MS4 TMDL ACTION PLAN

PERMIT NUMBER VAR040053

Submitted to DEQ:

October 2015

CITY OF WINCHESTER, VIRGINIA - CHESAPEAKE BAY TOTAL MAXIMUM DAILY LOAD (TMDL) ACTION PLAN

INTRODUCTION

The City of Winchester (Winchester) developed this Chesapeake Bay TMDL Action Plan (Action Plan) pursuant to the Special Condition for the Chesapeake Bay TMDL (Section I.C) located in the City's Municipal Separate Storm Sewer System (MS-4) Permit. To assist with the development of the Action Plan, the City utilized both the Department of Environmental Quality's (DEQ) Chesapeake Bay TMDL Special Condition Guidance Document (Guidance Memo No. 15-2005), and the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems, which became effective July 1, 2013. Furthermore, the City used in-house aerial imagery, the Virginia Geographic Information Network (VGIN), and Virginia Environmental Geographic Information Systems (VEGIS), and coupled the imagery with Winchester GIS data, to meet the technical requirements of the Action Plan.

The focus of the Action Plan is driven by the Chesapeake Bay TMDL which was approved by the US Environmental Protection Agency (EPA) in December of 2010. Nitrogen, Total Phosphorous, and Sediment are the Pollutants of Concern (POC) driving the need for required pollutant reductions in the Chesapeake Bay Basin area, which includes Winchester. Three permit cycles have been adopted to address the percent pollutant reduction required by an MS4 in Virginia. A 5% POC load reduction is required by the end of the first permit cycle on June 30, 2018, followed by a 35%, and 60% reduction in the following 2 cycles respectively. For the purposes of this Action Plan, the primary focus will be on Permit Cycle 1 and the associated 5% reduction requirements, although the loadings and reductions have been provided for the 35% and 60% cycles.

This Action Plan details the methodology and results used to develop the required plan components. Detailed sections are provided within the report for the following tasks:

- ***Review of Current MS4 Program and Existing Legal Authority*** - (Addresses Section I.C.2a(1) and I.C.2.a(2) of the MS4 Permit
- ***Data Sources Utilized & Estimate of MS4 Regulated Acreages*** – (Addresses Section I.C.2.a(4) and Section I.C.2.a(5) of the MS4 Permit)
- ***Estimated POC Loads and Required Reductions from Existing Sources*** – (Addresses Section 1.C.2.a(4) and Section I.C.2.a(5) of the MS4 Permit)
- ***Estimated POC Loads and Required Reductions from New and Grandfathered Sources*** – (Addresses Section 1.C.2.a(7) and Section I.C.2.a(8) of the MS4 Permit)
- ***Estimated POC Load Reductions from Existing BMPs*** - (Addresses Section I.C.2.a(6) of the MS4 Permit
- ***Means & Methods Strategy, Schedule, & Estimated Costs*** – (Addresses I.C.2.a(6) and I.C.2.a(11) of the MS4 Permit
- **List of Future Grandfathered Projects** – (Addresses I.C.2.a(10) of the MS4 Permit)
- **Public Comment Process** – (Addresses I.C.2.a(12) of the MS4 Permit)

REVIEW OF CURRENT MS4 PROGRAM AND EXISTING LEGAL AUTHORITY

The jurisdictional area of Winchester lies completely within a 2010 U.S. Census designated urbanized area. As such, the size and extent of the City's MS4 was evaluated based on the City limits. Winchester's MS4 regulated land includes all lands owned and operated by the City, as well as all conveyances and drainage areas served by the City's MS4.

The Virginia Department of Environmental Quality (DEQ) issued a VSMP General Permit for small Municipal Separate Storm Sewer Systems (MS4s) to Winchester (Permit Registration Number: VAR040053) on July 1, 2013. In accordance with the General Permit, Winchester is responsible for developing, implementing and maintaining an MS4 Program that guides design, construction, maintenance, and management of all lands within its jurisdictional area.

The City has reviewed its MS4 Program and the 2014 MS4 Annual Report to evaluate its ability to comply with the Special Condition for the Chesapeake Bay TMDL (Section I.C) in the MS4 Permit. The following is a list of the City's relevant existing legal authorities and policies:

- City of Winchester's Water Protection Ordinance
- City of Winchester's MS4 Program Plan
- City of Winchester's Public Services Standards Manual

Based on this review, it is our opinion that Winchester does not require any new or modified legal authorities or policies in order to meet the requirements of this special condition. However, the City may choose to coordinate with other adjacent MS4s (Frederick County Public Schools and VDOT) and explore the idea of establishing memorandums of understanding (MOU) to clarify MS4 service boundary line(s) and inter-jurisdictional responsibilities for POC loads and subsequent required POC load reductions in the future.

DATA SOURCES UTILIZED & ESTIMATE OF MS4 REGULATED ACREAGE

In order to determine Winchester's MS4 regulated land use acreage as of June 30, 2009, four separate land coverage areas had to be generated. The four land covers needed to develop the Action Plan were impervious land, pervious land, forested land, and open waters. Guidance Memo No. 15-2005 states that VGIN, and subsequently VEGIS, has aerial imagery available which could be used to determine the 2009 land cover conditions. After determining the most recent available VEGIS aerial imagery was flown in 2011 (VBMP2011), the City decided that its own 2010 aerial imagery should be used because it better represents the 2009 land cover condition. Once the best available aerial imagery was determined, the Winchester Corporate Limits GIS polygon shapefile was overlaid on the imagery to determine the extents of the study. The corporate limits shapefile was used as the bounding polygon and each of the four land coverage types were manually digitized with the "cut polygons" tool in Arc Map. The new polygons were then subsequently characterized by their corresponding land cover in the shapefile's attribute table, and the "calculate geometry" tool was run to provide areas for each polygon. Although labor intensive, this methodology was chosen because it was more precise than a raster based land cover processing tool, and it allowed for a simple area check at the end of the process to ensure accuracy.

The four land covers were classified by the following features:

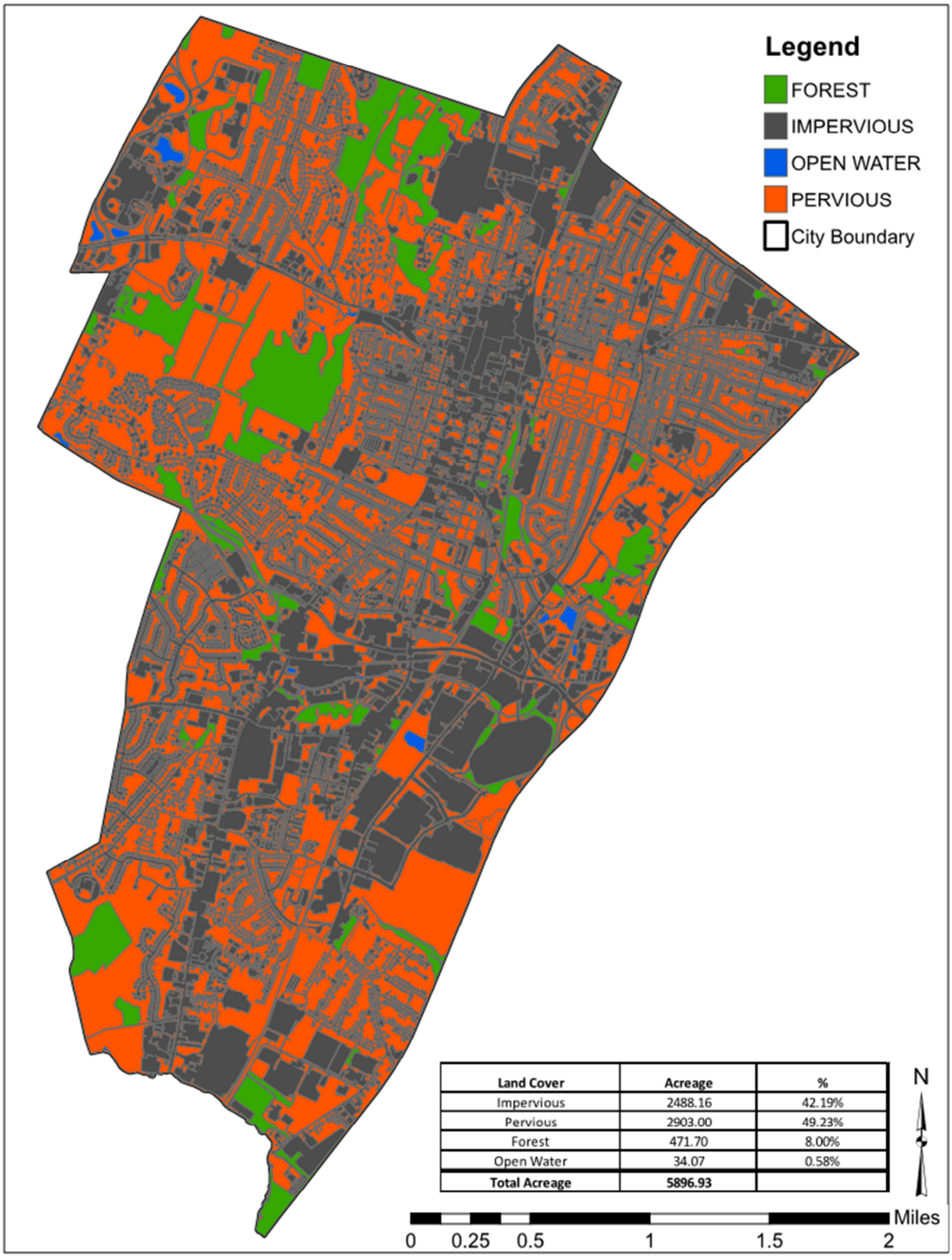
- Pervious land included areas of managed turf, high grass, landscaped and mulched areas, and stands of timber that do not meet the DEQ minimum requirements for forested lands;
- Impervious covers included railroad corridors, compacted gravel areas, roads, parking lots, roofs, and sidewalks;
- Open waters were based off any substantial accumulation of water, such as ponds and above ground streams; and,
- Forested Land;
    - Analysis of available aerial imagery shows that Winchester contains significant tracts of land that appear to be consistent with the definition of "forested lands" as shown in the footnote on page 5 of DEQ's Guidance Document. As such, these lands (shown in Table 1 and Figure 1) were excluded from the regulated urban impervious and regulated urban pervious cover calculations per the DEQ Guidance Document. Lands within Winchester's MS4 service area that contained tree canopy based on the 2010 aerial imagery, but did not appear to meet the aforementioned criteria for forested lands were classified as pervious lands.

Table 1 illustrates Winchester's 2010 Land Cover Summary and corresponding total acreages.

Table 1: 2010 Land Cover Summary

Land Cover	Acreage	%
Impervious	2488.16	42.19%
Pervious	2903.00	49.23%
Forest	471.70	8.00%
Open Water	34.07	0.58%
Total Acreage	5896.93	

The results of the land cover analysis show that Winchester is slightly more pervious than impervious, with a small portion of the land cover having open water characteristics. The land cover polygon shapefile results are illustrated in Figure 1.



Land Cover	Acreage	%
Impervious	2488.16	42.19%
Pervious	2903.00	49.23%
Forest	471.70	8.00%
Open Water	34.07	0.58%
Total Acreage	**5896.93**	

Figure 1: 2010 Land Cover Summary.

EXCLUDED LANDS

Along with forested lands and open waters, all lands owned/operated by a separate MS4 were excluded from the City's regulated area. Furthermore lands regulated under a General VPDES permit for Stormwater Associated with Industrial Activity (VAR05) and lands regulated under an Individual Permit were also excluded. The lands regulated under separate permits are shown in Table 2, and their corresponding locations within Winchester are shown in Figure 2.

Table 2: Excluded Lands regulated under the General VPDES permit for Industrial Stormwater Activity

Facility Name	Address	Permit No.	Permit Type
O'Sullivan Films Inc.	1944 Valley Ave	VAR050810	VPDES General Permit
Rubbermaid Commercial Products LLC	3124 Valley Avenue	VAR050978	VPDES General Permit
Federal Mogul Products Inc. - Winchester	2410 Papermill Road	VA0076384	Individual SW Permit
National Fruit Product Co. Inc.	550 Fairmont Ave	VA0051373	Individual SW Permit

Once the land coverage areas were delineated, the regulated acreage served by the City's MS4 (as of June 30, 2009) was then determined. Using the conservative jurisdictional approach, pervious and impervious lands located within the City's boundary were classified as regulated, excluding the lands covered under a General VPDES Permit as shown in Figure 2. The GIS polygon shapefile shown in Figure 1 was clipped to the polygon shapefile shown in Figure 2, and the land coverage's associated with the VPDES permitted areas were then removed from the Winchester MS4 regulated area. Based on this analysis, Winchester's MS4 regulated area is shown in Figure 3.

Figure 2: Lands Regulated Under a Separate VPDES Permit.

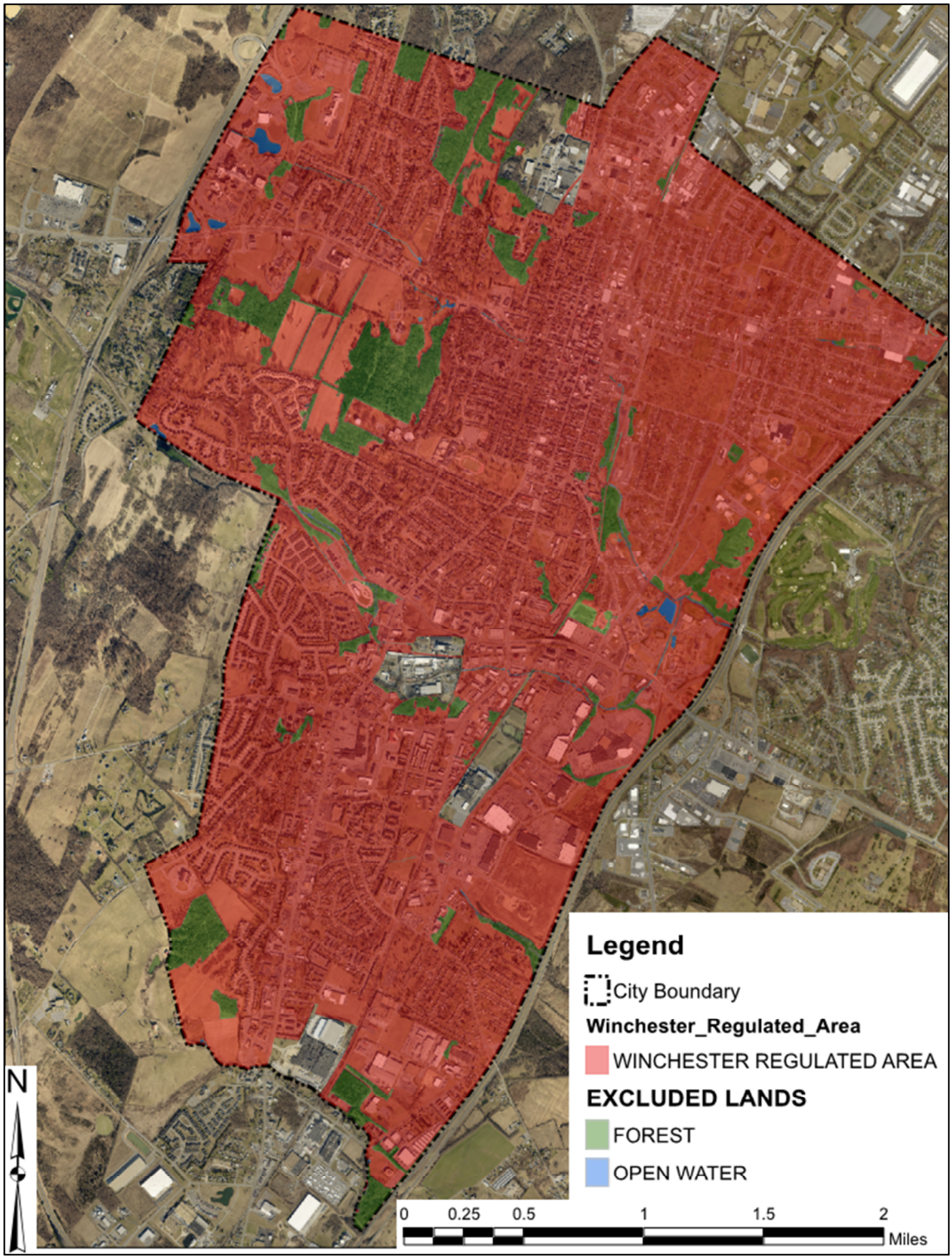


Figure 3: City of Winchester MS4 Regulated Area

ESTIMATED POC LOADS AND REQUIRED REDUCTIONS FROM EXISTING SOURCES

The GIS data created by the steps listed in the previous sections were imperative in determining the regulated pervious and impervious acres served by the City's MS4. The acreages associated with the regulated pervious and impervious areas were input into Table 2b from the MS4 General Permit titled "*Calculation Sheet for Estimating Existing Source Loads for the Potomac River Basin*". Table 2b was then used to derive an estimate of the annual POC loads discharged from Winchester's existing sources as of June 30, 2009. The estimated total POC Loadings for Nitrogen, Phosphorous, and Total Suspended Solids (TSS) were calculated by multiplying the acreages for each land cover (Subsource), by the 2009 Edge of Stream (EOS) loading rate for the corresponding pollutant. Forested lands and open waters were included in the extents of the MS4, but were excluded from the Existing Source POC load calculations shown in Table 3 (Table 2b from the MS4 General Permit Table).

Table 3: Permit Table 2b – Calculation Sheet for Estimating Existing Source Loads from the Potomac River Basin

Table 2b: Calculation for Estimating Existing Source Loads for the Potomac River Basin				
(*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (06/30/09)**	**2009 EOS Loading Rate (lbs./acre/yr.)**	**Estimated Total POC Load based on 2009 Progress Run (lbs./yr.)**
Regulated Urban Impervious	Nitrogen	2359.21	16.86	39,776.35
Regulated Urban Pervious		2848.97	10.07	28,689.15
Regulated Urban Impervious	Phosphorus	2359.21	1.62	3,821.97
Regulated Urban Pervious		2848.97	0.41	1,168.08
Regulated Urban Impervious	Total Suspended Solids	2359.21	1171.32	2,763,394.54
Regulated Urban Pervious		2848.97	175.80	500,849.27

The calculations shown in Table 3 illustrate the total POC Loadings for Nitrogen, Phosphorous, and TSS are **68,465.50 lbs./year, 4990.05 lbs./year, and 3,264,243.81 lbs./year** respectively.

The next component of the Action Plan was to calculate the total pollutant load reductions needed to reduce the annual POC loads from existing sources. As stated earlier in the Action Plan, the focus of this iteration of planning was to address the First Permit Cycle (July 1, 2013 to June 30, 2018) and the required 5% POC reductions. The regulated pervious and impervious acreages used to populate Table 3 (Permit Table 2a), were input into Table 4 (Permit *Table 3b from the MS4 General Permit titled "Calculation Sheet for Determining Total POC Reductions Required during the Permit Cycle for the Potomac River Basin*"). The 5% total reduction was calculated by multiplying the acreages for each specified land use, by the required reduction loading rate for its corresponding pollutant. The resultant 5% required reductions for Winchester are shown in Table 4 below.

Table 4: Permit Table 3b – Calculation Sheet for Determining Total POC Reductions Required During the First Permit Cycle for the Potomac River Basin

Table 3b: Calculation Sheet for Determining Total POC Reductions Required During the Permit Cycle for the Potomac River Basin				
(*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (06/30/09)**	**First Permit Cycle Required Reduction in Loading Rate (lbs./acre/yr.)**	**5% Total Reduction Required First Permit Cycle (lbs./yr.)**
Regulated Urban Impervious	Nitrogen	2359.21	0.08	188.74
Regulated Urban Pervious		2848.97	0.03	85.47
Regulated Urban Impervious	Phosphorus	2359.21	0.01	23.59
Regulated Urban Pervious		2848.97	0.001	2.85
Regulated Urban Impervious	Total Suspended Solids	2359.21	11.71	27,626.35
Regulated Urban Pervious		2848.97	0.77	2,193.71

The calculations shown in Table 5 illustrate the required 5% reduction in pounds per year for Nitrogen, Phosphorous, and TSS are **274.21 lbs./year, 26.44 lbs./year, and 29,820.06 lbs./year** respectively.

Along with the required 5% reductions, the total POC loads and the extrapolated values for the 35% and 60% reductions for the 2nd and 3rd permit cycles are shown in Table 5.

Table 5: Total POC loads and Required Reductions for the 2nd and 3rd Permit Cycles

Table 3b: Calculation Sheet for Determining Total POC Reductions Required During the Permit Cycle for the Potomac River Basin							
(*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)							
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (06/30/09)**	**First Permit Cycle Required Reduction in Loading Rate (lbs./acre/yr.)**	**5% Total Reduction Required First Permit Cycle (lbs./acre/yr.)**	**35% Total Reduction Required Second Permit Cycle (lbs./acre/yr.)**	**60% Total Reduction Required Third Permit Cycle (lbs./acre/yr.)**	**Total Reduction (lbs./yr.)**
Regulated Urban Impervious	Nitrogen	2,359.21	0.08	188.74	1,321.16	2,264.85	**3,774.74**
Regulated Urban Pervious		2,848.97	0.03	85.47	598.28	1,025.63	**1,709.38**
Regulated Urban Impervious	Phosphorus	2,359.21	0.01	23.59	165.15	283.11	**471.84**
Regulated Urban Pervious		2,848.97	0.00	2.85	19.94	34.19	**56.98**
Regulated Urban Impervious	Total Suspended Solids	2,359.21	11.71	27,626.40	193,384.81	331,516.82	**552,528.03**
Regulated Urban Pervious		2,848.97	0.77	2,193.71	15,355.96	26,324.50	**43,874.17**

ESTIMATED POC LOADS AND REQUIRED REDUCTIONS FROM NEW AND GRANDFATHERED SOURCES

Special Condition Requirement 7 "New Sources of Construction" (GP Section I.C.2.a (7)) and 8 "Grandfathered Projects" (GP Section I.C.2.a (8)) of the General Permit apply to permittiees that have:

- **i.** Adopted an average impervious land cover condition greater than 16% for the design of post-development stormwater management facilities under the Chesapeake Bay Preservation Act, or
- **ii.** Have allowed projects to be built with an impervious land cover condition greater than 16% for the design of post-development stormwater management facilities through a "fee-in-lieu of" or similar program.

If a permittee has met either of the criteria listed in (i) or (ii) above, then the permittee has to address the requirements set forth in the corresponding Special Condition. This would ultimately require further POC reductions in addition to those required for existing conditions as of June 30, 2009 (GP Section I.C.2.a (6)). The City of Winchester adhered to the technology based criteria under 9VAC25-870-96.C, which in turn stipulated that beyond the reduction requirements for existing conditions as of June 30, 2009, they do not have to compensate for any additional reductions required under Special Condition 7 or 8. This is due to the technology based criteria assuming an average land cover condition of 16% for the design of post-development stormwater management facilities.

ESTIMATED POC LOAD REDUCTIONS FROM EXISTING BMPS

For Winchester to receive credit towards the City's POC load reduction requirements from existing BMPs, methods such as Structural BMPs, Stream Restoration, or Redevelopment scenarios had to have been implemented. These practices had to be installed between June 30, 2009 and June 30, 2014, and also exceed state requirements for water quality. During that time period, Winchester experienced very limited development, and thus the need for water quality BMPs was minimal. Because of this, there are very few, if any, existing BMPs to analyze for excess Phosphorous, Nitrogen and TSS removal credit. Therefore, under this Action Plan, the City is not planning to take any credit towards its required POC load reductions from existing BMPs.

MEANS & METHODS STRATEGY, SCHEDULE, & ESTIMATED COSTS

In order to meet the 5% POC load reduction requirements set forth in Table 4, the City is utilizing multiple crediting strategies. To address the bulk of the load reduction requirements, Winchester will take credit for their street sweeping program as outlined in Appendix V.G of the TMDL Action Plan Guidance Document, and Appendix A.1 of this Action Plan. Furthermore, the City will also claim credit for homes that have met the conditions outlined in the email from DEQ titled "Chesapeake Bay TMDL Reductions: Septic Connection to Sanitary Sewer" sent on June 29th 2015. Table 6 outlines the POC Reduction crediting and how the methodology addresses the 5% required reductions.

Table 6. Means and Methods to address the total POC Reductions Required during the First Permit Cycle.

Means and Methods Crediting to Address the First Permit Cycle (5%) Reduction Requirements									
(*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)									
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (06/30/09)**	**First Permit Cycle Required Reduction in Loading Rate (lbs./acre)**	**5% Total Reduction Required First Permit Cycle (lbs.)**	**Means and Methods to Address 5% Reductions**	**Street Sweeping Crediting**	**Septic Connection To Sanitary Crediting**	**Total Reductions provided by Means and Methods**	**Percentage of 5% Reduction**
Regulated Urban Impervious	Nitrogen	2,359.21	0.08	188.74		Nitrogen Removed (lbs./year)	Nitrogen Removed (lbs./year)	Nitrogen Removed (lbs./year)	
Regulated Urban Pervious		2,848.97	0.03	85.47		206.73	8.86	215.59	78.62%
Total (N)				274.21					
Regulated Urban Impervious	Phosphorus	2,359.21	0.01	23.59		Phosphorous Removed (lbs./year)	Phosphorous Removed (lbs./year)	Phosphorous Removed (lbs./year)	
Regulated Urban Pervious		2,848.97	0.00	2.85		32.22	N/A	32.22	121.86%
Total (P)				26.44					
Regulated Urban Impervious	Total Suspended Solids	2,359.21	11.71	27,626.40		TSS Removed (lbs./year)	TSS Removed (lbs./year)	TSS Removed (lbs./year)	
Regulated Urban Pervious		2,848.97	0.77	2,193.71		35549.41	N/A	35549.41	119.21%
Total (TSS)				29,820.11					

Table 6 illustrates that the City still needs to reduce their Nitrogen load by 58.62 lbs./year. Winchester will address this deficit by purchasing Class-A Nitrogen Nutrient Credits from the Opequon Water Reclamation Facility to achieve 100% compliance with the First Permit Cycle Requirements.

Appendix A of this document outlines all approaches used to achieve the 5% reduction requirements, as well as their estimated schedule and costs.

LIST OF FUTURE GRANDFATHERED PROJECTS

Winchester does not have any future grandfathered projects to include in this TMDL Action Plan.

PUBLIC COMMENT PROCESS

The City encourages the public's involvement and participation in the development and implementation of its MS4 Program. In keeping with this objective, the City posted a copy of its Draft Chesapeake Bay TMDL Action Plan on its website http:/www.winchesterva.gov/engineering/stormwater to solicit public comment on the draft plan. All comments received from the public were taken into consideration when developing the final version of the Action Plan that was submitted to DEQ with its MS4 Annual Report in October of 2015.

CONCLUSION

Winchester developed this first permit term Action Plan as required in the 2013-2018 Phase II MS4 Permit Number VAR040053 and in accordance with the DEQ Guidance Document dated May 18, 2015. This TMDL Action Plan concludes that the first permit term pollutant reduction requirements calculated will be met by implementing the proposed methodologies identified in the Means and Methods Strategy, Schedule, and Estimated Costs section, and Appendix A of this TMDL Action Plan. Winchester reserves the right to modify this TMDL Action Plan as needed to maintain compliance with its Phase II MS4 Permit.

APPENDIX A – MEANS & METHODS DOCUMENTATION

A.1 - STREET SWEEPING

For the purposes of this Action Plan, the City used the Qualifying Street Lanes Method to calculate the Nitrogen, Phosphorous, and TSS Removal achieved through their current ongoing Street Sweeping Program which occurs bi-weekly. The City utilizes a Regenerative/Vacuum based technology to perform their street sweeping. The City chose to base their calculations off of their lane miles maintained, rather than the 5461 lane miles swept in order to use a more conservative approach. The lane miles were converted to lane feet to ensure a proper unit conversion. The TSS pre-sweeping annual nutrient load was calculated using the Simple Method shown in Equation A.1.

$$L = 0.226*R*C*A \quad \text{(A.1)}$$

Where: L = Annual load (lbs.)
R = Annual Runoff (43")
C = Pollutant Concentration (54.5 mg/l)
A = Area (1 Acre Impervious)
0.226 = Unit Conversion factor

The Street Sweeping crediting per the Guidance Document Appendix V.G titled "Street Sweeping", as well as the calculation methodology is shown in Table A1 below.

Table A1. Street Sweeping Crediting Process

Street Sweeping - Reference Appendix V.G of the TMDL Action Plan Guidance Document			
Qualifying Street Lanes Method		Lane Miles Maintained	Lane Feet Maintained
Calculation Methodology		221.5	1169520
Convert to impervious acres base on lane width		Lane Width (ft)	10
Impervious Acres at a 10 ft lane width		268.48	
Pre-Sweeping Annual Nutrient Load for TP (lbs./year)		2.00	
Pre-Sweeping Annual Nutrient Load for TN (lbs./year)		15.40	
Pre-Sweeping Annual Nutrient Load for TSS (lbs./year)[1]		529.63	
Winchesters Pre-Sweeping P Load (lbs.)		536.97	
Winchesters Pre-Sweeping N Load (lbs.)		4134.67	
Winchesters Pre-Sweeping TSS Load (lbs.)		142197.63	
Street Sweeping Technologies and Corresponding Reductions			
Technology	TN (lbs./year)	TP (lbs./year)	TSS (lbs./year)
Mechanical	0.04	0.04	0.1
Regenerative/Vacuum	0.05	0.06	0.25
Street Sweeping Reductions Provided			
POC	Pollutant Removal Credits to be applied to be applied to reductions (lbs./year)		
TP (lbs./year)	32.22		
TN (lbs./year)	206.73		
TSS (lbs./year)	35549.41		
[1]TSS Pre-sweeping annual nutrient load calculated using the Simple Method (Schuler 1987)			

A.2 - SEPTIC CONNECTION TO SANITARY SEWER

The City is claiming credit for 1 home that has met the conditions outlined in the email from DEQ titled "Chesapeake Bay TMDL Reductions: Septic Connection to Sanitary Sewer" sent on June 29th 2015. Correspondence with DEQ stated that requirements for this crediting process are as follows: (1) The connections have to be within the MS-4 Service Area and, (2) The disconnections and corresponding connection to the sanitary sewer had to occur post 2006. Table A2 shows the home that has connected to the Sanitary Sewer, followed by Table A3 which shows the calculation methodology.

Table A2. Sanitary Connections post 2006

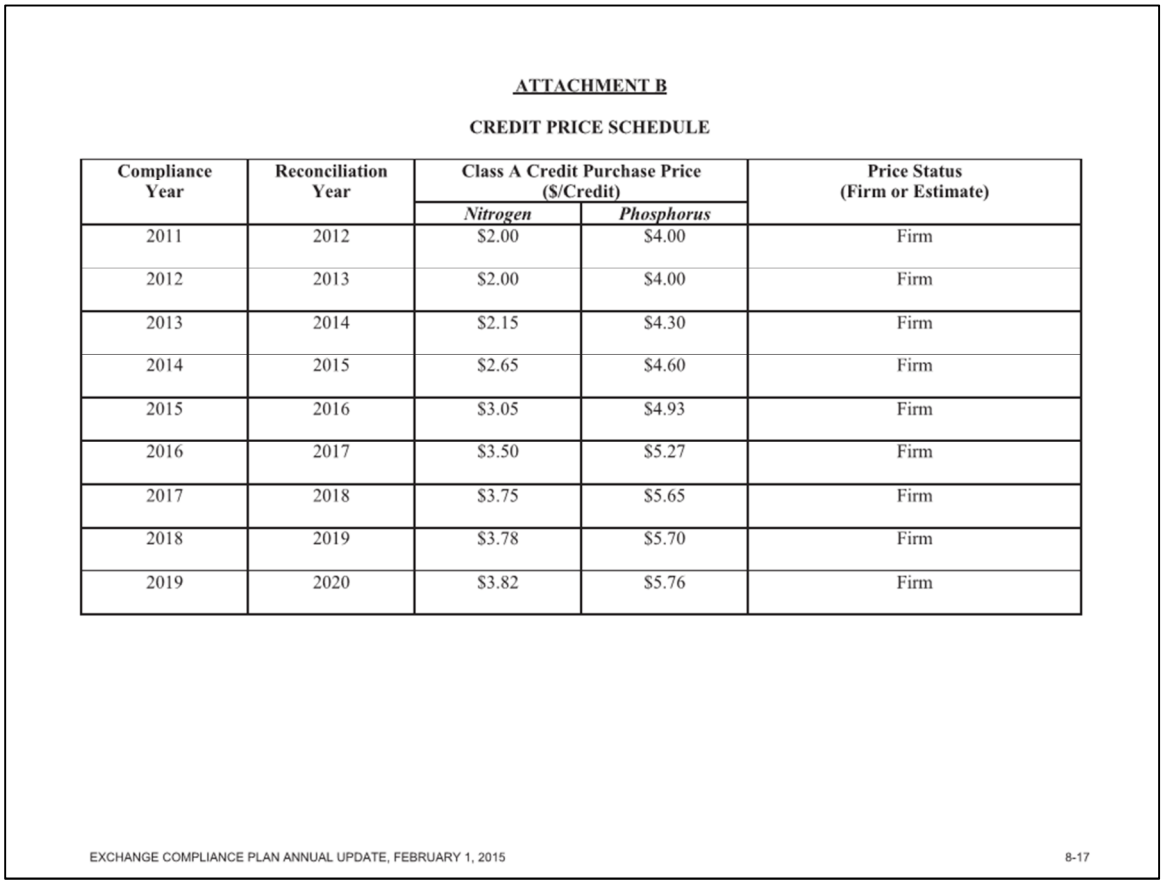
Septic Connection to Sanitary Sewer Homes	
Home	**Address**
#1	2316 Middle Road, Winchester VA 22601

Table A3. Septic Connection to Sanitary Sewer Crediting Process

Chesapeake Bay TMDL Reductions: Septic Connection to Sanitary Sewer			
Septic Tank TN at Edge of Stream		**3.6**	**lbs. TN/year/person**
Winchester Census Data		**2.46**	**Average number of people per household for 2009-2013**
TN Credit	**8.856**	**lbs. TN Per Year per household**	
Households with Septic Connection		**1**	**homes**
Total TN Reduction Credit Provided		**8.856**	**lbs. TN/year**

A.3 - NUTRIENT TRADING

The City will purchase the remaining credits needed for compliance with the First Permit Cycle through the Virginia Nutrient Credit Exchange Association. Winchester will purchase 59 Class-A Nitrogen Credits from the Opequon Water Reclamation Facility located at 3100 Berryville Pike, Winchester VA 22603. At the time of this Action Plan (2015), the Class-A Nitrogen Credit Purchase Price is $3.05 a share, for an overall cost of $179.95. The Credit Price schedule for subsequent years is shown in Figure A.3 taken from the Virginia Nutrient Credit Exchange Association 2015 Exchange Compliance Plan Annual Update.



ATTACHMENT B

CREDIT PRICE SCHEDULE

Compliance Year	Reconciliation Year	Class A Credit Purchase Price ($/Credit)		Price Status (Firm or Estimate)
		Nitrogen	*Phosphorus*	
2011	2012	$2.00	$4.00	Firm
2012	2013	$2.00	$4.00	Firm
2013	2014	$2.15	$4.30	Firm
2014	2015	$2.65	$4.60	Firm
2015	2016	$3.05	$4.93	Firm
2016	2017	$3.50	$5.27	Firm
2017	2018	$3.75	$5.65	Firm
2018	2019	$3.78	$5.70	Firm
2019	2020	$3.82	$5.76	Firm

EXCHANGE COMPLIANCE PLAN ANNUAL UPDATE, FEBRUARY 1, 2015 8-17

Figure A.3 Class-A Nutrient Credit Price Schedule