



Draft Phase II Chesapeake Bay TMDL Action Plan

Prince William County

Prepared in compliance with Permit No. VA0088595

June 19, 2019 - Draft

Submitted by:

Prince William County
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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."

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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.

1.2 Permit Requirement Crosswalk

Section I.D.1 of the MS4 Permit identifies the required components of this Action Plan. Table 1A provides an overview of the organization of the Action Plan and identifies the associated MS4 Permit requirement(s).

Table 1A – Action Plan and Permit Requirement Crosswalk

Action Plan Section	Action Plan Element	MS4 Permit Requirement	MS4 Permit Reference
2.1	Program Plan and Existing Legal Authority	A review of the current MS4 Program Plan including existing legal authorities and the permittee's ability to ensure compliance with this special condition.	Section I.D.1.b)1)(a)
2.2	New or Modified Legal Authority	Identifies any new or modified legal authorities, such as ordinances, permits, orders, contracts and inter-jurisdictional agreements, implemented or needing to be implemented to meet the requirements of this special condition.	Section I.D.1.b)1)(b)
3	Means and Methods to Address Discharges from New Sources	The means and methods utilized to address discharges into the MS4 from new sources.	Section I.D.1.b)1)(c)
4	Estimated Existing Source Loads and Calculated Total Pollutants of Concern (POC) Required Reductions	An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009 based on the 2009 progress run. The permittee shall utilize Table 1 and multiply the total existing acres served by the MS4 on June 30, 2009 and the 2009 Edge of Stream (EOS) Loading Rate. A determination of the total pollutant load reductions necessary to reduce the annual POC existing loads using Table 2 by multiplying the Total Existing Acres Served by MS4 by the First Permit Cycle Reduction in Loading Rate.	Section I.D.1.b)1)(d) and Section I.D.1.b)1)(e)
5	Means and Methods to Meet Required Reductions and Schedule	The means and methods, such as the management practices and retrofit programs that will be utilized to meet the required reductions identified in Part I.D.1.b)1)(e) and a schedule to achieve those reductions. The schedule should include annual benchmarks to demonstrate the on-going progress in meeting the reductions. The means and methods implemented prior to July 1, 2009 shall not be credited towards meeting the required reductions identified in Part I.D.1.b)1)(e).	Section I.D.1.b)1)(f)

6	Means and Methods to Offset Increased Loads from New Sources Initiating Construction between July 1, 2009 and June 30, 2014	The means and methods to offset the increased loads from new sources initiating construction between July 1, 2009 and June 30, 2014 that disturb one acre or greater as a result of the utilization of an average land cover condition greater than 16% impervious cover for the design of post development stormwater management facilities. The permittee shall utilize Table 3 to develop the equivalent pollutant load for nitrogen and total suspended solids. The permittee shall offset 5% of the calculated increased load from these new sources during the permit cycle.	Section I.D.1.b)1)(g)
7	Means and Methods to Offset Increased Loads from Grandfathered Projects Beginning Construction After July 1, 2014	The means and methods to offset the increased loads from grandfathered projects in accordance with 9VAC25-870-48, that disturb one acre or greater that begin construction after July 1, 2014 where the project utilized an average land cover condition greater than 16% impervious cover in the design of post development stormwater management facilities. The permittee shall utilize Table 3 to develop the equivalent pollutant load for nitrogen and total suspended solids.	Section I.D.1.b)1)(h)
8	List of Future Projects and Associated Acreage that Qualify as Grandfathered	A list of future projects and associated acreage that qualify as grandfathered in accordance with 9VAC25-870-48.	Section I.D.1.b)1)(i)
9	Estimated Expected Cost to Implement Necessary Reductions	An estimate of the expected cost to implement the necessary reductions during the permit cycle.	Section I.D.1.b)1)(j)
10	Public Comments on Draft Action Plan	An opportunity for receipt and consideration of public comment on the draft Chesapeake Bay TMDL Action Plan; and, A list of all comments received as a result of public comment and any modifications made to the draft Chesapeake Bay TMDL Action Plan as a result of the public comments.	Section I.D.1.b)1)(k) and Section I.D.1.b)1)(l)

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 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:

<http://www.pwcgov.org/government/dept/publicworks/environment/pages/ms-4-permit.aspx>

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. Table 2A provides a summary of these requirements and their location within the Program Plan.

Table 2A – MS4 Program Plan Components Related to Meeting the Chesapeake Bay TMDL

Program Plan Component	Program Plan Location	MS4 Permit Requirement	MS4 Permit
Nutrient Management Plans	BMPs d.1 and d.2 (Pages 13-14)	Implementation of turf and landscape nutrient management plans in accordance Part I.B.2.d).	Section I.D.1.c)2)(a)
Construction Site Runoff Controls	BMPs a.1 and a.2 (Pages 7-9)	Implementation of construction site runoff controls in Part I.B.2.a) in accordance with this state permit shall address discharges from transitional sources.	Section I.D.1.c)2)(b)
Discharges from New Sources	BMPs a.1 and a.2 (Pages 7-9)	Implementation of the means and methods to address discharges from new sources in accordance with requirements in Part I.B.2.a) for post-construction runoff from areas of new development and development on prior developed lands.	Section I.D.1.c)2)(c)
TMDL Action Plan Implementation	Section VI (Page 59)	Implementation of means and methods sufficient to meet 5% required reductions of POC loads from existing sources defined in this state permit in accordance with the Chesapeake Bay TMDL Watershed Implementation Plan as required in Part I.D.b)1)e).	Section I.D.1.c)2)(d)

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 - [Prince William County DCSM Section 400](#)
- Erosion and Sediment Control Ordinance – [Prince William County DCSM Section 700](#)
- Fire Prevention Ordinance – [Prince William County Code Chapter 9.1](#)
- 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. Means and Methods to Address Discharges from New Sources

As of July 1, 2014 Prince William County has adopted the Virginia Stormwater Management Program (VSMP) regulations into its local ordinance ([Prince William County Code Chapter 23.2](#), [Prince William County DCSM Section 700](#)). All development or redevelopment occurring within the County must incorporate water quality measures, also known as best management practices (BMPs). Any land disturbance activity greater than 2,500 square feet must have an approved erosion and sediment control plan. These standards and specifications are consistent with the requirements of the Virginia Stormwater Act, the Virginia Stormwater Management Program (VSMP) Regulations, the General Permit for Discharges of Stormwater from Construction Activities (9VAC25-880), and the Erosion and Sediment Control Law and Regulations.

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

4.1 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 MS4 service area.

4.2 Unaccounted Areas Assigned to VDOT

Part I.B.2.m(3) of the County's MS4 Permit specifies that the County should identify any areas within the County that drain to the VDOT MS4 and are unaccounted for in VDOT's Chesapeake Bay TMDL Action Plan. A total of 3,001.97 acres of land that drains to the VDOT MS4 are unaccounted for by the MS4 service area provided by VDOT.

4.3 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 4A. This estimate is based on the 2009 Chesapeake Bay Model progress run and is consistent with Table 1 of the County’s MS4 Permit.

Table 4A – Estimated Existing Source Loads from MS4

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	2009 EOS Loading Rate (Lbs/ac/yr)	Estimated Total POC Load Based on 2009 Progress Run (Lbs/yr)
Regulated Urban Impervious	Nitrogen	6,626.78	16.86	111,727.51
Regulated Urban Pervious		16,530.83	10.07	166,465.46
Regulated Urban Impervious	Phosphorous	6,626.78	1.62	10,735.38
Regulated Urban Pervious		16,530.83	0.41	6,777.64
Regulated Urban Impervious	Total Suspended Solids	6,626.78	1,171.32	7,762,079.95
Regulated Urban Pervious		16,530.83	175.8	2,906,119.91

4.4 Required Reductions

Using the above estimate of annual POC loadings as of June 30, 2009, an estimate for required reductions to meet the 5% POC reduction outlined in the County’s first permit cycle is included below in Table 4B. In addition, Table 4B identifies the 35% POC reduction required in the second permit cycle, based on the “seven times” methodology outlined in the County’s MS4 Permit Section I.D.1.d)5)(b). This computation is consistent with Page 7 of the Chesapeake Bay TMDL Special Condition Guidance (DEQ Guidance Memo No. 15-2005).

Table 4B –35% POC Reduction Required during Second Permit Cycle

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	1st Permit Cycle Required Reduction in Loading Rate (lbs/ac/yr)	Total Reduction Required During 1st Permit Cycle (lbs/yr)	Total Reduction Required During 2nd Permit Cycle (lbs/yr)
Regulated Urban Impervious	Nitrogen	6,626.78	0.07587	502.77	3,519.42
Regulated Urban Pervious		16,530.83	0.03021	499.40	3,495.77
Regulated Urban Impervious	Phosphorous	6,626.78	0.01296	85.88	601.18
Regulated Urban Pervious		16,530.83	0.00148625	24.57	171.98
Regulated Urban Impervious	Total Suspended Solids	6,626.78	11.7132	77,620.80	543,345.60
Regulated Urban Pervious		16,530.83	0.769125	12,714.27	88,999.92

Table 4C 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 4C – Reduction Required per Permit Cycle

Pollutant	1st Permit Cycle (5%)	2nd Permit Cycle (35%)	3rd Permit Cycle (60%)	Total (100%)
Nitrogen	1,002.17	7,015.19	12,026.04	20,043.40
Phosphorous	110.45	773.15	1,325.40	2,209.00
Total Suspended Solids	90,349.54	632,446.78	1,084,194.48	1,806,990.80

5. 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.

5.1 BMPs Implemented During the First Permit Cycle

The County has already exceeded the 5% POC reduction requirement for the first permit cycle. Table 5A provides a summary of the load reductions for each type of BMP completed and/or planned for the remainder of the first permit cycle. The load reductions have been summarized into three main project categories: Stream Restoration, Stormwater Retrofit and Reforestation. For more detailed information on the projects please refer to Appendix B. The table also includes the credit for facilities constructed between 2006 to 2009 and the offset credit from new sources that initiated construction between July 1, 2009 and June 30, 2014.

Table 5A – Summary of POC Reductions for 1st Permit Cycle

Project Status	Project Type	Number of Projects	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Completed	Stream Restoration	12	618.85	617.03	203,431.79
	Stormwater Retrofit	15	806.35	58.85	39,740.98
	Reforestation (LUC)	12	301.29	15.99	5,594.96
	Sub-total	39	1,726.50	691.87	248,767.72
Planned	Stream Restoration	1	259.17	292.81	52,283.42
	Stormwater Retrofit	1	217.71	34.49	25,290.37
	Reforestation (LUC)	-	-	-	-
	Sub-total	2	476.88	327.30	77,573.79
SWM/BMP Facilities Installed 2006-2009		88	4,231.83	393.69	464,836.62
SWM/BMP Facilities Installed 2009-2014		47	363.3	36.46	42,878.25
Total		176	6,798.51	1,449.33	834,056.39
Required 1st Permit Cycle Load Reductions (Table 4)			1,002.17	110.45	90,335.07
Credit toward 2nd Permit Cycle Reductions			5,796.34	1,338.88	743,721.32
Required Percent Reduction in 1st Permit Cycle			5%	5%	5%
Planned Percent Reduction in 1st Permit Cycle			33.9%	65.6%	46.2%

5.2 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 5C summarizes the POC reductions by project type.

Table 5B - POC Reductions for 2nd Permit Cycle by Type

Project Status	Project Type	Number of Projects	Nitrogen Reductions	Phosphorous Reductions	Total Suspended Solids Reductions
Planned	Stream Restoration	4	643.73	583.77	385,289.02
	Stormwater Retrofit	5	594.75	75.04	58,767.57
	Reforestation (LUC)	3	42.96	2.28	797.76
	Total	12	1,281.44	661.10	444,854.34

A total of four 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.

A total of three reforestation projects are planned for implementation during the second permit cycle. The load reductions associated with the land use change for each project have been calculated in accordance with Appendix V.H. of the Chesapeake Bay TMDL Special Condition Guidance. Appendix C includes details on each reforestation project including the implementation schedule, location, acreage of each project, and the calculated pollutant reductions.

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.

5.3 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.

5.4 Compliance Summary

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

Table 5C - Compliance Summary

	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)
Required 1st Permit Cycle Reductions (5%)	1,002.17	110.45	90,335.07
Required 2nd Permit Cycle Reductions (35%)	7,015.19	773.16	632,345.52
Total Required Reductions (40% cumulative)	8,017.36	883.61	722,680.59
1st Permit Cycle Reductions Achieved/Planned	6,798.51	1,449.33	834,056.39
2nd Permit Cycle Reductions Planned	1,281.44	661.10	444,854.34
Total Reductions Achieved/Planned thru 2nd Permit Cycle	8,079.95	2,110.42	1,278,910.73
Remainder/(Excess)	(62.59)	(1,226.81)	(556,230.15)
Cumulative Reduction	40.3%	95.5%	70.8%

As shown in Table 5C, the planned load reductions for the second permit cycle are projected to meet all three 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).

6. 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.

7. 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.

8. 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.

9. List of Future Projects Qualifying as Grandfathered

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

10. Estimate of the Expected Cost to Implement the Necessary Reductions

The implementation costs associated with the three project types identified in this Action Plan are provided in Table 10A below. 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.

Table 10A – Estimated Cost of Compliance for TMDL Projects

Project Status	Project Type	Number of Projects	Cost
Planned	Stream Restoration	4	\$10,325,000
	Stormwater Retrofit	5	\$1,700,000
	Reforestation (LUC)	3	\$75,000
	Total	12	\$12,100,000

11. 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

FAUQUIER COUNTY

STAFFORD COUNTY

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

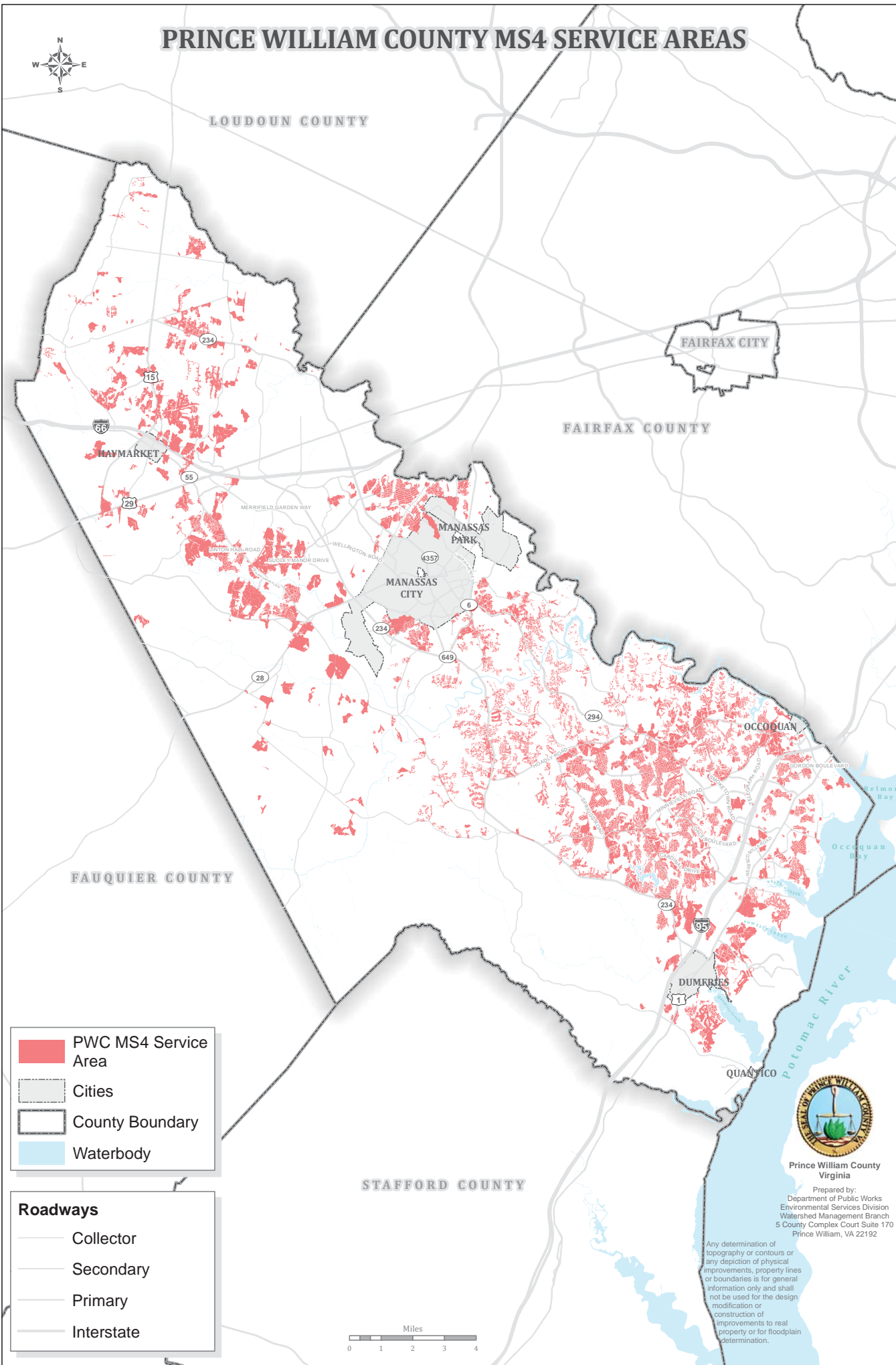
Roadways

- Collector
- Secondary
- Primary
- Interstate



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.



Appendix B – First Permit Cycle POC Reduction Documentation

FY19 Report-Stream Restoration: Stream Restoration Projects Beginning July 1, 2009

WMB Number	Project Name	Status	Installation FY	Latitude	Longitude	Total Drainage Area (Ac)	Impervious Area (Ac)	Pervious Area (Ac)	Forested Area (Ac)	Length	Pollutant Removal Rate	Physiographic Province	Estimated Total Pollutant Reduction (lbs/yr)			Percent Unregulated Area	Baseline Adjustment for Unregulated Areas (lbs/yr)			Total Pollutant Reduction Achieved After Baseline Adjustment (lbs/yr)		
													TN	TP	TSS		TN	TP	TSS	TN	TP	TSS
Completed Projects																						
76	Cow Branch Phase I	Completed	2011	38.62637	-77.27779	1,505.15	656.53	489.60	359.02	1,600	Interim Approved	Coastal Plain	120	108.8	24208	36%	613.55	88.90	77,864.74	77.38	70.16	15,609.85
78	Cow Branch Phase II	Completed	2012	38.63309	-77.27754	1,261.74	555.46	392.21	314.07	1,086	Interim Approved	Coastal Plain	81.45	73.848	16431.18	37%	533.87	77.39	67,792.77	51.44	46.64	10,377.70
81	Lower Cabin Run	Completed	2012	38.55637	-77.31275	250.53	52.09	111.39	87.04	1,073	Interim Approved	Coastal Plain	80.475	72.964	16234.49	3%	5.42	0.57	463.86	78.40	72.39	15,815.83
11	Northgate	Completed	2013	38.60703	-77.32944	7,543.75	1,153.02	2,847.75	3,542.98	300	Interim Approved	Piedmont	22.5	20.4	13464	19%	1,084.44	100.84	77,953.88	18.31	16.60	10,954.81
82	Deerfield Estates	Completed	2013	38.72890	-77.41942	62.22	12.67	23.93	25.61	225	Interim Approved	Piedmont	16.875	15.3	10098	5%	2.40	0.25	204.70	16.10	15.05	9,893.30
79	Cow Branch III	Completed	2015	38.63026	-77.27800	1,351.40	603.27	419.49	328.64	1,000	Interim Approved	Coastal Plain	75	68	15130	39%	604.15	87.75	76,896.67	45.88	41.60	9,255.93
268	Oak Street	Completed	2015	38.78353	-77.43967	359.56	76.60	232.65	50.31	200	Interim Approved	Piedmont	15	13.6	8976	80%	232.74	23.42	18,609.81	3.02	2.74	1,806.18
43	Hylbrook Park	Completed	2016	38.65086	-77.26413	263.59	82.49	114.41	66.69	1,268	Interim Approved	Coastal Plain	95.1	86.224	19184.84	27%	67.25	8.06	6,752.78	68.99	78.16	13,918.49
49	East Longview - Route 1 Restoration	Completed	2017	38.64522	-77.26070	144.73	55.33	65.38	24.02	925	Interim Approved	Coastal Plain	69.375	62.9	13995.25	68%	95.00	11.94	10,119.16	22.52	50.96	4,543.39
100	Dewey's Creek Reach 4	Completed	2017	38.56467	-77.31045	1,322.85	341.10	532.60	449.15	400	Interim Approved	Coastal Plain	30	27.2	6052	29%	342.39	38.66	31,845.39	21.20	19.22	4,276.94
158	Reach 5	Completed	2017	38.68478	-77.29637	86.76	36.57	37.65	12.54	2,100	Interim Approved	Piedmont	157.5	142.8	94248	12%	10.24	1.25	1,056.83	147.26	141.55	93,191.17
102	Dewey's Creek Reach 1	Completed	2018	38.57572	-77.31094	1,066.73	293.06	398.77	374.91	1,270	Interim Approved	Coastal Plain	95.25	86.36	19215.1	28%	277.11	32.85	27,422.95	68.35	61.97	13,788.21
Planned Projects																						
99	Dewey's Creek Reach 2	Construction	2019	38.56572	-77.30986	1,298.15	339.07	520.41	438.68	4,865	Interim Approved	Coastal Plain	364.875	330.82	73607.45	29%	334.00	38.01	31,377.59	259.17	292.81	52,283.42

FY19 Report - SWM Retrofits: Stormwater Facility Retrofits Beginning July 1, 2009

WMB Number	Project Name	Status	Installation FY	Latitude	Longitude	BMP Practice	Area Treated (Ac)	Impervious Area (Ac)	Pervious Area (Ac)	Forested Area (Ac)	Calculation Method	Estimated Total Pollutant Reduction (lbs/yr)			Precent Unregulated Area	Baseline Adjustment for Unregulated Area (lbs/yr)			Total Pollutant Reduction Achieved after Baseline Adjustment (lbs/yr)		
												TN	TP	TSS		TN	TP	TSS	TN	TP	TSS
Completed Projects																					
1	SWM Facility #257	Completed	2010	38.70846	-77.42804	Extended Detention	4.28	1.09	1.91	1.28	CBP Established Efficiency, Incremental	7.33	0.35	223.44	13.52%	0.53	0.06	52.90	6.80	0.29	170.54
21	Pond 51 - Hammill Mill Park SWMF	Completed	2011	38.66706	-77.26875	Extended Detention	7.13	2.10	2.76	2.27	CBP Established Efficiency, Incremental	12.41	0.63	406.44	3.06%	0.21	0.03	21.60	12.20	0.60	384.84
23	SWM Facility #154 - Dawson Ridge	Completed	2011	38.64959	-77.26743	Extended Detention	6.48	2.44	2.89	1.15	CBP Established Efficiency, Incremental	12.60	0.69	449.74	9.17%	0.61	0.08	69.64	11.99	0.61	380.09
24	SWM Facility #157 - Dawson Ridge	Completed	2011	38.64802	-77.26509	Extended Detention	4.86	1.56	1.46	1.83	CBP Established Efficiency, Incremental	8.38	0.44	290.67	7.23%	0.36	0.05	40.57	8.03	0.39	250.11
83	SWM Facility #363	Completed	2013	38.73062	-77.41825	Extended Detention	35.42	8.54	14.34	12.53	CBP Established Efficiency, Incremental	58.53	2.77	1,758.43	0.52%	0.18	0.02	19.30	58.35	2.75	1,739.13
129	SWM Facility #318	Completed	2013	38.56811	-77.30660	Extended Detention	17.48	3.27	9.46	4.75	CBP Established Efficiency, Incremental	28.95	1.27	763.03	0.00%	0.00	0.00	0.00	28.95	1.27	763.03
145	SWM Facility #494	Completed	2013	38.78569	-77.53199	Constructed Wetland	38.27	15.26	22.13	0.88	CBP Retrofits Expert Panel, ST, Incremental	99.20	14.00	5,442.51	5.70%	2.20	0.29	244.38	97.00	13.72	5,198.13
69	SWM Facility #77	Completed	2014	38.74038	-77.42235	Extended Detention	54.12	6.38	22.48	25.26	CBP Established Efficiency, Incremental	77.15	2.97	1,747.72	14.09%	5.89	0.55	424.59	71.26	2.42	1,323.13
85	SWM Facility #505	Completed	2014	38.56390	-77.30522	Extended Detention	16.26	4.28	7.77	4.22	CBP Established Efficiency, Incremental	28.49	1.39	872.77	3.07%	0.35	0.03	19.68	28.14	1.36	853.09
59	SWM Facility #99	Completed	2015	38.78563	-77.51022	Constructed Wetland	8.89	5.14	3.74	0.00	CBP Retrofits Expert Panel, ST, Incremental	40.20	4.84	4,319.55	81.51%	7.90	1.10	955.15	32.31	3.74	3,364.40
80	SWM Facility #98	Completed	2015	38.62455	-77.27419	Extended Detention	7.70	2.70	2.51	2.50	CBP Established Efficiency, Incremental	13.86	0.74	494.46	0.41%	0.03	0.00	3.52	13.83	0.74	490.94
169	SWM Facility #28	Completed	2017	38.68411	-77.27122	Wet Pond, L1	74.97	21.10	34.63	19.24	CBP Retrofits Expert Panel, ST, Incremental	67.40	5.81	5,409.80	8.34%	5.74	0.68	566.70	61.65	5.13	4,843.10
16	SWM Facility #147	Completed	2018	38.61010	-77.31428	Constructed Wetland, L1	45.24	15.28	24.02	5.93	CBP Retrofits Expert Panel, ST, Incremental	68.18	6.61	5,808.09	10.44%	4.17	0.47	388.79	64.01	6.14	5,419.30
173	SWM Facility #489	Completed	2018	38.68457	-77.29579	Extended Detention	82.12	32.67	36.52	12.92	CBP Established Efficiency, Incremental	162.85	9.05	5,943.86	15.04%	11.28	1.33	1,105.74	151.57	7.72	4,838.12
190	SWM Facility #109	Completed	2018	38.72093	-77.41199	Wet Pond, L1	72.52	9.79	21.94	40.78	CBP Retrofits Expert Panel, ST, Incremental	167.29	12.72	10,334.53	11.36%	7.00	0.75	611.50	160.29	11.97	9,723.03
Planned Projects																					
191	SWM Facility #424	Design	2019	38.57761	-77.30891	Constructed Wetland	92.01	39.01	41.88	11.11	CBP Retrofits Expert Panel, ST, Incremental	239.05	37.64	28,053.69	19.75%	21.34	3.14	2,763.32	217.71	34.49	25,290.37

1st Permit Cycle
Bay TMDL Reduction Calculation Worksheet

Cow Branch I Stream Restoration Status: Completed
 1,600

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Interim Removal Rates (lbs/lf)	0.075	0.068	15.13
Restoration Length (lf)	1,600	1,600	1,600
Initial POC Reductions	120.00	108.80	24,208.00

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	114.54	91.58	31.44	206.13	237.57
Other Regulated Land	223.82	181.59	58.66	405.41	464.06
Total Regulated Land	338.36	273.17	90.10	611.53	701.63
Total Unregulated Land	318.17	216.43	268.92	534.59	803.51
	656.53	489.60	359.02	1,146.13	1,505.15

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	40.63%	35.52%	23.85%		
TN (lbs) Reduction	48.76	42.62	28.62	120.00	
TP (lbs) Reduction	44.20	38.64	25.95	108.80	
TSS (lbs) Reduction	9,835.61	8,598.15	5,774.24	24,208.00	

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	318.17	482.79
Pervious	TN	0.03021000	0.60420000	216.43	130.76
Impervious	TP	0.01296000	0.25920000	318.17	82.47
Pervious	TP	0.00148625	0.02972500	216.43	6.43
Impervious	TSS	11.71320000	234.26400000	318.17	74,535.57
Pervious	TSS	0.76912500	15.38250000	216.43	3,329.17

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Credit for Unregulated Areas	42.62	38.64	8,598.15
Minus Unregulated Impervious Baseline	482.79	82.47	74,535.57
Minus Unregulated Pervious Baseline	130.76	6.43	3,329.17
Credit for Unregulated Areas	0.00	0.00	0.00
Credit for Regulated Areas	48.76	44.20	9,835.61
Credit for Forested Areas	28.62	25.95	5,774.24
Total Reductions Claimed	77.38	70.16	15,609.85

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Cow Branch I	Stream Restoration	38.62637	-77.27779	77.38	70.16	15,609.85

1st Permit Cycle
Bay TMDL Reduction Calculation Worksheet

Cow Branch II Stream Restoration Status: Completed
1,086

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Interim Removal Rates (lbs/lf)	0.075	0.068	15.13
Restoration Length (lf)	1,086	1,086	1,086
Initial POC Reductions	81.45	73.85	16,431.18

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	113.06	89.72	29.97	202.77	232.74
Other Regulated Land	165.35	114.71	37.79	280.06	317.84
Total Regulated Land	278.41	204.43	67.76	482.83	550.59
Total Unregulated Land	277.06	187.79	246.31	464.84	711.15
	555.46	392.21	314.07	947.67	1,261.74

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	38.27%	36.84%	24.89%		
TN (lbs) Reduction	31.17	30.01	20.27	81.45	
TP (lbs) Reduction	28.26	27.21	18.38	73.85	
TSS (lbs) Reduction	6,287.74	6,053.48	4,089.96	16,431.18	

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	277.06	420.40
Pervious	TN	0.03021000	0.60420000	187.79	113.46
Impervious	TP	0.01296000	0.25920000	277.06	71.81
Pervious	TP	0.00148625	0.02972500	187.79	5.58
Impervious	TSS	11.71320000	234.26400000	277.06	64,904.13
Pervious	TSS	0.76912500	15.38250000	187.79	2,888.64

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Credit for Unregulated Areas	30.01	27.21	6,053.48
Minus Unregulated Impervious Baseline	420.40	71.81	64,904.13
Minus Unregulated Pervious Baseline	113.46	5.58	2,888.64
Credit for Unregulated Areas	0.00	0.00	0.00
Credit for Regulated Areas	31.17	28.26	6,287.74
Credit for Forested Areas	20.27	18.38	4,089.96
Total Reductions Claimed	51.44	46.64	10,377.70

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Cow Branch II	Stream Restoration	38.63309	-77.27754	51.44	46.64	10,377.70

1st Permit Cycle
Bay TMDL Reduction Calculation Worksheet

Lower Cabin Run Stream Restoration Status: Completed
 1,073

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Interim Removal Rates (lbs/lf)	0.075	0.068	15.13
Restoration Length (lf)	1,073	1,073	1,073
Initial POC Reductions	80.48	72.96	16,234.49

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	38.84	90.50	76.78	129.35	206.13
Other Regulated Land	11.58	16.09	3.67	27.67	31.34
Total Regulated Land	50.42	106.60	80.45	157.02	237.47
Total Unregulated Land	1.67	4.80	6.59	6.46	13.05
	52.09	111.39	87.04	163.48	250.53

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	62.68%	2.58%	34.74%		
TN (lbs) Reduction	50.44	2.08	27.96	80.48	
TP (lbs) Reduction	45.73	1.88	25.35	72.96	
TSS (lbs) Reduction	10,175.27	418.66	5,640.55	16,234.49	

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	1.67	2.53
Pervious	TN	0.03021000	0.60420000	4.80	2.90
Impervious	TP	0.01296000	0.25920000	1.67	0.43
Pervious	TP	0.00148625	0.02972500	4.80	0.14
Impervious	TSS	11.71320000	234.26400000	1.67	390.09
Pervious	TSS	0.76912500	15.38250000	4.80	73.77

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Credit for Unregulated Areas	2.08	1.88	418.66
Minus Unregulated Impervious Baseline	2.53	0.43	390.09
Minus Unregulated Pervious Baseline	2.90	0.14	73.77
Credit for Unregulated Areas	0.00	1.31	0.00
Credit for Regulated Areas	50.44	45.73	10,175.27
Credit for Forested Areas	27.96	25.35	5,640.55
Total Reductions Claimed	78.40	72.39	15,815.83

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Lower Cabin Run	Stream Restoration	38.55637	-77.31275	78.40	72.39	15,815.83

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

Northgate Stream Restoration Status: Completed
300

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Interim Removal Rates (lbs/lf)	0.075	0.068	44.88
Restoration Length (lf)	300	300	300
Initial POC Reductions	22.50	20.40	13,464.00

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	464.82	1,033.52	665.50	1,498.35	2,163.84
Other Regulated Land	430.85	665.70	898.21	1,096.55	1,994.76
Total Regulated Land	895.67	1,699.22	1,563.71	2,594.89	4,158.60
Total Unregulated Land	257.34	1,148.53	1,979.27	1,405.87	3,385.14
	1,153.02	2,847.75	3,542.98	4,000.77	7,543.75

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	34.40%	18.64%	46.97%		
TN (lbs) Reduction	7.74	4.19	10.57	22.50	
TP (lbs) Reduction	7.02	3.80	9.58	20.40	
TSS (lbs) Reduction	4,631.34	2,509.19	6,323.47	13,464.00	

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	257.34	390.50
Pervious	TN	0.03021000	0.60420000	1,148.53	693.94
Impervious	TP	0.01296000	0.25920000	257.34	66.70
Pervious	TP	0.00148625	0.02972500	1,148.53	34.14
Impervious	TSS	11.71320000	234.26400000	257.34	60,286.66
Pervious	TSS	0.76912500	15.38250000	1,148.53	17,667.22

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Credit for Unregulated Areas	4.19	3.80	2,509.19
Minus Unregulated Impervious Baseline	390.50	66.70	60,286.66
Minus Unregulated Pervious Baseline	693.94	34.14	17,667.22
Credit for Unregulated Areas	0.00	0.00	0.00
Credit for Regulated Areas	7.74	7.02	4,631.34
Credit for Forested Areas	10.57	9.58	6,323.47
Total Reductions Claimed	18.31	16.60	10,954.81

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Northgate	Stream Restoration	38.60703	-77.32944	18.31	16.60	10,954.81

1st Permit Cycle
Bay TMDL Reduction Calculation Worksheet

Deerfield Estates Stream Restoration Status: Completed
225

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Interim Removal Rates (lbs/lf)	0.075	0.068	44.88
Restoration Length (lf)	225	225	225
Initial POC Reductions	16.88	15.30	10,098.00

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	6.64	19.42	21.63	26.06	47.69
Other Regulated Land	5.30	2.38	0.00	7.68	7.68
Total Regulated Land	11.94	21.81	21.63	33.74	55.38
Total Unregulated Land	0.73	2.13	3.98	2.86	6.84
	12.67	23.93	25.61	36.60	62.22

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	54.24%	4.60%	41.17%		
TN (lbs) Reduction	9.15	0.78	6.95	16.88	
TP (lbs) Reduction	8.30	0.70	6.30	15.30	
TSS (lbs) Reduction	5,476.73	464.21	4,157.06	10,098.00	

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	0.73	1.11
Pervious	TN	0.03021000	0.60420000	2.13	1.28
Impervious	TP	0.01296000	0.25920000	0.73	0.19
Pervious	TP	0.00148625	0.02972500	2.13	0.06
Impervious	TSS	11.71320000	234.26400000	0.73	172.00
Pervious	TSS	0.76912500	15.38250000	2.13	32.70

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Credit for Unregulated Areas	0.78	0.70	464.21
Minus Unregulated Impervious Baseline	1.11	0.19	172.00
Minus Unregulated Pervious Baseline	1.28	0.06	32.70
Credit for Unregulated Areas	0.00	0.45	259.51
Credit for Regulated Areas	9.15	8.30	5,476.73
Credit for Forested Areas	6.95	6.30	4,157.06
Total Reductions Claimed	16.10	15.05	9,893.30

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Deerfield Estates	Stream Restoration	38.7289	-77.41942	16.10	15.05	9,893.30

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

Cow Branch III Stream Restoration Status: Completed
1,000

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Interim Removal Rates (lbs/lf)	0.075	0.068	15.13
Restoration Length (lf)	1,000	1,000	1,000
Initial POC Reductions	75.00	68.00	15,130.00

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	114.53	91.58	31.42	206.10	237.53
Other Regulated Land	174.30	117.69	39.39	291.99	331.38
Total Regulated Land	288.82	209.27	70.81	498.09	568.90
Total Unregulated Land	314.44	210.22	257.83	524.67	782.50
	603.27	419.49	328.64	1,022.76	1,351.40

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	36.86%	38.82%	24.32%		
TN (lbs) Reduction	27.64	29.12	18.24	75.00	
TP (lbs) Reduction	25.06	26.40	16.54	68.00	
TSS (lbs) Reduction	5,576.54	5,874.07	3,679.39	15,130.00	

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	314.44	477.14
Pervious	TN	0.03021000	0.60420000	210.22	127.02
Impervious	TP	0.01296000	0.25920000	314.44	81.50
Pervious	TP	0.00148625	0.02972500	210.22	6.25
Impervious	TSS	11.71320000	234.26400000	314.44	73,662.90
Pervious	TSS	0.76912500	15.38250000	210.22	3,233.77

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Credit for Unregulated Areas	29.12	26.40	5,874.07
Minus Unregulated Impervious Baseline	477.14	81.50	73,662.90
Minus Unregulated Pervious Baseline	127.02	6.25	3,233.77
Credit for Unregulated Areas	0.00	0.00	0.00
Credit for Regulated Areas	27.64	25.06	5,576.54
Credit for Forested Areas	18.24	16.54	3,679.39
Total Reductions Claimed	45.88	41.60	9,255.93

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Cow Branch III	Stream Restoration	38.63026	-77.278	45.88	41.60	9,255.93

1st Permit Cycle
Bay TMDL Reduction Calculation Worksheet

Oak Street Stream Restoration Status: Completed
200

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Interim Removal Rates (lbs/lf)	0.075	0.068	44.88
Restoration Length (lf)	200	200	200
Initial POC Reductions	15.00	13.60	8,976.00

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	0.77	2.67	1.64	3.44	5.08
Other Regulated Land	10.99	7.61	0.29	18.60	18.90
Total Regulated Land	11.77	10.28	1.93	22.05	23.98
Total Unregulated Land	64.84	222.37	48.37	287.21	335.58
	76.60	232.65	50.31	309.26	359.56

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	6.13%	79.88%	13.99%		
TN (lbs) Reduction	0.92	11.98	2.10	15.00	
TP (lbs) Reduction	0.83	10.86	1.90	13.60	
TSS (lbs) Reduction	550.34	7,169.82	1,255.84	8,976.00	

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	64.84	98.38
Pervious	TN	0.03021000	0.60420000	222.37	134.36
Impervious	TP	0.01296000	0.25920000	64.84	16.81
Pervious	TP	0.00148625	0.02972500	222.37	6.61
Impervious	TSS	11.71320000	234.26400000	64.84	15,189.17
Pervious	TSS	0.76912500	15.38250000	222.37	3,420.64

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Credit for Unregulated Areas	11.98	10.86	7,169.82
Minus Unregulated Impervious Baseline	98.38	16.81	15,189.17
Minus Unregulated Pervious Baseline	134.36	6.61	3,420.64
Credit for Unregulated Areas	0.00	0.00	0.00
Credit for Regulated Areas	0.92	0.83	550.34
Credit for Forested Areas	2.10	1.90	1,255.84
Total Reductions Claimed	3.02	2.74	1,806.18

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Oak Street	Stream Restoration	38.78353	-77.43967	3.02	2.74	1,806.18

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

Hylbrook Park Stream Restoration Status: Completed
1,268

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Interim Removal Rates (lbs/lf)	0.075	0.068	15.13
Restoration Length (lf)	1,268	1,268	1,268
Initial POC Reductions	95.10	86.22	19,184.84

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	27.40	49.61	25.94	77.02	102.96
Other Regulated Land	29.32	18.21	5.67	47.52	53.19
Total Regulated Land	56.72	67.82	31.61	124.54	156.15
Total Unregulated Land	25.77	46.59	35.08	72.36	107.44
	82.49	114.41	66.69	196.90	263.59

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	47.25%	27.45%	25.30%		
TN (lbs) Reduction	44.93	26.11	24.06	95.10	
TP (lbs) Reduction	40.74	23.67	21.82	86.22	
TSS (lbs) Reduction	9,064.51	5,266.34	4,853.99	19,184.84	

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	25.77	39.10
Pervious	TN	0.03021000	0.60420000	46.59	28.15
Impervious	TP	0.01296000	0.25920000	25.77	6.68
Pervious	TP	0.00148625	0.02972500	46.59	1.38
Impervious	TSS	11.71320000	234.26400000	25.77	6,036.10
Pervious	TSS	0.76912500	15.38250000	46.59	716.68

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Credit for Unregulated Areas	26.11	23.67	5,266.34
Minus Unregulated Impervious Baseline	39.10	6.68	6,036.10
Minus Unregulated Pervious Baseline	28.15	1.38	716.68
Credit for Unregulated Areas	0.00	15.61	0.00
Credit for Regulated Areas	44.93	40.74	9,064.51
Credit for Forested Areas	24.06	21.82	4,853.99
Total Reductions Claimed	68.99	78.16	13,918.50

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Hylbrook Park	Stream Restoration	38.65086	-77.26413	68.99	78.16	13,918.50

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

East Longview Stream Restoration Status: Completed
925

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Interim Removal Rates (lbs/lf)	0.075	0.068	15.13
Restoration Length (lf)	925	925	925
Initial POC Reductions	69.38	62.90	13,995.25

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	0.49	1.70	0.67	2.19	2.86
Other Regulated Land	15.47	5.30	0.23	20.77	21.00
Total Regulated Land	15.96	7.00	0.90	22.96	23.86
Total Unregulated Land	39.36	58.38	23.12	97.74	120.87
	55.33	65.38	24.02	120.70	144.73

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	15.86%	67.54%	16.60%		
TN (lbs) Reduction	11.01	46.85	11.52	69.38	
TP (lbs) Reduction	9.98	42.48	10.44	62.90	
TSS (lbs) Reduction	2,220.23	9,451.86	2,323.17	13,995.25	

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	39.36	59.73
Pervious	TN	0.03021000	0.60420000	58.38	35.27
Impervious	TP	0.01296000	0.25920000	39.36	10.20
Pervious	TP	0.00148625	0.02972500	58.38	1.74
Impervious	TSS	11.71320000	234.26400000	39.36	9,221.11
Pervious	TSS	0.76912500	15.38250000	58.38	898.05

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Credit for Unregulated Areas	46.85	42.48	9,451.86
Minus Unregulated Impervious Baseline	59.73	10.20	9,221.11
Minus Unregulated Pervious Baseline	35.27	1.74	898.05
Credit for Unregulated Areas	0.00	30.54	0.00
Credit for Regulated Areas	11.01	9.98	2,220.23
Credit for Forested Areas	11.52	10.44	2,323.17
Total Reductions Claimed	22.52	50.96	4,543.39

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
East Longview	Stream Restoration	38.64522	-77.2607	22.52	50.96	4,543.39

1st Permit Cycle
Bay TMDL Reduction Calculation Worksheet

Dewey's Creek Reach 4 Stream Restoration Status: Completed
 540

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Interim Removal Rates (lbs/lf)	0.075	0.068	15.13
Restoration Length (lf)	540	540	540
Initial POC Reductions	40.50	36.72	8,170.20

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	110.97	195.38	63.59	306.35	369.94
Other Regulated Land	111.90	67.45	24.64	179.35	204.00
Total Regulated Land	222.87	262.83	88.23	485.71	573.93
Total Unregulated Land	118.22	269.77	360.92	387.99	748.92
	341.10	532.60	449.15	873.70	1,322.85

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	36.72%	29.33%	33.95%		
TN (lbs) Reduction	14.87	11.88	13.75	40.50	
TP (lbs) Reduction	13.48	10.77	12.47	36.72	
TSS (lbs) Reduction	2,999.82	2,396.33	2,774.04	8,170.20	

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	118.22	179.39
Pervious	TN	0.03021000	0.60420000	269.77	163.00
Impervious	TP	0.01296000	0.25920000	118.22	30.64
Pervious	TP	0.00148625	0.02972500	269.77	8.02
Impervious	TSS	11.71320000	234.26400000	118.22	27,695.64
Pervious	TSS	0.76912500	15.38250000	269.77	4,149.74

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Credit for Unregulated Areas	11.88	10.77	2,396.33
Minus Unregulated Impervious Baseline	179.39	30.64	27,695.64
Minus Unregulated Pervious Baseline	163.00	8.02	4,149.74
Credit for Unregulated Areas	0.00	0.00	0.00
Credit for Regulated Areas	14.87	13.48	2,999.82
Credit for Forested Areas	13.75	12.47	2,774.04
Total Reductions Claimed	28.62	25.95	5,773.87

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Dewey's Creek Reach 4	Stream Restoration	38.56476	-77.31045	28.62	25.95	5,773.87

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

Dewey's Creek Reach 1 Stream Restoration Status: Completed
1,270

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Interim Removal Rates (lbs/lf)	0.075	0.068	15.13
Restoration Length (lf)	1,270	1,270	1,270
Initial POC Reductions	95.25	86.36	19,215.10

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
Total Regulated Land	188.94	201.60	51.50	390.55	442.04
Total Unregulated Land	104.11	197.16	323.41	301.28	624.69
	293.06	398.77	374.91	691.82	1,066.73

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	36.61%	28.24%	35.15%		
TN (lbs) Reduction	34.87	26.90	33.48	95.25	
TP (lbs) Reduction	31.62	24.39	30.35	86.36	
TSS (lbs) Reduction	7,034.94	5,426.89	6,753.27	19,215.10	

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	26.90	24.39	5,426.89
Minus Unregulated Impervious Baseline	157.98	26.99	24,390.11
Minus Unregulated Pervious Baseline	119.13	5.86	3,032.84
Credit for Unregulated Areas	0.00	0.00	0.00
Credit for Regulated Areas	34.87	31.62	7,034.94
Credit for Forested Areas	33.48	30.35	6,753.27
Total Reductions Claimed	68.35	61.97	13,788.21

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	68.35	61.97	13,788.21

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

Reach 5 Stream Restoration Status: Completed
2,100

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Interim Removal Rates (lbs/lf)	0.075	0.068	44.88
Restoration Length (lf)	2,100	2,100	2,100
Initial POC Reductions	157.50	142.80	94,248.00

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	18.56	21.99	2.60	40.56	43.15
Other Regulated Land	13.94	8.93	0.99	22.86	23.85
Total Regulated Land	32.50	30.92	3.58	63.42	67.00
Total Unregulated Land	4.07	6.73	8.96	10.80	19.76
	36.57	37.65	12.54	74.22	86.76

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	73.09%	12.45%	14.46%		
TN (lbs) Reduction	115.12	19.61	22.77	157.50	
TP (lbs) Reduction	104.38	17.78	20.65	142.80	
TSS (lbs) Reduction	68,888.66	11,732.37	13,626.97	94,248.00	

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	4.07	6.17
Pervious	TN	0.03021000	0.60420000	6.73	4.07
Impervious	TP	0.01296000	0.25920000	4.07	1.05
Pervious	TP	0.00148625	0.02972500	6.73	0.20
Impervious	TSS	11.71320000	234.26400000	4.07	953.29
Pervious	TSS	0.76912500	15.38250000	6.73	103.54

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Credit for Unregulated Areas	19.61	17.78	11,732.37
Minus Unregulated Impervious Baseline	6.17	1.05	953.29
Minus Unregulated Pervious Baseline	4.07	0.20	103.54
Credit for Unregulated Areas	9.36	16.52	10,675.54
Credit for Regulated Areas	115.12	104.38	68,888.66
Credit for Forested Areas	22.77	20.65	13,626.97
Total Reductions Claimed	147.26	141.55	93,191.17

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Reach 5	Stream Restoration	38.68478	-77.29637	147.26	141.55	93,191.17

1st Permit Cycle
Bay TMDL Reduction Calculation Worksheet

Dewey's Creek Reach 2
4,865

Stream Restoration

Status:

Construction

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Interim Removal Rates (lbs/lf)	0.075	0.068	15.13
Restoration Length (lf)	4,865	4,865	4,865
Initial POC Reductions	364.88	330.82	73,607.45

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	110.94	194.99	63.38	305.93	369.31
Other Regulated Land	111.20	66.27	23.43	177.47	200.90
Total Regulated Land	222.14	261.26	86.81	483.40	570.21
Total Unregulated Land	116.92	259.15	351.87	376.07	727.94
	339.06	520.41	438.68	859.47	1,298.15

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	37.24%	28.97%	33.79%		
TN (lbs) Reduction	135.87	105.70	123.30	364.88	
TP (lbs) Reduction	123.19	95.84	111.79	330.82	
TSS (lbs) Reduction	27,409.65	21,323.85	24,873.95	73,607.45	

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	116.92	177.41
Pervious	TN	0.03021000	0.60420000	259.15	156.58
Impervious	TP	0.01296000	0.25920000	116.92	30.31
Pervious	TP	0.00148625	0.02972500	259.15	7.70
Impervious	TSS	11.71320000	234.26400000	116.92	27,390.15
Pervious	TSS	0.76912500	15.38250000	259.15	3,986.37

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Credit for Unregulated Areas	105.70	95.84	21,323.85
Minus Unregulated Impervious Baseline	177.41	30.31	27,390.15
Minus Unregulated Pervious Baseline	156.58	7.70	3,986.37
Credit for Unregulated Areas	0.00	57.83	0.00
Credit for Regulated Areas	135.87	123.19	27,409.65
Credit for Forested Areas	123.30	111.79	24,873.95
Total Reductions Claimed	259.17	292.81	52,283.60

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Dewey's Creek Reach 2	Stream Restoration	38.56572	-77.30986	259.17	292.81	52,283.60

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

SWM Facility #257 Extended Detention

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 #257	Dry Detention Pond	38.70846	-77.42804	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Extended Detention	20.00%	20.00%	20.00%

Runoff storage (acre-feet)	0.00
Impervious acres	0
Runoff depth	#DIV/0!

Retrofit Equation Results

TN	#DIV/0!
TP	#DIV/0!
TSS	#DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS
Removal Rate	Extended Detention	20.00%	20.00%	20.00%
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%
Incremental Removal Rate		16.50%	13.00%	13.00%

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	0.22	1.17	1.21	2.60
Other Regulated Land	0.67	0.37	0.00	1.04
Unregulated Land	0.20	0.38	0.06	0.64
	1.09	1.91	1.28	4.28

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	0.20	0.31
Unregulated Pervious	TN	0.03021000	0.60420000	0.38	0.23
Unregulated Impervious	TP	0.01296000	0.25920000	0.20	0.05
Unregulated Pervious	TP	0.00148625	0.02972500	0.38	0.01
Unregulated Impervious	TSS	11.71320000	234.26400000	0.20	47.09
Unregulated Pervious	TSS	0.76912500	15.38250000	0.38	5.81

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	1.09	18.44	16.50%	3.04	0.31	2.74	
Urban Pervious	Nitrogen	10.07	1.91	19.24	16.50%	3.17	0.23	2.95	6.80
Forest	Nitrogen	5.29	1.28	6.74	16.50%	1.11	0.00	1.11	
Urban Impervious	Phosphorus	1.62	1.09	1.77	13.00%	0.23	0.05	0.18	
Urban Pervious	Phosphorus	0.41	1.91	0.78	13.00%	0.10	0.01	0.09	0.29
Forest	Phosphorus	0.13	1.28	0.17	13.00%	0.02	0.00	0.02	
Urban Impervious	Total Suspended Solids	1,171.32	1.09	1,280.99	13.00%	166.53	47.09	119.44	
Urban Pervious	Total Suspended Solids	175.80	1.91	335.92	13.00%	43.67	5.81	37.86	170.54
Forest	Total Suspended Solids	79.91	1.28	101.89	13.00%	13.25	0.00	13.25	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #257	Extended Detention	38.70846	-77.42804	6.80	0.29	170.54

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

SWM Facility #51 Extended Detention

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 #51	Dry Detention Pond	38.66706	-77.26875	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Extended Detention	20.00%	20.00%	20.00%

Runoff storage (acre-feet)	0.00
Impervious acres	0
Runoff depth	#DIV/0!

Retrofit Equation Results

TN	#DIV/0!
TP	#DIV/0!
TSS	#DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS
Removal Rate	Extended Detention	20.00%	20.00%	20.00%
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%
Incremental Removal Rate		16.50%	13.00%	13.00%

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	1.07	2.06	1.66	4.78
Other Regulated Land	0.95	0.57	0.47	1.99
Unregulated Land	0.08	0.13	0.14	0.36
	2.10	2.76	2.27	7.13

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	0.08	0.13
Unregulated Pervious	TN	0.03021000	0.60420000	0.13	0.08
Unregulated Impervious	TP	0.01296000	0.25920000	0.08	0.02
Unregulated Pervious	TP	0.00148625	0.02972500	0.13	0.00
Unregulated Impervious	TSS	11.71320000	234.26400000	0.08	19.53
Unregulated Pervious	TSS	0.76912500	15.38250000	0.13	2.07

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	2.10	35.41	16.50%	5.84	0.13	5.72	
Urban Pervious	Nitrogen	10.07	2.76	27.77	16.50%	4.58	0.08	4.50	12.20
Forest	Nitrogen	5.29	2.27	12.01	16.50%	1.98	0.00	1.98	
Urban Impervious	Phosphorus	1.62	2.10	3.40	13.00%	0.44	0.02	0.42	
Urban Pervious	Phosphorus	0.41	2.76	1.13	13.00%	0.15	0.00	0.14	0.60
Forest	Phosphorus	0.13	2.27	0.30	13.00%	0.04	0.00	0.04	
Urban Impervious	Total Suspended Solids	1,171.32	2.10	2,460.31	13.00%	319.84	19.53	300.31	
Urban Pervious	Total Suspended Solids	175.80	2.76	484.73	13.00%	63.01	2.07	60.94	384.84
Forest	Total Suspended Solids	79.91	2.27	181.41	13.00%	23.58	0.00	23.58	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #51	Extended Detention	38.66706	-77.26875	12.20	0.60	384.84

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

SWM Facility #154 Extended Detention

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 #154	Dry Detention Pond	38.64959	-77.26743	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Extended Detention	20.00%	20.00%	20.00%

Runoff storage (acre-feet)	0.00
Impervious acres	0
Runoff depth	#DIV/0!

Retrofit Equation Results

TN	#DIV/0!
TP	#DIV/0!
TSS	#DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS
Removal Rate	Extended Detention	20.00%	20.00%	20.00%
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%
Incremental Removal Rate		16.50%	13.00%	13.00%

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	2.16	2.56	1.07	5.80
Other Regulated Land	0.00	0.01	0.00	0.01
Unregulated Land	0.28	0.32	0.08	0.67
	2.44	2.89	1.15	6.48

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	0.28	0.42
Unregulated Pervious	TN	0.03021000	0.60420000	0.32	0.19
Unregulated Impervious	TP	0.01296000	0.25920000	0.28	0.07
Unregulated Pervious	TP	0.00148625	0.02972500	0.32	0.01
Unregulated Impervious	TSS	11.71320000	234.26400000	0.28	64.75
Unregulated Pervious	TSS	0.76912500	15.38250000	0.32	4.90

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	2.44	41.16	16.50%	6.79	0.42	6.37	
Urban Pervious	Nitrogen	10.07	2.89	29.10	16.50%	4.80	0.19	4.61	11.99
Forest	Nitrogen	5.29	1.15	6.09	16.50%	1.01	0.00	1.01	
Urban Impervious	Phosphorus	1.62	2.44	3.95	13.00%	0.51	0.07	0.44	
Urban Pervious	Phosphorus	0.41	2.89	1.18	13.00%	0.15	0.01	0.14	0.61
Forest	Phosphorus	0.13	1.15	0.15	13.00%	0.02	0.00	0.02	
Urban Impervious	Total Suspended Solids	1,171.32	2.44	2,859.53	13.00%	371.74	64.75	306.99	
Urban Pervious	Total Suspended Solids	175.80	2.89	507.96	13.00%	66.03	4.90	61.14	380.09
Forest	Total Suspended Solids	79.91	1.15	92.03	13.00%	11.96	0.00	11.96	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #154	Extended Detention	38.64959	-77.26743	11.99	0.61	380.09

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

SWM Facility #157 Extended Detention

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 #157	Dry Detention Pond	38.64802	-77.26509	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Extended Detention	20.00%	20.00%	20.00%

Runoff storage (acre-feet)	0.00
Impervious acres	0
Runoff depth	#DIV/0!

Retrofit Equation Results

TN	#DIV/0!
TP	#DIV/0!
TSS	#DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS
Removal Rate	Extended Detention	20.00%	20.00%	20.00%
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%
Incremental Removal Rate		16.50%	13.00%	13.00%

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	1.40	1.27	1.48	4.15
Other Regulated Land	0.00	0.00	0.00	0.00
Unregulated Land	0.16	0.19	0.36	0.71
	1.56	1.46	1.83	4.86

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	0.16	0.24
Unregulated Pervious	TN	0.03021000	0.60420000	0.19	0.12
Unregulated Impervious	TP	0.01296000	0.25920000	0.16	0.04
Unregulated Pervious	TP	0.00148625	0.02972500	0.19	0.01
Unregulated Impervious	TSS	11.71320000	234.26400000	0.16	37.63
Unregulated Pervious	TSS	0.76912500	15.38250000	0.19	2.94

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	1.56	26.37	16.50%	4.35	0.24	4.11	
Urban Pervious	Nitrogen	10.07	1.46	14.74	16.50%	2.43	0.12	2.32	8.03
Forest	Nitrogen	5.29	1.83	9.70	16.50%	1.60	0.00	1.60	
Urban Impervious	Phosphorus	1.62	1.56	2.53	13.00%	0.33	0.04	0.29	
Urban Pervious	Phosphorus	0.41	1.46	0.60	13.00%	0.08	0.01	0.07	0.39
Forest	Phosphorus	0.13	1.83	0.24	13.00%	0.03	0.00	0.03	
Urban Impervious	Total Suspended Solids	1,171.32	1.56	1,832.06	13.00%	238.17	37.63	200.54	
Urban Pervious	Total Suspended Solids	175.80	1.46	257.39	13.00%	33.46	2.94	30.53	250.11
Forest	Total Suspended Solids	79.91	1.83	146.50	13.00%	19.04	0.00	19.04	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #157	Extended Detention	38.64802	-77.26509	8.03	0.39	250.11

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

SWM Facility #363 Extended Detention

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 #363	Dry Detention Pond	38.73062	-77.41825	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Extended Detention	20.00%	20.00%	20.00%

Runoff storage (acre-feet)	0.00
Impervious acres	0
Runoff depth	#DIV/0!

Retrofit Equation Results

TN	#DIV/0!
TP	#DIV/0!
TSS	#DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS
Removal Rate	Extended Detention	20.00%	20.00%	20.00%
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%
Incremental Removal Rate		16.50%	13.00%	13.00%

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	4.64	12.95	12.24	29.83
Other Regulated Land	3.82	1.28	0.00	5.11
Unregulated Land	0.08	0.11	0.30	0.48
	8.54	14.34	12.53	35.42

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	0.08	0.11
Unregulated Pervious	TN	0.03021000	0.60420000	0.11	0.07
Unregulated Impervious	TP	0.01296000	0.25920000	0.08	0.02
Unregulated Pervious	TP	0.00148625	0.02972500	0.11	0.00
Unregulated Impervious	TSS	11.71320000	234.26400000	0.08	17.62
Unregulated Pervious	TSS	0.76912500	15.38250000	0.11	1.69

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	8.54	143.99	16.50%	23.76	0.11	23.64	
Urban Pervious	Nitrogen	10.07	14.34	144.42	16.50%	23.83	0.07	23.76	58.35
Forest	Nitrogen	5.29	12.53	66.31	16.50%	10.94	0.00	10.94	
Urban Impervious	Phosphorus	1.62	8.54	13.84	13.00%	1.80	0.02	1.78	
Urban Pervious	Phosphorus	0.41	14.34	5.88	13.00%	0.76	0.00	0.76	2.75
Forest	Phosphorus	0.13	12.53	1.63	13.00%	0.21	0.00	0.21	
Urban Impervious	Total Suspended Solids	1,171.32	8.54	10,003.60	13.00%	1,300.47	17.62	1,282.85	
Urban Pervious	Total Suspended Solids	175.80	14.34	2,521.17	13.00%	327.75	1.69	326.06	1,739.13
Forest	Total Suspended Solids	79.91	12.53	1,001.64	13.00%	130.21	0.00	130.21	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #363	Extended Detention	38.73062	-77.41825	58.35	2.75	1,739.13

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

SWM Facility #494 Constructed Wetland

1 Determine existing published efficiency

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

2 Apply downward modification to BMP Efficiency

Facility Name	BMP Type	Lat	Long	Modification Type	Downward Modification Applied
SWM Facility #494	Dry Detention Pond	38.78569	-77.53199	No sediment forebay	-10%
				No micropool	-10%
Total					-20%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	20%	20%	60%
Efficiency Modification	Step 2	-20%	-20%	-20%
Modified Efficiency		16%	16%	48%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Retrofit Equations	Constructed Wetland	36.46%	57.29%	72.92%

Runoff storage (acre-feet)	1.85 (Final Design)
Impervious acres	18.67
Runoff depth	1.19

Retrofit Equation Results	
TN	36.46%
TP	57.29%
TSS	72.92%

5 Calculate Incremental Removal Rate

		TN	TP	TSS	
Removal Rate	Constructed Wetland	36.46%	57.29%	72.92%	Bay Program Retrofit Equations
Modified existing efficiency	Step 3	16%	16%	48%	
Incremental Removal Rate		20.46%	41.29%	24.92%	

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	8.63	14.18	0.72	23.53
Other Regulated Land	5.67	6.73	0.15	12.55
Unregulated Land	0.96	1.22	0.01	2.19
	15.26	22.13	0.88	38.27

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	0.96	1.46
Unregulated Pervious	TN	0.03021000	0.60420000	1.22	0.74
Unregulated Impervious	TP	0.01296000	0.25920000	0.96	0.25
Unregulated Pervious	TP	0.00148625	0.02972500	1.22	0.04
Unregulated Impervious	TSS	11.71320000	234.26400000	0.96	225.65
Unregulated Pervious	TSS	0.76912500	15.38250000	1.22	18.73

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	15.26	257.36	20.46%	52.65	1.46	51.19	
Urban Pervious	Nitrogen	10.07	22.13	222.83	20.46%	45.59	0.74	44.86	97.00
Forest	Nitrogen	5.29	0.88	4.66	20.46%	0.95	0.00	0.95	
Urban Impervious	Phosphorus	1.62	15.26	24.73	41.29%	10.21	0.25	9.96	
Urban Pervious	Phosphorus	0.41	22.13	9.07	41.29%	3.75	0.04	3.71	13.72
Forest	Phosphorus	0.13	0.88	0.11	41.29%	0.05	0.00	0.05	
Urban Impervious	Total Suspended Solids	1,171.32	15.26	17,879.35	24.92%	4,455.53	225.65	4,229.89	
Urban Pervious	Total Suspended Solids	175.80	22.13	3,890.18	24.92%	969.43	18.73	950.70	5,198.13
Forest	Total Suspended Solids	79.91	0.88	70.39	24.92%	17.54	0.00	17.54	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #494	Constructed Wetland	38.78569	-77.53199	97.00	13.72	5,198.13

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

SWM Facility #318 Extended Detention

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 #318	Dry Detention Pond	38.56811	-77.3066	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Extended Detention	20.00%	20.00%	20.00%

Runoff storage (acre-feet)	0.00
Impervious acres	0
Runoff depth	#DIV/0!

Retrofit Equation Results

TN	#DIV/0!
TP	#DIV/0!
TSS	#DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS
Removal Rate	Extended Detention	20.00%	20.00%	20.00%
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%
Incremental Removal Rate		16.50%	13.00%	13.00%

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	1.90	8.94	4.75	15.58
Other Regulated Land	1.37	0.52	0.00	1.89
Unregulated Land	0.00	0.00	0.00	0.00
	3.27	9.46	4.75	17.48

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	0.00	0.00
Unregulated Pervious	TN	0.03021000	0.60420000	0.00	0.00
Unregulated Impervious	TP	0.01296000	0.25920000	0.00	0.00
Unregulated Pervious	TP	0.00148625	0.02972500	0.00	0.00
Unregulated Impervious	TSS	11.71320000	234.26400000	0.00	0.00
Unregulated Pervious	TSS	0.76912500	15.38250000	0.00	0.00

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	3.27	55.08	16.50%	9.09	0.00	9.09	
Urban Pervious	Nitrogen	10.07	9.46	95.26	16.50%	15.72	0.00	15.72	28.95
Forest	Nitrogen	5.29	4.75	25.13	16.50%	4.15	0.00	4.15	
Urban Impervious	Phosphorus	1.62	3.27	5.29	13.00%	0.69	0.00	0.69	
Urban Pervious	Phosphorus	0.41	9.46	3.88	13.00%	0.50	0.00	0.50	1.27
Forest	Phosphorus	0.13	4.75	0.62	13.00%	0.08	0.00	0.08	
Urban Impervious	Total Suspended Solids	1,171.32	3.27	3,826.83	13.00%	497.49	0.00	497.49	
Urban Pervious	Total Suspended Solids	175.80	9.46	1,663.05	13.00%	216.20	0.00	216.20	763.03
Forest	Total Suspended Solids	79.91	4.75	379.58	13.00%	49.35	0.00	49.35	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #318	Extended Detention	38.56811	-77.3066	28.95	1.27	763.03

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

SWM Facility #77 Extended Detention

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 #77	Dry Detention Pond	38.74038	-77.42235	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Extended Detention	20.00%	20.00%	20.00%

Runoff storage (acre-feet)	0.00
Impervious acres	0
Runoff depth	#DIV/0!

Retrofit Equation Results

TN	#DIV/0!
TP	#DIV/0!
TSS	#DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS
Removal Rate	Extended Detention	20.00%	20.00%	20.00%
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%
Incremental Removal Rate		16.50%	13.00%	13.00%

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	3.86	15.30	11.18	30.33
Other Regulated Land	1.12	0.96	0.00	2.07
Unregulated Land	1.40	6.22	14.09	21.71
	6.38	22.48	25.26	54.12

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	1.40	2.13
Unregulated Pervious	TN	0.03021000	0.60420000	6.22	3.76
Unregulated Impervious	TP	0.01296000	0.25920000	1.40	0.36
Unregulated Pervious	TP	0.00148625	0.02972500	6.22	0.18
Unregulated Impervious	TSS	11.71320000	234.26400000	1.40	328.87
Unregulated Pervious	TSS	0.76912500	15.38250000	6.22	95.73

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	6.38	107.58	16.50%	17.75	2.13	15.62	
Urban Pervious	Nitrogen	10.07	22.48	226.33	16.50%	37.34	3.76	33.58	71.26
Forest	Nitrogen	5.29	25.26	133.65	16.50%	22.05	0.00	22.05	
Urban Impervious	Phosphorus	1.62	6.38	10.34	13.00%	1.34	0.36	0.98	
Urban Pervious	Phosphorus	0.41	22.48	9.21	13.00%	1.20	0.18	1.01	2.42
Forest	Phosphorus	0.13	25.26	3.28	13.00%	0.43	0.00	0.43	
Urban Impervious	Total Suspended Solids	1,171.32	6.38	7,473.96	13.00%	971.61	328.87	642.75	
Urban Pervious	Total Suspended Solids	175.80	22.48	3,951.14	13.00%	513.65	95.73	417.92	1,323.13
Forest	Total Suspended Solids	79.91	25.26	2,018.90	13.00%	262.46	0.00	262.46	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #77	Extended Detention	38.74038	-77.42235	71.26	2.42	1,323.13

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

SWM Facility #505 Extended Detention

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 #505	Dry Detention Pond	38.5639	-77.30522	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Extended Detention	20.00%	20.00%	20.00%

Runoff storage (acre-feet)	0.00
Impervious acres	0
Runoff depth	#DIV/0!

Retrofit Equation Results

TN	#DIV/0!
TP	#DIV/0!
TSS	#DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS
Removal Rate	Extended Detention	20.00%	20.00%	20.00%
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%
Incremental Removal Rate		16.50%	13.00%	13.00%

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	1.98	6.70	3.47	12.14
Other Regulated Land	2.25	0.63	0.01	2.88
Unregulated Land	0.05	0.45	0.74	1.24
	4.28	7.77	4.22	16.26

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	0.05	0.08
Unregulated Pervious	TN	0.03021000	0.60420000	0.45	0.27
Unregulated Impervious	TP	0.01296000	0.25920000	0.05	0.01
Unregulated Pervious	TP	0.00148625	0.02972500	0.45	0.01
Unregulated Impervious	TSS	11.71320000	234.26400000	0.05	12.83
Unregulated Pervious	TSS	0.76912500	15.38250000	0.45	6.85

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	4.28	72.13	16.50%	11.90	0.08	11.82	
Urban Pervious	Nitrogen	10.07	7.77	78.21	16.50%	12.90	0.27	12.64	28.14
Forest	Nitrogen	5.29	4.22	22.31	16.50%	3.68	0.00	3.68	
Urban Impervious	Phosphorus	1.62	4.28	6.93	13.00%	0.90	0.01	0.89	
Urban Pervious	Phosphorus	0.41	7.77	3.18	13.00%	0.41	0.01	0.40	1.36
Forest	Phosphorus	0.13	4.22	0.55	13.00%	0.07	0.00	0.07	
Urban Impervious	Total Suspended Solids	1,171.32	4.28	5,011.14	13.00%	651.45	12.83	638.62	
Urban Pervious	Total Suspended Solids	175.80	7.77	1,365.40	13.00%	177.50	6.85	170.65	853.09
Forest	Total Suspended Solids	79.91	4.22	337.07	13.00%	43.82	0.00	43.82	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #505	Extended Detention	38.5639	-77.30522	28.14	1.36	853.09

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

SWM Facility #99 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 #99	Dry Detention Pond	38.7856	-77.5102	No sediment forebay No micropool	-10% -10%
Total					-20%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5%	10%	10%
Efficiency Modification	Step 2	-20%	-20%	-20%
Modified Efficiency		4%	8%	8%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Retrofit Equations	Constructed Wetland	36.31%	57.06%	72.63%

Runoff storage (acre-feet)	0.50 (Final Design)
Impervious acres	5.14
Runoff depth	1.17

Retrofit Equation Results	
TN	36.31%
TP	57.06%
TSS	72.63%

5 Calculate Incremental Removal Rate

		TN	TP	TSS	
Removal Rate	Constructed Wetland	36.31%	57.06%	72.63%	Bay Program Retrofit Equations
Modified existing efficiency	Step 3	4%	8%	8%	
Incremental Removal Rate		32.31%	49.06%	64.63%	

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	0.09	0.14	0.00	0.23
Other Regulated Land	1.20	0.22	0.00	1.41
Unregulated Land	3.85	3.39	0.00	7.25
	5.14	3.74	0.00	8.89

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	3.85	5.85
Unregulated Pervious	TN	0.03021000	0.60420000	3.39	2.05
Unregulated Impervious	TP	0.01296000	0.25920000	3.85	1.00
Unregulated Pervious	TP	0.00148625	0.02972500	3.39	0.10
Unregulated Impervious	TSS	11.71320000	234.26400000	3.85	902.99
Unregulated Pervious	TSS	0.76912500	15.38250000	3.39	52.16

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	5.14	86.73	32.31%	28.02	5.85	22.18	
Urban Pervious	Nitrogen	10.07	3.74	37.71	32.31%	12.18	2.05	10.14	32.31
Forest	Nitrogen	5.29	0.00	0.00	32.31%	0.00	0.00	0.00	
Urban Impervious	Phosphorus	1.62	5.14	8.33	49.06%	4.09	1.00	3.09	
Urban Pervious	Phosphorus	0.41	3.74	1.54	49.06%	0.75	0.10	0.65	3.74
Forest	Phosphorus	0.13	0.00	0.00	49.06%	0.00	0.00	0.00	
Urban Impervious	Total Suspended Solids	1,171.32	5.14	6,025.21	64.63%	3,893.84	902.99	2,990.84	
Urban Pervious	Total Suspended Solids	175.80	3.74	658.29	64.63%	425.42	52.16	373.26	3,364.11
Forest	Total Suspended Solids	79.91	0.00	0.00	64.63%	0.00	0.00	0.00	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #99	Constructed Wetland	38.7856	-77.5102	32.31	3.74	3,364.11

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

SWM Facility #98 Extended Detention

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 #98	Dry Detention Pond	38.62455	-77.27419	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Extended Detention	20.00%	20.00%	20.00%

Runoff storage (acre-feet)	0.00
Impervious acres	0
Runoff depth	#DIV/0!

Retrofit Equation Results

TN	#DIV/0!
TP	#DIV/0!
TSS	#DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS
Removal Rate	Extended Detention	20.00%	20.00%	20.00%
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%
Incremental Removal Rate		16.50%	13.00%	13.00%

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	2.66	2.48	2.42	7.56
Other Regulated Land	0.03	0.01	0.06	0.10
Unregulated Land	0.01	0.02	0.02	0.05
	2.70	2.51	2.50	7.70

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	0.01	0.02
Unregulated Pervious	TN	0.03021000	0.60420000	0.02	0.01
Unregulated Impervious	TP	0.01296000	0.25920000	0.01	0.00
Unregulated Pervious	TP	0.00148625	0.02972500	0.02	0.00
Unregulated Impervious	TSS	11.71320000	234.26400000	0.01	3.24
Unregulated Pervious	TSS	0.76912500	15.38250000	0.02	0.28

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	2.70	45.53	16.50%	7.51	0.02	7.49	
Urban Pervious	Nitrogen	10.07	2.51	25.24	16.50%	4.16	0.01	4.15	13.83
Forest	Nitrogen	5.29	2.50	13.21	16.50%	2.18	0.00	2.18	
Urban Impervious	Phosphorus	1.62	2.70	4.38	13.00%	0.57	0.00	0.57	
Urban Pervious	Phosphorus	0.41	2.51	1.03	13.00%	0.13	0.00	0.13	0.74
Forest	Phosphorus	0.13	2.50	0.32	13.00%	0.04	0.00	0.04	
Urban Impervious	Total Suspended Solids	1,171.32	2.70	3,163.41	13.00%	411.24	3.24	408.00	
Urban Pervious	Total Suspended Solids	175.80	2.51	440.60	13.00%	57.28	0.28	57.00	490.94
Forest	Total Suspended Solids	79.91	2.50	199.56	13.00%	25.94	0.00	25.94	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #98	Extended Detention	38.62455	-77.27419	13.83	0.74	490.94

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

SWM Facility #28 Wet Pond - 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 #28	Dry Detention Pond	38.68411	-77.27122	No sediment forebay No micropool	-10% -10%
Total					-20%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-20.00%	-20.00%	-20.00%
Modified Efficiency		4.00%	8.00%	8.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Retrofit Equations	Wet Pond - Level 1	12.36%	19.42%	24.73%

Runoff storage (acre-feet)	0.39 (Final Design)
Impervious acres	26.18
Runoff depth	0.18

Retrofit Equation Results	
TN	12.36%
TP	19.42%
TSS	24.73%

5 Calculate Incremental Removal Rate

		TN	TP	TSS	
Removal Rate	Wet Pond - Level 1	12.36%	19.42%	24.73%	Bay Program Retrofit Equations
Modified existing efficiency	Step 3	4.00%	8.00%	8.00%	
Incremental Removal Rate		8.36%	11.42%	16.73%	

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	17.06	22.98	6.36	46.40
Other Regulated Land	1.88	7.55	0.11	9.53
Unregulated Land	2.15	4.11	12.77	19.03
	21.10	34.63	19.24	74.97

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	2.15	3.26
Unregulated Pervious	TN	0.03021000	0.60420000	4.11	2.48
Unregulated Impervious	TP	0.01296000	0.25920000	2.15	0.56
Unregulated Pervious	TP	0.00148625	0.02972500	4.11	0.12
Unregulated Impervious	TSS	11.71320000	234.26400000	2.15	503.55
Unregulated Pervious	TSS	0.76912500	15.38250000	4.11	63.15

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	21.10	355.69	8.36%	29.74	3.26	26.47	61.65
Urban Pervious	Nitrogen	10.07	34.63	348.70	8.36%	29.15	2.48	26.67	
Forest	Nitrogen	5.29	19.24	101.80	8.36%	8.51	0.00	8.51	
Urban Impervious	Phosphorus	1.62	21.10	34.18	11.42%	3.90	0.56	3.35	5.13
Urban Pervious	Phosphorus	0.41	34.63	14.20	11.42%	1.62	0.12	1.50	
Forest	Phosphorus	0.13	19.24	2.50	11.42%	0.29	0.00	0.29	
Urban Impervious	Total Suspended Solids	1,171.32	21.10	24,710.75	16.73%	4,134.11	503.55	3,630.56	4,843.10
Urban Pervious	Total Suspended Solids	175.80	34.63	6,087.46	16.73%	1,018.43	63.15	955.28	
Forest	Total Suspended Solids	79.91	19.24	1,537.74	16.73%	257.26	0.00	257.26	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #28	Wet Pond - Level 1	38.68411	-77.27122	61.65	5.13	4,843.10

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

SWM Facility #147 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 #147	Dry Detention Pond	38.6101	-77.31428	No sediment forebay	-10%
				Short Circuiting	-10%
				No micropool	-10%
				Total	-30%

3 Calculate modified existing efficiency

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

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Retrofit Equations	Constructed Wetland -L1	16.34%	25.69%	32.70%

Runoff storage (acre-feet) 0.32 (Final Design)
 Impervious acres 15.29
 Runoff depth 0.25

Retrofit Equation Results
 TN 16.34%
 TP 25.69%
 TSS 32.70%

5 Calculate Incremental Removal Rate

		TN	TP	TSS	
Removal Rate	Constructed Wetland -L1	16.34%	25.69%	32.70%	Bay Program Retrofit Equations
Modified existing efficiency	Step 3	4%	7%	7%	
Incremental Removal Rate		12.84%	18.69%	25.70%	

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	10.19	19.50	0.89	30.57
Other Regulated Land	3.65	1.25	0.00	4.90
Unregulated Land	1.44	3.28	5.04	9.77
	15.28	24.02	5.93	45.24

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	1.44	2.19
Unregulated Pervious	TN	0.03021000	0.60420000	3.28	1.98
Unregulated Impervious	TP	0.01296000	0.25920000	1.44	0.37
Unregulated Pervious	TP	0.00148625	0.02972500	3.28	0.10
Unregulated Impervious	TSS	11.71320000	234.26400000	1.44	338.33
Unregulated Pervious	TSS	0.76912500	15.38250000	3.28	50.46

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	15.28	257.68	13%	33.09	2.19	30.89	64.01
Urban Pervious	Nitrogen	10.07	24.02	241.92	13%	31.06	1.98	29.08	
Forest	Nitrogen	5.29	5.93	31.39	13%	4.03	0.00	4.03	
Urban Impervious	Phosphorus	1.62	15.28	24.76	19%	4.63	0.37	4.25	6.14
Urban Pervious	Phosphorus	0.41	24.02	9.85	19%	1.84	0.10	1.74	
Forest	Phosphorus	0.13	5.93	0.77	19%	0.14	0.00	0.14	
Urban Impervious	Total Suspended Solids	1,171.32	15.28	17,902.07	26%	4,600.83	338.33	4,262.50	5,419.30
Urban Pervious	Total Suspended Solids	175.80	24.02	4,223.37	26%	1,085.41	50.46	1,034.95	
Forest	Total Suspended Solids	79.91	5.93	474.13	26%	121.85	0.00	121.85	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #147	Constructed Wetland -L1	38.6101	-77.31428	64.01	6.14	5,419.30

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

SWM Facility #489 Extended Detention

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 #489	Dry Detention Pond	38.68457	-77.29579	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Extended Detention	20.00%	20.00%	20.00%

Runoff storage (acre-feet)	0.00
Impervious acres	0
Runoff depth	#DIV/0!

Retrofit Equation Results

TN	#DIV/0!
TP	#DIV/0!
TSS	#DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS
Removal Rate	Extended Detention	20.00%	20.00%	20.00%
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%
Incremental Removal Rate		16.50%	13.00%	13.00%

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	18.46	21.62	2.44	42.52
Other Regulated Land	10.03	6.73	0.81	17.57
Unregulated Land	4.18	8.17	9.67	22.03
	32.67	36.52	12.92	82.12

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	4.18	6.35
Unregulated Pervious	TN	0.03021000	0.60420000	8.17	4.94
Unregulated Impervious	TP	0.01296000	0.25920000	4.18	1.08
Unregulated Pervious	TP	0.00148625	0.02972500	8.17	0.24
Unregulated Impervious	TSS	11.71320000	234.26400000	4.18	980.08
Unregulated Pervious	TSS	0.76912500	15.38250000	8.17	125.66

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	32.67	550.84	16.50%	90.89	6.35	84.54	
Urban Pervious	Nitrogen	10.07	36.52	367.80	16.50%	60.69	4.94	55.75	151.57
Forest	Nitrogen	5.29	12.92	68.35	16.50%	11.28	0.00	11.28	
Urban Impervious	Phosphorus	1.62	32.67	52.93	13.00%	6.88	1.08	5.80	
Urban Pervious	Phosphorus	0.41	36.52	14.97	13.00%	1.95	0.24	1.70	7.72
Forest	Phosphorus	0.13	12.92	1.68	13.00%	0.22	0.00	0.22	
Urban Impervious	Total Suspended Solids	1,171.32	32.67	38,268.56	13.00%	4,974.91	980.08	3,994.84	
Urban Pervious	Total Suspended Solids	175.80	36.52	6,420.90	13.00%	834.72	125.66	709.05	4,838.12
Forest	Total Suspended Solids	79.91	12.92	1,032.52	13.00%	134.23	0.00	134.23	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #489	Extended Detention	38.68457	-77.29579	151.57	7.72	4,838.12

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

SWM Facility #109 Wet Pond-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 #109	Dry Detention Pond	38.72093	-77.41199	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Wet Pond-L1	31.30%	49.19%	62.61%

Runoff storage (acre-feet)	0.59 (Final Design)
Impervious acres	9.78
Runoff depth	0.72

Retrofit Equation Results

TN	31.30%
TP	49.19%
TSS	62.61%

5 Calculate Incremental Removal Rate

		TN	TP	TSS	
Removal Rate	Wet Pond-L1	31.30%	49.19%	62.61%	Bay Program Retrofit Equations
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%	
Incremental Removal Rate		27.80%	42.19%	55.61%	

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	4.33	12.95	22.73	40.00
Other Regulated Land	3.25	2.97	0.01	6.23
Unregulated Land	2.21	6.03	18.05	26.29
	9.79	21.94	40.78	72.52

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	2.21	3.36
Unregulated Pervious	TN	0.03021000	0.60420000	6.03	3.64
Unregulated Impervious	TP	0.01296000	0.25920000	2.21	0.57
Unregulated Pervious	TP	0.00148625	0.02972500	6.03	0.18
Unregulated Impervious	TSS	11.71320000	234.26400000	2.21	518.79
Unregulated Pervious	TSS	0.76912500	15.38250000	6.03	92.71

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	9.79	165.06	27.80%	45.89	3.36	42.53	
Urban Pervious	Nitrogen	10.07	21.94	220.97	27.80%	61.44	3.64	57.79	160.30
Forest	Nitrogen	5.29	40.78	215.74	27.80%	59.98	0.00	59.98	
Urban Impervious	Phosphorus	1.62	9.79	15.86	42.19%	6.69	0.57	6.12	
Urban Pervious	Phosphorus	0.41	21.94	9.00	42.19%	3.80	0.18	3.62	11.97
Forest	Phosphorus	0.13	40.78	5.30	42.19%	2.24	0.00	2.24	
Urban Impervious	Total Suspended Solids	1,171.32	9.79	11,467.33	55.61%	6,376.78	518.79	5,857.99	
Urban Pervious	Total Suspended Solids	175.80	21.94	3,857.72	55.61%	2,145.21	92.71	2,052.50	9,722.70
Forest	Total Suspended Solids	79.91	40.78	3,258.89	55.61%	1,812.21	0.00	1,812.21	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #109	Wet Pond-L1	38.72093	-77.41199	160.30	11.97	9,722.70

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

SWM Facility #424 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 #424	Dry Detention Pond	38.57761	-77.30891	No sediment forebay No micropool	-10% -10%
Total					-20%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5%	10%	10%
Efficiency Modification	Step 2	-20%	-20%	-20%
Modified Efficiency		4%	8%	8%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
BMP Clearinghouse	Constructed Wetland L1	25%	50%	60%

Runoff storage (acre-feet)
Impervious acres
Runoff depth #DIV/0!

Retrofit Equation Results
TN #DIV/0!
TP #DIV/0!
TSS #DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS	
Removal Rate	Constructed Wetland L1	25%	50%	60%	BMP Clearinghouse
Modified existing efficiency	Step 3	4%	8%	8%	
Incremental Removal Rate		21%	42%	52%	

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	20.66	32.51	11.04	64.21
Other Regulated Land	7.00	2.55	0.02	9.57
Unregulated Land	11.35	6.82	0.05	18.22
	39.01	41.88	11.11	92.01

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	11.35	17.22
Unregulated Pervious	TN	0.03021000	0.60420000	6.82	4.12
Unregulated Impervious	TP	0.01296000	0.25920000	11.35	2.94
Unregulated Pervious	TP	0.00148625	0.02972500	6.82	0.20
Unregulated Impervious	TSS	11.71320000	234.26400000	11.35	2,658.38
Unregulated Pervious	TSS	0.76912500	15.38250000	6.82	104.94

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	39.01	657.78	21%	138.13	17.22	120.91	
Urban Pervious	Nitrogen	10.07	41.88	421.77	21%	88.57	4.12	84.45	217.71
Forest	Nitrogen	5.29	11.11	58.79	21%	12.35	0.00	12.35	
Urban Impervious	Phosphorus	1.62	39.01	63.20	42%	26.55	2.94	23.60	
Urban Pervious	Phosphorus	0.41	41.88	17.17	42%	7.21	0.20	7.01	31.22
Forest	Phosphorus	0.13	11.11	1.44	42%	0.61	0.00	0.61	
Urban Impervious	Total Suspended Solids	1,171.32	39.01	45,698.12	52%	23,763.02	2,658.38	21,104.64	
Urban Pervious	Total Suspended Solids	175.80	41.88	7,363.26	52%	3,828.89	104.94	3,723.95	25,290.37
Forest	Total Suspended Solids	79.91	11.11	888.03	52%	461.78	0.00	461.78	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #424	Constructed Wetland L1	38.57761	-77.30891	217.71	31.22	25,290.37

Appendix C – Second Permit Cycle POC Reduction Summaries

Stream Restoration Projects Planned for Second Permit Cycle

WMB Number	Project Name	Status	Installation FY	Latitude	Longitude	Total Drainage Area (Ac)	Impervious Area (Ac)	Pervious Area (Ac)	Forested Area (Ac)	Length	Pollutant Removal Rate	Physiographic Province	Estimated Total Pollutant Reduction (lbs/yr)			Percent Unregulated Area	Baseline Adjustment for Unregulated Areas (lbs/yr)			Total Pollutant Reduction Achieved After Baseline Adjustment (lbs/yr)		
													TN	TP	TSS		TN	TP	TSS	TN	TP	TSS
Planned Projects																						
194	Powells Creek Phase 1	Construction	2020	38.60268	-77.32370	7,587.64	1,160.30	2,870.83	3,556.51	3,280	Interim Approved	Piedmont	246.00	223.04	147,206.40	18.64%	1,090.80	101.39	78,367.50	200.14	181.46	119,764.84
200	Spriggs Road	Construction	2019	38.61685	-77.37109	53.70	17.24	22.86	13.60	518	Interim Approved	Piedmont	38.85	35.22	23,247.84	0.18%	0.07	0.01	4.27	38.78	35.22	23,243.57
195	Powells Creek Phase 2	Design	2022	38.60268	-77.32370	8,234.99	1,285.17	3,120.26	3,829.56	4,400	Interim Approved	Piedmont	330.00	299.20	197,472.00	17.90%	1,135.53	105.40	81,415.57	270.94	245.65	162,132.07
210	Buckhall Branch	Design	2023	38.75166	-77.43126	82.87	19.29	43.06	20.52	1,786	Interim Approved	Piedmont	133.95	121.45	80,155.68	0.12%	0.08	0.01	7.13	133.87	121.44	80,148.55

Stormwater Facility Retrofits Planned for Second Permit Cycle

WMB Number	Project Name	Status	Installation FY	Latitude	Longitude	BMP Practice	Area Treated (Ac)	Impervious Area (Ac)	Pervious Area (Ac)	Forested Area (Ac)	Calculation Method	Estimated Total Pollutant Reduction (lbs/yr)			Precent Unregulated Area	Baseline Adjustment for Unregulated Area (lbs/yr)			Total Pollutant Reduction Achieved after Baseline Adjustment (lbs/yr)		
												TN	TP	TSS		TN	TP	TSS	TN	TP	TSS
Planned Projects																					
271	SWM Facility #232	Design	2020	38.78560	-77.51020	Wet Pond, L1	11.89	2.44	6.66	2.79	CBP Retrofits Expert Panel, ST, Incremental	35.47	3.09	2,451.41	0.00%	0.00	0.00	0.00	35.47	3.09	2,451.41
68	SWM Facility #416	Design	2022	38.75104	-77.43079	Constructed Wetland, L1	119.79	33.81	65.66	20.32	CBP Established Efficiency, Incremental	287.83	36.26	27,967.64	2.99%	3.32	0.42	356.39	284.51	35.84	27,611.25
148	SWM Facility #386	Concept	2023	38.78888	-77.52390	Constructed Wetland, L1	21.38	12.13	8.83	0.41	CBP Established Efficiency, Incremental	63.57	10.03	8,372.76	2.07%	0.47	0.07	57.83	63.10	9.97	8,314.92
60	SWM Facility #91	Concept	2023	38.79483	-77.50565	Constructed Wetland, L1	25.48	14.02	11.26	0.19	CBP Retrofits Expert Panel, ST, Incremental	73.68	12.59	9,579.11	0.84%	0.27	0.04	37.52	73.41	11.45	9,541.59
131	SWM Facility #689	Concept	2024	38.79471	-77.58665	Wet Pond, L1	69.37	11.02	32.29	26.06	CBP Established Efficiency, Incremental	139.49	14.83	10,952.77	2.52%	1.24	0.13	104.37	138.25	14.70	10,848.40

Reforestation Projects (LUC) Planned for Second Permit Cycle

WMB Number	Project Name	Status	Installation FY	Latitude	Longitude	BMP Type	Existing Land Use	New Land Use	Area (Ac)	Total Pollutant Reduction (lbs/yr)		
										TN	TP	TSS
Planned Projects												
272	Lake Drive Reforestation	Design	2020	38.78564	-77.43405	Land Use Change	Pervious	Forest	1.00	7.16	0.38	132.96
236	Ben Lomond Park Area E	Design	2021	38.79858	-77.47709	Land Use Change	Pervious	Forest	3.00	21.48	1.14	398.88
270	Bristoe Station Battlefield Phase 3	Design	2022	38.72238	-77.54464	Land Use Change	Pervious	Forest	2.00	14.32	0.76	265.92

Appendix D – Second Permit Cycle POC Reduction Calculation Worksheets

Phase II Bay TMDL Reduction Calculation Worksheet

Powells 725 Phase 1
3,280

Stream Restoration

Status:

Construction

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Interim Removal Rates (lbs/lf)	0.075	0.068	44.88
Restoration Length (lf)	3,280	3,280	3,280
Initial POC Reductions	246.00	223.04	147,206.40

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	470.82	1,049.31	666.65	1,520.12	2,186.77
Other Regulated Land	430.85	665.70	898.21	1,096.55	1,994.76
Total Regulated Land	901.67	1,715.01	1,564.86	2,616.67	4,181.53
Total Unregulated Land	258.63	1,155.82	1,991.65	1,414.45	3,406.11
	1,160.30	2,870.83	3,556.51	4,031.13	7,587.64

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	34.49%	18.64%	46.87%		
TN (lbs) Reduction	84.84	45.86	115.31	246.00	
TP (lbs) Reduction	76.92	41.58	104.54	223.04	
TSS (lbs) Reduction	50,765.59	27,441.56	68,999.25	147,206.40	

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	258.63	392.45
Pervious	TN	0.03021000	0.60420000	1,155.82	698.35
Impervious	TP	0.01296000	0.25920000	258.63	67.04
Pervious	TP	0.00148625	0.02972500	1,155.82	34.36
Impervious	TSS	11.71320000	234.26400000	258.63	60,588.06
Pervious	TSS	0.76912500	15.38250000	1,155.82	17,779.44

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Credit for Unregulated Areas	45.86	41.58	27,441.56
Minus Unregulated Impervious Baseline	392.45	67.04	60,588.06
Minus Unregulated Pervious Baseline	698.35	34.36	17,779.44
Credit for Unregulated Areas	0.00	0.00	0.00
Credit for Regulated Areas	84.84	76.92	50,765.59
Credit for Forested Areas	115.31	104.54	68,999.25
Total Reductions Claimed	200.14	181.46	119,764.84

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Powells 725 Phase 1	Stream Restoration	38.60268	-77.3237	200.14	181.46	119,764.84

Phase II Bay TMDL Reduction Calculation Worksheet

Spriggs Road
518

Stream Restoration

Status:

Construction

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Interim Removal Rates (lbs/lf)	0.075	0.068	44.88
Restoration Length (lf)	518	518	518
Initial POC Reductions	38.85	35.22	23,247.84

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	0.29	0.25	0.01	0.54	0.55
Other Regulated Land	16.94	22.53	12.81	39.47	52.28
Total Regulated Land	17.23	22.78	12.83	40.01	52.84
Total Unregulated Land	0.01	0.08	0.77	0.09	0.87
	17.24	22.86	13.60	40.10	53.70

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	74.50%	0.18%	25.32%		
TN (lbs) Reduction	28.94	0.07	9.84	38.85	
TP (lbs) Reduction	26.24	0.06	8.92	35.22	
TSS (lbs) Reduction	17,319.75	40.69	5,887.40	23,247.84	

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	0.01	0.02
Pervious	TN	0.03021000	0.60420000	0.08	0.05
Impervious	TP	0.01296000	0.25920000	0.01	0.00
Pervious	TP	0.00148625	0.02972500	0.08	0.00
Impervious	TSS	11.71320000	234.26400000	0.01	3.03
Pervious	TSS	0.76912500	15.38250000	0.08	1.25

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Credit for Unregulated Areas	0.07	0.06	40.69
Minus Unregulated Impervious Baseline	0.02	0.00	3.03
Minus Unregulated Pervious Baseline	0.05	0.00	1.25
Credit for Unregulated Areas	0.00	0.06	36.42
Credit for Regulated Areas	28.94	26.24	17,319.75
Credit for Forested Areas	9.84	8.92	5,887.40
Total Reductions Claimed	38.78	35.22	23,243.57

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Spriggs Road	Stream Restoration	38.61685	-77.37109	38.78	35.22	23,243.57

Phase II Bay TMDL Reduction Calculation Worksheet

Powells 725 Phase 2
4,400

Stream Restoration

Status:

Design

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Interim Removal Rates (lbs/lf)	0.075	0.068	44.88
Restoration Length (lf)	4,400	4,400	4,400
Initial POC Reductions	330.00	299.20	197,472.00

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
Total Regulated Land	1,016.78	1,914.91	1,642.20	2,931.69	4,573.89
Total Unregulated Land	268.39	1,205.36	2,187.36	1,473.75	3,661.11
	1,285.17	3,120.27	3,829.56	4,405.44	8,235.00

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	35.60%	17.90%	46.50%		
TN (lbs) Reduction	117.48	59.06	153.46	330.00	
TP (lbs) Reduction	106.52	53.55	139.14	299.20	
TSS (lbs) Reduction	70,300.75	35,339.93	91,831.31	197,472.00	

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) - Piedmont
Credit for Unregulated Areas	59.06	53.55	35,339.93
Minus Unregulated Impervious Baseline	407.25	69.57	62,874.11
Minus Unregulated Pervious Baseline	728.28	35.83	18,541.45
Credit for Unregulated Areas	0.00	0.00	0.00
Credit for Regulated Areas	117.48	106.52	70,300.75
Credit for Forested Areas	153.46	139.14	91,831.31
Total Reductions Claimed	270.94	245.65	162,132.07

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Powells 725 Phase 2	Stream Restoration	38.60268	-77.3237	270.94	245.65	162,132.07

Phase II Bay TMDL Reduction Calculation Worksheet

Buckhall Stream Restoration Status: Design
1,786

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Interim Removal Rates (lbs/lf)	0.075	0.068	44.88
Restoration Length (lf)	1,786	1,786	1,786
Initial POC Reductions	133.95	121.45	80,155.68

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	0.00	0.00	0.00	0.00	0.00
Other Regulated Land	19.26	42.99	20.31	62.25	82.56
Total Regulated Land	19.26	42.99	20.31	62.25	82.56
Total Unregulated Land	0.03	0.08	0.20	0.10	0.30
	19.29	43.06	20.52	62.35	82.87

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	75.12%	0.12%	24.76%		
TN (lbs) Reduction	100.62	0.16	33.16	133.95	
TP (lbs) Reduction	91.23	0.15	30.07	121.45	
TSS (lbs) Reduction	60,212.91	98.37	19,844.40	80,155.68	

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	0.03	0.04
Pervious	TN	0.03021000	0.60420000	0.08	0.05
Impervious	TP	0.01296000	0.25920000	0.03	0.01
Pervious	TP	0.00148625	0.02972500	0.08	0.00
Impervious	TSS	11.71320000	234.26400000	0.03	5.96
Pervious	TSS	0.76912500	15.38250000	0.08	1.17

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Piedmont
Credit for Unregulated Areas	0.16	0.15	98.37
Minus Unregulated Impervious Baseline	0.04	0.01	5.96
Minus Unregulated Pervious Baseline	0.05	0.00	1.17
Credit for Unregulated Areas	0.08	0.14	91.24
Credit for Regulated Areas	100.62	91.23	60,212.91
Credit for Forested Areas	33.16	30.07	19,844.40
Total Reductions Claimed	133.87	121.44	80,148.55

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Buckhall	Stream Restoration	38.75166	-77.43126	133.87	121.44	80,148.55

**Phase II Stormwater Retrofits
Reduction Calculation Worksheet**

SWM Facility #232 Wet Pond-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 #232	Dry Detention Pond	38.7856	-77.5102	No sediment forebay	-10%
				Short circuiting	-10%
				No micropool	-10%
				Total	-30%

3 Calculate modified existing efficiency

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

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
BMP Clearinghouse	Wet Pond-Level 1	32.35%	50.84%	64.70%

Runoff storage (acre-feet)	0.21
Impervious acres	3.2
Runoff depth	0.79

Retrofit Equation Results	
TN	32.35%
TP	50.84%
TSS	64.70%

5 Calculate Incremental Removal Rate

		TN	TP	TSS	
Removal Rate	Wet Pond-Level 1	32.35%	50.84%	64.70%	Bay Program Retrofit Equations
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%	
Incremental Removal Rate		28.85%	43.84%	57.70%	

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	1.32	6.24	2.79	10.36
Other Regulated Land	1.11	0.42	0.00	1.54
Unregulated Land	0.00	0.00	0.00	0.00
	2.4361	6.66	2.79	11.89

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	0.00	0.00
Unregulated Pervious	TN	0.03021000	0.60420000	0.00	0.00
Unregulated Impervious	TP	0.01296000	0.25920000	0.00	0.00
Unregulated Pervious	TP	0.00148625	0.02972500	0.00	0.00
Unregulated Impervious	TSS	11.71320000	234.26400000	0.00	0.00
Unregulated Pervious	TSS	0.76912500	15.38250000	0.00	0.00

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	2.44	41.07	28.85%	11.85	0.00	11.85	35.47
Urban Pervious	Nitrogen	10.07	6.66	67.10	28.85%	19.36	0.00	19.36	
Forest	Nitrogen	5.29	2.79	14.78	28.85%	4.26	0.00	4.26	
Urban Impervious	Phosphorus	1.62	2.44	3.95	43.84%	1.73	0.00	1.73	3.09
Urban Pervious	Phosphorus	0.41	6.66	2.73	43.84%	1.20	0.00	1.20	
Forest	Phosphorus	0.13	2.79	0.36	43.84%	0.16	0.00	0.16	
Urban Impervious	Total Suspended Solids	1,171.32	2.44	2,853.47	57.70%	1,646.58	0.00	1,646.58	2,451.41
Urban Pervious	Total Suspended Solids	175.80	6.66	1,171.46	57.70%	675.98	0.00	675.98	
Forest	Total Suspended Solids	79.91	2.79	223.29	57.70%	128.85	0.00	128.85	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #232	Wet Pond-Level 1	38.7856	-77.5102	35.47	3.09	2,451.41

**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%
				Total	-30%

3 Calculate modified existing efficiency

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

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
 Runoff depth #DIV/0!

 Retrofit Equation Results
 TN #DIV/0!
 TP #DIV/0!
 TSS #DIV/0!

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%	
Incremental Removal Rate		21.50%	43.00%	53.00%	

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	32.42	63.66	20.13	116.21
Unregulated Land	1.39	2.00	0.19	3.58
	33.81	65.66	20.32	119.79

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	1.39	2.11
Unregulated Pervious	TN	0.03021000	0.60420000	2.00	1.21
Unregulated Impervious	TP	0.01296000	0.25920000	1.39	0.36
Unregulated Pervious	TP	0.00148625	0.02972500	2.00	0.06
Unregulated Impervious	TSS	11.71320000	234.26400000	1.39	325.63
Unregulated Pervious	TSS	0.76912500	15.38250000	2.00	30.77

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	33.81	570.04	21.50%	122.56	2.11	120.45	284.51
Urban Pervious	Nitrogen	10.07	65.66	661.20	21.50%	142.16	1.21	140.95	
Forest	Nitrogen	5.29	20.32	107.49	21.50%	23.11	0.00	23.11	
Urban Impervious	Phosphorus	1.62	33.81	54.77	43.00%	23.55	0.36	23.19	35.84
Urban Pervious	Phosphorus	0.41	65.66	26.92	43.00%	11.58	0.06	11.52	
Forest	Phosphorus	0.13	20.32	2.64	43.00%	1.14	0.00	1.14	
Urban Impervious	Total Suspended Solids	1,171.32	33.81	39,602.33	53.00%	20,989.23	325.63	20,663.61	27,611.25
Urban Pervious	Total Suspended Solids	175.80	65.66	11,543.03	53.00%	6,117.80	30.77	6,087.04	
Forest	Total Suspended Solids	79.91	20.32	1,623.77	53.00%	860.60	0.00	860.60	

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	284.51	35.84	27,611.25

**Phase II Stormwater Retrofits
Reduction Calculation Worksheet**

SWM Facility #386 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 #386	Dry Detention Pond	38.7888	-77.5239	No sediment forebay	-10%
				Short circuiting	-10%
				No micropool	-10%
				Total	-30%

3 Calculate modified existing efficiency

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

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
 Runoff depth #DIV/0!

 Retrofit Equation Results
 TN #DIV/0!
 TP #DIV/0!
 TSS #DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS	
Removal Rate	Constructed Wetland L1	25.00%	50.00%	60.00%	BMP Clearinghouse
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%	
Incremental Removal Rate		21.50%	43.00%	53.00%	

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	10.42	8.12	0.37	18.91
Other Regulated Land	1.48	0.52	0.01	2.02
Unregulated Land	0.23	0.19	0.02	0.44
	12.1332	8.83	0.41	21.38

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	0.23	0.36
Unregulated Pervious	TN	0.03021000	0.60420000	0.19	0.11
Unregulated Impervious	TP	0.01296000	0.25920000	0.23	0.06
Unregulated Pervious	TP	0.00148625	0.02972500	0.19	0.01
Unregulated Impervious	TSS	11.71320000	234.26400000	0.23	54.94
Unregulated Pervious	TSS	0.76912500	15.38250000	0.19	2.89

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	12.13	204.57	21.50%	43.98	0.36	43.63	63.10
Urban Pervious	Nitrogen	10.07	8.83	88.97	21.50%	19.13	0.11	19.01	
Forest	Nitrogen	5.29	0.41	2.16	21.50%	0.46	0.00	0.46	
Urban Impervious	Phosphorus	1.62	12.13	19.66	43.00%	8.45	0.06	8.39	9.97
Urban Pervious	Phosphorus	0.41	8.83	3.62	43.00%	1.56	0.01	1.55	
Forest	Phosphorus	0.13	0.41	0.05	43.00%	0.02	0.00	0.02	
Urban Impervious	Total Suspended Solids	1,171.32	12.13	14,211.83	53.00%	7,532.27	54.94	7,477.33	8,314.92
Urban Pervious	Total Suspended Solids	175.80	8.83	1,553.16	53.00%	823.17	2.89	820.28	
Forest	Total Suspended Solids	79.91	0.41	32.66	53.00%	17.31	0.00	17.31	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #386	Constructed Wetland L1	38.7888	-77.5239	63.10	9.97	8,314.92

**Phase II Stormwater Retrofits
Reduction Calculation Worksheet**

SWM Facility #91 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 #91	Dry Detention Pond	38.57761	-77.30891	No sediment forebay No micropool	-10% -10%
Total					-20%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5%	10%	10%
Efficiency Modification	Step 2	-20%	-20%	-20%
Modified Efficiency		4%	8%	8%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
BMP Clearinghouse	Constructed Wetland L1	25%	50%	60%

Runoff storage (acre-feet)
Impervious acres
Runoff depth #DIV/0!

Retrofit Equation Results
TN #DIV/0!
TP #DIV/0!
TSS #DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS	
Removal Rate	Constructed Wetland L1	25%	50%	60%	BMP Clearinghouse
Modified existing efficiency	Step 3	4%	8%	8%	
Incremental Removal Rate		21%	42%	52%	

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	13.60	11.15	0.19	24.93
Other Regulated Land	0.27	0.06	0.00	0.33
Unregulated Land	0.16	0.06	0.00	0.22
	14.0237	11.26	0.19	25.48

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	0.16	0.24
Unregulated Pervious	TN	0.03021000	0.60420000	0.06	0.04
Unregulated Impervious	TP	0.01296000	0.25920000	0.16	0.04
Unregulated Pervious	TP	0.00148625	0.02972500	0.06	0.00
Unregulated Impervious	TSS	11.71320000	234.26400000	0.16	36.61
Unregulated Pervious	TSS	0.76912500	15.38250000	0.06	0.90

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	14.02	236.44	21%	49.65	0.24	49.42	73.41
Urban Pervious	Nitrogen	10.07	11.26	113.42	21%	23.82	0.04	23.78	
Forest	Nitrogen	5.29	0.19	1.00	21%	0.21	0.00	0.21	
Urban Impervious	Phosphorus	1.62	14.02	22.72	42%	9.54	0.04	9.50	11.45
Urban Pervious	Phosphorus	0.41	11.26	4.62	42%	1.94	0.00	1.94	
Forest	Phosphorus	0.13	0.19	0.02	42%	0.01	0.00	0.01	
Urban Impervious	Total Suspended Solids	1,171.32	14.02	16,426.27	52%	8,541.66	36.61	8,505.05	9,541.59
Urban Pervious	Total Suspended Solids	175.80	11.26	1,980.00	52%	1,029.60	0.90	1,028.70	
Forest	Total Suspended Solids	79.91	0.19	15.09	52%	7.85	0.00	7.85	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #91	Constructed Wetland L1	38.57761	-77.30891	73.41	11.45	9,541.59

**Phase II Stormwater Retrofits
Reduction Calculation Worksheet**

SWM Facility #689 Wet Pond, 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 #689	Dry Detention Pond	38.79471	-77.58665	No sediment forebay	-10%
				Short circuiting	-10%
				No micropool	-10%
				Total	-30%

3 Calculate modified existing efficiency

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

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
BMP Clearinghouse	Wet Pond, L1	25.00%	50.00%	60.00%

Runoff storage (acre-feet)	
Impervious acres	
Runoff depth	#DIV/0!
Retrofit Equation Results	
TN	#DIV/0!
TP	#DIV/0!
TSS	#DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS	
Removal Rate	Wet Pond, L1	25.00%	50.00%	60.00%	BMP Clearinghouse
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%	
Incremental Removal Rate		21.50%	43.00%	53.00%	

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	5.12	25.19	25.64	55.94
Other Regulated Land	5.53	5.99	0.17	11.68
Unregulated Land	0.37	1.12	0.26	1.75
	11.0185	32.29	26.06	69.37

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	0.37	0.56
Unregulated Pervious	TN	0.03021000	0.60420000	1.12	0.67
Unregulated Impervious	TP	0.01296000	0.25920000	0.37	0.10
Unregulated Pervious	TP	0.00148625	0.02972500	1.12	0.03
Unregulated Impervious	TSS	11.71320000	234.26400000	0.37	87.20
Unregulated Pervious	TSS	0.76912500	15.38250000	1.12	17.17

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	11.02	185.77	21.50%	39.94	0.56	39.38	138.25
Urban Pervious	Nitrogen	10.07	32.29	325.17	21.50%	69.91	0.67	69.24	
Forest	Nitrogen	5.29	26.06	137.87	21.50%	29.64	0.00	29.64	
Urban Impervious	Phosphorus	1.62	11.02	17.85	43.00%	7.68	0.10	7.58	14.70
Urban Pervious	Phosphorus	0.41	32.29	13.24	43.00%	5.69	0.03	5.66	
Forest	Phosphorus	0.13	26.06	3.39	43.00%	1.46	0.00	1.46	
Urban Impervious	Total Suspended Solids	1,171.32	11.02	12,906.24	53.00%	6,840.31	87.20	6,753.11	10,848.40
Urban Pervious	Total Suspended Solids	175.80	32.29	5,676.72	53.00%	3,008.66	17.17	2,991.49	
Forest	Total Suspended Solids	79.91	26.06	2,082.64	53.00%	1,103.80	0.00	1,103.80	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #689	Wet Pond, L1	38.79471	-77.58665	138.25	14.70	10,848.40

Appendix E – Estimated Implementation Costs

Appendix E: Implementation Costs for Projects Second Permit Cycle

WMB Number	Project Name	Project Type	Status	Implementation FY	Cost
Planned					
194	Powells Creek Phase 1	Stream	Construction	2020	\$3,800,000
200	Spriggs Road	Stream	Construction	2019	\$375,000
195	Powells Creek Phase 2	Stream	Design	2022	\$4,400,000
210	Buckhall Branch	Stream	Design	2023	\$1,750,000
271	SWM Facility #232	Retrofit	Design	2020	\$250,000
68	SWM Facility #416	Retrofit	Design	2022	\$450,000
148	SWM Facility #386	Retrofit	Concept	2023	\$400,000
60	SWM Facility #91	Retrofit	Concept	2023	\$250,000
131	SWM Facility #689	Retrofit	Concept	2024	\$350,000
272	Lake Drive Reforestation	Reforestation	Design	2020	\$15,000
236	Ben Lomond Park Area E	Reforestation	Design	2021	\$35,000
270	Bristoe Station Battlefield Phase 3	Reforestation	Design	2022	\$25,000
					\$12,100,000

Appendix F – Public Comments

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