VPDES MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)
PERMIT: VAR040039

Chesapeake Bay TMDL Action Plan – 2nd Term
The College of William & Mary

WILLIAM & MARY

CHARTERED 1693

Date:
October 31, 2019

DAA Project Number:
R06714-98

Draper Aden Associates
Engineering • Surveying • Environmental Services

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1.0 INTRODUCTION

This Chesapeake Bay TMDL update is provided to meet reporting requirements per permit section II, part A-11. This update will outline the College of William & Mary's (CWM) compliance path for the second permit cycle of the Chesapeake Bay TMDL.

2.0 LEGAL AUTHORITIES

No new legal authorities, such as ordinances, permits, policy, specific contract language, orders, and interjuridictional agreements have been implemented.

3.0 REQUIRED LOAD REDUCTIONS

WLA has been updated per the permit requirements to reflect land cover as of June 30, 2019 for the college. Cumulative WLA reductions calculations can be found in Appendix A.

Table 1: Required Cumulative Phase II Reductions

Pollutant	Sum of 40% Cumulative Reduction (lb/yr)
Nitrogen	58.54
Phosphorus	14.75
Total Suspended Solids	6,697

4.0 TOTAL CURRENT REDUTION

Cumulative reductions calculations can be found in Appendix B. Current cumulative reductions exceed the required phase II removal reductions.

Table 2: Achieved Cumulative Reductions

Pollutant	Cumulative Reduction (lb/yr)
Nitrogen	477.77
Phosphorus	34.51
Total Suspended Solids	15,730

5.0 CURRENT IMPLEMETED BMPS

Currently the College has implemented the following projects for removal compliance.

Table 3: Current Implement BMPS

BMP	Date Implemented	Nitrogen Removal Reduction (lb/yr)	Phosphorus Removal Reduction (lb/yr)	TSS Removal Reduction (lb/yr)
School of Education - Bioretention	2010	8.03	1.89	773.47
School of Business - Bioretention	2009	1.04	0.28	122.26
School of Business - Cistern	2009	2.63	0.49	189.54
Law School – BMP - Retrofit	2006	17.98	2.68	977.46
South Sunken Garden - Bioretention	2016	6.67	0.78	205
Crim Dell – BMP - Retrofit	2018	88.38	6.24	5,061
Heath Center – Manufactured	2017	51.99	3.59	3,696
Health Center BMP – Retrofit	2017	129.13	8.56	3,472
Wildflower Refuge – BMP - Retrofit	2017	171.92	9.99	1,234
	Total	477.77	34.51	15,730.75

6.0 BMPS TO BE IMPLEMETED

Currently the College does not intends to implement any new BMP's during the second permit cycle.

7.0 PUBLIC PARTICIPATION

The College does not intend to implement any new measures that would require public feedback. If the College proposes a new BMP for TMDL compliance, this section will be updated with any public feedback that is received.

APPENDIX A – CUMULATIVE REDUCTION CALCULATIONS

College of William Mary
Chesapeake Bay TMDL Action Plan
October 31, 2019

Land Cover

Land Cover Date	Impervious	Pervious
6/30/2009	108.47	122.61
6/30/2019	116.15	114.93

Table 3 a: Calculation Sheet for Determing Total POC Reductions Required During the Permit Cycle for the James River, Lynnhaven, and Creek Basins

Pollutant	Subsource	Loading rate (lbs/ac/yr)	Total Existing Acres Served by MS4 (06/30/09)	Load (lbs/yr)	Percentage of MS4 required Chesapeake Bay total L2 loading reduction	Percentage of L2 required reduction by 6/30/2023	40% cummative reduction required by 6/30/2023	Sum of 40% cumulative reduction (lb/yr)
Nitrogen	Regulated Urban Impervious	9.39	108.47	1018.53	9%	40%	36.67	57.24
	Regulated Urban Pervious	6.99	122.61	857.04	6%	40%	20.57	
Phosphorus	Regulated Urban Impervious	1.76	108.47	190.91	16%	40%	12.22	14.00
	Regulated Urban Pervious	0.5	122.61	61.31	7.25%	40%	1.78	
Total Suspended Solids	Regulated Urban Impervious	676.94	108.47	73427.68	20%	40%	5874.21	6307.98
	Regulated Urban Pervious	101.08	122.61	12393.42	8.75%	40%	433.77	

POC Loads as of June 30, 2009 (pre-Development)

Pollutant	Subsource	Loading rate (lbs/ac/yr)	Total Existing Acres Served by MS4 (06/30/09)	Estimated Total POC Load as of 06/30/09 (lbs/yr)	Sum of Estimated Toal POC (lb/yr)
Nitrogen	Regulated Urban Impervious	9.39	108.47	1018.53	1875.58
	Regulated Urban Pervious	6.99	122.61	857.04	
Phosphorus	Regulated Urban Impervious	1.76	108.47	190.91	252.21
	Regulated Urban Pervious	0.5	122.61	61.31	
Total Suspended Solids	Regulated Urban Impervious	676.94	108.47	73427.68	85821.10
	Regulated Urban Pervious	101.08	122.61	12393.42	

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Post-Development Conditions 06/30/2019

Pollutant	Subsource	2009 EOS Loading Rate (lbs/acre/yr)	Total Existing Acres Served by MS4 (06/30/19)	Estimated Total POC Load as of 06/30/19 (lbs/yr)	Sum ofEstimated Toal POC (lb/yr)
Nitrogen	Regulated Urban Impervious	9.39	116.15	1090.65	1894.01
	Regulated Urban Pervious	6.99	114.93	803.36	
Phosphorus	Regulated Urban Impervious	1.76	116.15	204.42	261.89
	Regulated Urban Pervious	0.5	114.93	57.47	
Total Suspended Solids	Regulated Urban Impervious	676.94	116.15	78626.58	90243.71
	Regulated Urban Pervious	101.08	114.93	11617.12	

Total Load Change from "New Sources" between 6/30/09 and 06/30/19

Pollutant	Subsource	Estimated Toal POC Load as of 06/30/19 (lbs/yr)	Estimated Total POC Load as of 06/30/09 (lbs/yr)	load Change (lbs/yr)	Total Load Change (lbs/yr)
Nitrogen	Regulated Urban Impervious	1090.65	1018.53	72.12	18.43
	Regulated Urban Pervious	803.36	857.04	-53.68	
Phosphorus	Regulated Urban Impervious	204.42	190.91	13.52	9.68
	Regulated Urban Pervious	57.47	61.31	-3.84	
Total Suspended Solids	Regulated Urban Impervious	78626.58	73427.68	5198.90	4422.60
	Regulated Urban Pervious	11617.12	12393.42	-776.29	

Total Load Removal Required

Pollutant	Subsource	Load as of (06/30/09)	Load change since (07/1/18)	Load (lbs/yr)	Percentage of MS4 required Chesapeake Bay total L2 loading reduction	Percentage of L2 required reduction by 6/30/2023	40% cummative reduction required by 6/30/2023	Sum of 40% cumulative reduction (lb/yr)
Nitrogen	Regulated Urban Impervious	1018.53	72.12	1090.65	9%	100%	98.16	146.36
	Regulated Urban Pervious	857.04	-53.68	803.36	6%	100%	48.20	
Phosphorus	Regulated Urban Impervious	190.91	13.52	204.42	16%	100%	32.71	36.87
	Regulated Urban Pervious	61.31	-3.84	57.47	7.25%	100%	4.17	
Total Suspended Solids	Regulated Urban Impervious	73427.68	5198.90	78626.58	20%	100%	15725.32	16741.81
	Regulated Urban Pervious	12393.42	-776.29	11617.12	8.75%	100%	1016.50	

APPENDIX B – CUMULATIVE REDUCTION ACHIEVED CALCULATION

College of William & Mary
Stormwater Infrastructure Improvements

Chesapeake Bay TMDL
Cumulative Reduction Achieved Calculations
10/31/2019

					Direct drainage area (not including upstream)			Pollutant Load from direct drainage area			Pollutant Load from upstream			Total Pollutant Load						Removal Achieved					
Completed Projects	Type	Total Area Treated (Ac) Imp.	Perv.	Forest	Imp.	Perv.	Forest	N (lbs)	P (lbs)	TSS (lbs)	N (lbs)	P (lbs)	TSS (lbs)	N (lbs)	P (lbs)	TSS (lbs)	Removal Efficiences N	P	TSS	N (lbs)	P (lbs)	TSS (lbs)	Calculation Methodology	Year Constructed	Remarks
School of Education (SOE)	Bioretention	1.74	2.26	0	1.74	2.26	0	32.14	4.19	1,406.32	0.00	0.00	0.00	32.14	4.19	1,406.32	25	45	55	8.03	1.89	773.47	Ches Bay Program (Established Efficiencies)		Bioretention C/D soils, underdrain
School of Business	Bioretention	0.3	0.19	0	0.3	0.19	0	4.15	0.62	222.29	0.00	0.00	0.00	4.15	0.62	222.29	25	45	55	1.04	0.28	122.26	Ches Bay Program (Established Efficiencies)		Bioretention C/D soils, underdrain
School of Business	Cistern	0.56	0	0	0.56	0	0	5.26	0.99	379.09	0.00	0.00	0.00	5.26	0.99	379.09	50	50	50	2.63	0.49	189.54	BMP Clearinghouse		RS = 1,395 cf, IA = 0.56 Ac
Law School	Retrofit	6.48	3.53	1.86	6.48	3.53	1.86	89.91	13.41	4,887.31	0.00	0.00	0.00	89.91	13.41	4,887.31	20	20	20	17.98	2.68	977.46	10% per missing design element based on Ches Bay Program (Established Efficiences)		Credit for adding forebay & outlet pool to dry ED basin (20%, 20% & 60%)
South Sunken Garden	Bioretention	0.31	0.65	0.00	0.31	0.65	0.00	7.41	0.86	273.11	0.00	0.00	0.00	7.41	0.86	273.11	90	90	75	6.67	0.78	204.59	Type 2, BMP Clearinghouse for N&P, TSS from Ches Bay Program RR curves	2016	N & P from BMP Clearinghouse, Ches Bay Program RR TSS Curves
Crim Dell	Retrofit	6.37	11.68	3.29	6.06	11.03	3.29	141.81	16.61	5,474.19	0.74	0.09	68.52	142.55	16.70	5,542.71	62	37	91	88.38	6.24	5,061.15	Ches Bay Program ST Curves	circa 1930	Conversion for non-BMP to wet pond
Health Center Crystal Stream	Manufactured	6.97	4.18	0.00	6.97	4.18	0.00	94.67	14.36	5,140.79	0.00	0.00	0.00	94.67	14.36	5,140.79	55	25	72	51.99	3.59	3,696.23	N & TSS: Bay Program ST curves, P: BMP Clearinghouse	2016	RD = 1"
Health Center BMP	Retrofit	9.96	20.06	8.83	9.96	20.06	8.83	254.58	28.71	9,453.25	42.68	10.77	1,444.56	297.26	39.48	10,897.81	43	22	32	129.13	8.56	3,472.40	Ches Bay Program ST Curves - dry detention missing two elements	2005	Conversion from non-compliant dry detention to wet pond
Wildflower Refuge BMP	Retrofit	33.58	52.17	19.35	23.62	32.11	10.52	471.07	58.99	20,049.04	222.30	41.37	7,906.97	693.37	100.37	27,956.01	25	10	4	171.92	9.99	1,233.65	Ches Bay Program ST Curves - dry detention missing two elements	2005 2016	Conversion from non-compliant dry detention to wet pond RD = 1"
TOTALS																				**477.77**	**34.51**	**15,730.75**			