%	51.2%	573.12	0.29	0.00	0.00
BMP 035 RETROFIT	RR	2019	Ld_Residential	5.9	0.65			0.89	2.50		2.50	15.0%	3,542.66	2.95	29.50	84.9%	78.8%	67.7%	3,007.65	1.50	2.32	19.97
BMP 035 RETROFIT	RR	2019	Forest	3.9	0.65			0.00	#N/A	0.65	0.65	0.0%	636.40	0.00	0.00	64.0%	59.8%	51.2%	407.49	0.20	0.00	0.00
BMP 035 RETROFIT	RR	2019	Cropland	3.3	0.65			0.00	#N/A	0.65	0.65	0.0%	4,922.97	0.00	0.00	64.0%	59.8%	51.2%	3,152.17	1.58	0.00	0.00
BMP 034 RETROFIT	RR	2019	Cropland	2.8	0.65			0.00	#N/A	0.65	0.65	0.0%	4,177.07	0.00	0.00	64.0%	59.8%	51.2%	2,674.57	1.34	0.00	0.00
BMP 034 RETROFIT	RR	2019	Forest	2.7	0.65			0.00	#N/A	0.65	0.65	0.0%	440.59	0.00	0.00	64.0%	59.8%	51.2%	282.11	0.14	0.00	0.00
BMP 034 RETROFIT	RR	2019	Ld_Residential	1.4	0.65			0.21	2.50		2.50	15.0%	840.63	0.70	7.00	84.9%	78.8%	67.7%	713.68	0.36	0.55	4.74
BMP 032 RETROFIT	RR	2019	Cropland	13.2	0.65			0.00	#N/A	0.65	0.65	0.0%	19,691.89	0.00	0.00	64.0%	59.8%	51.2%	12,608.68	6.30	0.00	0.00
BMP 032 RETROFIT	RR	2019	Ld_Residential	2.0	0.65			0.30	2.50		2.50	15.0%	1,200.90	1.00	10.00	84.9%	78.8%	67.7%	1,019.54	0.51	0.79	6.77
BMP 032 RETROFIT	RR	2019	Forest	0.9	0.65			0.00	#N/A	0.65	0.65	0.0%	146.86	0.00	0.00	64.0%	59.8%	51.2%	94.04	0.05	0.00	0.00
BMP 059 RETROFIT	RR	2019	Ld_Residential	10.1	0.60			1.52	2.50		2.50	15.0%	6,064.55	5.05	50.50	84.9%	78.8%	67.7%	5,148.68	2.57	3.98	34.19
BMP 059 RETROFIT	RR	2019	Forest	5.9	0.60			0.00	#N/A	0.60	0.60	0.0%	962.76	0.00	0.00	61.7%	57.5%	49.3%	593.55	0.30	0.00	0.00
BMP 059 RETROFIT	RR	2019	Wetland	0.4	0.60			0.00	#N/A	0.60	0.60	0.0%	59.44	0.00	0.00	61.7%	57.5%	49.3%	36.65	0.02	0.00	0.00
BMP 075 RETROFIT	RR	2019	Ld_Residential	7.2	0.60			1.08	2.50		2.50	15.0%	4,323.24	3.60	36.00	84.9%	78.8%	67.7%	3,670.35	1.84	2.84	24.37
BMP 075 RETROFIT	RR	2019	Cropland	3.3	0.60			0.00	#N/A	0.60	0.60	0.0%	4,922.97	0.00	0.00	61.7%	57.5%	49.3%	3,035.07	1.52	0.00	0.00
BMP 005 RETROFIT	RR	2019	Ld_Residential	3.6	1.22			0.54	2.50		2.50	15.0%	2,161.62	1.80	18.00	84.9%	78.8%	67.7%	1,835.17	0.92	1.42	12.19
BMP 005 RETROFIT	RR	2019	Disturbed	0.9	1.22			0.00	#N/A	1.22	1.22	0.0%	203.13	0.00	0.00	78.6%	73.3%	62.7%	159.62	0.08	0.00	0.00
BMP 006 RETROFIT	RR	2019	Ld_Residential	6.7	0.60			1.01	2.50		2.50	15.0%	4,023.02	3.35	33.50	84.9%	78.8%	67.7%	3,415.46	1.71	2.64	22.68
BMP 002 RETROFIT	RR	2019	Ld_Residential	1.2	1.22			0.18	2.50		2.50	15.0%	720.54	0.60	6.00	84.9%	78.8%	67.7%	611.72	0.31	0.47	4.06
BMP 002 RETROFIT	RR	2019	Disturbed	1.1	1.22			0.00	#N/A	1.22	1.22	0.0%	248.27	0.00	0.00	78.6%	73.3%	62.7%	195.10	0.10	0.00	0.00
BMP 004 RETROFIT	RR	2019	Ld_Residential	12.7	0.90			1.91	2.50		2.50	15.0%	7,625.72	6.35	63.50	84.9%	78.8%	67.7%	6,474.09	3.24	5.00	42.99
BMP 004 RETROFIT	RR	2019	Disturbed	5.6	0.90			0.00	#N/A	0.90	0.90	0.0%	1,263.92	0.00	0.00	72.6%	67.8%	57.9%	917.68	0.46	0.00	0.00
BMP 004 RETROFIT	RR	2019	Forest	0.2	0.90			0.00	#N/A	0.90	0.90	0.0%	32.64	0.00	0.00	72.6%	67.8%	57.9%	23.70	0.01	0.00	0.00
BMP 011 RETROFIT	RR	2019	Ld_Residential	1.7	0.60			0.26	2.50		2.50	15.0%	1,020.77	0.85	8.50	84.9%	78.8%	67.7%	866.61	0.43	0.67	5.75
BMP 015 RETROFIT	RR	2019	Ld_Residential	6.6	1.22			0.99	2.50		2.50	15.0%	3,962.97	3.30	33.00	84.9%	78.8%	67.7%	3,364.49	1.68	2.60	22.34
BMP 015 RETROFIT	RR	2019	Disturbed	6.5	1.22			0.00	#N/A	1.22	1.22	0.0%	1,467.05	0.00	0.00	78.6%	73.3%	62.7%	1,152.84	0.58	0.00	0.00
BMP 049 RETROFIT	RR	2019	Disturbed	12.6	1.18			0.00	#N/A	1.18	1.18	0.0%	2,843.82	0.00	0.00	78.0%	72.8%	62.2%	2,218.94	1.11	0.00	0.00
BMP 049 RETROFIT	RR	2019	Ld_Residential	7.4	1.18			1.11	2.50		2.50	15.0%	4,443.33	3.70	37.00	84.9%	78.8%	67.7%	3,772.30	1.89	2.92	25.05
BMP 049 RETROFIT	RR	2019	Cropland	0.3	1.18			0.00	#N/A	1.18	1.18	0.0%	447.54	0.00	0.00	78.0%	72.8%	62.2%	349.20	0.17	0.00	0.00
BMP 048 RETROFIT	RR	2019	Disturbed	4.5	1.05			0.00	#N/A	1.05	1.05	0.0%	1,015.65	0.00	0.00	75.9%	70.8%	60.5%	770.80	0.39	0.00	0.00
BMP 048 RETROFIT	RR	2019	Forest	0.2	1.05			0.00	#N/A	1.05	1.05	0.0%	32.64	0.00	0.00	75.9%	70.8%	60.5%	24.77	0.01	0.00	0.00
BMP 050 RETROFIT	RR	2019	Disturbed	4.6	1.18			0.00	#N/A	1.18	1.18	0.0%	1,038.22	0.00	0.00	78.0%	72.8%	62.2%	810.09	0.41	0.00	0.00
BMP 050 RETROFIT	RR	2019	Cropland	0.6	1.18			0.00	#N/A	1.18	1.18	0.0%	895.09	0.00	0.00	78.0%	72.8%	62.2%	698.40	0.35	0.00	0.00
BMP 050 RETROFIT	RR	2019	Ld_Residential	0.3	1.18			0.05	2.50		2.50	15.0%	180.14	0.15	1.50	84.9%	78.8%	67.7%	152.93	0.08	0.12	1.02
BMP 062 RETROFIT	RR	2019	Disturbed	6.1	1.18			0.00	#N/A	1.18	1.18	0.0%	1,376.77	0.00	0.00	78.0%	72.8%	62.2%	1,074.25	0.54	0.00	0.00
BMP 062 RETROFIT	RR	2019	Ld_Residential	5.5	1.18			0.83	2.50		2.50	15.0%	3,302.48	2.75	27.50	84.9%	78.8%	67.7%	2,803.74	1.40	2.17	18.62
BMP 062 RETROFIT	RR	2019	Cropland	2.1	1.18			0.00	#N/A	1.18	1.18	0.0%	3,132.80	0.00	0.00	78.0%	72.8%	62.2%	2,444.42	1.22	0.00	0.00
BMP 057 RETROFIT	RR	2019	Ld_Residential	13.2	1.22			1.98	2.50		2.50	15.0%	7,925.94	6.60	66.00	84.9%	78.8%	67.7%	6,728.97	3.36	5.20	44.68
BMP 057 RETROFIT	RR	2019	Disturbed	1.7	1.22			0.00	#N/A	1.22	1.22	0.0%	383.69	0.00	0.00	78.6%	73.3%	62.7%	301.51	0.15	0.00	0.00
BMP 063 RETROFIT	RR	2019	Ld_Residential	2.0	0.85			0.30	2.50		2.50	15.0%	1,200.90	1.00	10.00	84.9%	78.8%	67.7%	1,019.54	0.51	0.79	6.77
BMP 063 RETROFIT	RR	2019	Cropland	0.5	0.85			0.00	#N/A	0.85	0.85	0.0%	745.91	0.00	0.00	71.3%	66.5%	56.9%	531.47	0.27	0.00	0.00
BMP 064 RETROFIT	RR	2019	Cropland	7.3	0.85			0.00	#N/A	0.85	0.85	0.0%	10,890.21	0.00	0.00	71.3%	66.5%	56.9%	7,759.46	3.88	0.00	0.00
BMP 064 RETROFIT	RR	2019	Ld_Residential	0.5	0.85			0.08	2.50		2.50	15.0%	300.23	0.25	2.50	84.9%	78.8%	67.7%	254.89	0.13	0.20	1.69
BMP 065 RETROFIT	RR	2019	Ld_Residential	6.4	0.85			0.96	2.50		2.50	15.0%	3,842.88	3.20	32.00	84.9%	78.8%	67.7%	3,262.53	1.63	2.52	21.66
BMP 065 RETROFIT	RR	2019	Cropland	1.2	0.85			0.00	#N/A	0.85	0.85	0.0%	1,790.17	0.00	0.00	71.3%	66.5%	56.9%	1,275.53	0.64	0.00	0.00
BMP 083 RETROFIT	RR	2019	Ld_Residential	3.2	0.85			0.48	2.50		2.50	15.0%	1,921.44	1.60	16.00	84.9%	78.8%	67.7%	1,631.27	0.82	1.26	10.83
BMP 083 RETROFIT	RR	2019	Cropland	1.9	0.85			0.00	#N/A	0.85	0.85	0.0%	2,834.44	0.00	0.00	71.3%	66.5%	56.9%	2,019.59	1.01	0.00	0.00
BMP 084 RETROFIT	RR	2019	Ld_Residential	8.4	0.85			1.26	2.50		2.50	15.0%	5,043.78	4.20	42.00	84.9%	78.8%	67.7%	4,282.07	2.14	3.31	28.43
BMP 084 RETROFIT	RR	2019	Cropland	0.4	0.85			0.00	#N/A	0.85	0.85	0.0%	596.72	0.00	0.00	71.3%	66.5%	56.9%	425.18	0.21	0.00	0.00
Total				**228.7**															**123,170.44**	**61.59**	**45.63**	**391.98**

Total Load for all 25 basin retrofits (lb/yr) =	161,624.02	57.90	579.00
Existing Dry Detention Basin 10% Effectiveness Value (lb/yr) =	16162.40	5.79	57.90
Proposed Dry Extended Detention Basin 60% Effectiveness Value (lb/yr) =	96974.41	34.74	347.40
Total Reduction for all 25 basin retrofits (60%-10%) (1b/yr) =	80812.01	28.95	289.50

Exhibit 16

Watershed: White Clay Creek
Municipality: Franklin Township

OPTION C - Stream Restoration East Branch (W09 & W08), Middle Branch (W03) and West Branch (W01)

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified projects only	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no impervious area	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
BMP 302 Franklin Preserve	Stream Restoration	2019				690		#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	0.0%	0.0%	0.0%	79,350.00	39.68	120.06	132.48
Total																			**79,350.00**	**39.68**	**120.06**	**132.48**

The calculated stream restoration length is 348 ft. (both sides of stream)
Stream restoration is located downstream of urbanized area.
Stream restoration is not located within the urbanized area.
At the proposed stream restoration location, the upstream drainage area consists of 74.6% urbanized area and 25.4% non-urbanized area.
To be conservative, the upstream drainage only includes the drainage area included within Franklin Township
If the upstream drainage area is revised to add the drainage area outside of Franklin Township, the percentage of urbanized area would be greater than 74.6%.
The stream restoration length shall be increased from 690 ft. to 925 ft. (both sides of stream) to account for the upstream drainge area containing less than 100% urbanized area.
690 ft./.746 = 925 ft.

PROJECT: **Franklin MS4**
LOCATION: **Franklin Twp., Chester County**

Soils:
HSG: **B**

Treatment Depth							
Runoff from 3.2" rainfall in 24 hours - 2 Year Storm							
Land Use	***CN***	***Area***		***CN* Area***	***Vr***	***Vr***	**S**
		SF	***AC***	***AC***	***Inches***	***CF***	***Inches***
Forest	55	1	0.000	0.001	0.251	0	8.18
Open Land/Wetland	58	1	0.000	0.001	0.341	0	7.24
Ld_Residential	65	1	0.000	0.001	0.600	0	5.38
Cropland	75	1	0.000	0.002	1.094	0	3.33
Disturbed	86	1	0.000	0.002	1.835	0	1.63
	Total:	**1**	**0.000**	**0.002**	**1.835**	**0**	**1.63**

Weighted	**P_{24}**	**Volume of runoff Vr**	
CN	**inches**		**CF**
86.0	3.20		0

Exhibit 17

Load Reductions Achieved for 5 Year Permit Cycle

Provided Short Term Reduction

WHITE CLAY CREEK
Summary of W09, W08, W03 W01

REQUIRED

	sediment load (lbs/yr)	nitrogen load (lbs/yr)	phosphorus load (lbs/yr)
TOTAL	1,069,942.74	3,410.43	752.27
Ex. BMPs (prior to 1995)	-161,833.46	-351.47	-109.05
Ex. BMPs (1995-2012)	-115,334.44	-199.62	-53.19
TOTAL	792,774.84	2,859.34	590.03

required short term reductions	10% sediment (lbs/yr)	5% nitrogen (lbs/yr)	5% phosphorus (lbs/yr)
	79,277.48	142.97	29.50

LOAD REDUCTIONS ACHIEVED FOR 5 YEAR PERMIT CYCLE (2018-2023)

PROVIDED - OPTION A (BMP 301)

Forest/Riparian Buffers load reduction achieved	sediment (lbs/yr)	nitrogen (lbs/yr)	phosphorus (lbs/yr)
Properties 1+2+3	86,302.09	155.37	18.09
percentage of required (%)	10.89	5.43	3.07
Properties 1 thru 4	112,239.23	162.48	18.91
percentage of required (%)	14.16	5.68	3.20

PROVIDED - OPTION B (BMPs 002, 004, 005, 006, 011, 015, 017, 031, 032, 033, 034, 035, 036, 048, 049, 050, 057, 059, 062, 063, 064, 065, 075, 083 & 084)

Basin Retrofits load reduction achieved	sediment (lbs/yr)	nitrogen (lbs/yr)	phosphorus (lbs/yr)
25 Basin Retrofits	80,812.01	289.50	28.95
percentage of required (%)	10.19	10.12	4.91

PROVIDED - OPTION C (BMP 302)

Stream Restoration load reduction achieved	sediment (lbs/yr)	nitrogen (lbs/yr)	phosphorus (lbs/yr)
L = 925 ft.	79,350.00	132.48	120.06
percentage of required (%)	10.01	4.63	20.35

Exhibit 18

Public Notice

Exhibit 18

PUBLIC NOTICE The Franklin Township Total Maximum Daily Load (TMDL) Plan for the White Clay Creek/Christina River watershed and the Advanced Waiver Request for Big Elk Creek/Chesapeake Bay watershed are available for public review on the Township website at http://www.franklintownship.us and by request at the Township Building at 20 Municipal Lane, Kemblesville, PA 19347. Written comments from the public will be accepted for a period of 30 days from the date of this public notice. Written comments will also be accepted during the Board of Supervisors meeting scheduled for August 19, 2020 at 7:00 pm at the Township Building. The Total Maximum Daily Load Plan describes proposed measures to be taken to reduce sediment and nutrient pollution of the White Clay Creek/Christina River watershed within Franklin Township and it is a requirement of the Township's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit. The Advanced Waiver Request is a waiver request submission to PADEP to allow Franklin Township eliminate the requirement to complete a Pollutant Reduction Plan (PRP) for the Big Elk Creek/Chesapeake Bay watershed.