



# Prince William County

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## Draft Phase II Chesapeake Bay TMDL Action Plan

**Virginia Stormwater Management Program (VSMP)  
Municipal Separate Storm Sewer System (MS4) Permit No.  
VA0088595**

January 10, 2025 – Draft

Environmental Management Division  
Prince William County Department of Public Works  
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Prince William, VA 22192

## CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

*Benjamin Eb*

Signature

Sr Environmental Program Manager

Title

01/10/2025

Date

## Table of Contents

1. Introduction .....	1
1.1 Purpose .....	1
2. Current Program and Legal Authority.....	1
2.1 Program Plan .....	1
2.2 Existing Legal Authority .....	2
2.3 New or Modified Legal Authority .....	2
3. Estimated Existing Source Loads and Calculated Total Pollutant of Concern (POC) Required Reductions .....	2
3.1 MS4 Regulated Area.....	2
3.2 Existing Source Loads .....	4
3.3 Required Reductions .....	5
3.4 Reductions Achieved .....	5
4. Means and Methods to Meet Required Reductions and Schedule .....	5
4.1 BMPs Planned for the Second Permit Cycle.....	6
4.2 Additional Means and Methods .....	6
4.3 Compliance Summary .....	7
5. All Structural Facilities (Regulatory and Non-Regulatory) Between January 1, 2006 and June 30, 2009 .....	7
6. Means and Methods to Offset Increased Loads from New Sources Initiating Construction Between July 1, 2009 and June 30, 2014 .....	7
7. Means and Methods to Offset Increased Loads from Grandfathered Projects Beginning Construction After July 1, 2014 .....	7
8. List of Future Projects Qualifying as Grandfathered .....	7
9. Estimate of the Expected Cost to Implement the Necessary Reductions.....	8
10. Public Comments on Draft Action Plan .....	8

## List of Tables

Table 1 – Estimated Existing Source Loads from MS4.....	4
Table 2 – Reduction Required per Permit Cycle .....	5
Table 3 – Total Reductions Achieved.....	5
Table 4 – POC Reductions for 2nd Permit Cycle by Project.....	6
Table 5 – Compliance Summary.....	7

## Appendices

Appendix A – MS-4 Service Area Delineation Map
Appendix B – Summary of Completed Projects
Appendix C – Summary of Planned Projects
Appendix D – POC Reduction Calculation Worksheets
Appendix E – Public Comments

## **1. Introduction**

### **1.1 Purpose**

This Draft Phase II Chesapeake Bay TMDL Action Plan (Action Plan) builds on Prince William County’s initial Chesapeake Bay TMDL Action Plan approved by the Virginia Department of Environmental Quality (DEQ) on June 28, 2017. This Action Plan documents how the County intends to meet the “Chesapeake Bay TMDL Special Condition” in Section I.D.1 of the Municipal Separate Storm Sewer System Permit No. VA0088595 (MS4 Permit) issued December 17, 2014. The County is required to document the means and methods that will be utilized to meet the required reductions of specific Pollutants of Concern (POCs) allocated in the Special Condition of the Commonwealth of Virginia’s Phase I and II Chesapeake Bay Total Maximum Daily Load (TMDL) Watershed Implementation Plans (WIPs).

These reductions are based on the Level 2 (L2) scoping run of the Chesapeake Bay Watershed Model for existing developed lands (pervious and impervious regulated urban lands developed prior to July 1, 2009). Level 2 implementation equates to an average reduction of 9% of nitrogen loads, 16% of phosphorous loads, and 20% of sediment loads from impervious regulated areas and 6% of nitrogen loads, 7.25% of phosphorous loads, and 8.75% of sediment loads from pervious regulated acres beyond the 2009 progress run loadings. As part of this effort, Virginia Department of Environmental Quality (VADEQ) has committed to a phased approach for MS4 permittees to implement necessary reductions. Permittees will have up to three, five-year permit cycles to achieve required reductions. The County’s first permit cycle (December 17, 2014 – December 16, 2019) represents implementation of 5% of the L2 as specified in the 2010 Phase I WIP. The second permit cycle will require an additional 35% of total L2 reductions (40% cumulative), while the final permit cycle will require implementation of the remaining 60% of reductions (100% cumulative).

This Action Plan documents how the County plans to implement the 35% second permit cycle reduction for a cumulative total reduction of 40% by the end of the second permit term.

## **2. Current Program and Legal Authority**

Prince William County has determined through a review of its program plan and associated ordinance, that it currently holds sufficient legal authority to ensure compliance with the MS4 Permit. The following section briefly describes these authorities, and their relationship to permit compliance.

### **2.1 Program Plan**

The County has completed an MS4 Program Plan (Program Plan) that documents the implementation of all MS4 Permit requirements, including the programmatic and legal authorities required to meet the Chesapeake Bay Special Condition (Section I.D.1). The full Program Plan can be accessed from the following link: [Community MS4 Program](#)

Prince William County's Program Plan outlines the specific BMPs that the County is implementing in order to meet requirements set forth in its MS4 Permit and the associated Chesapeake Bay Special Condition.

## **2.2 Existing Legal Authority**

The following legal authorities enable Prince William County to comply with the Chesapeake Bay TMDL Special Condition. These legal authorities are referenced in the County's Program Plan and are included here for additional reference.

- Stormwater Management Ordinance – [Prince William County Code Chapter 23.2](#)
- Solid Waste Ordinance - [Prince William County Code Chapter 22.0](#)
- Water Supply System Ordinance - [DCSM SECTION 400](#)
- Erosion and Sediment Control Ordinance – [DCSM SECTION 700](#)
- Fire Prevention Ordinance – [Prince William County Code Chapter 9.2](#)
- Sewers and Sewage Disposal Ordinance - [Prince William County Code Chapter 23.0](#)

## **2.3 New or Modified Legal Authority**

As described in subsection 2.2 above, the existing authority is sufficient for compliance with this Special Condition. There is no need for new or modified legal authority beyond what is described in the section above. As the County reaches its second and third permit cycles, an assessment of potential new or modified legal authority will be made. All updates will be reflected in future iterations of this document, as well as in the County's Program Plan.

## **3. Estimated Existing Source Loads and Calculated Total Pollutant of Concern (POC) Required Reductions**

### **3.1 MS4 Regulated Area**

The existing POC source loads from Prince William County have been estimated by means of a comprehensive GIS-based desktop analysis. Utilizing the County's extensive stormwater inventory and a specifically developed MS4 Delineation and Stormwater Tool, the County's regulated outfalls and associated drainage areas were identified. Included in the analysis was information on the ownership and operation of regulated outfalls, pipe networks, and SWM/BMP facilities, along with a determination of impervious surface acres in the County.

In order to determine the 2009 impervious area, the County's 2012 impervious area assessment was used as a base, as this was the best data available. Using ortho-rectified aerial photography dated 2009, an impervious data layer was created by identifying areas throughout the County that were undeveloped as of June 30, 2009. This was largely accomplished using the aerial photography but also included an inventory of land development projects initiated throughout Prince William County after the first permit cycle 2009 progress run deadline as well as specific as-built plans and plats when necessary. Included in the impervious surface determination are structures, bridges,

roadways, driveways, alleyways, paved medians, parking lots, sidewalks, and hard surface sports courts, as well as large patio surfaces that may include swimming pools.

Data pertaining to outfalls, pipe networks, and SWM/BMP facilities are continuously updated and maintained by the County's GIS department. These structures were imported into the Stormwater Delineation tool and are included in the assessment of the County's MS4 service area. The Stormwater Tool will update the attribute data for each outfall to include a unique ID, its latitude and longitude in decimal degrees, the local watershed (WTRSHD\_ID), the 5th and 6th order VA HUC, the HUC12, and the waterbody receiving outflow (listed as a REACHCODE). Outfalls also contain ownership and maintenance responsibility information.

Once the initial MS4 service area was identified, excluded areas as outlined in the TMDL Action Plan Guidance Document (Section II.2) were removed. This included land regulated under any general VPDES permitted facility, lands regulated under an individual VPDES permit, forested lands, agricultural lands, wetlands and open waters. Refer to Appendix A for a map of the County's 2009 MS4 service area.

### 3.2 Existing Source Loads

An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009 is provided below in Table 1. This estimate is based on the 2009 Chesapeake Bay Model progress run and is consistent with Table 1a of the County's MS4 Permit.

**Table 1 – Estimated Existing Source Loads from MS4**

Pollutant	Subsource	Loading Rate (lbs/ac/yr)	Existing developed lands as of 6/30/09 served by the MS4 within the regulated area (acres)	Loads (lbs/yr)	Percentage of MS4 required Chesapeake Bay total L2 loading reduction	Percentage of L2 required reduction by June 30, 2026	40% cumulative reduction required by June 30, 2026 (lbs/yr)	Sum of 40% cumulative reduction (lb/yr)
Nitrogen	Regulated Urban Impervious	16.86	6,626.78	111,727.51	9%	40%	4,022.19	8,017.36
	Regulated Urban Pervious	10.07	16,530.83	166,465.46	6%	40%	3,995.17	
Phosphorous	Regulated Urban Impervious	1.62	6,626.78	10,735.38	16%	40%	687.06	883.62
	Regulated Urban Pervious	0.41	16,530.83	6,777.64	7.25%	40%	196.55	



### 3.3 Required Reductions

Table 2 computes the required POC reductions for each permit cycle and identifies the 100% POC reductions required by the end of the County’s third permit cycle.

**Table 2 – Reduction Required per Permit Cycle**

<b>Pollutant</b>	<b>1st Permit Cycle (5%)</b>	<b>2nd Permit Cycle (35%)</b>	<b>3rd Permit Cycle (60%)</b>	<b>Total (100%)</b>
Nitrogen	1,002.17	7,015.19	12,026.04	<b>20,043.40</b>
Phosphorous	110.45	773.15	1,325.40	<b>2,209.00</b>

### 3.4 Reductions Achieved

Table 3 shows the total reductions the County has achieved to date. Appendix B shows a comprehensive list of projects completed to date, which includes total reductions for each project.

**Table 3 – Total Reductions Achieved**

<b>Pollutant</b>	<b>Required 40% cumulative reduction (lbs/yr)</b>	<b>Reductions achieved to date (lbs/yr)</b>	<b>Percent reduction achieved to date</b>
Nitrogen	8,017.36	9,848.18	49%
Phosphorous	883.62	2,783.97	126%

## **4. Means and Methods to Meet Required Reductions and Schedule**

Prince William County has a comprehensive watershed improvement program, which aims to improve water quality through the implementation of water quality improvement projects such as stormwater facility retrofits, stream restorations, and reforestation projects. The primary means and methods planned for this permit cycle include the implementation of stormwater facility retrofits, stream restorations, and reforestation projects.

#### 4.1 BMPs Planned for the Second Permit Cycle

This section outlines the County’s planned reductions for the second permit cycle through the implementation of stream restorations, stormwater retrofits and reforestation projects. Table 4 summarizes the POC reductions by project.

**Table 4 - POC Reductions for 2nd Permit Cycle by Type**

<b>Project Status</b>	<b>Project Name</b>	<b>Reduction TN</b>	<b>Reduction TP</b>
Planned	Powells Creek Phase 2	600	246
	SWM Facility #62 Retrofit	7	1
	Chinn Park - SWM Facility #5749 Retrofit	88	11
	Chinn Park - Stream	265	69
	SWM Facility #416 Retrofit	259	40
	Middle Dewey's Phase 1	746	276
	SWM Facility #460 Retrofit	76	11
	SWM Facility #521 Retrofit	117	19

A total of three stream restoration projects are planned during the second permit cycle. The load reductions associated with each planned stream restoration project have been computed in accordance with Appendix V.J. of the Chesapeake Bay TMDL Special Condition Guidance. Appendix C includes details on each project including the implementation schedule, location, restoration length and pollutant reductions. Appendix D includes the reduction calculation worksheets for each project.

The County plans to implement five stormwater retrofits during the second permit cycle. The estimated load reductions for planned projects have been calculated in accordance with Appendix V.D. of the Chesapeake Bay TMDL Special Condition Guidance. Appendix C provides more details on each project identified in this plan including the implementation schedule, location, practice type, treatment area and pollutant reductions. Appendix D includes the reduction calculation worksheets for each project.

The details, extent and timing of planned projects may change at the discretion of the County. Updates will be provided in each annual report as well as with the draft third phase Bay TMDL Action Plan.

#### 4.2 Additional Means and Methods

The County reserves the right to implement and take credit for additional creditable facilities or practices as provided for in the Chesapeake Bay TMDL Special Condition Guidance, such as credit for redevelopment, septic conversions, off-site pollutant reduction credits, and nutrient management plans not required under the MS4 permit. The guidance document specifically references the work of the Chesapeake Bay Urban Stormwater Workgroup, which includes credits for street sweeping, urban nutrient management and homeowner best management practices such

as rainwater harvesting, downspout disconnection, permeable hard-scapes, tree planting, and impervious cover removal. Reductions achieved will be documented to DEQ in the annual reports.

### 4.3 Compliance Summary

Table 5 demonstrates how the County will meet the required reductions for each POC with the implementation of BMP's described in the above sections.

**Table 5 - Compliance Summary**

Pollutant	Required 40% cumulative reduction (lbs/yr)	Reductions achieved to date (lbs/yr)	Percent reduction achieved to date	Planned Reductions (lbs/yr)	Percent reduction achieved with this Action Plan
Nitrogen	8,017.36	9,848.18	49%	2,158	60%
Phosphorous	883.62	2,783.97	126%	673	156%

As shown in Table 5, the planned load reductions for the second permit cycle are projected to exceed all POC's. Load reductions beyond those required for the second permit cycle will be applied to the 60% reduction progress requirement of the third permit cycle (100% cumulative reduction).

### **5. All Structural Facilities (Regulatory and Non-Regulatory) Between January 1, 2006 and June 30, 2009**

The documentation associated with this requirement was addressed in the initial Action Plan.

### **6. Means and Methods to Offset Increased Loads from New Sources Initiating Construction Between July 1, 2009 and June 30, 2014**

The documentation associated with this requirement was addressed in the initial Action Plan.

### **7. Means and Methods to Offset Increased Loads from Grandfathered Projects Beginning Construction After July 1, 2014**

The documentation associated with this requirement was addressed in the initial Action Plan.

### **8. List of Future Projects Qualifying as Grandfathered**

The documentation associated with this requirement was addressed in the initial Action Plan.

## **9. Estimate of the Expected Cost to Implement the Necessary Reductions**

Refer to Appendix E for the estimated costs for each project including the costs for planning, design, and construction of each project. The estimates are based on currently available cost information and may change during the course of the permit cycle but will be updated with each subsequent Annual Report.

## **10. Public Comments on Draft Action Plan**

Reserved for public comments on the final Phase II Action Plan.

## Appendix A – MS-4 Service Area Delineation Map

# PRINCE WILLIAM COUNTY MS4 SERVICE AREAS



LOUDOUN COUNTY

FAIRFAX CITY

FAIRFAX COUNTY

HAYMARKET

MANASSAS PARK  
MANASSAS CITY

OCCOQUAN

FAUQUIER COUNTY

DUMFRIES

QUANTICO

STAFFORD COUNTY



Prince William County  
Virginia

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Any determination of topography or contours or any depiction of physical improvements, property lines or boundaries is for general information only and shall not be used for the design modification or construction of improvements to real property or for floodplain determination.



- PWC MS4 Service Area
- Cities
- County Boundary
- Waterbody

**Roadways**

- Collector
- Secondary
- Primary
- Interstate

## Appendix B – Summary of Completed Projects

<b>Project Name</b>	<b>BMP Type</b>	<b>Date</b>	<b>TN</b>	<b>TP</b>	<b>TSS</b>
Innovation - Area 1D	Land Use Change	2011	1.58	0.08	29.25
Ben Lomond Park Area A	Land Use Change	2012	1.07	0.06	19.94
Ben Lomond Park Area B	Land Use Change	2013	27.28	1.45	506.58
Ben Lomond Park Area C	Land Use Change	2013	1.65	0.09	30.58
Sudley Place Reforestation	Land Use Change	2014	22.70	1.20	421.48
Ben Lomond Park Area D	Land Use Change	2015	0.86	0.05	15.96
Hope Hill Crossing	Land Use Change	2015	36.44	1.93	676.77
Garner Drive	Land Use Change	2016	2.86	0.15	53.18
Hunter Ridge Estates Area A	Land Use Change	2016	40.45	2.15	751.22
Hunter Ridge Estates Area B	Land Use Change	2017	34.01	1.81	631.56
Bristoe Station Battlefield Phase 1	Land Use Change	2017	100.17	5.32	1,860.11
Bristoe Station Battlefield Phase 2	Land Use Change	2018	32.22	1.71	598.32
Bristoe Station Battlefield Phase 3	Land Use Change	2021	73.03	3.88	1,356.19
Lake Drive Reforestation	Land Use Change	2019	7.16	0.38	132.96
Cow Branch Phase I	Stream Restoration	2011	77.38	70.16	15,609.85
Cow Branch Phase II	Stream Restoration	2012	51.44	46.64	10,377.70
Lower Cabin Run	Stream Restoration	2012	78.40	72.39	15,815.83
Northgate	Stream Restoration	2013	18.31	16.60	10,954.81
Deerfield Estates	Stream Restoration	2013	16.10	15.05	9,893.30
Cow Branch III	Stream Restoration	2015	45.88	41.60	9,255.93
Oak Street	Stream Restoration	2015	3.02	2.74	1,806.18
Hylbrook Park	Stream Restoration	2016	68.99	78.16	13,918.49
Leesylvania Living Shoreline 1	Stream Restoration	2016	55.31	5.25	14,060.43
East Longview - Route 1 Restoration	Stream Restoration	2017	22.52	50.96	4,543.39
Dewey's Creek Reach 4	Stream Restoration	2017	21.20	19.22	4,276.94
Reach 5	Stream Restoration	2017	147.26	141.55	93,191.17
Dewey's Creek Reach 1	Stream Restoration	2018	389.00	229.00	34,168.00
Dewey's Creek Reach 2	Stream Restoration	2020	2,298.00	1,235.00	55,424.00
Powells Creek Phase 1	Stream Restoration	2022	444.00	205.00	1,200,352.00
SWM Facility #257	SWM Retrofit	2010	6.80	0.29	170.54
Pond 51 - Hammill Mill Park SWMF	SWM Retrofit	2011	12.20	0.60	384.84
SWM Facility #154 - Dawson Ridge	SWM Retrofit	2011	11.99	0.61	380.09
SWM Facility #157 - Dawson Ridge	SWM Retrofit	2011	8.03	0.39	250.11
SWM Facility #363	SWM Retrofit	2013	58.35	2.75	1,739.13
SWM Facility #318	SWM Retrofit	2013	28.95	1.27	763.03
SWM Facility #494	SWM Retrofit	2013	97.00	13.72	5,198.13
SWM Facility #77	SWM Retrofit	2014	71.26	2.42	1,323.13
SWM Facility #505	SWM Retrofit	2014	28.14	1.36	853.09
SWM Facility #99	SWM Retrofit	2015	32.31	3.74	3,364.40
SWM Facility #98	SWM Retrofit	2015	13.83	0.74	490.94
SWM Facility #28	SWM Retrofit	2017	61.65	5.13	4,843.10
SWM Facility #147	SWM Retrofit	2018	64.01	6.14	5,419.30
SWM Facility #489	SWM Retrofit	2018	151.57	7.72	4,838.12
SWM Facility #109	SWM Retrofit	2018	160.29	11.97	9,723.03
SWM Facility #424	SWM Retrofit	2020	217.71	31.22	25,290.37
SWM Facility #232	SWM Retrofit	2021	47.59	4.22	3,365.39
SWM Facility #386	SWM Retrofit	2022	63.10	9.97	8,314.92
SWM/BMP Facilities Historic	SWM/BMP	2009	4,231.83	393.69	464,836.62
SWM/BMP Facilities New Sources	SWM/BMP	2014	363.30	36.46	42,878.25
			<b>9,848.18</b>	<b>2,783.97</b>	<b>2,085,158.65</b>



## Appendix C – Summary of Planned Projects

2025 TMDL Action Plan Tables

Project Name	Magisterial District	Watershed	Project Type	Project Phase	Implementation FY - Plan B	Cost	Cost/lb TN	Length	Area Treated (Ac)	Reduction TN	Reduction TP	Reduction TSS
Powells Creek Phase 2	Potomac	Powells	Stream	Construction	2024	\$8,400,000	\$14,000	4,400	8,235.0	600	246	553,365
SWM Facility #62 Retrofit	Coles	Occoquan	Retrofit	Design	2025	\$345,000	\$50,000			7	1	409
Chinn Park - SWM Facility #5749 Retrofit	Occoquan	Occoquan	Retrofit	Design	2025	\$750,000	\$8,507			88	11	4,460
Chinn Park - Stream	Occoquan	Occoquan	Stream	Design	2025	\$2,520,000	\$9,509	1,575		265	69	1,403,531
SWM Facility #416 Retrofit	Coles	Bull Run	Retrofit	Design	2026	\$850,000	\$3,277		119.8	259	40	31,741
Middle Dewey's Phase 1	Potomac	Quantico	Stream	Design	2026	\$6,244,800	\$8,371	3,903		746	276	282,044
SWM Facility #460 Retrofit	Brentsville	Broad Run	Retrofit	Design	2026	\$335,960	\$4,403		34.5	76	11	4,460
SWM Facility #521 Retrofit	Brentsville	Broad Run	Retrofit	Design	2026	\$385,100	\$3,300		68.1	117	19	4,336

## Appendix D – POC Reduction Calculation Worksheets

Chinn Park  
3,634

Stream Restoration  
Includes Main Stem, Tributary 1 US + DS, & Tributary 2

Status: Construction

**1 Calculate POC Reductions**

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
100% Load Reduction Estimates (lbs/yr)	479.18	124.62	1,698,000
Percent Efficiency	0.85		
<b>Initial POC Reductions</b>	<b>407.30</b>	<b>105.93</b>	<b>1,443,300.00</b>

<- Estimate to be updated after 1st monitoring yr

**2 Characterize the Drainage Area**

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	6.14	3.45	2.65	9.59	12.24
Other Regulated Land	11.83	3.62	4.88	15.45	20.33
<b>Total Regulated Land</b>	<b>17.97</b>	<b>7.07</b>	<b>7.53</b>	<b>25.04</b>	<b>32.57</b>
<b>Total Unregulated Land</b>	<b>158.03</b>	<b>178.66</b>	<b>591.88</b>	<b>336.69</b>	<b>928.57</b>
	<b>176.00</b>	<b>185.73</b>	<b>599.41</b>	<b>361.73</b>	<b>961.14</b>

**3 Compute Ratios and Calculate Proportional Reductions by Land Use**

	Regulated Area	Unregulated Area	Forested Acres	Total Credit
Ratio	<b>2.61%</b>	<b>35.03%</b>	<b>62.36%</b>	
TN (lbs) Reduction	10.61	142.68	254.01	<b>407.30</b>
TP (lbs) Reduction	2.76	37.11	66.06	<b>105.93</b>
TSS (lbs) Reduction	37,601.42	505,591.98	900,106.60	<b>1,443,300.00</b>

Total Check  
100.00%

**4 Account for Total Baseline Reductions on Unregulated Land**

Urban Land Use	POC	Required 5% Load Reductions (lbs/acre/yr)	Baseline Loading Rate (*20)	Acres	Baseline Reduction (lbs/yr)
Impervious	TN	0.07587000	1.51740000	158.03	239.79
Pervious	TN	0.03021000	0.60420000	178.66	107.95
Impervious	TP	0.01296000	0.25920000	158.03	40.96
Pervious	TP	0.00148625	0.02972500	178.66	5.31
Impervious	TSS	11.71320000	234.26400000	158.03	37,020.74
Pervious	TSS	0.76912500	15.38250000	178.66	2,748.24

**5 Calculate Total Reductions Minus Required Baseline**

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Credit for Unregulated Areas	142.68	37.11	505,591.98
Minus Unregulated Impervious Baseline	239.79	40.96	37,020.74
Minus Unregulated Pervious Baseline	107.95	5.31	2,748.24
<b>Credit for Unregulated Areas</b>	<b>0.00</b>	<b>0.00</b>	<b>465,823.00</b>
<b>Credit for Regulated Areas</b>	<b>10.61</b>	<b>2.76</b>	<b>37,601.42</b>
<b>Credit for Forested Areas</b>	<b>254.01</b>	<b>66.06</b>	<b>900,106.60</b>
<b>Total Reductions Claimed</b>	<b>264.62</b>	<b>68.82</b>	<b>1,403,531.02</b>

**6 Reduction Summary Table**

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Chinn Park	Stream Restoration	38.66978	-77.32693	264.62	68.82	1,403,531.02

**Reduction Calculation Summary**  
**January 22, 2020**

SWM Facility #62                      Dry Detention Facility

**1 Determine existing published efficiency**

BMP Type	Source	TN	TP	TSS
Dry Detention Pond	CBP	5%	10%	10%

**2 Apply downward modification to BMP Efficiency**

Facility Name	BMP Type	Lat	Long	Modification Type	Downward Modification Applied
SWM Facility #62	Dry Detention Pond	38.67916	-77.44683	No sediment forebay	-10%
				Short-circuiting	-10%
				No micropool	-10%
<b>Total</b>					<b>-30%</b>

**3 Calculate modified existing efficiency**

		TN	TP	TSS
Published Efficiency	Step 1	5%	10%	10%
Efficiency Modification	Step 2	-30%	-30%	-30%
<b>Modified Efficiency</b>		<b>4%</b>	<b>7%</b>	<b>7%</b>

**4 Determine efficiency of proposed BMP Type**

Source	BMP Type	TN	TP	TSS
Bay Program Retrofit Equations	Dry Detention Facility	-0.46%	-0.72%	-0.91%

Runoff storage (acre-feet) \_\_\_\_\_ (Final Design)  
 Impervious acres **3.76**  
 Runoff depth **0.00**

**Retrofit Equation Results**  
 TN -0.46%  
 TP -0.72%  
 TSS -0.91%

**5 Calculate Incremental Removal Rate**

		TN	TP	TSS	
Removal Rate	Dry Detention Facility	0%	-1%	-1%	Bay Program Retrofit Equations
Modified existing efficiency	Step 3	4%	7%	7%	
<b>Incremental Removal Rate</b>		<b>-4%</b>	<b>-8%</b>	<b>-8%</b>	

**6 Calculate Load Reduction**

**Characterize the Drainage Area**

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	1.15	0.64	5.37	7.16
Other Regulated Land	0.00	0.00	0.00	0.00
Unregulated Land	0.99	1.05	10.67	12.71
	<b>2.14</b>	<b>1.69</b>	<b>16.04</b>	<b>19.87</b>

Subsource	Pollutant	2009 EOS Loading Rate (lbs/acre/yr)	DA	Load	Efficiency	Reduction	Sub-total/POC
Regulated Urban Impervious	Nitrogen	16.86	2.14	36.08	5%	1.80	<b>6.90</b>
Regulated Urban Pervious	Nitrogen	10.07	1.69	17.02	5%	0.85	
Regulated Forest	Nitrogen	5.29	16.04	84.85	5%	4.24	
Regulated Urban Impervious	Phosphorus	1.62	2.14	3.47	10%	0.35	<b>0.62</b>
Regulated Urban Pervious	Phosphorus	0.41	1.69	0.69	10%	0.07	
Regulated Forest	Phosphorus	0.13	16.04	2.09	10%	0.21	
Regulated Urban Impervious	Total Suspended Solids	1,171.32	2.14	2,506.62	10%	250.66	<b>408.55</b>
Regulated Urban Pervious	Total Suspended Solids	175.80	1.69	297.10	10%	29.71	
Regulated Forest	Total Suspended Solids	79.91	16.04	1,281.76	10%	128.18	

**7 Reduction Summary Table**

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #62	Dry Detention Facility	38.67916	-77.44683	6.90	0.62	408.55

**1st Permit Cycle  
Bay TMDL Reduction Calculation Worksheet**

Dewey's Creek Reach 1  
1,270

Stream Restoration

Status: Completed

**1 Calculate POC Reductions**

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
100% Load Reduction Estimates (lbs/yr)	564.0	273.0	49,600.0
Percent Efficiency	0.96		
<b>Initial POC Reductions</b>	<b>541.44</b>	<b>262.08</b>	<b>47,616.00</b>

<- See 3/08/2022 Stantec Memo

**2 Characterize the Drainage Area**

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	93.18	147.74	32.99	240.92	273.91
Other Regulated Land	95.76	53.87	18.51	149.63	168.14
<b>Total Regulated Land</b>	<b>188.94</b>	<b>201.60</b>	<b>51.50</b>	<b>390.55</b>	<b>442.04</b>
<b>Total Unregulated Land</b>	<b>104.11</b>	<b>197.16</b>	<b>323.41</b>	<b>301.28</b>	<b>624.69</b>
	<b>293.06</b>	<b>398.77</b>	<b>374.91</b>	<b>691.82</b>	<b>1,066.73</b>

**3 Compute Ratios and Calculate Proportional Reductions by Land Use**

	Regulated Area	Unregulated Area	Forested Acres	Total Credit
Ratio	<b>36.61%</b>	<b>28.24%</b>	<b>35.15%</b>	
TN (lbs) Reduction	198.23	152.92	190.29	<b>541.44</b>
TP (lbs) Reduction	95.95	74.02	92.11	<b>262.08</b>
TSS (lbs) Reduction	17,432.94	13,448.11	16,734.95	<b>47,616.00</b>

Total Check  
100.00%

**4 Account for Total Baseline Reductions on Unregulated Land**

Urban Land Use	POC	Required 5% Load Reductions (lbs/acre/yr)	Baseline Loading Rate (*20)	Acres	Baseline Reduction (lbs/yr)
Impervious	TN	0.07587000	1.51740000	104.11	157.98
Pervious	TN	0.03021000	0.60420000	197.16	119.13
Impervious	TP	0.01296000	0.25920000	104.11	26.99
Pervious	TP	0.00148625	0.02972500	197.16	5.86
Impervious	TSS	11.71320000	234.26400000	104.11	24,390.11
Pervious	TSS	0.76912500	15.38250000	197.16	3,032.84

**5 Calculate Total Reductions Minus Required Baseline**

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Credit for Unregulated Areas	152.92	74.02	13,448.11
Minus Unregulated Impervious Baseline	157.98	26.99	24,390.11
Minus Unregulated Pervious Baseline	119.13	5.86	3,032.84
<b>Credit for Unregulated Areas</b>	<b>0.00</b>	<b>41.17</b>	<b>0.00</b>
<b>Credit for Regulated Areas</b>	<b>198.23</b>	<b>95.95</b>	<b>17,432.94</b>
<b>Credit for Forested Areas</b>	<b>190.29</b>	<b>92.11</b>	<b>16,734.95</b>
<b>Total Reductions Claimed</b>	<b>388.52</b>	<b>229.23</b>	<b>34,167.89</b>

**6 Reduction Summary Table**

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Dewey's Creek Reach 1	Stream Restoration	38.57572	-77.31094	388.52	229.23	34,167.89

**1st Permit Cycle  
Bay TMDL Reduction Calculation Worksheet**

Powells Creek Phase 2  
7,183

Stream Restoration  
Includes Main Stem, Lacrosse Tributary, & 300 ft extension

Status: **Completed**

**1 Calculate POC Reductions**

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
100% Load Reduction Estimates (lbs/yr)	858.7	352.7	746,800.0
Percent Efficiency	0.85		
<b>Initial POC Reductions</b>	<b>729.90</b>	<b>299.80</b>	<b>634,780.00</b>

<- Estimate. To be updated after 1st monitoring year (2025)

**2 Characterize the Drainage Area**

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	556.80	1,234.69	742.49	1,791.49	2,533.98
Other Regulated Land	459.98	680.22	899.71	1,140.20	2,039.91
<b>Total Regulated Land</b>	<b>1,016.78</b>	<b>1,914.91</b>	<b>1,642.20</b>	<b>2,931.69</b>	<b>4,573.89</b>
<b>Total Unregulated Land</b>	<b>268.39</b>	<b>1,205.36</b>	<b>2,187.36</b>	<b>1,473.75</b>	<b>3,661.11</b>
	<b>1,285.17</b>	<b>3,120.27</b>	<b>3,829.56</b>	<b>4,405.44</b>	<b>8,235.00</b>

**3 Compute Ratios and Calculate Proportional Reductions by Land Use**

	Regulated Area	Unregulated Area	Forested Acres	Total Credit
Ratio	<b>35.60%</b>	<b>17.90%</b>	<b>46.50%</b>	
TN (lbs) Reduction	259.85	130.62	339.43	<b>729.90</b>
TP (lbs) Reduction	106.73	53.65	139.42	<b>299.80</b>
TSS (lbs) Reduction	225,983.99	113,601.34	295,194.67	<b>634,780.00</b>

Total Check  
100.00%

**4 Account for Total Baseline Reductions on Unregulated Land**

Urban Land Use	POC	Required 5% Load Reductions (lbs/acre/yr)	Baseline Loading Rate (*20)	Acres	Baseline Reduction (lbs/yr)
Impervious	TN	0.07587000	1.51740000	268.39	407.25
Pervious	TN	0.03021000	0.60420000	1,205.36	728.28
Impervious	TP	0.01296000	0.25920000	268.39	69.57
Pervious	TP	0.00148625	0.02972500	1,205.36	35.83
Impervious	TSS	11.71320000	234.26400000	268.39	62,874.11
Pervious	TSS	0.76912500	15.38250000	1,205.36	18,541.45

**5 Calculate Total Reductions Minus Required Baseline**

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Credit for Unregulated Areas	130.62	53.65	113,601.34
Minus Unregulated Impervious Baseline	407.25	69.57	62,874.11
Minus Unregulated Pervious Baseline	728.28	35.83	18,541.45
<b>Credit for Unregulated Areas</b>	<b>0.00</b>	<b>0.00</b>	<b>32,185.77</b>
<b>Credit for Regulated Areas</b>	<b>259.85</b>	<b>106.73</b>	<b>225,983.99</b>
<b>Credit for Forested Areas</b>	<b>339.43</b>	<b>139.42</b>	<b>295,194.67</b>
<b>Total Reductions Claimed</b>	<b>599.27</b>	<b>246.14</b>	<b>553,364.43</b>

**6 Reduction Summary Table**

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Powells Creek Phase 2	Stream Restoration	38.60268	-77.32370	599.27	246.14	553,364.43

**Phase II Stormwater Retrofits  
Reduction Calculation Worksheet**

SWM Facility #10 Existing Dry Pond Converted to Constructed Wetland

**1 Determine existing published efficiency**

BMP Type	Source	TN	TP	TSS
Dry Detention Pond	CBP	5%	10%	10%

**2 Apply downward modification to BMP Efficiency**

Facility Name	BMP Type	Lat	Long	Modification Type	Downward Modification Applied
SWM Facility #10	Dry Detention Pond	38.690203	-77.371878	No sediment forebay No micropool	-10% -10%
<b>Total</b>					<b>-20%</b>

**3 Calculate modified existing efficiency**

		TN	TP	TSS
Published Efficiency	Step 1	5%	10%	10%
Efficiency Modification	Step 2	-20%	-20%	-20%
<b>Modified Efficiency</b>		<b>4.00%</b>	<b>8.00%</b>	<b>8.00%</b>

**4 Determine efficiency of proposed BMP Type**

Source	BMP Type	TN	TP	TSS
CBP Retrofit Equations	Constructed Wetland	35.75%	56.17%	71.49%

Runoff storage (acre-feet)	1.38
Impervious acres	15.18
Runoff depth	1.09

	Retrofit Equation Results		BMP CH	CBP Retrofit Curves
TN	35.75%		52%	36%
TP	56.17%		50%	56%
TSS	71.49%			71%

**5 Calculate Incremental Removal Rate**

		TN	TP	TSS
Removal Rate	Constructed Wetland	35.75%	56.17%	71.49%
Modified existing efficiency	Step 3	4.00%	8.00%	8.00%
<b>Incremental Removal Rate</b>		<b>31.75%</b>	<b>48.17%</b>	<b>63.49%</b>

**6 Calculate Load Reduction**

**6a Characterize the Drainage Area**

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	15.18	4.43	19.82	39.43
Other Regulated Land	5.19	3.46	0.37	9.02
Unregulated Land	8.23	7.26	113.14	128.63
	<b>28.60</b>	<b>15.15</b>	<b>133.33</b>	<b>177.08</b>

**6b Account for Total Baseline Reductions on Unregulated Land**

	POC	Required 5% Load Reductions	Baseline Loading Rate (*20)	Acres	Baseline Reduction
Unregulated Impervious	TN	0.07587000	1.51740000	8.23	12.49
Unregulated Pervious	TN	0.03021000	0.60420000	7.26	4.39
Unregulated Impervious	TP	0.01296000	0.25920000	8.23	2.13
Unregulated Pervious	TP	0.00148625	0.02972500	7.26	0.22
Unregulated Impervious	TSS	11.71320000	234.26400000	8.23	1,927.99
Unregulated Pervious	TSS	0.76912500	15.38250000	7.26	111.68

**6c Calculate Total Load Reduction**

Land Use	Pollutant	2009 EOS Loading Rate (lbs/acre/yr)	DA	Load	Efficiency	Initial Reduction	Baseline	Total Reduction	Sub-total/POC
Urban Impervious	Nitrogen	16.86	28.60	482.20	31.75%	153.09	12.49	140.60	
Urban Pervious	Nitrogen	10.07	15.15	152.56	31.75%	48.43	4.39	44.05	408.57
Forest	Nitrogen	5.29	133.33	705.32	31.75%	223.92	0.00	223.92	
Urban Impervious	Phosphorus	1.62	28.60	46.33	48.17%	22.32	2.13	20.19	
Urban Pervious	Phosphorus	0.41	15.15	6.21	48.17%	2.99	0.22	2.78	31.31
Forest	Phosphorus	0.13	133.33	17.33	48.17%	8.35	0.00	8.35	
Urban Impervious	Total Suspended Solids	1,171.32	28.60	33,499.75	63.49%	21,270.54	1,927.99	19,342.55	
Urban Pervious	Total Suspended Solids	175.80	15.15	2,663.37	63.49%	1,691.10	111.68	1,579.42	27,686.94
Forest	Total Suspended Solids	79.91	133.33	10,654.40	63.49%	6,764.97	0.00	6,764.97	

**7 Reduction Summary Table**

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #10	Constructed Wetland	38.690203	-77.371878	408.57	31.31	27,686.94



**Phase II Stormwater Retrofits  
Reduction Calculation Worksheet**

SWM Facility #79

Existing Dry Pond Converted to Constructed Wetland Level 1

**1 Determine existing published efficiency**

BMP Type	Source	TN	TP	TSS
Dry Detention Pond	CBP	5%	10%	10%

**2 Apply downward modification to BMP Efficiency**

Facility Name	BMP Type	Lat	Long	Modification Type	Downward Modification Applied
SWM Facility #79	Dry Detention Pond	38.690203	-77.371878	No sediment forebay	-10%
				No micropool	-10%
<b>Total</b>					<b>-20%</b>

**3 Calculate modified existing efficiency**

		TN	TP	TSS
Published Efficiency	Step 1	5%	10%	10%
Efficiency Modification	Step 2	-20%	-20%	-20%
<b>Modified Efficiency</b>		<b>4.00%</b>	<b>8.00%</b>	<b>8.00%</b>

**4 Determine efficiency of proposed BMP Type**

Source	BMP Type	TN	TP	TSS
CBP Retrofit Curve	Constructed Wetland Level 1	38.43%	60.40%	76.86%

Runoff storage (acre-feet)	1.46
Impervious acres	10.75
Runoff depth	1.63

Retrofit Equation Results		BMP CH L1	CBH Established	CBP Curves
TN	38.43%	25%	20%	38%
TP	60.40%	50%	45%	60%
TSS	76.86%		60%	77%

**5 Calculate Incremental Removal Rate**

		TN	TP	TSS
Removal Rate	Constructed Wetland Level 1	38.43%	60.40%	76.86%
Modified existing efficiency	Step 3	4.00%	8.00%	8.00%
<b>Incremental Removal Rate</b>		<b>34.43%</b>	<b>52.40%</b>	<b>68.86%</b>

**6 Calculate Load Reduction**

**6a Characterize the Drainage Area**

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	4.63	6.09	13.41	24.13
Other Regulated Land	0.00	0.00	0.00	0.00
Unregulated Land	7.39	8.75	64.00	80.14
	<b>12.02</b>	<b>14.84</b>	<b>77.41</b>	<b>104.27</b>

**6b Account for Total Baseline Reductions on Unregulated Land**

	POC	Required 5% Load Reductions	Baseline Loading Rate (*20)	Acres	Baseline Reduction
Unregulated Impervious	TN	0.07587000	1.51740000	7.39	11.21
Unregulated Pervious	TN	0.03021000	0.60420000	8.75	5.29
Unregulated Impervious	TP	0.01296000	0.25920000	7.39	1.92
Unregulated Pervious	TP	0.00148625	0.02972500	8.75	0.26
Unregulated Impervious	TSS	11.71320000	234.26400000	7.39	1,731.21
Unregulated Pervious	TSS	0.76912500	15.38250000	8.75	134.60

**6c Calculate Total Load Reduction**

Land Use	Pollutant	2009 EOS Loading Rate (lbs/acre/yr)	DA	Load	Efficiency	Initial Reduction	Baseline	Total Reduction	Sub-total/POC
Urban Impervious	Nitrogen	16.86	12.02	202.66	34.43%	69.76	11.21	58.55	
Urban Pervious	Nitrogen	10.07	14.84	149.44	34.43%	51.44	5.29	46.16	<b>245.68</b>
Forest	Nitrogen	5.29	77.41	409.50	34.43%	140.97	0.00	140.97	
Urban Impervious	Phosphorus	1.62	12.02	19.47	52.40%	10.20	1.92	8.29	
Urban Pervious	Phosphorus	0.41	14.84	6.08	52.40%	3.19	0.26	2.93	<b>16.49</b>
Forest	Phosphorus	0.13	77.41	10.06	52.40%	5.27	0.00	5.27	
Urban Impervious	Total Suspended Solids	1,171.32	12.02	14,079.27	68.86%	9,695.10	1,731.21	7,963.89	
Urban Pervious	Total Suspended Solids	175.80	14.84	2,608.87	68.86%	1,796.49	134.60	1,661.89	<b>13,885.40</b>
Forest	Total Suspended Solids	79.91	77.41	6,185.83	68.86%	4,259.62	0.00	4,259.62	

**7 Reduction Summary Table**

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #79	Constructed Wetland Level 1	38.690203	-77.371878	245.68	16.49	13,885.40

**Phase II Stormwater Retrofits  
Reduction Calculation Worksheet**

SWM Facility #132

Existing Dry Pond Converted to Extended Detention

**1 Determine existing published efficiency**

BMP Type	Source	TN	TP	TSS
Dry Pond	Chesapeake Bay Program	5%	10%	10%

**2 Apply downward modification to BMP Efficiency**

Facility Name	BMP Type	Lat	Long	Modification Type	Downward Modification Applied
SWM Facility #132	Dry Pond	38.679011	77.447243	no forebay	-10%
				short circuiting	-10%
				no micropool	-10%
<b>Total</b>					<b>-30%</b>

**3 Calculate modified existing efficiency**

		TN	TP	TSS
Published Efficiency	Step 1	5%	10%	10%
Efficiency Modification	Step 2	-30%	-30%	-30%
<b>Modified Efficiency</b>		<b>3.50%</b>	<b>7.00%</b>	<b>7.00%</b>

**4 Determine efficiency of proposed BMP Type**

Source	BMP Type	TN	TP	TSS
CBP Program - Established Efficiencies	Extended Dry Pond	20.00%	20.00%	60.00%

Runoff storage (acre-feet)	0.32
Impervious acres	3.79
Runoff depth	1.01

Removal Efficiency Options	CBP Established Efficiencies
TN	20.00%
TP	20.00%
TSS	60.00%

**5 Calculate Incremental Removal Rate of Proposed BMP**

		TN	TP	TSS	
Removal Rate	Existing Dry Pond Converted to	20.00%	20.00%	60.00%	CBP Program - Established Efficiencies
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%	
<b>Incremental Removal Rate</b>		<b>16.50%</b>	<b>13.00%</b>	<b>53.00%</b>	

**6 Calculate Load Reduction**

**6a Characterize the Drainage Area**

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	1.95	7.55	1.70	11.20
Other Regulated Land	0.00	0.00	0.00	0.00
Unregulated Land	1.84	1.48	1.91	5.23
	<b>3.79</b>	<b>9.03</b>	<b>3.61</b>	<b>16.43</b>

**6b Account for Total Baseline Reductions on Unregulated Land**

	POC	Required 5% Load Reductions	Baseline Loading Rate (*20)	Acres	Baseline Reduction
Unregulated Impervious	TN	0.07587000	1.51740000	1.84	2.79
Unregulated Pervious	TN	0.03021000	0.60420000	1.48	0.89
Unregulated Impervious	TP	0.01296000	0.25920000	1.84	0.48
Unregulated Pervious	TP	0.00148625	0.02972500	1.48	0.04
Unregulated Impervious	TSS	11.71320000	234.26400000	1.84	431.05
Unregulated Pervious	TSS	0.76912500	15.38250000	1.48	22.77

**6c Calculate Total Load Reduction**

Land Use	Pollutant	2009 EOS Loading Rate (lbs/acre/yr)	DA	Load	Efficiency	Initial Reduction	Baseline	Total Reduction	Sub-total/POC
Urban Impervious	Nitrogen	16.86	3.79	63.90	16.50%	10.54	2.79	7.75	<b>25.01</b>
Urban Pervious	Nitrogen	10.07	9.03	90.93	16.50%	15.00	0.89	14.11	
Forest	Nitrogen	5.29	3.61	19.10	16.50%	3.15	0.00	3.15	
Urban Impervious	Phosphorus	1.62	3.79	6.14	13.00%	0.80	0.48	0.32	<b>0.82</b>
Urban Pervious	Phosphorus	0.41	9.03	3.70	13.00%	0.48	0.04	0.44	
Forest	Phosphorus	0.13	3.61	0.47	13.00%	0.06	0.00	0.06	
Urban Impervious	Total Suspended Solids	1,171.32	3.79	4,439.30	53.00%	2,352.83	431.05	1,921.78	<b>2,893.27</b>
Urban Pervious	Total Suspended Solids	175.80	9.03	1,587.47	53.00%	841.36	22.77	818.60	
Forest	Total Suspended Solids	79.91	3.61	288.48	53.00%	152.89	0.00	152.89	

**7 Reduction Summary Table**

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #132	Existing Dry Pond Converted to	38.679011	77.447243	25.01	0.82	2,893.27

**Phase II Stormwater Retrofits  
Reduction Calculation Worksheet**

SWM Facility #416

Constructed Wetland L1

**1 Determine existing published efficiency**

BMP Type	Source	TN	TP	TSS
Dry Detention Pond	CBP	5%	10%	10%

**2 Apply downward modification to BMP Efficiency**

Facility Name	BMP Type	Lat	Long	Modification Type	Downward Modification Applied
SWM Facility #416	Dry Detention Pond	38.75104	-77.43079	No sediment forebay	-10%
				Short circuiting	-10%
				No micropool	-10%
				<b>Total</b>	<b>-30%</b>

**3 Calculate modified existing efficiency**

		TN	TP	TSS
Published Efficiency	Step 1	5%	10%	10%
Efficiency Modification	Step 2	-30%	-30%	-30%
<b>Modified Efficiency</b>		<b>3.50%</b>	<b>7.00%</b>	<b>7.00%</b>

**4 Determine efficiency of proposed BMP Type**

Source	BMP Type	TN	TP	TSS
BMP Clearinghouse	Constructed Wetland L1	25.00%	50.00%	60.00%

Runoff storage (acre-feet)  
**Impervious acres** 45.58  
 Runoff depth **0.00**

**Retrofit Equation Results**  
 TN -0.46%  
 TP -0.72%  
 TSS -0.91%

**5 Calculate Incremental Removal Rate**

		TN	TP	TSS	
Removal Rate	Constructed Wetland L1	25.00%	50.00%	60.00%	Bay Program Retrofit Equations
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%	
<b>Incremental Removal Rate</b>		<b>21.50%</b>	<b>43.00%</b>	<b>53.00%</b>	

**6 Calculate Load Reduction**

**6a Characterize the Drainage Area**

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	0.00	0.00	0.00	0.00
Other Regulated Land	33.39	44.31	6.02	83.72
Unregulated Land	12.19	10.65	25.71	48.55
	<b>45.58</b>	<b>54.96</b>	<b>31.73</b>	<b>132.27</b>

**6b Account for Total Baseline Reductions on Unregulated Land**

	POC	Required 5% Load Reductions	Baseline Loading Rate (*20)	Acres	Baseline Reduction
Unregulated Impervious	TN	0.07587000	1.51740000	12.19	18.50
Unregulated Pervious	TN	0.03021000	0.60420000	10.65	6.43
Unregulated Impervious	TP	0.01296000	0.25920000	12.19	3.16
Unregulated Pervious	TP	0.00148625	0.02972500	10.65	0.32
Unregulated Impervious	TSS	11.71320000	234.26400000	12.19	2,855.68
Unregulated Pervious	TSS	0.76912500	15.38250000	10.65	163.82

**6c Calculate Total Load Reduction**

Land Use	Pollutant	2009 EOS Loading Rate (lbs/acre/yr)	DA	Load	Efficiency	Initial Reduction	Baseline	Total Reduction	Sub-total/POC
Urban Impervious	Nitrogen	16.86	45.58	768.48	21.50%	165.22	18.50	146.73	<b>295.37</b>
Urban Pervious	Nitrogen	10.07	54.96	553.45	21.50%	118.99	6.43	112.56	
Forest	Nitrogen	5.29	31.73	167.85	21.50%	36.09	0.00	36.09	
Urban Impervious	Phosphorus	1.62	45.58	73.84	43.00%	31.75	3.16	28.59	<b>39.74</b>
Urban Pervious	Phosphorus	0.41	54.96	22.53	43.00%	9.69	0.32	9.37	
Forest	Phosphorus	0.13	31.73	4.12	43.00%	1.77	0.00	1.77	
Urban Impervious	Total Suspended Solids	1,171.32	45.58	53,388.77	53.00%	28,296.05	2,855.68	25,440.37	<b>31,741.23</b>
Urban Pervious	Total Suspended Solids	175.80	54.96	9,661.97	53.00%	5,120.84	163.82	4,957.02	
Forest	Total Suspended Solids	79.91	31.73	2,535.54	53.00%	1,343.84	0.00	1,343.84	

**7 Reduction Summary Table**

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #416	Constructed Wetland L1	38.75104	-77.43079	295.37	39.74	31,741.23

**Phase II Stormwater Retrofits  
Reduction Calculation Worksheet**

SWM Facility #460 Existing Extended Dry Pond Converted to Wet Pond

**1 Determine existing published efficiency**

BMP Type	Source	TN	TP	TSS
Extended Dry Pond	CBP	20%	20%	60%

**2 Apply downward modification to BMP Efficiency**

Facility Name	BMP Type	Lat	Long	Modification Type	Downward Modification Applied
SWM Facility #460	Extended Dry Pond	38.690203	-77.371878	No sediment forebay No micropool Short circuiting	-10% -10% -10%
<b>Total</b>					<b>-30%</b>

**3 Calculate modified existing efficiency**

		TN	TP	TSS
Published Efficiency	Step 1	20%	20%	60%
Efficiency Modification	Step 2	-30%	-30%	-30%
<b>Modified Efficiency</b>		<b>14.00%</b>	<b>14.00%</b>	<b>42.00%</b>

**4 Determine efficiency of proposed BMP Type**

Source	BMP Type	TN	TP	TSS
CBP Retrofit Equations	Wet Pond	35.08%	55.12%	70.15%

Runoff storage (acre-feet)	1.15
Impervious acres	13.62
Runoff depth	1.01

Retrofit Equation Results		BMP CH L1	BMP CH L2	CBP Curves
TN	35.08%	30%	40%	35%
TP	55.12%	50%	75%	55%
TSS	70.15%			70%

**5 Calculate Incremental Removal Rate**

		TN	TP	TSS
Removal Rate	Wet Pond	35.08%	55.12%	70.15%
Modified existing efficiency	Step 3	14.00%	14.00%	42.00%
<b>Incremental Removal Rate</b>		<b>21.08%</b>	<b>41.12%</b>	<b>28.15%</b>

**6 Calculate Load Reduction**

**6a Characterize the Drainage Area**

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	0.05	0.09	0.02	0.16
Other Regulated Land	9.57	9.52	5.15	24.24
Unregulated Land	6.82	0.83	0.73	8.38
	<b>16.44</b>	<b>10.44</b>	<b>5.90</b>	<b>32.78</b>

**6b Account for Total Baseline Reductions on Unregulated Land**

	POC	Required 5% Load Reductions	Baseline Loading Rate (*20)	Acres	Baseline Reduction
Unregulated Impervious	TN	0.07587000	1.51740000	6.82	10.35
Unregulated Pervious	TN	0.03021000	0.60420000	0.83	0.50
Unregulated Impervious	TP	0.01296000	0.25920000	6.82	1.77
Unregulated Pervious	TP	0.00148625	0.02972500	0.83	0.02
Unregulated Impervious	TSS	11.71320000	234.26400000	6.82	1,597.68
Unregulated Pervious	TSS	0.76912500	15.38250000	0.83	12.77

**6c Calculate Total Load Reduction**

Land Use	Pollutant	2009 EOS Loading Rate (lbs/acre/yr)	DA	Load	Efficiency	Initial Reduction	Baseline	Total Reduction	Sub-total/POC
Urban Impervious	Nitrogen	16.86	16.44	277.18	21.08%	58.42	10.35	48.07	
Urban Pervious	Nitrogen	10.07	10.44	105.13	21.08%	22.16	0.50	21.66	<b>76.30</b>
Forest	Nitrogen	5.29	5.90	31.21	21.08%	6.58	0.00	6.58	
Urban Impervious	Phosphorus	1.62	16.44	26.63	41.12%	10.95	1.77	9.18	
Urban Pervious	Phosphorus	0.41	10.44	4.28	41.12%	1.76	0.02	1.74	<b>11.23</b>
Forest	Phosphorus	0.13	5.90	0.77	41.12%	0.32	0.00	0.32	
Urban Impervious	Total Suspended Solids	1,171.32	16.44	19,256.50	28.15%	5,420.88	1,597.68	3,823.20	
Urban Pervious	Total Suspended Solids	175.80	10.44	1,835.35	28.15%	516.67	12.77	503.90	<b>4,459.82</b>
Forest	Total Suspended Solids	79.91	5.90	471.47	28.15%	132.72	0.00	132.72	

**7 Reduction Summary Table**

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #460	Wet Pond	38.690203	-77.371878	76.30	11.23	4,459.82

**Phase II Stormwater Retrofits  
Reduction Calculation Worksheet**

SWM Facility #521

Existing Dry Pond Converted to Wet Pond (Maximize Treatment Volume)

**1 Determine existing published efficiency**

BMP Type	Source	TN	TP	TSS
Extended Dry Detention Pond	CBP	20%	20%	60%

**2 Apply downward modification to BMP Efficiency**

Facility Name	BMP Type	Lat	Long	Modification Type	Downward Modification Applied
SWM Facility #521	Extended Dry Detention Pond	38.690203	-77.371878	No sediment forebay No micropool	-10% -10%
<b>Total</b>					<b>-20%</b>

**3 Calculate modified existing efficiency**

		TN	TP	TSS
Published Efficiency	Step 1	20%	20%	60%
Efficiency Modification	Step 2	-20%	-20%	-20%
<b>Modified Efficiency</b>		<b>16.00%</b>	<b>16.00%</b>	<b>48.00%</b>

**4 Determine efficiency of proposed BMP Type**

Source	BMP Type	TN	TP	TSS
CBP Retrofit Equations	Wet Pond (Maximize Treatment Volume)	32.20%	50.60%	64.40%

Runoff storage (acre-feet)	2.11
Impervious acres	32.56
Runoff depth	0.78

	Retrofit Equation Results		BMP CH L1	BMP CH L2	CBP Curves
TN	32.20%		30%	40%	32%
TP	50.60%		50%	75%	51%
TSS	64.40%				64%

**5 Calculate Incremental Removal Rate**

		TN	TP	TSS
Removal Rate	Wet Pond (Maximize Treatment Volume)	32.20%	50.60%	64.40%
Modified existing efficiency	Step 3	16.00%	16.00%	48.00%
<b>Incremental Removal Rate</b>		<b>16.20%</b>	<b>34.60%</b>	<b>16.40%</b>

**6 Calculate Load Reduction**

**6a Characterize the Drainage Area**

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	0.10	0.05	0.00	0.15
Other Regulated Land	20.99	21.42	4.33	46.74
Unregulated Land	11.47	2.34	4.72	18.53
	<b>32.56</b>	<b>23.81</b>	<b>9.05</b>	<b>65.42</b>

**6b Account for Total Baseline Reductions on Unregulated Land**

	POC	Required 5% Load Reductions	Baseline Loading Rate (*20)	Acres	Baseline Reduction
Unregulated Impervious	TN	0.07587000	1.51740000	11.47	17.40
Unregulated Pervious	TN	0.03021000	0.60420000	2.34	1.41
Unregulated Impervious	TP	0.01296000	0.25920000	11.47	2.97
Unregulated Pervious	TP	0.00148625	0.02972500	2.34	0.07
Unregulated Impervious	TSS	11.71320000	234.26400000	11.47	2,687.01
Unregulated Pervious	TSS	0.76912500	15.38250000	2.34	36.00

**6c Calculate Total Load Reduction**

Land Use	Pollutant	2009 EOS Loading Rate (lbs/acre/yr)	DA	Load	Efficiency	Initial Reduction	Baseline	Total Reduction	Sub-total/POC
Urban Impervious	Nitrogen	16.86	32.56	548.96	16.20%	88.92	17.40	71.52	
Urban Pervious	Nitrogen	10.07	23.81	239.77	16.20%	38.84	1.41	37.42	116.69
Forest	Nitrogen	5.29	9.05	47.87	16.20%	7.75	0.00	7.75	
Urban Impervious	Phosphorus	1.62	32.56	52.75	34.60%	18.25	2.97	15.28	
Urban Pervious	Phosphorus	0.41	23.81	9.76	34.60%	3.38	0.07	3.31	18.99
Forest	Phosphorus	0.13	9.05	1.18	34.60%	0.41	0.00	0.41	
Urban Impervious	Total Suspended Solids	1,171.32	32.56	38,138.18	16.40%	6,254.17	2,687.01	3,567.16	
Urban Pervious	Total Suspended Solids	175.80	23.81	4,185.80	16.40%	686.42	36.00	650.42	4,336.18
Forest	Total Suspended Solids	79.91	9.05	723.19	16.40%	118.59	0.00	118.59	

**7 Reduction Summary Table**

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #521	Wet Pond (Maximize Treatment Volume)	38.690203	-77.371878	116.69	18.99	4,336.18

**Phase II Stormwater Retrofits  
Reduction Calculation Worksheet**

SWM Facility #5749

Existing Dry Pond Converted to Wet Pond (Maximize Treatment Volume)

**1 Determine existing published efficiency**

BMP Type	Source	TN	TP	TSS
Extended Dry Detention Pond	CBP	20%	20%	60%

**2 Apply downward modification to BMP Efficiency**

Facility Name	BMP Type	Lat	Long	Modification Type	Downward Modification Applied
SWM Facility #5749	BMP-CMAC	38.67072	-77.3229	No sediment forebay	-10%
<b>Total</b>					<b>-10%</b>

**3 Calculate modified existing efficiency**

		TN	TP	TSS
Published Efficiency	Step 1	20%	20%	60%
Efficiency Modification	Step 2	-10%	-10%	-10%
<b>Modified Efficiency</b>		<b>18.00%</b>	<b>18.00%</b>	<b>54.00%</b>

**4 Determine efficiency of proposed BMP Type**

Source	BMP Type	TN	TP	TSS
CBP Retrofit Equations	Wet Pond (Maximize Treatment Volume)	44.87%	71.17%	90.28%

Runoff storage (acre-feet)	2.68
Impervious acres	10.42
Runoff depth	3.08

	Retrofit Equation Results		BMP CH L1	BMP CH L2	CBP Curves
TN	44.87%		30%	40%	45%
TP	71.17%		50%	75%	71%
TSS	90.28%				90%

**5 Calculate Incremental Removal Rate**

		TN	TP	TSS
Removal Rate	Wet Pond (Maximize Treatment Volume)	44.87%	71.17%	90.28%
Modified existing efficiency	Step 3	18.00%	18.00%	54.00%
<b>Incremental Removal Rate</b>		<b>26.87%</b>	<b>53.17%</b>	<b>36.28%</b>

**6 Calculate Load Reduction**

**6a Characterize the Drainage Area**

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	6.14	3.45	2.65	12.24
Other Regulated Land	0.00	0.00	0.00	0.00
Unregulated Land	4.28	6.94	13.89	25.11
	<b>10.42</b>	<b>10.39</b>	<b>16.54</b>	<b>37.35</b>

**6b Account for Total Baseline Reductions on Unregulated Land**

	POC	Required 5% Load Reductions	Baseline Loading Rate (*20)	Acres	Baseline Reduction
Unregulated Impervious	TN	0.07587000	1.51740000	4.28	6.49
Unregulated Pervious	TN	0.03021000	0.60420000	6.94	4.19
Unregulated Impervious	TP	0.01296000	0.25920000	4.28	1.11
Unregulated Pervious	TP	0.00148625	0.02972500	6.94	0.21
Unregulated Impervious	TSS	11.71320000	234.26400000	4.28	1,002.65
Unregulated Pervious	TSS	0.76912500	15.38250000	6.94	106.75

**6c Calculate Total Load Reduction**

Land Use	Pollutant	2009 EOS Loading Rate (lbs/acre/yr)	DA	Load	Efficiency	Initial Reduction	Baseline	Total Reduction	Sub-total/POC
Urban Impervious	Nitrogen	16.86	10.42	175.68	26.87%	47.21	6.49	40.72	
Urban Pervious	Nitrogen	10.07	10.39	104.63	26.87%	28.12	4.19	23.92	<b>88.16</b>
Forest	Nitrogen	5.29	16.54	87.50	26.87%	23.51	0.00	23.51	
Urban Impervious	Phosphorus	1.62	10.42	16.88	53.17%	8.97	1.11	7.87	
Urban Pervious	Phosphorus	0.41	10.39	4.26	53.17%	2.26	0.21	2.06	<b>11.07</b>
Forest	Phosphorus	0.13	16.54	2.15	53.17%	1.14	0.00	1.14	
Urban Impervious	Total Suspended Solids	1,171.32	10.42	12,205.15	36.28%	4,427.45	1,002.65	3,424.80	
Urban Pervious	Total Suspended Solids	175.80	10.39	1,826.56	36.28%	662.59	106.75	555.84	<b>4,460.09</b>
Forest	Total Suspended Solids	79.91	16.54	1,321.71	36.28%	479.45	0.00	479.45	

**7 Reduction Summary Table**

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #5749	Wet Pond (Maximize Treatment Volume)	38.67072	-77.3229	88.16	11.07	4,460.09

## Appendix E – Public Comments

Reserved for public comments on the final Phase II Action Plan.


# Prince William County


Final Audit Report


2025-01-10


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