London Grove Township

Christina Basin MS4 TMDL Plan
Part 1 – MS4 TMDL Strategy

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Submitted By: London Grove Township

Date: 13 September 2012
Revised 26 February 2016

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SECTION A - INTRODUCTION

This MS4 TMDL Strategy is Part 1 of London Grove Township's MS4 TMDL Plan is submitted in accordance with the requirements of Individual Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s). This MS4 TMDL Strategy has been prepared and will be implemented as part of the Christina Basin TMDL Implementation Plan (C-TIP), and addresses all requirements of the Christina Basin stormwater TMDLs (as listed in Subsection C.I), applicable to London Grove Township. London Grove Township is a participating member of the C-TIP Partnership as indicated in Appendix A. This TMDL Strategy has been revised in response to PADEP's review of the original submittal dated 26 February 2015.

The London Grove Township MS4 TMDL Strategy (Part I) is based on, and consistent with all applicable Christina Basin TMDLs. This MS4 TMDL Strategy is organized to follow and respond to the instructions presented in the Individual Permit instruction packages. Part II, MS4 TMDL Design Details, will be developed by London Grove Township, and will be submitted to DEP within one year of the date of the approval of coverage under the Municipality's new MS4 permit.

Significant coordination with both EPA and PADEP over more than a three year period has resulted in the development of this strategy. A letter from PADEP, included for reference as Appendix B, provides support for the approach taken in this MS4 TMDL Strategy, and more specifically, offers concurrence with the general concept for revising the Christina Basin TMDL MS4 Allocations. This MS4 TMDL Strategy is based on several analyses of the data and results published in the Christina Basin stormwater TMDL Reports and current conditions that have been previously reviewed by PADEP.

This MS4 TMDL Strategy includes the following:

Section A ..... Introduction

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Appendix A – Municipalities Participating in C-TIP Partnership

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SECTION B - KEY DEFINITIONS

I. Definitions from PAG-13 (3/2012), "Authorization to Discharge"

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

- Owned or operated by a state, city, town, borough, township, county, district, association or other public body (created under state law) having jurisdiction over disposal of sewage, industrial wastes, stormwater or other wastes,
- Designed or used for collecting or conveying stormwater,
- Not a combined sewer, and
- Not part of a Publicly Owned Treatment Works as defined at 40 CFR § 122.2.

Outfall: A "Point Source" as defined by 40 CFR § 122.2 is the point where an MS4 discharges stormwater to other surface waters of this Commonwealth. This does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream and are used to convey waters of the Commonwealth (40 CFR § 122.26(b)(9)).

Regulated Small MS4: Any small MS4 that is covered by the federal Phase II stormwater program, either through automatic nationwide designation under 40 CFR § 122.32(a)(1) (via the Urbanized Area criteria) or by designation on a case-by-case basis by DEP pursuant to 40 CFR § 122.32(a)(2). "Regulated small MS4s" are a subset of "small MS4s".

Storm Sewershed: The catchment area that drains into the storm sewer system based on the surface topography in the area served by the storm sewer.

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

II. Definitions Used in this MS4 TMDL Strategy:

Adjusted TMDL Allocations: MS4 Baseline Loads, MS4 Allocations (Waste Load Allocations), or Load Reductions that have been recalculated to more accurately represent the pollutant loads received and discharged by the regulated MS4, and covered by the MS4 permit, as recommended in the TMDL Reports. Adjustment methods are described in Subsection C.VII.b.

Load Reduction: The required pollutant load reduction; difference between the TMDL MS4 Baseline Load and the MS4 Allocation (Waste Load Allocation).

MS4 Allocation: Used herein to refer to EPA's "MS4 Allocation, EPA's "MS4 Load Allocation", as used in the TMDL Reports, and which appear to be used by EPA as synonyms for "Waste Load Allocation" (WLA).

MS4 TMDL Implementation Area: All areas that are within the Municipality's boundaries and within a TMDL Watershed that are:

a. Located where the target pollutant load reductions are quantifiable at the impaired stream segment that receives stormwater discharges from the Municipality's regulated small MS4; and
b. Within the Urbanized Area; or
c. Outside the Urbanized Area and in accordance with PADEP's forthcoming credit, trading, and offset policies.

This is the maximum geographic area within which the MS4 Municipality can install new TMDL control measures or can identify previously installed control measures (2003-2012) that can be counted toward achieving the Municipality's required pollutant Load Reduction.

Regulated Storm Sewershed: All land area that drains to the Regulated Small MS4 that is both within the Urbanized Area and within the Municipal boundary.

TMDL Storm Sewershed: All Regulated Storm Sewershed areas and portions of the Regulated Small MS4 that are within a TMDL Subbasin. This represents the land area that generates the pollutant load received and discharged by the Regulated Small MS4 and which can be used to "adjust" EPA's MS4 Baseline Loads, MS4 Allocations, and required pollutant Load Reductions.

TMDL Subbasin: Any "subbasin" delineated in either EPA Christina Basin TMDL Report and for which either TMDL Report lists WLAs for TSS, TN and/or TP.

TMDL Watershed: The watershed in which the TMDL Subbasin is located; Either Brandywine Creek, Red Clay Creek, or White Clay Creek watershed.

SECTION C - REQUIRED INFORMATION

I. Title of TMDL(s) that affect London Grove Township:

The following TMDLs have been established for various portions of the watersheds in the Christina Basin, PA. Those that are and are not applicable to London Grove Township are indicated below:

a. *Total Maximum Daily Loads for Bacteria and Sediment in the Christina River Basin, Pennsylvania, Delaware, and Maryland.* September 2006. U.S. Environmental Protection Agency, Philadelphia, PA (herein referred to as Bacteria/Sediment TMDL Report). This TMDL Report presents TMDLs for sediment and bacteria.

☒ Applicable, London Grove Township is listed with a WLA in the above Report

☐ Not Applicable, London Grove Township is NOT listed with a WLA in the above Report.

b. *Revisions to Total Maximum Daily Loads for Nutrient and Low Dissolved Oxygen Under High-Flow Conditions, Christina River Basin, Pennsylvania, Delaware, and Maryland.* September 2006. U.S. Environmental Protection Agency, Philadelphia, PA (herein referred to as the Nutrient/Low DO TMDL Report). This TMDL Report presents TMDLs for Total Nitrogen and Total Phosphorus.

☒ Applicable, London Grove Township is listed with a WLA in the above Report

☐ Not Applicable, London Grove Township is NOT listed with a WLA in the above Report.

c. *Total Maximum Daily Loads, Polychlorinated Biphenyls (PCBs) and Chlordane, West Branch Brandywine Creek, Chester County, Pennsylvania.* March 9, 2001. Pennsylvania Department of Environmental Protection, Harrisburg, PA (herein referred to as the Brandywine Creek PCB/Chlordane TMDL Report). This TMDL Report presents a TMDL only for PCB.

☒ Not Applicable, London Grove Township is NOT listed with a WLA in the above Report.

d. *Total Maximum Daily Load for the Red Clay Creek Basin Chester County, Pennsylvania.* April 7, 2007. U.S. Environmental Protection Agency, Philadelphia, PA (herein referred to as the Red Clay Creek PCB TMDL Report). This TMDL Report presents TMDLs for PCB.

☒ Not Applicable, London Grove Township is NOT listed with a WLA in the above Report.

Further details about the applicability of the above TMDLs are provided in Subsection C.III.

II. Watershed Name(s) and Hydrologic Unit Code (HUC):

Following are the list of watershed names and the eight-digit HUC for the areas that are addressed in the Christina Basin TMDL Reports. Only watersheds that are checked below discharge through the London Grove Township Regulated Small MS4 to water bodies with TMDLs:

Brandywine-Christina Watershed, HUC #02040205, including:

- ☐ Brandywine Creek Watershed (PA)
- ☐ Red Clay Creek Watershed (PA)
- ☒ White Clay Creek Watershed (PA)

These watersheds are referred to herein as the TMDL Watersheds (see "Key Definitions", above). Figure 1 presents the Christina Basin, the TMDL Watersheds and the subbasins used in the TMDL Reports (herein referred to as the TMDL Subbasins - see "Key Definitions"), as well as municipal boundaries, streams and Urbanized Area boundaries.

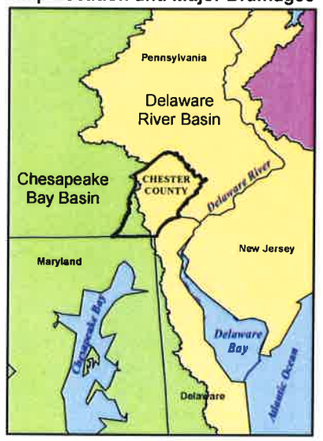
RAGAN ENGINEERING Associates

East Vincent
Phoenixville
East Nantmeal
West Vincent
East Pikeland
Schuylkill
West Nantmeal
West Pikeland
Charlestown
Honey Brook
Wallace
Upper Uwchlan
Tredyffrin
Uwchlan
East Whiteland
West Brandywine
East Brandywine
Malvern
Easttown
West Caln
East Caln
West Whiteland
Downingtown
Willistown
Caln
East Goshen
Valley
Coatesville
West Goshen
Sadsbury
Valley
West Sadsbury
South Coatesville
West Bradford
West Chester
Modena
Parkesburg
East Bradford
Atglen
East Fallowfield
Westtown
Highland
Newlin
Thornbury
Pocopson
West Fallowfield
Birmingham
West Marlborough
East Marlborough
Londonderry
Pennsbury
Kennett Square
Kennett
Upper Oxford
London Grove
Avondale
Penn
West Grove
New Garden
Lower Oxford
Oxford
New London
East Nottingham
Franklin
London Britain
West Nottingham
Elk
Delaware River

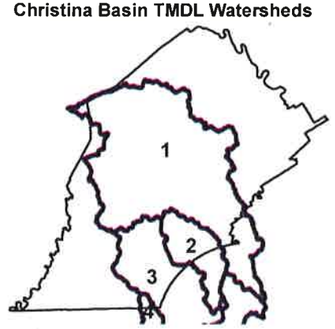
Figure 1. Christina Basin and its TMDL Watersheds, TMDL Subbasins and Municipalities

- Christina Basin Watersheds
- Christina Basin HSPF Subbasins (As presented in the Chritina Basin EPA TMDL Reports)
- TMDL Subbasins (Listed with at least 1 WLA)
- 2000 Urbanized Area
- 2010 Urbanized Area
- Chester County Boundary
- Municipalities
- Water Body
- Streams

Map Location and Major Drainages



Christina Basin TMDL Watersheds



1. Brandywine Creek watershed
2. Red Clay Creek watershed
3. White Clay Creek watershed

N

0 2 4 8
Miles

Data Sources:

- Adminstrative Boundaries, Watershed, and Streams are from Chester County GIS.
- 2000 Urbanized Area - U.S. Department of Commerce, U.S. Census Bureau, Geography Division.
- 2010 Urbanized Area - U.S. Department of Commerce, U.S. Census Bureau, Geography Division
- HSPF Subbasin Delineation - GIS files provided by USGS Exton, PA Office - June 2009.

III. List of Pollutants and Waste Load Allocations (WLAs) Assigned to Each MS4 Covered by the NOI:

This NOI is for London Grove Township.

a. *Pollutants Assigned:*

The following TMDL pollutants (as presented in the applicable TMDL Reports listed in Subsection C.I.) are applicable to London Grove Township because a Waste Load Allocation has been listed for London Grove Township, and its implementation is addressed in this London Grove Township MS4 TMDL Strategy:

- ☒ Total Suspended Solids (Sediment)
- ☒ Total Nitrogen
- ☒ Total Phosphorus

Table 1 lists the pollutants (total suspended solids, total nitrogen and total phosphorous) and WLAs presented in the Bacteria/Sediment TMDL Report and the Nutrient/Low DO TMDL Report for London Grove Township and for all other municipalities listed in the TMDL Report(s). The TMDL Report(s) present these WLAs as "MS4 Load Allocation" (for Total Suspended Solids (TSS) referred to in the TMDL Report and herein as sediment), and "MS4 Allocation" (for total nitrogen (TN), and total phosphorus (TP), referred to herein as nitrogen and phosphorus, respectively), and these terms and numbers are presented in Table 1 exactly as presented in the TMDL Reports.

Table 1. Brandywine-Christina Watershed (HUC # 02040205)
EPA TMDL MS4 Baseline Pollutant Loadings, MS4 Allocations, and Reductions

MUNICIPALITIES LISTED IN TMDL REPORTS Brandywine Creek Watershed	Sediment (tons/year)				Total Nitrogen (kg/day)				Total Phosphorus (kg/day)			
	Baseline MS4 Load[1b]	MS4 Load Allocation[1b]	MS4 Load Reduction[1e]	% Reduction[1b]	MS4 Baseline Load[2g]	MS4 Allocation[2e]	MS4 Load Reduction[2m]	% Reduction[2m]	MS4 Baseline 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	79.76	151.53	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			0.00		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			0.00		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			0.00		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]	MS4 Baseline Load[2a]	MS4 Allocation[2a]	MS4 Load Reduction[2m]	% Reduction[2m]	MS4 Baseline Load[2a]	MS4 Allocation[2a]	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]	MS4 Baseline Load[2i]	MS4 Allocation[2e]	MS4 Load Reduction[2m]	% Reduction[2m]	MS4 Baseline Load[2i]	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.

(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. 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)

Municipalities that are not currently regulated under the NPDES MS4 program, and thus not required to implement TMDLs

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)

b. *Pollutants Not Applicable:*

The following TMDL pollutants (as listed in the TMDL Reports listed in Subsection C.I.) are NOT applicable to London Grove Township, as indicated and explained below:

☒ Bacteria – London Grove Township is:

- ☒ a) not listed with a WLA for bacteria. Therefore, implementation of the Bacteria TMDL is not addressed in this London Grove Township MS4 TMDL Strategy.
- ☐ b) is listed with a WLA for bacteria, however, based on the PADEP letter dated March 21, 2012 (Appendix B) and best information available[1] at the time of preparation of this MS4 TMDL Strategy there are no streams designated as impaired by bacteria attributed to stormwater runoff located within or downstream of London Grove Township, or within the Christina Basin, PA. Therefore, implementation of the Bacteria TMDL is not addressed in this London Grove Township MS4 TMDL Strategy.

☒ PCB/Chlordane (Brandywine Creek) –

- ☐ a) There are no Municipal WLAs listed in the Brandywine Creek PCB/Chlordane TMDL Report. This TMDL applies only to 5.6 miles of the West Branch Brandywine Creek in East Fallowfield, West Bradford, and Newlin Townships, the City of Coatesville, and Modena Borough. As quoted in the TMDL Report: "*Pennsylvania found no permitted point sources contributing to the load of either chlordane or PCBs to the West Branch Brandywine Creek"* and "*…the WLA was assigned a value of 0*". Therefore, implementation of the Brandywine Creek PCB/Chlordane TMDL is not addressed in this London Grove Township MS4 TMDL Strategy.
- ☒ **b)** London Grove Township has no land area in the Brandywine Creek Watershed. Therefore, implementation of the Brandywine Creek PCB/Chlordane TMDL is not addressed in this London Grove Township MS4 TMDL Strategy.

☒ **PCB (Red Clay Creek) –**

- ☐ **a)** There are no Municipal WLAs listed in the Red Clay Creek PCB TMDL Report. As quoted in the TMDL Report: "*According to PADEP, there are no known point sources of PCB to Red Clay and the East and West Branches of Red Clay Creek at this time*" and "*…the WLA was set to zero.*" Therefore, implementation of the Red Clay Creek PCB TMDL is not addressed in this London Grove Township MS4 TMDL Strategy.

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[1] *2010 Pennsylvania Integrated Water Quality Monitoring and Assessment Report*."Undated, Pennsylvania Department of Environmental Protection. Office of Water Management, Bureau of Water Supply & Wastewater Management, Water Quality Assessment and Standards Division.

☒ **b)** London Grove Township has no land area in the Red Clay Creek Watershed. Therefore, implementation of the Red Clay Creek PCB TMDL is not addressed in this London Grove Township MS4 TMDL Strategy.

IV. List of Municipalities Subject to the Same TMDL Pollutants (within HUC Watershed 02040205):

Table 1, presented in Subsection C.III, lists all Pennsylvania municipalities in the HUC 02040205 that are subject to the sediment, nitrogen and phosphorus TMDLs.

V. List of Counties Subject to the TMDL (within HUC Watershed 02040205):

There are no counties listed or referenced in any of the above referenced TMDL Reports and therefore there are no counties subject to any of the Christina TMDLs.

VI. Allocated Pollutant Loadings Established in Each Applicable TMDL:

Table 1, as presented in Subsection C.III, lists the EPA allocated pollutant loadings for London Grove Township for each applicable TMDL pollutant addressed by the Christina Basin Bacteria/Sediment and Low DO/Nutrient TMDL Reports. The allocated pollutant loadings are presented within these TMDL Reports as "MS4 Load Allocation" or "MS4 Allocation", and Table 1 presents the pollutant loadings and terminology exactly as presented in the TMDL Reports.

VII. Reduction in Pollutant Loads Necessary to Meet Each Applicable TMDL or WLA:

a. *EPA Pollutant Load Reductions:*

Table 1, as presented in Section C.III, lists the applicable pollutant Load Reductions required by the TMDL Reports. London Grove Township is located within White Clay Creek watershed. Table 1 indicates that pollutant Load Reductions are required by London Grove Township for Total Suspended Solids (Sediment), Total Nitrogen and Total Phosphorus.

i. **Sediment Reductions:** The pollutant Load Reductions for sediment (TSS) are presented within the Bacteria/Sediment TMDL Report as "Percent Reduction" and are presented in Table 1 exactly as presented in the Bacteria/Sediment TMDL Report. Table 1 also includes Municipal sediment "MS4 Load Reductions" in tons per year, which were calculated for the C-TIP based on the following equation:

(MS4 Load Reduction) = (Baseline MS4 Load) - (MS4 Load Allocation)

where "Baseline MS4 Load" and "MS4 Load Allocation" are taken from tables presented in the Sediment TMDL Report.

ii. **Nitrogen and Phosphorus Reductions:** The Nutrient/Low DO TMDL Report does not present pollutant Load Reductions by Municipality; they are presented only by Subbasin and only by "percent". Table 1 presents TN (nitrogen) and TP (phosphorus) Load Reductions by Municipality and percent reductions that were calculated using the following equations:

(MS4 Load Reduction) = (MS4 Baseline Load) – (MS4 Allocation)
(Percent Reduction) = (MS4 Load Reduction) / (MS4 Baseline Load)

where "MS4 Baseline Load" and "MS4 Load Allocation" are taken from tables presented in the Nutrient/Low DO TMDL Report.

b. *Adjusted MS4 Allocations and Required Load Reductions:*

London Grove Township
☒ has adjusted their MS4 Allocation(s) and Load Reduction(s). See below.
☐ has NOT adjusted their MS4 Allocation(s) and Load Reduction(s) at this time and will adhere to Table 1 Load Reductions (Skip below and go to Part VIII).

i. **Justification for Adjusting MS4 Baseline, MS4 Allocations, and Reductions:**

The TMDL Reports explain that the EPA MS4 Allocation and required Load Reductions were calculated assuming the entire land area within the TMDL Subbasin in the Municipality drains to the MS4. However because the Urbanized Area boundary bisects many municipalities in the Christina Basin, and because most Regulated MS4s cover only a portion of the Municipality, EPA acknowledges that the municipal allocations should be recalculated when MS4 mapping is available. This involves recalculating MS4 Baselines, MS4 Allocations, and pollutant Load Reductions.

The Bacteria /Sediment TMDL Report States:

"5.0 REASONABLE ASSURANCE AND IMPLEMENTATION

For purposes of this TMDL, WLAs were developed for each municipality holding MS4 permits. Distribution of loads was estimated using land use data within municipal boundaries and application of unit area loadings (lbs/acre/year) determined for subbasins defined in the HSPF model and used for TMDL development. As additional data are collected by PADEP regarding drainage areas of each storm sewer system in the basin, these WLAs can be refined to more detailed representation of WLAs for each stormwater permit and LAs for areas not bound by such permits. To do this,

the drainage area of each storm sewer should be delineated so that the area and distributions of land use can be determined. The land use areas within the stormwater drainage areas can be multiplied by the unit area loadings reported herein to determine the WLA for each MS4 permit and to calculate the load reduction necessary to meet the TMDL. The remaining load in each respective township can then be assigned to LAs. Until such storm water drainage area data are available, the WLAs and required load reductions reported herein are applicable."

(Exerpt from *Total Maximum Daily Loads for Bacteria and Sediment in the Christina River Basin Watershed Pennsylvania, Delaware, and Maryland. Philadelphia, PA.* April, 2005 (pg. 5-2).)

The Nutrient/Low DO TMDL Report States:

"5.0 REASONABLE ASSURANCE AND IMPLEMENTATION

For purposes of this TMDL, WLAs were developed for each municipality holding MS4 permits. Distribution of loads was estimated using land use data within municipal boundaries and application of unit area loadings (lbs/acre/year) determined for subbasins defined in the HSPF model and used for TMDL development. As additional data are collected by PADEP regarding drainage areas of each storm sewer system in the basin, these WLAs can be refined to more detailed representation of WLAs for each stormwater permit and LAs for areas not bound by such permits. To do this, the drainage area of each storm sewer should be delineated so that the area and distributions of land use can be determined. The remaining load in each respective township can then be assigned to LAs. Until such storm water drainage area data are available, the WLAs and required load reductions reported herein are applicable."

(Excerpt from *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.* September, 2006 (pg. 5-2).)

After extensive coordination with PADEP and analyses of available TMDL and GIS data, an approach was selected for adjusting MS4 Baselines, MS4 Allocations and required Load Reductions for the MS4 TMDL Strategy that reflects the actual extent of Regulated MS4s, and their contributing drainage areas, as described in the following section.

ii. Adjustment Approach:

1. Adjustment Process:

The MS4 Baselines, MS4 Allocations and Load Reductions were adjusted using the following approach:

1) The TMDL Storm Sewershed or Urbanized Area was delineated for each TMDL Subbasin based on mapping of the MS4 system and topography, excluding any portions that are discharging to streams that are not currently listed by PADEP for stormwater related impairments; and

2) The delineated TMDL Storm Sewershed or Urbanized Area land area was then used to pro-rate the MS4 Baselines, MS4 Allocations, and Load Reduction requirements.

Methods used for adjusting MS4 Baselines, MS4 Allocations and Load Reductions are described in the following subsection. The overall process included the following steps:

- A base map for London Grove Township was prepared using best available geographic data to include: political boundaries, streams and surface water bodies, TMDL Subbasin boundaries, TMDL Watershed boundaries, and the Urbanized Area.
- The London Grove Township Regulated Small MS4 (as defined in "Key Definitions") was mapped.
- The Regulated Storm Sewershed (as defined in "Key Definitions") was delineated using best available topographic data (2-foot LiDAR contours).
- The TMDL Storm Sewershed area (as defined in "Key Definitions") was delineated for each TMDL subbasin that is applicable to London Grove Township.
    - The portions of the TMDL Storm Sewershed that do not drain to a stream currently listed as impaired by PADEP for stormwater related causes are subtracted from the TMDL Storm Sewershed area for each TMDL subbasin.
- The total land area within the Urbanized Area within each TMDL Subbasin was calculated and used in lieu of the TMDL Storm Sewershed area as a simplified method.
    - The portions of the Urbanized Area that do not drain to a stream currently listed as impaired by PADEP for stormwater related causes are subtracted from the Urbanized Area land area for each TMDL subbasin.
- Adjusted MS4 Baselines, MS4 Allocations, and Load Reductions for each applicable TMDL pollutant were calculated by TMDL Subbasin using the methods and equations as presented below.

2. Delineation of TMDL Storm Sewershed:

The following method was used by London Grove Township to delineate the TMDL Storm Sewershed. This methodology is consistent with the recommended approach described by EPA in the TMDL Reports and has been conditionally approved by PADEP in its letter dated March 21, 2012 (Appendix B):

☒ **Land Use Area Method** – Within each applicable TMDL subbasin, the TMDL Storm Sewershed area is delineated based on 2008 LiDAR topography (2-foot contours), and the individual land use areas are determined using 2010 land use data. The Adjustment Equations are then applied to each land use type to recalculate the MS4 Baselines, MS4 Allocations and required Load Reductions for each category of land use within each TMDL Subbasin, for each applicable pollutant. The individual land use Baselines, MS4 Allocations and required Load Reductions are then summed by TMDL Subbasin, and then by TMDL Watershed. The TMDL Watershed totals become the adjusted MS4 Baseline, Allocation and required Load Reductions for each applicable pollutant.

☐ **Total Land Area Method** – Within each applicable TMDL subbasin, the TMDL Storm Sewershed area is delineated based on 2008 LiDAR topography (2-foot contours). The Adjustment Equations are then applied to the total TMDL Storm Sewershed area for each TMDL Subbasin to recalculate the MS4 Baselines, MS4 Allocations, and Load Reductions for each applicable pollutant. The TMDL Subbasin totals are then summed by TMDL Watershed. The TMDL Watershed totals become the adjusted MS4 Baseline, Allocation and required Load Reductions for each applicable pollutant.

☐ **Urbanized Area Method** – Within each applicable TMDL subbasin, the total land area within the Urbanized Area is determined using the Urbanized Areas currently depicted on the PADEP Stormwater webpage (2000 Census). The Adjustment Equations are then applied to the total land area within the Urbanized Area for each TMDL Subbasin to recalculate the MS4 Baselines, MS4 Allocations, and Load Reductions for each applicable pollutant. The TMDL Subbasin totals are then summed by TMDL Watershed. The TMDL Watershed totals become the adjusted MS4 Baseline, MS4 Allocation and required Load Reductions for each applicable pollutant.

☐ **Other Method** – If needed.

iii. Recalculation of Required Load Reduction (Adjustment Equations):

Each method above results in a delineation of the land area(s) to be used to calculate the Adjusted MS4 Baselines, MS4 Allocations, and required Load Reductions (See "Key Definitions") using the following Adjustment Equations:

$$\text{Adjustment Ratio} = \frac{\left(\begin{array}{c}\text{Actual Contributing land area (acres)}\\ \text{as delineated by the Municipality}\end{array}\right)}{\left(\begin{array}{c}\text{Land area (acres) used by EPA to}\\ \text{calculate the EPA MS4 Allocation}\end{array}\right)}$$

Adjusted MS4 Baseline = Adjustment Ratio x (EPA MS4 Baseline)

Adjusted MS4 Allocation = Adjustment Ratio x (EPA MS4 Allocation)
Adjusted MS4 Load Reduction = (Adjusted MS4 Baseline) – (Adjusted MS4 Allocation)

The adjustment calculations are provided in Appendix C:

- Appendix C.1 – MS4 Worksheet for Calculating Adjusted MS4 Baseline Loads, MS4 Allocations, required Load Reductions and new Municipal LAs - Land Use Area method.

iv. New Municipal Load Allocation (LA):

The portion of the EPA MS4 Allocation that was removed by the adjustment is now assigned as the Load Allocation (LA) for London Grove Township. The total TMDL Allocation for London Grove Township remains unchanged by the adjusted MS4 Allocation, and becomes: MS4 Allocation (WLA) + Municipal LA +MOS.

Table 2 presents the Adjusted MS4 Baselines, MS4 Allocations and adjusted Load Reductions for London Grove Township. The new LA for London Grove Township is also shown for each TMDL Watershed.

Table 2. Adjusted MS4 Baselines, MS4 Allocations Required Load Reductions and New LA for London Grove Township

Note: All values are calculated in this section from the Watershed Totals in Appendix C.1, column K	TMDL Watershed 1
NITROGEN - Applicable (Y) Not Applicable	
Total Nitrogen MS4 baseline Load (kg/day):	262.80
Total Nitrogen MS4 Allocation (kg/day):	128.43
Nitrogen Reduction (kg/day):	134.37
TMDL Percent Reduction:	0.51
Adjusted Total Nitrogen MS4 baseline Load (kg/day):	14.99
Adjusted Total Nitrogen MS4 Allocation (kg/day):	7.29
Adjusted Nitrogen Reduction (kg/day):	7.71
Adjusted Nitrogen Percent Reduction:	0.51
New Nitrogen Municipal Load Allocation (kg/day):*	121.14
PHOSPHORUS - Applicable (Y) Not Applicable	
Total Phosphorus MS4 baseline Load (kg/day):	25.88
Total Phosphorus MS4 Allocation (kg/day):	7.97
Phosphorus Reduction (kg/day):	17.91
TMDL Percent Reduction:	0.69
Adjusted Total Phosphorus MS4 baseline Load (kg/day):	3.83
Adjusted Total Phosphorus MS4 Allocation (kg/day):	1.18
Adjusted Phosphurus Reduction (kg/day):	2.66
Adjusted Phosphorus Percent Reduction:	0.69
New Phosphorus Municipal Load Allocation (kg/day):*	6.79
SEDIMENT - Applicable (Y) Not Applicable	
Total Sediment baseline MS4 Load (tons/year):	13616.33
Total Sediment MS4 Allocation (tons/year):	4842.82
Sediment Reduction (tons/year):	8773.51
TMDL Percent Reduction:	0.64
Adjusted Total Sediment MS4 baseline Load (tons/year):	353.99
Adjusted Total Sediment MS4 Allocation (tons/year):	124.17
Adjusted Sediment Reduction (tons/year):	229.82
Adjusted Sediment Percent Reduction:	0.65
New Sediment Municipal Load Allocation (tons/year):*	4718.65

* The new Municipal Load Allocations are not addressed by this MS4 Strategy.

VIII. Control Measures and BMPs Implemented to Meet the TMDL(s):

a. *MS4 TMDL Implementation Area:*

The TMDL Implementation Area for placing TMDL BMPs/control measures consists of any location within a TMDL Subbasin that drains to a stream with a stormwater-related impairment, and typically within the Urbanized Area. Once PADEP credit, trading, and offset policies are in place, BMPs/control measures may be located outside the Urbanized Area, subject to those policies. The MS4 TMDL Implementation Area for London Grove Township is based on the information above, the definition presented in "Key Definitions" and the priorities below.

b. *Priorities for Implementation:*

Based on PADEP feedback from the letter dated March 21, 2012 (Appendix B), BMP/control measure selection has been prioritized within the Implementation Area in the following order:

- First on properties owned by the Municipality that will minimize the volume and rate of stormwater flow discharging from the Regulated Small MS4 and are within the TMDL watershed and the Urbanized Area;
- Second, on non-Municipal properties that will minimize the volume and rate of stormwater flow discharging from the Regulated Small MS4 and are within the TMDL watershed and Urbanized Area;
- Third, on non-Municipal properties within the Urbanized Area that are a source of sediment or nutrients; and
- Fourth, on any sources outside the Urbanized Area located within the TMDL watershed and targeted to maximize pollutant load reductions, and in accordance with DEP's forthcoming applicable credit, trading, and offset policies.

London Grove Township will formally establish its responsibilities associated with protecting the permanence of each BMP/control measure implemented for achieving the TMDL Load Reductions presented in this MS4 TMDL Strategy, in order to sustain those water quality improvements into the long-term future. This includes establishing the necessary legal and administrative arrangements and instruments to insure that London Grove Township can fulfill its responsibilities for access, and inspection, maintenance, and operation (O, M & I) of any constructed TMDL BMP/control measure, and protect each measure against future disturbance except as authorized by London Grove Township. These responsibilities will be established and implemented for each BMP/control measure installation or retrofit for which a Load Reduction is counted by London Grove Township toward its incremental and total TMDL targets.

c. ***Inventory of Previously Installed Pollutant Reduction Control Measures (March 10, 2003– September 13, 2012:***

London Grove Township:

☒ *has previously installed pollutant reduction control measures to claim (2003-2012). See below.*

☐ *has NO previously installed pollutant reduction control measures to claim at this time (2003-2012). (Skip below and go to Subsection VIII.d).*

Table 3 provides an inventory of control measures implemented by London Grove Township between March 10, 2003 and September 13, 2012 and the pollutant load reduction provided by each. Each control measure listed has been inspected by London Grove Township to confirm it has been operated and maintained consistent with its original design. Locations of these control measures are shown in Figure 2 along with the Urbanized Area and stormwater impaired streams.

For each installed control measure included in Table 3, the Municipality's engineer has determined the pollutant load reduction achieved. This pollution reduction is only counted toward London Grove Township's first 5-year incremental target and total (cumulative) TMDL target. These control measures satisfy the following conditions as specified by PADEP in its letter dated March 21, 2012 (Appendix B) (the following is PADEP exact language):

1. *The municipality must demonstrate that the subject BMPs satisfy all applicable legal requirements.*
2. *The municipal actions must have occurred after the more recent of (a) March 10, 2003, (the date PCSM began to be implemented statewide) or (b) the completion date of the stream assessment for the applicable TMDL.*
3. *The municipality must demonstrate that actions taken by the municipality to reduce pollutant loads were voluntary and not required by any permit, order, or other enforceable mechanism, or by any state, federal or local law.*
4. *The municipality must demonstrate that any actions taken reduced pollutant loads from the status quo ante prior to the action.*
5. *Pollutant load reductions may not be claimed for open space or agricultural preservation; to count an action to reduce pollutant loads must be restorative, not preservative.*
6. *Net pollutant loading reductions must be calculated by netting the demonstrated pollutant load reductions of the applicable restoration BMPs installed after the applicable eligibility date against the increased pollutant loadings, if any, due to the addition of impervious surface and other development in and otherwise impacting the municipality during the timeframe in which credit for an applicable pollutant load reduction is sought.*
7. *Pollutant load reductions may be counted upon DEP's determination that all applicable legal requirements have been satisfied and there is a demonstrated quantifiable net decrease in applicable pollutant loadings in the municipality for the identified timeframe.*

Table 3. Previously Installed BMPs/Control Measures and Pollutant Reductions For London Grove Township in White Clay Creek Watershed

BMP/ control measure #	Date Installed	Description	BMP Category *	TMDL Subbasin	In Urbanized Area?	Pollutant(s) Treated	Removal Efficiency (for each)**	Estimated Pollutant Load Reduction**	Date of Last Inspection	Condition/ Performance of BMP at inspection
1	2011	Riparian Buffer Plantings at Goddard Park	☒ 1 ☐ 2 ☐ 3	W02	☐ Yes ☒ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	65% 50% 50%	N-0.0275 (kg/day) P-0.0003 (kg/day) S-3.22 (tons/year)	June 2012	Good
2	2011	Invasive Species Removal at Goddard Park	☒ 1 ☐ 2 ☐ 3	W02	☐ Yes ☒ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	85% 85% 50%	N-0.3625 (kg/day) P-0.0065 (kg/day) S-1.85 (tons/year)	June 2012	Good
3	2011	Rain Garden #1 @ LGT Building	☒ 1 ☐ 2 ☐ 3	W08	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	85% 85% 30%	N-0.0016 (kg/day) P-0.00214 (kg/day) S-0.06 (tons/year)	June 2012	Good
4	2011	Rain Garden #2 @ LGT Building	☒ 1 ☐ 2 ☐ 3	W08	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	85% 85% 30%	N-0.002 (kg/day) P-0.00267 (kg/day) S-0.07 (tons/year)	June 2012	Fair
5	2011	SECCRA Re-forest Disturbed Areas	☒ 1 ☐ 2 ☐ 3	W04	☐ Yes ☒ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	85% 85% 50%	N-0.004 (kg/day) P-0.0052 (kg/day) S-0.77 (tons/year)	June 2012	Good
6	2010	Riparian Buffer Plantings at Hills of Sullivan #1	☒ 1 ☐ 2 ☐ 3	W08	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	65% 50% 50%	N-0.0068 (kg/day) P-0.00314 (kg/day) S-0.02 (tons/year)	June 2012	Fair
7	2011	Riparian Buffer Plantings at Hills of Sullivan #2	☒ 1 ☐ 2 ☐ 3	W08	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	65% 50% 50%	N-0.0068 (kg/day) P-0.0053 (kg/day) S-0.03 (tons/year)	June 2012	Fair

	1 and 2	**Total Installed BMP/control measure Reduction** (sum of BMP/control measures categories 1 +2**)→	**N (kg/day)** **P (kg/day)** **S (tons/year)**	**0.411 kg/day** **0.0252 kg/day** **6.01 tons/year**
	3	**Reductions achieved through Municipal Stormwater Ordinance Control Measure** (Sum of BMP/control measures category 3**)	**N (kg/day)** **P (kg/day)** **S (tons/year)**	**0**
	Total Gross Reduction → **(BMP/control measures + Stormwater Ordinance)**		**N (kg/day)** **P (kg/day)** **S (tons/year)**	**0.411 kg/day** **0.0252 kg/day** **6.01 tons/year**
	Increased Pollutant loadings due to development, additional impervious surfaces, or other sources between March 10, 2003 and September 2012 **Total Increase →**		**N (kg/day)** **P (kg/day)** **S (tons/year)**	**-0.756 kg/day** **-0.7719 kg/day** **-792.9 tons/year**
	TOTAL NET REDUCTION → *(Total Gross – Increase)* **Counted towards meeting the TMDL**		**N (kg/day)** **P (kg/day)** **S (tons/year)**	**1.167 kg/day** **0.7971 kg/day** **798.91 tons/year**

*BMP/control measure Categories:

1) Voluntary retrofits/control measures – non-structural or structural.

2) Voluntary increased control measures above the NPDES requirements installed as part of land development project.

3) Non-voluntary increased control measures required by the Municipal Stormwater Management Ordinance, which exceed NPDES requirements.

**All calculations and supporting documentation are provided in Appendix D.

The PADEP letter further states that "*...any municipality that seeks to count pollutant load reductions made in the past can do so only if they satisfy all of the above factors to DEP's satisfaction.*"

Projects listed in Table 3 include BMP/control measures that fall into three categories:

1. Voluntary BMPs/control measures or retrofits, either structural or non-structural, which were not completed as part of a land development project;

2. BMPs/control measures installed as part of (a) land development project(s) approved by the Municipality, which voluntarily exceeded the pollutant removal efficiency required by the NPDES construction permit (i.e., pollutant removal required by NPDES application worksheet of calculations and PA BMP Manual);

3. BMPs/control measures installed as part of (a) land development project(s) approved by the Municipality, which exceeded the pollutant removal efficiency required by the NPDES construction permit, as required by the Municipality's Stormwater Management Ordinance.

Category 3 BMPs/control measures are considered to be the "Municipal Stormwater Ordinance Control Measure", which is further discussed in the next subsection. For BMP/control measure categories 2 and 3, above, only the portion of pollutant load removal that is above and beyond the PADEP NPDES permit requirement is included in Table 3. For all BMPs/control measures, permanent protection, inspection, operation and maintenance provisions have been put into place. For each control measure listed in Table 3 justification for pollutant reduction credit, including calculations and information in support of items 1 through 7 above have been provided in Appendix D.

d. *Municipal Stormwater Ordinance Control Measure:*

London Grove Township has been very proactive in the management of stormwater in the past decade. Their current ordinance equal or exceed the level of control imposed by the new Act 167 Model Stormwater Ordinance proposed as part of the "County-wide Act 167 Plan for Chester County". The existing stormwater ordinance will exceed the minimum PADEP NPDES permit requirements for new construction for the following components related to water quality protection:

1. Infiltration;
2. Volume control;
3. Minimum area of proposed impervious surface or proposed or earth disturbance to which ordinance standards apply;

London Grove Township may document all future BMPs/control measures installed as part of new construction or redevelopment projects that meet the requirements of its Ordinance and achieve pollutant load reductions that exceed the minimum requirements of a PADEP NPDES permit for new construction. Only the portion of pollutant load removal that is above and beyond the PADEP NPDES permit requirement is counted towards the required TMDL pollutant Load Reductions and will be counted toward the TMDL implementation timeline and milestones for London Grove Township (see Subsection 3.IX).

e. *Proposed Control Measures to be Implemented:*

Table 4 and Figure 2 present the candidate BMPs/control measures to be implemented by London Grove Township during this 5-year permit cycle. London Grove Township is reviewing the opportunities to implement these or other BMP/control measures at locations where the water quality benefits will be maximized.

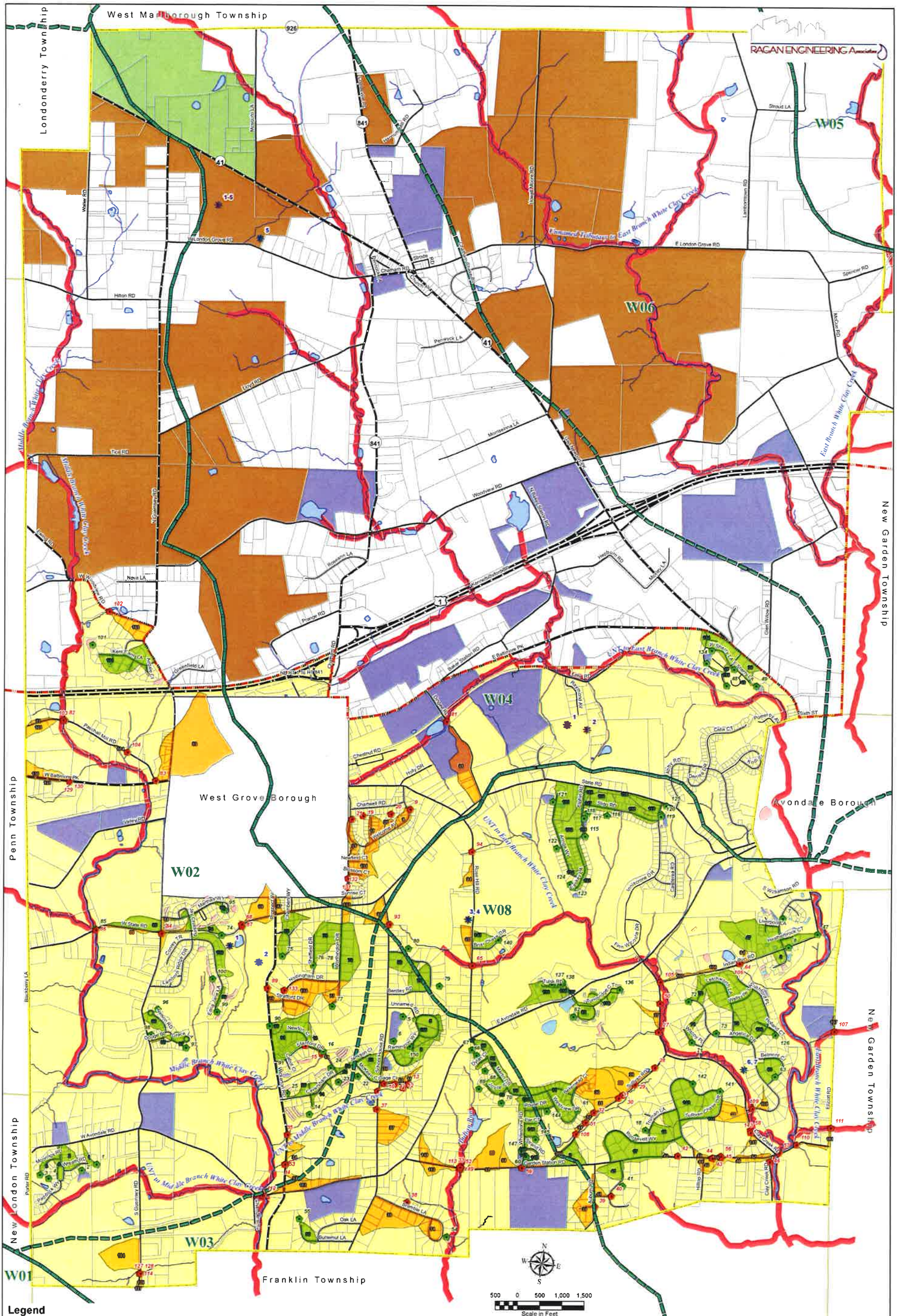
For each BMP/control measure listed in Table 4, justification for load reduction performance, including calculations and a brief analysis to explain and justify the selection of BMP/control measures proposed, have been provided in Appendix D. In subsequent permit cycles all BMPs/control measures implemented from Table 4 will be moved to Table 3, and counted towards the MS4 TMDL milestones.

The final list of selected BMP/control measures with the specific location and MS4 TMDL design details will be submitted to PADEP as London Grove Township's MS4 TMDL Plan – Part II, no later than one year from the effective date of authorization of London Grove Township's MS4 permit renewal. All constructed or retrofitted BMP/control measures will be accompanied by the necessary legal and/or administrative arrangements and instruments to establish long term access and inspection, operation and maintenance responsibilities by London Grove Township and permanent protection from disturbance or modification except as authorized by London Grove Township.

f. *Collaborative Effort (Primary Strategy):*

Source of Pollution

According to the TMDL Report, London Grove Township consists of approximately 10,786 acres. Of that area, the two largest land uses that generate a significant amount of pollution are agriculture (6,534 acres or 60.5%) and residential (1,228 acres or 10.5%). However, 95% of the sediment load is coming from the agriculture land use and 62% of the nitrogen load is coming from agriculture. Agriculture, while still being the largest contributor of phosphorus pollution, generates about 43% of the total phosphorus load. In comparison, residential land use, which is where the majority of the MS4 outfalls are located, represents only 3% of the sediment load, 10.7% of the nitrogen load and 14.3% of the phosphorus load. When the MS4 outfall



London Grove Township,
Chester County, Pennsylvania

FIGURE 2
LOCATION OF PREVIOUSLY INSTALLED AND CANDIDATE BMPs/ CONTROL MEASURES

sewershed is parsed down to only the regulated outfall's contributory drainage areas, the residential land use only accounts for 1.2% of the sediment load, 4.3% of the nitrogen load and 12.2% of the phosphorous load. It should also be noted that approximately 60% of the subdivisions that account for the regulated outfall sewershed area have already been fitted with water quality Best Management Practices (BMPs). The source of all of the numbers presented in this section is Table C-1 found in Appendix A.

Removal of Pollution

At best, the implementation of pollution reduction techniques to the MS4 regulated outfalls has the potential to remove less than 1% of the sediment load, approximately 2% of the nitrogen load and possibly as much as 6% of the phosphorus load. Pollution reduction techniques designed to reduce the non-point source runoff pollution from the agricultural land use have the potential to remove up to 47% of the sediment load, 30% of the nitrogen load and 21% of the phosphorous load. Based on this analysis, it appears that London Grove Township could be more effective removing pollution by spending their time and money on BMP's that target the agricultural community.

Pollution Removal Strategy

It appears there is a "greater environmental potential" available to the Township by planning, designing and installing BMPs that help the farmers operate utilizing farming techniques designed to maximize farming production while minimizing runoff pollution. The Township consists of numerous farms ranging in size and nature scatter throughout the Township, but concentrated north of the Route 1 Bypass. Figure #2 shows crops farms and mushroom farms that have the greatest potential for pollution reduction. These farms would be the focus of London Grove Township's efforts to work with the farming community to reduce pollution.

London Grove Township has been working with The Nature Conservancy, White Clay Creek Watershed Association, Chester County Conservation District, University of Delaware and neighboring Townships to form a coalition to study the non-point source pollution issue, devise a strategy to remove the pollution, identify funding and implement the strategy. The results of this strategy are reflected in Table 5 – Timeline & Milestones for Attaining TMDL Pollutant Load Reductions. For the remainder of this permit cycle (current – 2018) the Township would be working with the coalition to develop the detailed approach. Early in the next permit cycle, the coalition would development specific projects. Later in that same period, the coalition would seek funding and projects identified earlier would begin to be implemented. In the next permit cycle, we would evaluate the projects that had been implemented for effectiveness and ease of maintenance. Mid-course adjustments would be made and additional projects developed, funded and implemented. This process would continue for each subsequent permit cycle.

Table 4. List of Candidate BMPs/Control Measures
White Clay Creek – London Grove Township

BMP/ control measure #	Description of BMP/Control Measure	BMP Category *	TMDL Subbasin	In Urbanized Area?	Pollutant(s) Treated	Removal Efficiency (for each)**	Estimated Pollutant Load Reduction*
1	SECCRA Re-forestation of Disturbed Area	☒ 1 ☐ 2 ☐ 3	W04	☐ Yes ☒ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	85% 85% 50%	N–0.014 (kg/day) P–0.0113 (kg/day) S-1.68 (tons/year)
2	SECCRA Re-forestation of Disturbed Area	☒ 1 ☐ 2 ☐ 3	W04	☐ Yes ☒ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	85% 85% 50%	N-0.014 (kg/day) P-0.0113 (kg/day) S-1.68 (tons/year)
3	SECCRA Re-forestation of Disturbed Area	☒ 1 ☐ 2 ☐ 3	W04	☐ Yes ☒ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	85% 85% 50%	N-0.014 (kg/day) P-0.0113 (kg/day) S-1.68 (tons/year
4	SECCRA Re-forestation of Disturbed Area	☒ 1 ☐ 2 ☐ 3	W04	☐ Yes ☒ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	85% 85% 50%	N-0.014 (kg/day) P-0.0113 (kg/day) S-1.68 (tons/year
5	SECCRA Re-forestation of Disturbed Area	☒ 1 ☐ 2 ☐ 3	W04	☐ Yes ☒ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	85% 85% 50%	N-0.014 (kg/day) P-0.0113 (kg/day) S-1.68 (tons/year
		TOTAL ESTIMATED REDUCTION → Counted towards meeting the TMDL					**N-0.072 (kg/day) P-0.0565 (kg/day) S-8.41 (tons/year)**

*BMP Categories:

1) Retrofits/control measures – non-structural or structural.
2) Increased control measures above the NPDES requirements installed as part of land development project.
3) Increased control measures required by the Municipal Stormwater Management Ordinance, which exceed NPDES requirements.

**All calculations and supporting documentation are provided in Appendix D.

IX. Analysis of Consistency of this Implementation Plan with WLAs and TMDLs:

a. *Analysis of Consistency:*

As shown in Tables 1, 2, 3, 4, and 5 (presented below), Figures 1 and 2, and as described in the "Key Definitions" and Subsections C.I through C.VIII of this MS4 TMDL Strategy, the implementation actions listed in Subsection C.VIII and this MS4 TMDL Strategy are consistent with the requirements and assumptions of the applicable TMDL Reports listed in Subsection C.I.

b. *Timeline and Milestones:*

Table 5 presents the TMDL implementation timeline and milestones for *London Grove Township*. In accordance with the expectations set forth in the PADEP letter dated March 21, 2012 (Appendix B), *London Grove Township* will attain its full required pollutant Load Reduction(s) within the following timeline:

- *Regulated small MS4s with applicable WLAs requiring reductions of up to 50% should have a timeline no longer than 10 years;*
- *Where reductions of 50-85% are required in the WLA, the timeline should be no longer than 15 years; and*
- *Regulated small MS4s subject to WLAs requiring reductions 85% or greater, should have a timeline no greater than 20 years.*

The PADEP letter further states: "*Operators of regulated small MS4s can seek a longer timeframe if they are able to provide a compelling justification in their MS4 TMDL Plan submittal, to DEPs satisfaction, demonstrating why a longer timeframe is necessary.*"

Table 5. Timeline and Milestones for Attaining TMDL Pollutant Load Reductions
London Grove Township - *2016 -2033*

TMDL WATERSHED	Pollutant	Load Reduction Required	Percent Load Reduction Required	PADEP Required Timeframe for Attaining Reduction*		Cumulative Percent of Required Pollutant Load Reduction Attained by end of Permit Cycle**			
				Total years	Calendar Year	(1) 2018****	(2) 2023	(3) 2028	(4) 2033
White Clay Creek	Nitrogen	7.71 (kg/day)	51	18	***	15.1%	30.0%	30.0%	24.8%
	Phosphorus	2.66 (kg/day)	69	18	***	35.9%	20.0%	20.0%	24.1%
	Sediment	229.82 (tons/year)	65	18	***	350.0%	N/A	N/A	N/A

Notes:

*Per PADEP letter dated March 21, 2012 (Appendix B), "Regulated small MS4s with applicable WLAs requiring reductions up to 50% should have a timeline no longer than 10 years. Where reductions of 50 - 85% are required in the WLA, the timeline should be no longer than 15 years. Regulated small MS4s subject to WLSs requiring reductions of 85% or greater should have a timeline no greater than 20 years."

** Per PADEP letter dated March 21, 2012 (Appendix B), "...at least 10-15% of the pollutant load reductions are targeted to be achieved by the end of the first MS4 TMDL permit cycle unless a municipality provides compelling justification in its MS4 TMDL Plan, to DEP's satisfaction, demonstrating the raionale for why alternate load reduction percentages may be merited in the first and other permit terms."

As shown, the following milestones will be achieved by London Grove Township:

- One year from authorization of permit renewal: Proposed BMP/control measure design details will be submitted to PADEP as the London Grove Township MS4 TMDL Plan, Part II, for PADEP approval.
- Proposed control measures will be installed on-the-ground in time for their successful operation to be documented in the periodic report or progress report submitted at the end of the third year of coverage under this permit.
- Prior to next permit cycle, the London Grove Township's timeline and milestones will be reviewed and, if necessary, revised based on progress achieved and experience gained in this 5-year permit cycle.

c. *Implementation Tracking:*

London Grove Township will maintain a TMDL Implementation and Attainment Log (Table 6), that will be an official tally of progress toward the incremental (by permit cycle) and total (cumulative) TMDL targets presented in this MS4 TMDL Strategy. This log will document reductions achieved as new control measures are installed or retrofitted during each permit cycle, and reductions achieved through implementation of the London Grove Township stormwater ordinance (Subsection C.VIII.d). The TMDL Implementation and Attainment Log will be included in each periodic municipal MS4 permit report to PADEP.

All pollutant reduction actions taken by the Municipality that satisfy the requirements specified in this MS4 TMDL Strategy and by PADEP will be quantified and recorded in the TMDL Implementation and Attainment Log (Table 6), and applied towards the Adjusted required pollutant Load Reductions (Table 2) (or EPA original MS4 reduction (Table 1), if no adjustment was made). Progress will be reported both numerically (mass/time) and as a percentage of the overall MS4 required Load Reduction.

Table 6. TMDL Implementation and Attainment Log
London Grove Township - *White Clay Creek, 2016 -2033*

Line	TMDL WATERSHED 1: [Insert Name of TMDL Watershed*]	Sediment (tons/year)	Nitrogen (kg/day)	Phosphorus (kg/day)	Source or Calculation
	REQUIRED POLLUTANT LOAD REDUCTIONS:	Check if NOT Applicable ☐	Check if NOT Applicable ☐	Check if NOT Applicable ☐	
1	**Total MS4 Load Reduction Required**	**229.82**	**7.71**	**2.66**	Table 2 / Appendix C
	POLLUTANT LOAD REDUCTIONS ACHIEVED:				
2	Total Net Reductions achieved 2003 - 2012	798.91	1.167	0.7971	Table 3, Total Net Reduction
3	Reductions estimated through proposed control measures (Permit cycle 1)				Table 4, Total Estimated Reduction
4	**Total Pollutant Reduction estimated by end of MS4 Permit Cycle**	**798.91**	**1.167**	**0.7971**	Line 2 + Line 3
	TMDL IMPLEMENTATION PROGRESS:				
5	**Percentage of Total TMDL Reduction Achieved during this MS4 Permit Cycle (incremental)**	348%	15.1%	35.9%	(Line 4 / line 1) x 100
6	**Percentage of Total TMDL Reduction Achieved by end of this MS4 Permit Cycle (cumulative)**	348%	15.1%	35.9%	Same as line 5 (for this permit cycle only)
7	**Implementation Milestone (target) for current MS4 Permit Cycle (Percent of Required Pollutant Load Reduction Attained by end of Permit Cycle)**	350%	15.2%	35.9%	Table 5
8	**Percentage of Remaining Pollutant Load Reduction to be achieved in future MS4 Permit Cycles**	0%	84.8%	64.1%	100% - Line 6

Notes:
All numbers are reported in mass/time, except when % is noted.

d. ***Process for Evaluating and Updating MS4 TMDL Plan:***

London Grove Township will review its progress on meeting milestones on a periodic basis, maintain inspections and records to evaluate control measures and will periodically evaluate this MS4 TMDL Strategy for necessary modifications. Any modifications will be coordinated with PADEP prior to implementation. London Grove Township will also continue participation in the C-TIP Partnership and work with the group to evaluate, and, as needed, revise the overall C-TIP approach to ensure timely progress toward the TMDL Watershed implementation targets.

e. ***BMP/Control measures Performance Evaluation and Reporting:***

BMP/control measures performance evaluation will consist of inspections conducted by London Grove Township (or its designee) to ensure that the BMP/control measures constructed or retrofitted to meet the TMDL requirements continue to be maintained as designed. The Municipality will insure that an appropriate technical expert will inspect the facility during construction and annually, and will report observations made. Any needs will be identified and reported, and will be scheduled for implementation. Inspection information will be maintained on file and summarized in municipal periodic MS4 permit reports.

X. Additional Information: (See Appendices)

SECTION D – References

2010 Pennsylvania Integrated Water Quality Monitoring and Assessment Report. Undated. Pennsylvania Department of Environmental Protection. Office of Water Management, Bureau of Water Supply & Wastewater Management, Water Quality Assessment and Standards Division, Harrisburg, PA.

Furlan, Ronald C. – PADEP. Letter dated March 21, 2012, re: Christina Basin Total Maximum Daily Load Implementation Plan (C-TIP) (2/13/2012).

Revisions to Total Maximum Daily Loads for Nutrient and Low Dissolved Oxygen Under High-Flow Conditions, Christina River Basin, Pennsylvania, Delaware, and Maryland. September 2006. U.S. Environmental Protection Agency, Philadelphia, PA.

Total Maximum Daily Loads for Bacteria and Sediment in the Christina River Basin, Pennsylvania, Delaware, and Maryland. September 2006. U.S. Environmental Protection Agency, Philadelphia, PA

Total Maximum Daily Load for the Red Clay Creek Basin Chester County, Pennsylvania. April 7, 2007. U.S. Environmental Protection Agency, Philadelphia, PA.

Total Maximum Daily Loads, Polychlorinated Biphenyls (PCBs) and Chlordane, West Branch Brandywine Creek, Chester County, Pennsylvania. March 9, 2001. Pennsylvania Department of Environmental Protection, Harrisburg, PA,

SIGNATURE AND SEAL BY PROFESSIONAL ENGINEER

_____
Name

_____
Signature

_____
PA License Number

_____
Date

APPENDIX A

MUNICIPALITIES PARTICIPATING IN C-TIP PARTNERSHIP

APPENDIX A

Brandywine Valley Association

This is a list of the Municipalities that are members of the CTIP partnership.

1. Avondale Borough
2. Caln Township
3. Coatesville
4. Downingtown Borough
5. East Bradford Township
6. East Brandywine Township
7. East Caln Township
8. East Fallowfield Township
9. Franklin Township
10. Honey Brook Township
11. Kennett Borough
12. Kennett Township
13. London Grove Township
14. Londonderry Township
15. New Garden Township
16. New London Township
17. Parkesburg Borough
18. Penn Township
19. Pocopson Township
20. Sadsbury Township
21. South Coatesville
22. Thornbury Township
23. Uwchlan Township
24. Valley Township
25. West Bradford Township
26. West Brandywine Township
27. West Caln Township
28. West Chester Borough
29. West Goshen Township
30. West Whiteland Township

1760 Unionville-Wawaset Road, West Chester, PA 19382-6751
T: 610-793-1090 F: 610- 793-2813 E: water@bva-rcva.org
Web: www.brandywinewatershed.org

APPENDIX B

PADEP LETTER
DATED 21 MARCH 2012

APPENDIX B

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF POINT AND NON-POINT SOURCE MANAGEMENT

March 21, 2012

Ms. Jan Bowers
Chester County Water Resources Authority
601 Westtown Rd., Suite 270
West Chester, PA 19380-0990

Re: Christina River Total Maximum Daily Load Implementation Plan (C-TIP)(02/13/2012)

Dear Ms. Bowers:

This letter constitutes the Department of Environmental Protection's (DEP) response to the Chester County Water Resource Authority's (CCWRA) submittal of the February 13, 2012, C-TIP proposal and discussions held in Harrisburg on that date. DEP would like to thank you, along with other CCWRA staff, the CCWRA, the Chester County Board of Commissioners, the Chester County Conservation District, the Brandywine Valley Association, and others who have taken the time and initiative to develop the approach and vet it with the many Christina Basin municipalities in Chester County. This coordinated effort is critical to the preparation and implementation of measures to meaningfully address the complex and geographically large Christina Basin TMDLs for Sediment and Nutrients. We are also appreciative of the efforts expended to revise earlier versions of C-TIP in response to concerns raised in several discussions with our agency.

In sum, DEP generally concurs with your approach, in concept, as a viable way for Christina municipalities to make substantial progress in addressing applicable MS4 TMDL WLAs under PAG-13 or an MS4 Individual NPDES permit to improve this Commonwealth's waters. We believe that your conceptual approach is generally sound, and parts of it, such as the approach to the parsing of WLA load in a municipality, mimic ongoing efforts we have engaged in. Also, we concur with your analysis regarding the non-applicability of bacteria TMDLs to the municipalities due to the absence of bacteria § 303(d) listings in the Christina Basin. In addition, your implementation approach appears sound, as well, though we have specific concerns below that will need to be addressed.

Although we generally concur with your proposal, our concurrence is conditioned on CCWRA and the implementing municipalities addressing our comments on how C-TIP can and should be improved, and some caveats, as set forth in the following paragraphs.

DEP's general conceptual approval of the February 13, 2012, C-TIP approach is subject to these caveats:

1. ***Concurrence in Concept Only*** - The conceptual approval from DEP of the February 13, 2012, C-TIP proposal is expressly limited to only the concept that has been brought before DEP, not any particulars or specifics in the proposal, except as expressly noted in this letter.

2. ***Right to Change Position*** - DEP reserves the right to change its position regarding the C-TIP proposal should further information or analysis reveal technical or legal flaws in the concept, as proposed or implemented, or should other circumstances or factors arise meriting a change in position.

3. ***No Pre-Approval of Municipal MS4 TMDL Plans*** - DEP's conceptual approval of the February 13, 2012, C-TIP proposal does not constitute pre-approval of any municipal MS4 TMDL Plan. The MS4 TMDL Strategy portion of each Plan that each municipality must develop under PAG-13 must be submitted to DEP by September 14, 2012, and will be evaluated on its own merits. Similarly, the MS4 TMDL Design Details part of the Plan that each municipality must develop must be submitted to DEP within one year of approval of coverage by DEP. DEP will not approve a MS4 TMDL Plan for a municipality unless the agency conducts an evaluation of the proposed Plan and then makes a finding that the Plan satisfies all applicable conditions of the permit and federal, state and local law, including a timeline with milestones outlining what will be accomplished, both in the first permit term and ultimately, along with the ten elements required for a Plan on pages 16-17 of Part C of the PAG-13 Authorization to Discharge.

DEP's approval is further conditioned on CCWRA and the implementing municipalities addressing the following concerns to the satisfaction of DEP.

1. ***Timeline for Attaining Pollutant Reduction Goals*** – The C-TIP proposes a 25 year timeline to meet pollutant reduction targets. While this timeline is markedly better than the 40 year timeline set forth in the prior C-TIP proposal that was presented to DEP, it still falls short of the 15 year timeline recommended by EPA. As a condition of concurring with the C-TIP proposal, the timelines in the C-TIP need to be modified and implemented as follows.

DEP expects timeframes for pollutant reductions to be based on the pollutant load percentage reduction required for each regulated small MS4. Regulated small MS4s with applicable WLAs requiring reductions up to 50% should have a timeline no longer than 10 years. Where reductions of 50-85% are required in the WLA, the timeline should be no longer than 15 years. Regulated small MS4s subject to WLAs requiring reductions of 85% or greater should have a timeline no greater than 20 years. Operators of regulated small MS4s can seek a longer timeframe if they are able to provide a compelling justification in their MS4 TMDL Plan submittal, to DEP's satisfaction, demonstrating why a longer timeframe is necessary. Each MS4 TMDL Plan, including a request for an alternate timeline, will be evaluated on its merits.

2. ***Priorities for Municipal Pollutant Load Reductions*** – On page 4 of the C-TIP narrative, the C-TIP gives first priority to implementing measures on "municipal owned/operated pollutant sources." DEP supports the focus on these areas as a way to harvest "low-hanging fruit" pollutant

load reductions in the first permit term and thereafter. Moreover, DEP expects that C-TIP municipalities will prioritize the installation and implementation of BMPs on municipal owned sources and other sources claimed by the municipality to minimize the volume and rate of stormwater flow discharging from the regulated small MS4 to surface waters. DEP also expects that BMPs will be installed and implemented at locations on municipal owned sources within the watershed that are targeted to maximize pollutant load reductions. It is important that pollutant reduction opportunities be undertaken in an efficient manner given the challenges of eliminating impairments and the costs of installing and implementing measures to address these impairments.

As a condition of DEP's concurrence with C-TIP, DEP expects that the C-TIP be amended and implemented to reflect the above-stated priorities, unless the municipality is able to provide a compelling justification, to DEP's satisfaction, demonstrating why a different approach is preferable.

3. ***First Term Permit Reductions*** - The C-TIP proposal specifies a 5% reduction in pollutant load in the first MS4 TMDL permit cycle (ie, the cycle running from approximately 2013-2018), along with 20-25% reductions listed in the C-TIP for subsequent permit cycles. While we acknowledge that there will be startup issues in obtaining such reductions, 5% seems like a low reduction target for the first permit term. Municipalities should, as specified in the C-TIP, be tackling their "low hanging fruit" in the first permit cycle, such as runoff from municipal owned and operated facilities. DEP questions whether it is reasonable to "backload" reductions to later permit cycles when the low hanging fruit is targeted as a priority in the first permit term. Accordingly, DEP's concurrence in the C-TIP proposal is conditioned on the C-TIP indicating that an effort will be made so that at least 10-15% of pollutant load reductions are targeted to be achieved by the end of the first MS4 TMDL permit cycle unless a municipality provides compelling justification in its MS4 TMDL Plan, to DEP's satisfaction, demonstrating the rationale for why alternate load reduction percentages may be merited in the first and other permit terms. Such demonstration needs to be consistent with any demonstration made for an alternate timeline as set forth above.

4. ***Cause or Contribute Terminology*** – Throughout the C-TIP proposal there are references to the term "cause or contribute," or various iterations thereof. As we understand your use of the term, it is meant to address situations where the TMDL erroneously assigns a WLA to a municipality, such as the situation where a regulated small MS4 does not discharge stormwater from its outfalls (assuming they have been correctly identified) into the subbasin subject to the WLA. It could also apply to situations where an operator of a regulated small MS4 is not required under law to submit a MS4 TMDL Plan. We think your use of the term "cause or contribute" is better expressed in the phrase "the operator of the regulated small MS4 is not required to submit an MS4 TMDL Plan because the WLA is not applicable." The term "cause or contribute" is a term of art under the federal Clean Water Act that carries with it many permitting and water-quality based effluent limitations; implications that we believe unduly complicate what you are trying to do. If you choose to continue using the term "cause or contribute" you will need to provide a definition, together with an explanation and requisite justification explaining how, as the term is used in your proposal, a municipality would demonstrate that it does not "cause or contribute" to an existing impairment, including the justifications they would need to provide. This is a critical issue since the C-TIP proposal contains numerous "outs" excusing operators of

regulated small MS4s from preparing and executing MS4 TMDL Plans if they do not "cause or contribute."

In sum, DEP's concurrence is conditioned on the C-TIP proposal being amended in either of two ways. First, the proposal can be amended to delete any references to the term "cause or contribute" and replace them with terminology such as "the permittee is not required to submit an MS4 TMDL Plan because the WLA is not applicable," or some similar language, along with conforming revisions. A second alternative is to provide an explanation with requisite definitions and justifications explaining how, as the term is used in your proposal, a permittee would demonstrate that it does not "cause or contribute" to an existing impairment, including the justifications they would need to provide.

5. ***Eligible Past Pollutant Reductions*** – A question arises whether a municipality participating in the C-TIP will be able to count pollutant reductions the permittee made at some time after the assessment that resulted in the impairment listing for which a TMDL (and WLA) was prepared. In prior C-TIP correspondence between DEP and CCWRA (July 15, 2011), DEP set out the following prerequisites for a municipality seeking to count pollutant load reductions from past actions. Any pollutant reductions claimed by a municipality for past BMP implementations will be analyzed under these factors: (1) the municipality must demonstrate that the subject BMPs satisfy all applicable legal requirements; (2) the municipal actions must have occurred after the more recent of: (a) March 10, 2003, (the date PCSM began to be implemented statewide) or (b) the completion date of the stream assessment for the applicable TMDL; (3) the municipality must demonstrate that any actions taken by the municipality to reduce pollutant loads were voluntary and not required by any permit, order, or other enforceable mechanism, or by any state, federal or local law; (4) the municipality must demonstrate that any actions taken reduced pollutant loads from the *status quo ante* prior to the action; (5) pollutant load reductions may not be claimed for open space or agricultural preservation; to count an action to reduce pollutant loads must be restorative not preservative; (6) net pollutant loading reductions must be calculated by netting the demonstrated pollutant load reductions of the applicable restoration BMPs installed after the applicable eligibility date against the increased pollutant loadings, if any, due to the addition of impervious surface and other development in and otherwise impacting the municipality during the timeframe in which credit for an applicable pollutant load reduction is sought; and (7) pollutant load reductions may be counted upon DEP's determination that all applicable legal requirements have been satisfied and there is a demonstrated quantifiable net decrease in applicable pollutant loadings in the municipality for the identified timeframe.

DEP's concurrence in the C-TIP concept is conditioned such that any municipality that seeks to count pollutant load reductions made in the past can do so only if they satisfy all of the above factors to DEP's satisfaction.

6. ***Eligibility of Reductions Outside the Urbanized Area (UA)*** – A question arises whether pollutant reductions undertaken outside the UA by any entity can be counted by a municipality toward meeting a permittee's MS4's TMDL WLA obligations. In prior C-TIP correspondence between DEP and CCWRA (July 15, 2011), DEP set out the following prerequisites that a municipality must demonstrate, to DEP's satisfaction, to count reductions undertaken outside of

the UA toward meeting a permittee's MS4's TMDL WLA obligation: (1) the municipality must demonstrate that it satisfies all applicable legal requirements; (2) any load reductions outside the UA can only be counted if they are consistent with DEP's forthcoming applicable credit, trading and offset policies; (3) the performance of any BMPs must be substantiated to the satisfaction of DEP with appropriate analyses to satisfy the claimed pollutant load reduction; (4) the permittee must establish suitable authority (e.g. ownership and control) over the BMP facilities; (5) the facilities and BMPs cannot also be counted toward meeting some other party's TMDL obligations; and (6) the target pollutant load reductions must be quantifiable at the impaired stream segment that receives stormwater discharges from the municipality's regulated small MS4.

DEP's concurrence in the C-TIP concept is conditioned such that any municipality that seeks credits for pollutant load reductions undertaken outside the UA may do so only if they satisfy all of the above factors to DEP's satisfaction.

7. ***Offsets, Trading and Credits in MS4 TMDL Plans*** – As referenced above, any offset or credit sought by a municipality must be in accordance with DEP's applicable credit, trading and offset policies. As you are aware, DEP currently has an ongoing stakeholder group (in which you are a participant) that is discussing how offsets, trading and credits would be applied in a stormwater context. As such, municipalities that seek to include offsets and/or credits for pollutant load reductions in an MS4 TMDL Plan will need to ensure that such proposals conform with DEP's applicable credit, trading and offset policies as they evolve and are finalized and implemented.

8. ***Adjustment of Allocations After First Permit Cycle*** – The C-TIP proposal provides no explanation of how load reductions will be allocated by a municipality after the first MS4 TMDL permit cycle. DEP's concurrence in the C-TIP approach is conditioned on CCWRA providing language to DEP detailing how such load reductions will be re-allocated after the first MS4 TMDL permit cycle.

In closing, DEP thanks you again for your contributions toward planning, coordinating and implementing a program that has the tremendous potential to improve and protect Pennsylvania's water resources. We look forward to a continuing dialogue as PAG-13 implementation dates approach. If you have any questions about this letter, please contact me by e-mail at rfurlan@pa.gov or by telephone at 717.787.8184.

Sincerely,

Ronald C. Furlan, PE, Division Manager
Division of Planning and Permitting

APPENDIX C

MS4 WORKSHEET FOR CALCULATING ADJUSTED MS4 BASELINE LOADS, ADJUSTED MS4 ALLOCATIONS AND ADJUSTED MS4 LOAD REDUCTIONS

APPENDIX C.1 - MS4 WORKSHEET FOR CALCULATING ADJUSTED MS4 BASELINE LOADS, ADJUSTED MS4 ALLOCATIONS AND ADJUSTED MS4 LOAD REDUCTIONS - LAND USE AREA METHOD

MUNICIPALITY NAME: *London Grove Township* **CHESTER COUNTY, PA**

DATE OF TMDL PLAN SUBMISSION:

	LIST APPLICABLE TMDL WATERSHED(S):	LIST ONLY THE TMDL SUBBASINS WITHIN EACH TMDL WATERSHED:
1)	*White Clay Creek*	*W02, W03, W04, W06, W08*
2)		

FOR ALL LISTED TMDL SUBBASINS FILL IN SECTIONS 1, 2 and 4 WITH THE VALUES REFERENCED FROM THE APPLICABLE TMDL REPORT
ALL OTHER VALUES ARE CALCULATED AS DESCRIBED. CALCULATIONS MUST BE APPLIED TO ALL NEW ROWS ADDED.

1 LAND USE AREAS (ACRES):

Copied from Tables C-1. -C-4. in Appendix C of TMDL Report; Total (Watershed) is the sum of all acres for all land uses in each TMDL Watershed

TMDL subbasin	Residential	Agriculture	OpenLand	Forest	Water	Urban	MS4 Total	Total (Watershed)
W02	468.12	1618.92	19.51	507.13	19.51	19.51	2652.70	
W03	195.05	253.57	0.00	195.05	0.00	19.51	663.18	
W04	312.08	2145.56	19.51	916.74	19.51	136.54	3549.94	10786.36
W06	39.01	1891.99	0.00	351.09	0.00	39.01	2321.10	
W08	214.58	624.16	39.01	702.18	0.00	19.51	1599.44	

2 TMDL STORM SEWERSHED AREAS (ACRES):

To be calculated by Municipality and inserted below

The following method, as described in Subsection VII.B, was used to assign these TMDL Storm Sewershed areas:

Urbanized Area as TMDL Storm Sewershed area (with land use distributions)

TMDL subbasin	Residential	Agriculture	OpenLand	Forest	Water	Urban	MS4 Total	Total (Watershed)
W02	125.51	39.80	7.33	2.05	0.00	12.21	186.90	
W03	99.59	28.81	0.14	3.02	0.00	0.01	131.57	
W04	36.70	5.94	0.03	0.88	0.00	8.08	51.63	626.44
W06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
W08	214.58	17.38	14.43	9.95	0.00	0.00	256.34	

3 LAND USE ADJUSTMENT RATIOS:

Divide the TMDL Storm Sewershed area for each land use from Section 2 by the corresponding land use area from Section 1

TMDL subbasin	Residential	Agriculture	OpenLand	Forest	Water	Urban	MS4 Total	Total (Watershed)
W02	0.27	0.02	0.38	0.00	0.00	0.63	0.07	
W03	0.51	0.11	0.00	0.02	0.00	0.00	0.20	
W04	0.12	0.00	0.00	0.00	0.00	0.06	0.01	0.06
W06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
W08	1.00	0.03	0.37	0.01	0.00	0.00	0.16	

4 MS4 BASELINE LOADS AND MS4 ALLOCATIONS:

Total nitrogen MS4 baseline loads (kg/day): Copied from TMDL Report Appendix C, Table(s): *Table C-9a*

TMDL Subbasin	Residential	Agriculture	OpenLand	Forest	Water	Urban	Subtotal	Total (Watershed)
W02	10.28	35.58	0.43	11.14	0.43	0.43	58.29	
W03	4.19	5.45	0.00	4.19	0.00	0.42	14.25	
W04	6.55	45.04	0.41	19.24	0.41	2.87	74.52	262.80
W06	1.20	58.19	0.00	10.80	0.00	1.20	71.39	
W08	5.82	17.91	1.06	19.03	0.00	0.53	44.35	

Total nitrogen MS4 allocations (kg/day): Copied from TMDL Report Appendix C, Table(s): *Table C-9b*

TMDL Subbasin	Residential	Agriculture	OpenLand	Forest	Water	Urban	Subtotal	Total (Watershed)
W02	4.63	16.00	0.19	5.01	0.19	0.19	26.21	
W03	2.09	2.72	0.00	2.09	0.00	0.21	7.11	
W04	3.28	22.52	0.20	9.62	0.20	1.43	37.25	128.43
W06	0.60	29.09	0.00	5.40	0.00	0.60	35.69	
W08	2.91	8.95	0.53	9.52	0.00	0.26	22.17	

APPENDIX C.1 - MS4 WORKSHEET FOR CALCULATING ADJUSTED MS4 BASELINE LOADS, ADJUSTED MS4 ALLOCATIONS AND ADJUSTED MS4 LOAD REDUCTIONS - LAND USE AREA METHOD

MUNICIPALITY NAME: *London Grove Township* **CHESTER COUNTY, PA**

DATE OF TMDL PLAN SUBMISSION:

	LIST APPLICABLE TMDL WATERSHED(S):	LIST ONLY THE TMDL SUBBASINS WITHIN EACH TMDL WATERSHED:
1)	*White Clay Creek*	*W02, W03, W04, W06, W08*
2)		

FOR ALL LISTED TMDL SUBBASINS FILL IN SECTIONS 1, 2 and 4 WITH THE VALUES REFERENCED FROM THE APPLICABLE TMDL REPORT
ALL OTHER VALUES ARE CALCULATED AS DESCRIBED. CALCULATIONS MUST BE APPLIED TO ALL NEW ROWS ADDED.

Total phosphorus MS4 baseline loads (kg/day):	Copied from TMDL Report Appendix C, Table(s):				*Table C-10a*			
TMDL Subbasin	Residential	Agriculture	OpenLand	Forest	Water	Urban	Subtotal	Total (Watershed)
W02	0.109	0.377	0.005	0.118	0.005	0.005	0.619	
W03	0.803	1.044	0.000	0.803	0.000	0.080	2.730	
W04	0.092	0.632	0.006	0.270	0.006	0.040	1.046	25.876
W06	0.016	0.760	0.000	0.141	0.000	0.016	0.933	
W08	2.695	8.298	0.490	8.820	0.000	0.245	20.548	

Total phosphorus MS4 allocations (kg/day):	Copied from TMDL Report Appendix C, Table(s):				*Table C-10b*			
TMDL Subbasin	Residential	Agriculture	OpenLand	Forest	Water	Urban	Subtotal	Total (Watershed)
W02	0.049	0.170	0.002	0.053	0.002	0.002	0.278	
W03	0.362	0.470	0.000	0.362	0.000	0.036	1.230	
W04	0.041	0.285	0.003	0.122	0.003	0.018	0.472	7.967
W06	0.004	0.190	0.000	0.035	0.000	0.004	0.233	
W08	0.755	2.323	0.137	2.470	0.000	0.069	5.754	

Sediment baseline MS4 loads (tons/year):	Copied from TMDL Report Appendix C, Table(s):				*Table C-7b*			
TMDL Subbasin	Residential	Agricultural	Open	Forested	Wetland	Urban	Subtotal	Total (Watershed)
W02	154.41	3203.99	6.43	33.46	0.01	6.43	3404.73	
W03	64.34	501.83	0.00	12.87	0.00	6.43	585.47	
W04	102.94	4246.25	6.43	60.48	0.01	45.04	4461.15	13616.33
W06	12.87	3744.42	0.00	23.16	0.00	12.87	3793.32	
W08	70.77	1235.27	12.87	46.32	0.00	6.43	1371.66	

Sediment MS4 WLAs (tons/year):	Copied from TMDL Report Appendix C, Table(s):				*Table C-7a*			
TMDL Subbasin	Residential	Agricultural	Open	Forested	Wetland	Urban	Subtotal	Total (Watershed)
W02	54.92	1117.97	2.29	33.46	0.01	2.29	1210.94	
W03	22.88	170.19	0.00	12.87	0.00	2.29	208.23	
W04	36.61	1471.25	2.29	60.48	0.01	16.02	1586.66	4842.82
W06	4.58	1316.82	0.00	23.16	0.00	4.58	1349.14	
W08	25.17	409.49	4.58	46.32	0.00	2.29	487.85	

5 ADJUSTED MS4 BASELINE LOADS AND MS4 ALLOCATIONS

Adjusted nitrogen MS4 baseline loads (kg/day):	Multiply the MS4 Baseline Loads from section 4 by the corresponding Land Use Adjustment Ratio from section 3							
TMDL Subbasin	Residential	Agriculture	OpenLand	Forest	Water	Urban	Subtotal	Total (Watershed)
W02	2.76	0.87	0.16	0.05	0.00	0.27	4.11	
W03	2.14	0.62	0.00	0.06	0.00	0.00	2.82	
W04	0.77	0.12	0.00	0.02	0.00	0.17	1.08	14.99
W06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
W08	5.82	0.50	0.39	0.27	0.00	0.00	6.98	

Adjusted nitrogen MS4 allocations (kg/day):	Multiply the MS4 Allocations (WLA) from section 4 by the corresponding Land Use Adjustment Ratio from section 3							
TMDL Subbasin	Residential	Agriculture	OpenLand	Forest	Water	Urban	Subtotal	Total (Watershed)
W02	1.24	0.39	0.07	0.02	0.00	0.12	1.85	
W03	1.07	0.31	0.00	0.03	0.00	0.00	1.41	
W04	0.39	0.06	0.00	0.01	0.00	0.08	0.54	7.29
W06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
W08	2.91	0.25	0.20	0.13	0.00	0.00	3.49	

APPENDIX C.1 - MS4 WORKSHEET FOR CALCULATING ADJUSTED MS4 BASELINE LOADS, ADJUSTED MS4 ALLOCATIONS AND ADJUSTED MS4 LOAD REDUCTIONS - LAND USE AREA METHOD

MUNICIPALITY NAME: *London Grove Township* CHESTER COUNTY, PA

DATE OF TMDL PLAN SUBMISSION:

	LIST APPLICABLE TMDL WATERSHED(S):	LIST ONLY THE TMDL SUBBASINS WITHIN EACH TMDL WATERSHED:
1)	*White Clay Creek*	*W02, W03, W04, W06, W08*
2)		

FOR ALL LISTED TMDL SUBBASINS FILL IN SECTIONS 1, 2 and 4 WITH THE VALUES REFERENCED FROM THE APPLICABLE TMDL REPORT
ALL OTHER VALUES ARE CALCULATED AS DESCRIBED. CALCULATIONS MUST BE APPLIED TO ALL NEW ROWS ADDED.

Adjusted phosphorus MS4 baseline loads (kg/day): TMDL Subbasin	Multiply the MS4 Baseline Loads from section 4 by the corresponding Land Use Adjustment Ratio from section 3 Residential	Agriculture	OpenLand	Forest	Water	Urban	Subtotal	Total (Watershed)
W02	0.03	0.01	0.00	0.00	0.00	0.00	0.04	
W03	0.41	0.12	0.00	0.01	0.00	0.00	0.54	
W04	0.01	0.00	0.00	0.00	0.00	0.00	0.02	3.83
W06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
W08	2.70	0.23	0.18	0.12	0.00	0.00	3.23	

Adjusted phosphorus MS4 allocations (kg/day): TMDL Subbasin	Multiply the MS4 Allocations (WLA) from section 4 by the corresponding Land Use Adjustment Ratio from section 3 Residential	Agriculture	OpenLand	Forest	Water	Urban	Subtotal	Total (Watershed)
W02	0.01	0.00	0.00	0.00	0.00	0.00	0.02	
W03	0.18	0.05	0.00	0.01	0.00	0.00	0.24	
W04	0.00	0.00	0.00	0.00	0.00	0.00	0.01	1.18
W06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
W08	0.76	0.06	0.05	0.04	0.00	0.00	0.91	

Adjusted Sediment baseline MS4 loads (tons/year): TMDL Subbasin	Multiply the MS4 Baseline Loads from section 4 by the corresponding Land Use Adjustment Ratio from section 3 Residential	Agricultural	Open	Forested	Wetland	Urban	Sub-Total	Total (Watershed)
W02	41.40	78.77	2.42	0.14	0.00	4.02	126.74	
W03	32.85	57.02	0.00	0.20	0.00	0.00	90.07	
W04	12.11	11.76	0.01	0.06	0.00	2.67	26.59	353.99
W06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
W08	70.77	34.40	4.76	0.66	0.00	0.00	110.58	

Adjusted Sediment MS4 WLAs (tons/year): TMDL Subbasin	Multiply the MS4 Allocations (WLA) from section 4 by the corresponding Land Use Adjustment Ratio from section 3 Residential	Agricultural	Open	Forested	Wetland	Urban	Sub-Total	Total (Watershed)
W02	14.72	27.48	0.86	0.14	0.00	1.43	44.64	
W03	11.68	19.34	0.00	0.20	0.00	0.00	31.22	
W04	4.31	4.07	0.00	0.06	0.00	0.95	9.39	124.17
W06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
W08	25.17	11.40	1.69	0.66	0.00	0.00	38.92	

6	MUNICIPAL TMDL SUMMARY (BY WATERSHED)	
	Note: All values are calculated in this section from the Watershed Totals in Appendix C.1, column K	**TMDL Watershed 1**
	NITROGEN - Applicable ☑ Not Applicable ☐	
	Total Nitrogen MS4 baseline Load (kg/day):	262.80
	Total Nitrogen MS4 Allocation (kg/day):	128.43
	Nitrogen Reduction (kg/day):	134.37
	TMDL Percent Reduction:	51.1%
	Adjusted Total Nitrogen MS4 baseline Load (kg/day):	14.99
	Adjusted Total Nitrogen MS4 Allocation (kg/day):	**7.29**
	Adjusted Nitrogen Reduction (kg/day):	**7.71**
	Adjusted Nitrogen Percent Reduction:	**51%**
	New Nitrogen Municipal Load Allocation (kg/day):*	121.14
	PHOSPHORUS - Applicable ☑ Not Applicable ☐	
	Total Phosphorus MS4 baseline Load (kg/day):	25.88
	Total Phosphorus MS4 Allocation (kg/day):	7.97
	Phosphorus Reduction (kg/day):	17.91
	TMDL Percent Reduction:	69.2%
	Adjusted Total Phosphorus MS4 baseline Load (kg/day):	3.83
	Adjusted Total Phosphorus MS4 Allocation (kg/day):	**1.18**
	Adjusted Phosphurus Reduction (kg/day):	**2.66**
	Adjusted Phosphorus Percent Reduction:	**69%**
	New Phosphorus Municipal Load Allocation (kg/day):*	6.79
	SEDIMENT - Applicable ☑ Not Applicable ☐	
	Total Sediment baseline MS4 Load (tons/year):	13616.33
	Total Sediment MS4 Allocation (tons/year):	4842.82
	Sediment Reduction (tons/year):	8773.51
	TMDL Percent Reduction:	64.4%
	Adjusted Total Sediment MS4 baseline Load (tons/year):	353.99
	Adjusted Total Sediment MS4 Allocation (tons/year):	**124.17**
	Adjusted Sediment Reduction (tons/year):	**229.82**
	Adjusted Sediment Percent Reduction:	**65%**
	New Sediment Municipal Load Allocation (tons/year):*	4718.65

* The new Municipal Load Allocations are not addressed by this MS4 TMDL Strategy

APPENDIX D

BMP/CONTROL MEASURE DOCUMENTATION AND CALCULATIONS

London Grove Townshp
TMDL Loading Rates

NITROGEN (kg/day/acre)						
	Residential	Agriculture	OpenLand	Forest	Water	Urban
W02	0.02196	0.02198	0.02204	0.02197	0.02204	0.02204
W03	0.02148	0.02149		0.02148		0.02153
W04	0.02099	0.02099	0.02101	0.02099	0.02101	0.02102
W06	0.03076	0.03076		0.03076		0.03076
W08	0.02712	0.02869	0.02717	0.02710		0.02717
PHOSPHOROUS (kg/day/acre)						
	Residential	Agriculture	OpenLand	Forest	Water	Urban
W02	0.00023	0.00023	0.00026	0.00023	0.00026	0.00026
W03	0.00412	0.00412		0.00412		0.00410
W04	0.00029	0.00029	0.00031	0.00029	0.00031	0.00029
W06	0.00041	0.00040		0.00040		0.00041
W08	0.01256	0.01329	0.01256	0.01256		0.01256
SEDIMENT (Tons/yr/acre)						
	Residential	Agricultural	Open	Forested	Water	Urban
W02	0.32985	1.97909	0.32957	0.06598	0.00051	0.32957
W03	0.32986	1.97906		0.06598		0.32957
W04	0.32985	1.97909	0.32957	0.06597	0.00051	0.32987
W06	0.32992	1.97909		0.06597		0.32992
W08	0.32981	1.97909	0.32992	0.06597		0.32957

Previously Installed BMP
Load Reduction

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Polluntant Removal Calculations
Previously Installed (2003-2012)

BMP ID	Sediment tn/yr)	Nitrogen (kg/day)	Phosphorus (kg/day)
1 - Goddard Park	3.22	0.027	0.0003
2 - Goddard Park	1.85	0.363	0.0065
3 - LGT Rain Garden	0.06	0.002	0.0021
4 - LGT Rain Garden	0.07	0.002	0.0027
5 - SECCRA Riparian Buffer	0.77	0.004	0.0052
6 - Hills of Sullivan	0.02	0.007	0.0031
7 - Hills of Sullivan	0.03	0.007	0.0053
Total Pollutant Removed	6.01	0.411	0.0252

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Pollutant Removal Calculations

Identification		Ownership	
BMP ID	1 - Goddard Park (1)	Public	Yes
Status	2011	Private	
Location		Public Lease/ROW	
TMDL Watershed	W02	**BMP Type**	
Latitude	Varies	Constructed Wetlands	
Longitude	Varies	Infiltration Basin	
BMP Category		Reforestation	Yes
Structural		Street Sweeping	
Non-structural	Yes	Water Quality Inlets	
		Wet Pond	
		Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	
Agricultural Drainage Area (ac)	2.50
Open Land Drainage Area (ac)	
Forest Drainage Area (ac)	
Water Drainage Area (ac)	
Urban Drainage Area (ac)	

Pollutant Loading Rates By Land Use			
Residential Pollutant Loading Rates		**Agricultural Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32985	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.00023	P (kg/ac/day)	0.00023
NO3 (kg/ac/day)	0.02196	NO3 (kg/ac/day)	0.02198
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32957	Sediment (tn/ac/yr)	0.06598
P (kg/ac/day)	0.00026	P (kg/ac/day)	0.00023
NO3 (kg/ac/day)	0.02204	NO3 (kg/ac/day)	0.02197
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.00051	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0.00026	P (kg/ac/day)	0.00026
NO3 (kg/ac/day)	0.02204	NO3 (kg/ac/day)	0.02204

Pollutant Loads By Land Use			
Residential Pollutant Loads		**Agricultural Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	4.95
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0550
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000

Total Pollutant Loads	
Sediment (tn/yr)	4.95
P (kg/day)	0.0006
NO3 (kg/day)	0.0550

Pollutant Load Load Reduction			
BMP Removal Rates (%)		**Pollutant Loads Removed**	
Sediment	65.00%	Sediment (tn/yr)	3.22
P	50.00%	P (kg/day)	0.0003
NO3	50.00%	NO3 (kg/day)	0.0275

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Pollutant Removal Calculations

Identification			Ownership	
BMP ID	2 - Goddard Park (2)		Public	Yes
Status	2011		Private	
Location			Public Lease/ROW	
TMDL Watershed	W02		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	
Structural			Street Sweeping	
Non-structural	Yes		Water Quality Inlets	
			Rain Garden	
			Other-Inv. Spec. Removal	Yes

BMP Watershed Land Use	
Residential Drainage Areas (ac)	
Agricultural Drainage Area (ac)	
Open Land Drainage Area (ac)	
Forest Drainage Area (ac)	33.00
Water Drainage Area (ac)	
Urban Drainage Area (ac)	

Pollutant Loading Rates By Land Use			
Residential Pollutant Loading Rates		**Agricultural Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32985	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.00023	P (kg/ac/day)	0.00023
NO3 (kg/ac/day)	0.02196	NO3 (kg/ac/day)	0.02198
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32957	Sediment (tn/ac/yr)	0.06598
P (kg/ac/day)	0.00026	P (kg/ac/day)	0.00023
NO3 (kg/ac/day)	0.02204	NO3 (kg/ac/day)	0.02197
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.00051	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0.00026	P (kg/ac/day)	0.00026
NO3 (kg/ac/day)	0.02204	NO3 (kg/ac/day)	0.02204

Pollutant Loads By Land Use			
Residential Pollutant Loads		**Agricultural Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	2.18
P (kg/ac/day)	0.00	P (kg/ac/day)	0.01
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.7250
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000

Total Pollutant Loads	
Sediment (tn/yr)	2.18
P (kg/day)	0.01
NO3 (kg/day)	0.7250

Pollutant Load Load Reduction			
BMP Removal Rates (%)		**Pollutant Loads Removed**	
Sediment	85.00%	Sediment (tn/yr)	1.85
P	85.00%	P (kg/day)	0.0065
NO3	50.00%	NO3 (kg/day)	0.3625

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Pollutant Removal Calculations

Identification			Ownership	
BMP ID	3 - Rain Garden (3)		Public	Yes
Status	2011		Private	
Location			Public Lease/ROW	
TMDL Watershed	W08		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	
Structural			Street Sweeping	
Non-structural	Yes		Water Quality Inlets	
			Rain Garden	Yes
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	
Agricultural Drainage Area (ac)	
Open Land Drainage Area (ac)	
Forest Drainage Area (ac)	
Water Drainage Area (ac)	
Urban Drainage Area (ac)*	0.20

Pollutant Loading Rates By Land Use			
Residential Pollutant Loading Rates		**Agricultural Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32981	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01329
NO3 (kg/ac/day)	0.02712	NO3 (kg/ac/day)	0.02869
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32992	Sediment (tn/ac/yr)	0.06597
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0.02717	NO3 (kg/ac/day)	0.0271
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0	NO3 (kg/ac/day)	0.02717

Pollutant Loads By Land Use			
Residential Pollutant Loads		**Agricultural Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.07
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0054

Total Pollutant Loads	
Sediment (tn/yr)	0.07
P (kg/day)	0.00
NO3 (kg/day)	0.0054

Pollutant Load Load Reduction			
BMP Removal Rates (%)		**Pollutant Loads Removed**	
Sediment	85.00%	Sediment (tn/yr)	0.06
P	85.00%	P (kg/day)	0.0021
NO3	30.00%	NO3 (kg/day)	0.0016

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Pollutant Removal Calculations

Identification			Ownership	
BMP ID	4 - LGT Rain Garden (4)		Public	Yes
Status	2011		Private	
Location			Public Lease/ROW	
TMDL Watershed	W08		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	
Structural			Street Sweeping	
Non-structural	Yes		Water Quality Inlets	
			Rain Garden	Yes
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	
Agricultural Drainage Area (ac)	
Open Land Drainage Area (ac)	
Forest Drainage Area (ac)	
Water Drainage Area (ac)	
Urban Drainage Area (ac)*	0.25

Pollutant Loading Rates By Land Use			
Residential Pollutant Loading Rates		**Agricultural Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32981	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01329
NO3 (kg/ac/day)	0.02712	NO3 (kg/ac/day)	0.02869
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32992	Sediment (tn/ac/yr)	0.06597
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0.02717	NO3 (kg/ac/day)	0.0271
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0	NO3 (kg/ac/day)	0.02717

Pollutant Loads By Land Use			
Residential Pollutant Loads		**Agricultural Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.08
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0068

Total Pollutant Loads	
Sediment (tn/yr)	0.08
P (kg/day)	0.00
NO3 (kg/day)	0.0068

Pollutant Load Load Reduction			
BMP Removal Rates (%)		**Pollutant Loads Removed**	
Sediment	85.00%	Sediment (tn/yr)	0.07
P	85.00%	P (kg/day)	0.0027
NO3	30.00%	NO3 (kg/day)	0.0020

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Pollutant Removal Calculations

Identification			Ownership	
BMP ID	5 - SECCRA Riparian Buffer (4)		Public	Yes
Status	2011		Private	
Location			Public Lease/ROW	
TMDL Watershed	W04		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	Yes
Structural			Street Sweeping	
Non-structural	Yes		Water Quality Inlets	
			Rain Garden	
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	
Agricultural Drainage Area (ac)	0.46
Open Land Drainage Area (ac)	
Forest Drainage Area (ac)	
Water Drainage Area (ac)	
Urban Drainage Area (ac)*	

Pollutant Loading Rates By Land Use			
Residential Pollutant Loading Rates		**Agricultural Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32981	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01329
NO3 (kg/ac/day)	0.02712	NO3 (kg/ac/day)	0.02869
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32992	Sediment (tn/ac/yr)	0.06597
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0.02717	NO3 (kg/ac/day)	0.0271
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0	NO3 (kg/ac/day)	0.02717

Pollutant Loads By Land Use			
Residential Pollutant Loads		**Agricultural Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.91
P (kg/ac/day)	0.00	P (kg/ac/day)	0.01
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0132
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000

Total Pollutant Loads	
Sediment (tn/yr)	0.91
P (kg/day)	0.01
NO3 (kg/day)	0.0132

Pollutant Load Load Reduction			
BMP Removal Rates (%)		**Pollutant Loads Removed**	
Sediment	85.00%	Sediment (tn/yr)	0.77
P	85.00%	P (kg/day)	0.0052
NO3	30.00%	NO3 (kg/day)	0.0040

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Pollutant Removal Calculations

Identification			Ownership	
BMP ID	6 - Hill of Sullivan (6)		Public	Yes
Status	2010		Private	
Location			Public Lease/ROW	
TMDL Watershed	W08		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	Yes
Structural			Street Sweeping	
Non-structural	Yes		Water Quality Inlets	
			Wet Pond	
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	
Agricultural Drainage Area (ac)	
Open Land Drainage Area (ac)	
Forest Drainage Area (ac)	0.50
Water Drainage Area (ac)	
Urban Drainage Area (ac)*	

Pollutant Loading Rates By Land Use			
Residential Pollutant Loading Rates		**Agricultural Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32981	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01329
NO3 (kg/ac/day)	0.02712	NO3 (kg/ac/day)	0.02869
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32992	Sediment (tn/ac/yr)	0.06597
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0.02717	NO3 (kg/ac/day)	0.0271
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0	NO3 (kg/ac/day)	0.02717

Pollutant Loads By Land Use			
Residential Pollutant Loads		**Agricultural Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.03
P (kg/ac/day)	0.00	P (kg/ac/day)	0.01
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0136
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000

Total Pollutant Loads	
Sediment (tn/yr)	0.03
P (kg/day)	0.01
NO3 (kg/day)	0.0136

Pollutant Load Load Reduction			
BMP Removal Rates (%)		**Pollutant Loads Removed**	
Sediment	65.00%	Sediment (tn/yr)	0.02
P	50.00%	P (kg/day)	0.0031
NO3	50.00%	NO3 (kg/day)	0.0068

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Pollutant Removal Calculations

Identification			Ownership	
BMP ID	7 - Hills of Sullivan (7)		Public	Yes
Status	2011		Private	
Location			Public Lease/ROW	
TMDL Watershed	W08		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	Yes
Structural			Street Sweeping	
Non-structural	Yes		Water Quality Inlets	
			Wet Pond	
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	
Agricultural Drainage Area (ac)	
Open Land Drainage Area (ac)	
Forest Drainage Area (ac)	0.50
Water Drainage Area (ac)	
Urban Drainage Area (ac)*	

Pollutant Loading Rates By Land Use

Residential Pollutant Loading Rates		Agricultural Pollutant Loading Rates	
Sediment (tn/ac/yr)	0.32981	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01329
NO3 (kg/ac/day)	0.02712	NO3 (kg/ac/day)	0.02869
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32992	Sediment (tn/ac/yr)	0.06597
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0.02717	NO3 (kg/ac/day)	0.0271
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0	NO3 (kg/ac/day)	0.02717

Pollutant Loads By Land Use

Residential Pollutant Loads		Agricultural Pollutant Loads	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.03
P (kg/ac/day)	0.00	P (kg/ac/day)	0.01
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0136
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000

Total Pollutant Loads	
Sediment (tn/yr)	0.033
P (kg/day)	0.006
NO3 (kg/day)	0.0136

Pollutant Load Load Reduction

BMP Removal Rates (%)		Pollutant Loads Removed	
Sediment	85.00%	Sediment (tn/yr)	0.03
P	85.00%	P (kg/day)	0.0053
NO3	50.00%	NO3 (kg/day)	0.0068

Candidate (Future) BMP Load Reduction

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Polluntant Removal Calculations
First Permit Cycle (2013-2018)

BMP ID	Sediment tn/yr)	Nitrogen (kg/day)	Phosphorus (kg/day)
1 - SECCRA Riparian Buffer	1.68	0.014	0.0113
2 - SECCRA Riparian Buffer	1.68	0.014	0.0113
3 - SECCRA Riparian Buffer	1.68	0.014	0.0113
4 - SECCRA Riparian Buffer	1.68	0.014	0.0113
5 - SECCRA Riparian Buffer	1.68	0.014	0.0113
Total Pollutant Removed	8.41	0.072	0.0565

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Pollutant Removal Calculations

Identification			Ownership	
BMP ID	1 - SECCRA Riparian Buffer (1)		Public	Yes
Status	2012		Private	
Location			Public Lease/ROW	
TMDL Watershed	W04		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	Yes
Structural			Street Sweeping	
Non-structural	Yes		Water Quality Inlets	
			Wet Pond	
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	
Agricultural Drainage Area (ac)	1.00
Open Land Drainage Area (ac)	
Forest Drainage Area (ac)	
Water Drainage Area (ac)	
Urban Drainage Area (ac)*	

Pollutant Loading Rates By Land Use

Residential Pollutant Loading Rates		Agricultural Pollutant Loading Rates	
Sediment (tn/ac/yr)	0.32981	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01329
NO3 (kg/ac/day)	0.02712	NO3 (kg/ac/day)	0.02869
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32992	Sediment (tn/ac/yr)	0.06597
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0.02717	NO3 (kg/ac/day)	0.0271
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0	NO3 (kg/ac/day)	0.02717

Pollutant Loads By Land Use

Residential Pollutant Loads		Agricultural Pollutant Loads	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	1.98
P (kg/ac/day)	0.00	P (kg/ac/day)	0.01
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0287
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000

Total Pollutant Loads	
Sediment (tn/yr)	1.98
P (kg/day)	0.01
NO3 (kg/day)	0.0287

Pollutant Load Load Reduction

BMP Removal Rates (%)		Pollutant Loads Removed	
Sediment	85.00%	Sediment (tn/yr)	1.68
P	85.00%	P (kg/day)	0.0113
NO3	50.00%	NO3 (kg/day)	0.0143

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Pollutant Removal Calculations

Identification			Ownership	
BMP ID	2 - SECCRA Riparian Buffer (2)		Public	Yes
Status	2013		Private	
Location			Public Lease/ROW	
TMDL Watershed	W04		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	
Structural			Street Sweeping	Yes
Non-structural	Yes		Water Quality Inlets	
			Wet Pond	
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	
Agricultural Drainage Area (ac)	1.00
Open Land Drainage Area (ac)	
Forest Drainage Area (ac)	
Water Drainage Area (ac)	
Urban Drainage Area (ac)*	

Pollutant Loading Rates By Land Use

Residential Pollutant Loading Rates		Agricultural Pollutant Loading Rates	
Sediment (tn/ac/yr)	0.32981	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01329
NO3 (kg/ac/day)	0.02712	NO3 (kg/ac/day)	0.02869
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32992	Sediment (tn/ac/yr)	0.06597
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0.02717	NO3 (kg/ac/day)	0.0271
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0	NO3 (kg/ac/day)	0.02717

Pollutant Loads By Land Use

Residential Pollutant Loads		Agricultural Pollutant Loads	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	1.98
P (kg/ac/day)	0.00	P (kg/ac/day)	0.01
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0287
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.0000
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000

Total Pollutant Loads	
Sediment (tn/yr)	1.98
P (kg/day)	0.01
NO3 (kg/day)	0.0287

Pollutant Load Load Reduction

BMP Removal Rates (%)		Pollutant Loads Removed	
Sediment	85.00%	Sediment (tn/yr)	1.68
P	85.00%	P (kg/day)	0.0113
NO3	50.00%	NO3 (kg/day)	0.0143

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Pollutant Removal Calculations

Identification			Ownership	
BMP ID	3 - SECCRA Ripaian Buffer (3)		Public	Yes
Status	2014		Private	
Location			Public Lease/ROW	
TMDL Watershed	W04		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	
Structural			Street Sweeping	Yes
Non-structural	Yes		Water Quality Inlets	
			Wet Pond	
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	
Agricultural Drainage Area (ac)	1.00
Open Land Drainage Area (ac)	
Forest Drainage Area (ac)	
Water Drainage Area (ac)	
Urban Drainage Area (ac)*	

Pollutant Loading Rates By Land Use

Residential Pollutant Loading Rates		Agricultural Pollutant Loading Rates	
Sediment (tn/ac/yr)	0.32981	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01329
NO3 (kg/ac/day)	0.02712	NO3 (kg/ac/day)	0.02869
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32992	Sediment (tn/ac/yr)	0.06597
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0.02717	NO3 (kg/ac/day)	0.0271
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0	NO3 (kg/ac/day)	0.02717

Pollutant Loads By Land Use

Residential Pollutant Loads		Agricultural Pollutant Loads	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	1.98
P (kg/ac/day)	0.00	P (kg/ac/day)	0.01
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0287
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000

Total Pollutant Loads	
Sediment (tn/yr)	1.98
P (kg/day)	0.01
NO3 (kg/day)	0.0287

Pollutant Load Load Reduction

BMP Removal Rates (%)		Pollutant Loads Removed	
Sediment	85.00%	Sediment (tn/yr)	1.68
P	85.00%	P (kg/day)	0.01
NO3	50.00%	NO3 (kg/day)	0.0143

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Pollutant Removal Calculations

Identification			Ownership	
BMP ID	4 - SECCRA Riparian Buffer		Public	Yes
Status	2015		Private	
Location			Public Lease/ROW	
TMDL Watershed	W04		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	
Structural			Street Sweeping	Yes
Non-structural	Yes		Water Quality Inlets	
			Wet Pond	
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	
Agricultural Drainage Area (ac)	1.00
Open Land Drainage Area (ac)	
Forest Drainage Area (ac)	
Water Drainage Area (ac)	
Urban Drainage Area (ac)*	

Pollutant Loading Rates By Land Use			
Residential Pollutant Loading Rates		**Agricultural Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32981	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01329
NO3 (kg/ac/day)	0.02712	NO3 (kg/ac/day)	0.02869
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32992	Sediment (tn/ac/yr)	0.06597
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0.02717	NO3 (kg/ac/day)	0.0271
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0	NO3 (kg/ac/day)	0.02717

Pollutant Loads By Land Use			
Residential Pollutant Loads		**Agricultural Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	1.98
P (kg/ac/day)	0.00	P (kg/ac/day)	0.01
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0287
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000

Total Pollutant Loads	
Sediment (tn/yr)	1.98
P (kg/day)	0.01
NO3 (kg/day)	0.0287

Pollutant Load Load Reduction			
BMP Removal Rates (%)		**Pollutant Loads Removed**	
Sediment	85.00%	Sediment (tn/yr)	1.68
P	85.00%	P (kg/day)	0.01
NO3	50.00%	NO3 (kg/day)	0.0143

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
BMP Pollutant Removal Calculations

Identification			Ownership	
BMP ID	5 - SECCRA Riparian Buffer		Public	Yes
Status	2016		Private	
Location			Public Lease/ROW	
TMDL Watershed	W04		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	
Structural			Street Sweeping	Yes
Non-structural	Yes		Water Quality Inlets	
			Wet Pond	
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	
Agricultural Drainage Area (ac)	1.00
Open Land Drainage Area (ac)	
Forest Drainage Area (ac)	
Water Drainage Area (ac)	
Urban Drainage Area (ac)*	

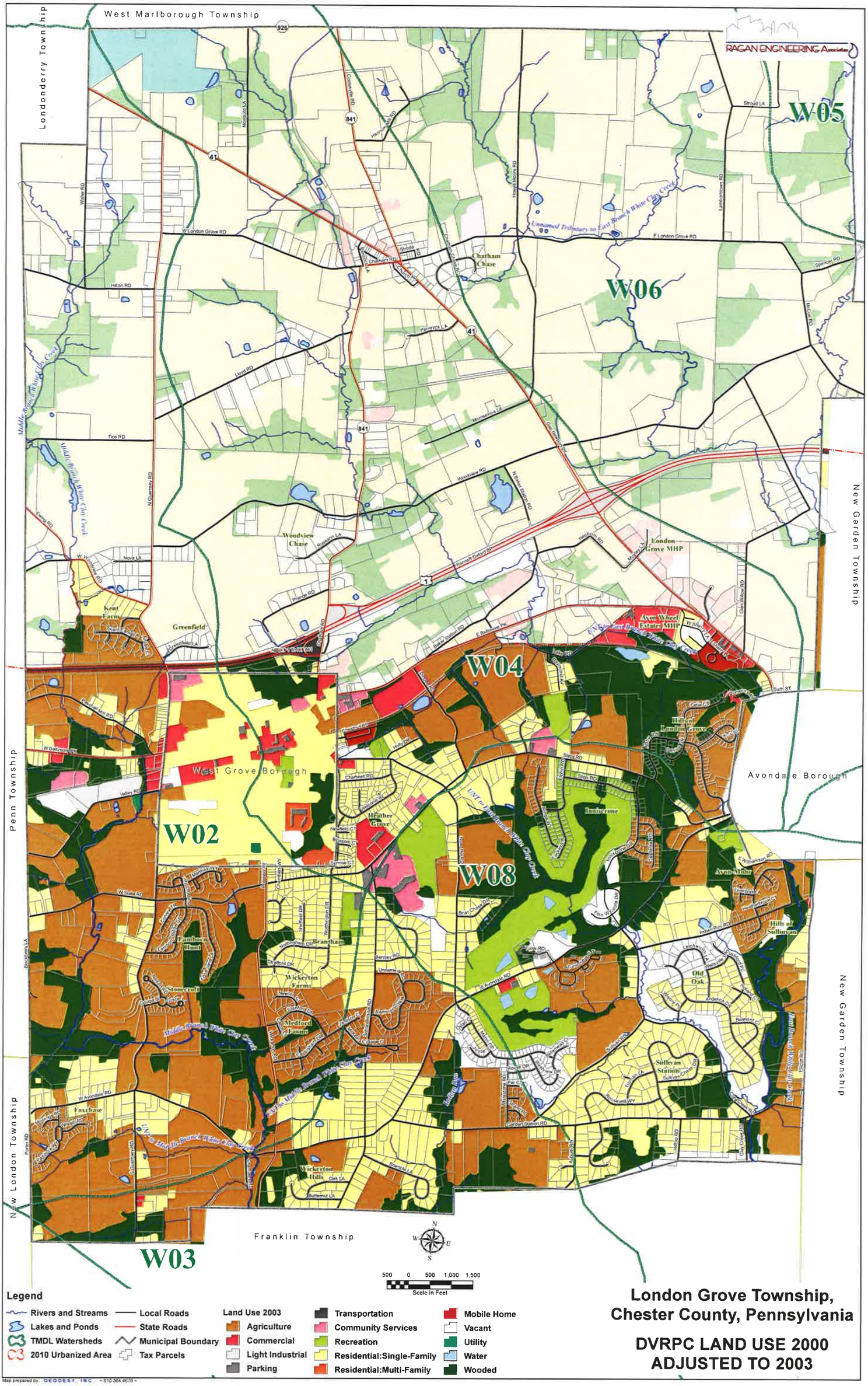
Pollutant Loading Rates By Land Use			
Residential Pollutant Loading Rates		**Agricultural Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32981	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01329
NO3 (kg/ac/day)	0.02712	NO3 (kg/ac/day)	0.02869
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32992	Sediment (tn/ac/yr)	0.06597
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0.02717	NO3 (kg/ac/day)	0.0271
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0	NO3 (kg/ac/day)	0.02717

Pollutant Loads By Land Use			
Residential Pollutant Loads		**Agricultural Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	1.98
P (kg/ac/day)	0.00	P (kg/ac/day)	0.01
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0287
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000

Total Pollutant Loads	
Sediment (tn/yr)	1.98
P (kg/day)	0.01
NO3 (kg/day)	0.0287

Pollutant Load Load Reduction			
BMP Removal Rates (%)		**Pollutant Loads Removed**	
Sediment	85.00%	Sediment (tn/yr)	1.68
P	85.00%	P (kg/day)	0.01
NO3	50.00%	NO3 (kg/day)	0.0143

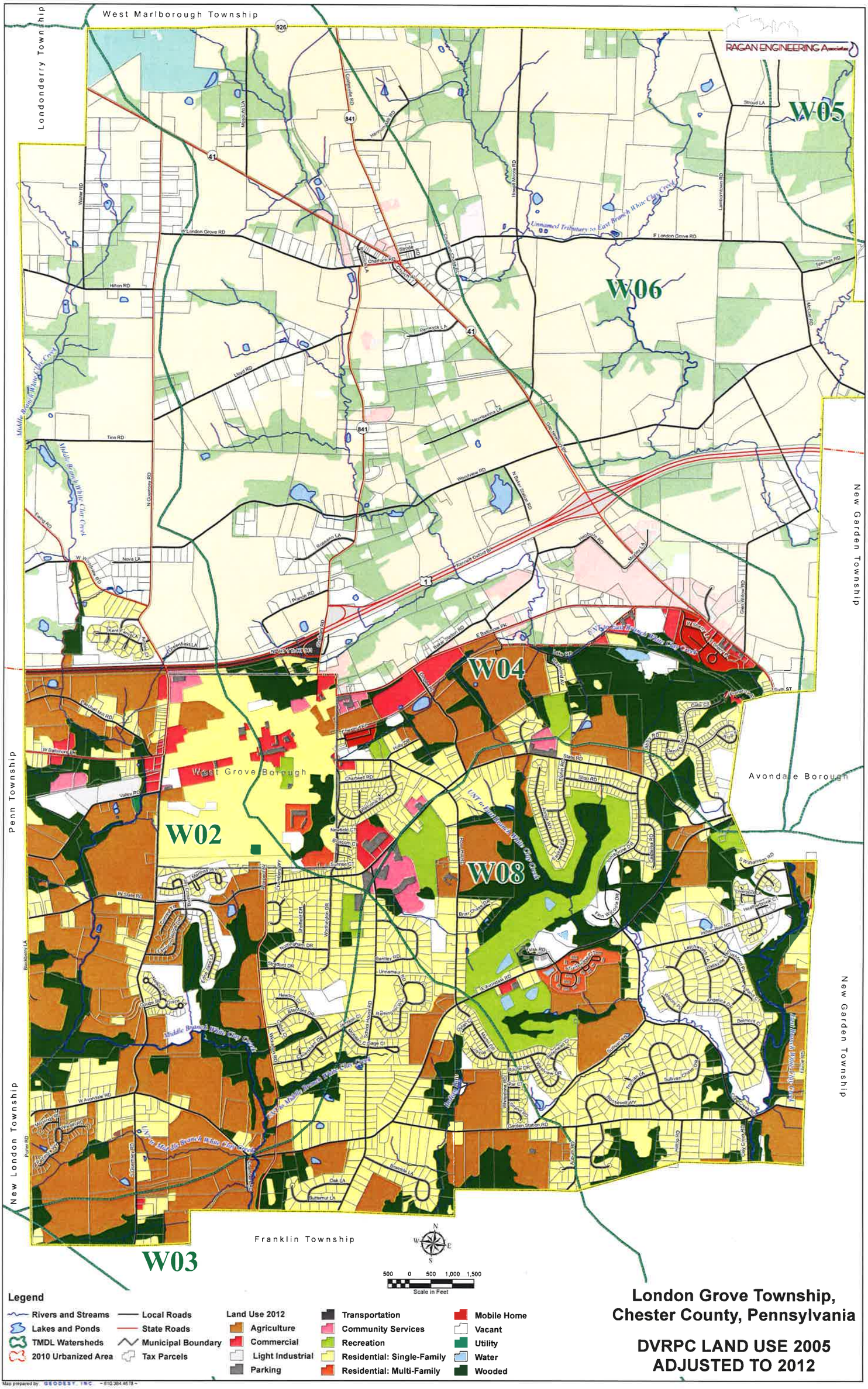
Pollutant Load Adjustment
Based on Development
Between 2003 and 2012



London Grove Township, Chester County, Pennsylvania

DVRPC LAND USE 2000 ADJUSTED TO 2003

Map prepared by: GEODEST, INC. ~ 610.384.4678 ~


West Marlborough Township
Londonderry Township
RAGAN ENGINEERING Associates
W05
W06
W04
W02
W08
W03
West Grove Borough
Avondale Borough
Penn Township
New London Township
New Garden Township
New Garden Township
Franklin Township
Middle Branch White Clay Creek
Unnamed Tributary to East Branch White Clay Creek
UNT to East Branch White Clay Creek
N
S
E
W
500 0 500 1,000 1,500
Scale in Feet
Legend
Rivers and Streams
Lakes and Ponds
TMDL Watersheds
2010 Urbanized Area
Local Roads
State Roads
Municipal Boundary
Tax Parcels
Land Use 2012
Agriculture
Commercial
Light Industrial
Parking
Transportation
Community Services
Recreation
Residential: Single-Family
Residential: Multi-Family
Mobile Home
Vacant
Utility
Water
Wooded
London Grove Township,
Chester County, Pennsylvania
DVRPC LAND USE 2005
ADJUSTED TO 2012
Map prepared by: GEODESY, INC. ~ 610.384.4678 ~

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
Land Use Adjusted for Development Calculations (2003 - 2012*)

BMP ID	Residential (ac)	Agricultural (ac)	Open Land (ac)	Forest (ac)	Water (ac)	Urban (ac)
LU Change W02	129.60	-221.00	93.40	-3.44	0.00	1.63
LU change W03	109.34	-88.60	-20.10	-0.20	0.00	0.00
LU Change W04	64.30	-71.10	31.20	53.07	0.00	-5.28
LU Change W08	210.66	-105.00	-62.76	-43.09	-0.13	-0.99
Total Land Use Change	513.9	-485.700	41.7400	6.3400	-0.1300	-4.6400

*DVRPC Land Cover for 2000 (adjusted to 2003) and DVRPC Land cover 2005 (adjusted to 2012).

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
Polluntant Load Adjust for Development Calculations (2003 - 2012*)

BMP ID	Sediment (tn/yr)	Nitrogen (kg/day)	Phosphorus (kg/day)
LU Change W02	-394.3	-2.0506	-0.0214
LU change W03	-139.3	0.4403	0.0846
LU Change W04	-117.7	0.8602	0.0119
LU Change W08	-141.5	1.5060	0.6968
Total Pollutant Added/Removed	-792.9	0.756	0.7719

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
Polluntant Load Adjust for Development Calculations (2003 - 2012*)

Identification			Ownership	
BMP ID	Land Use Change 2003 - 2012		Public	
Status			Private	
Location			Public Lease/ROW	
TMDL Watershed	W02		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	
Structural			Street Sweeping	
Non-structural	Yes		Water Quality Inlets	
			Wet Pond	
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	129.60
Agricultural Drainage Area (ac)	-221.00
Open Land Drainage Area (ac)	93.40
Forest Drainage Area (ac)	-3.44
Water Drainage Area (ac)	0.00
Urban Drainage Area (ac)*	1.63

Pollutant Loading Rates By Land Use

Residential Pollutant Loading Rates		Agricultural Pollutant Loading Rates	
Sediment (tn/ac/yr)	0.32985	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.00023	P (kg/ac/day)	0.00023
NO3 (kg/ac/day)	0.022	NO3 (kg/ac/day)	0.022
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32957	Sediment (tn/ac/yr)	0.06598
P (kg/ac/day)	0.00026	P (kg/ac/day)	0.00023
NO3 (kg/ac/day)	0.022	NO3 (kg/ac/day)	0.022
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.00051	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0.00026	P (kg/ac/day)	0.00026
NO3 (kg/ac/day)	0.022	NO3 (kg/ac/day)	0.022

Pollutant Loads By Land Use

Residential Pollutant Loads		Agricultural Pollutant Loads	
Sediment (tn/ac/yr)	42.75	Sediment (tn/ac/yr)	-437.38
P (kg/ac/day)	0.03	P (kg/ac/day)	-0.05
NO3 (kg/ac/day)	2.8512	NO3 (kg/ac/day)	-4.8620
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	-0.23
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	-0.0757
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.54
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0359

Total Pollutant Loads	
Sediment (tn/yr)	-394.32
P (kg/day)	-0.02
NO3 (kg/day)	-2.0506

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
Polluntant Load Adjust for Development Calculations (2003 - 2012*)

Identification			Ownership	
BMP ID	Land Use Change 2003 - 2012		Public	
Status			Private	
Location			Public Lease/ROW	
TMDL Watershed	W03		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	
Structural			Street Sweeping	
Non-structural			Water Quality Inlets	
			Wet Pond	
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	109.34
Agricultural Drainage Area (ac)	-88.60
Open Land Drainage Area (ac)	-20.10
Forest Drainage Area (ac)	-0.20
Water Drainage Area (ac)	0.00
Urban Drainage Area (ac)*	0.00

Pollutant Loading Rates By Land Use

Residential Pollutant Loading Rates		Agricultural Pollutant Loading Rates	
Sediment (tn/ac/yr)	0.32986	Sediment (tn/ac/yr)	1.97906
P (kg/ac/day)	0.00412	P (kg/ac/day)	0.00412
NO3 (kg/ac/day)	0.02148	NO3 (kg/ac/day)	0.02149
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.06598
P (kg/ac/day)	0	P (kg/ac/day)	0.00412
NO3 (kg/ac/day)		NO3 (kg/ac/day)	0.02148
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0	P (kg/ac/day)	0.0041
NO3 (kg/ac/day)	0	NO3 (kg/ac/day)	0.02153

Pollutant Loads By Land Use

Residential Pollutant Loads		Agricultural Pollutant Loads	
Sediment (tn/ac/yr)	36.07	Sediment (tn/ac/yr)	-175.34
P (kg/ac/day)	0.45	P (kg/ac/day)	-0.37
NO3 (kg/ac/day)	2.3486	NO3 (kg/ac/day)	-1.9040
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	-0.01
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	-0.0043
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	0.00
P (kg/ac/day)	0.00	P (kg/ac/day)	0.0000
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	0.0000

Total Pollutant Loads	
Sediment (tn/yr)	-139.29
P (kg/day)	0.08
NO3 (kg/day)	0.44

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
Polluntant Load Adjust for Development Calculations (2003 - 2012*)

Identification			Ownership	
BMP ID	Land Use Change 2003 - 2012		Public	
Status			Private	
Location			Public Lease/ROW	
TMDL Watershed	W04		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	
Structural			Street Sweeping	
Non-structural			Water Quality Inlets	
			Wet Pond	
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	64.30
Agricultural Drainage Area (ac)	-71.10
Open Land Drainage Area (ac)	31.20
Forest Drainage Area (ac)	53.07
Water Drainage Area (ac)	0.00
Urban Drainage Area (ac)*	-5.28

Pollutant Loading Rates By Land Use			
Residential Pollutant Loading Rates		**Agricultural Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32985	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.00029	P (kg/ac/day)	0.00029
NO3 (kg/ac/day)	0.02099	NO3 (kg/ac/day)	0.02099
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32957	Sediment (tn/ac/yr)	0.06597
P (kg/ac/day)	0.00031	P (kg/ac/day)	0.00029
NO3 (kg/ac/day)	0.02101	NO3 (kg/ac/day)	0.02099
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.00051	Sediment (tn/ac/yr)	0.32987
P (kg/ac/day)	0.00031	P (kg/ac/day)	0.00029
NO3 (kg/ac/day)	0.02101	NO3 (kg/ac/day)	0.02102

Pollutant Loads By Land Use			
Residential Pollutant Loads		**Agricultural Pollutant Loads**	
Sediment (tn/ac/yr)	21.21	Sediment (tn/ac/yr)	-140.71
P (kg/ac/day)	0.02	P (kg/ac/day)	-0.02
NO3 (kg/ac/day)	1.3497	NO3 (kg/ac/day)	-1.4924
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	3.50
P (kg/ac/day)	0.00	P (kg/ac/day)	0.02
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	1.1139
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	-1.74
P (kg/ac/day)	0.00	P (kg/ac/day)	0.00
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	-0.1110

Total Pollutant Loads	
Sediment (tn/yr)	-117.74
P (kg/day)	0.01
NO3 (kg/day)	0.8602

London Grove Township
Christina River Basin TMDL Implementation Plan (CTIP)
Polluntant Load Adjust for Development Calculations (2003 - 2012*)

Identification			Ownership	
BMP ID	Land Use Change 2003 - 2012		Public	
Status	2016		Private	
Location			Public Lease/ROW	
TMDL Watershed	W08		**BMP Type**	
Latitude	Varies		Constructed Wetlands	
Longitude	Varies		Infiltration Basin	
BMP Category			Reforestation	
Structural			Street Sweeping	
Non-structural			Water Quality Inlets	
			Wet Pond	
			Other	

BMP Watershed Land Use	
Residential Drainage Areas (ac)	210.66
Agricultural Drainage Area (ac)	-105.00
Open Land Drainage Area (ac)	-62.76
Forest Drainage Area (ac)	-43.09
Water Drainage Area (ac)	-0.13
Urban Drainage Area (ac)*	-0.99

Pollutant Loading Rates By Land Use			
Residential Pollutant Loading Rates		**Agricultural Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32981	Sediment (tn/ac/yr)	1.97909
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01329
NO3 (kg/ac/day)	0.02712	NO3 (kg/ac/day)	0.02869
Open Land Pollutant Loading Rates		**Forest Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0.32992	Sediment (tn/ac/yr)	0.06597
P (kg/ac/day)	0.01256	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0.02717	NO3 (kg/ac/day)	0.0271
Water Pollutant Loading Rates		**Urban Pollutant Loading Rates**	
Sediment (tn/ac/yr)	0	Sediment (tn/ac/yr)	0.32957
P (kg/ac/day)	0	P (kg/ac/day)	0.01256
NO3 (kg/ac/day)	0	NO3 (kg/ac/day)	0.02717

Pollutant Loads By Land Use			
Residential Pollutant Loads		**Agricultural Pollutant Loads**	
Sediment (tn/ac/yr)	69.48	Sediment (tn/ac/yr)	-207.80
P (kg/ac/day)	2.65	P (kg/ac/day)	-1.40
NO3 (kg/ac/day)	5.7131	NO3 (kg/ac/day)	-3.0125
Open Land Pollutant Loads		**Forest Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	-2.84
P (kg/ac/day)	0.00	P (kg/ac/day)	-0.54
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	-1.1677
Water Pollutant Loads		**Urban Pollutant Loads**	
Sediment (tn/ac/yr)	0.00	Sediment (tn/ac/yr)	-0.33
P (kg/ac/day)	0.00	P (kg/ac/day)	-0.01
NO3 (kg/ac/day)	0.0000	NO3 (kg/ac/day)	-0.0269

Total Pollutant Loads	
Sediment (tn/yr)	-141.50
P (kg/day)	0.70
NO3 (kg/day)	1.5060