

**SECTION II**

**TOWN OF VINTON**

**Total Maximum Daily Loads (TMDLs)**

## **TMDL EXECUTIVE SUMMARY**

The Town of Vinton Total Maximum Daily Load (TMDL) Action Plan for Sediment and E. coli Reduction in the Roanoke River have been prepared as required by the Town of Vinton's General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4s) General Permit No. VAR040026.

The Roanoke River and Tinker Creek were listed as "impaired" because they did not meet the Virginia water quality standard for wildlife habitat as measured using the modified Rapid Bioassessment Protocols (EPA, 1999). Streams are required to support the propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them. Sediment was identified as the probable stressor pollutant that is adversely impacting macroinvertebrates (benthic organisms). The Town was assigned a WLA of 119.3 tons of sediment/year.

The Roanoke River, Tinker Creek, and Glade Creek were originally listed as "impaired" because they did not meet the Virginia water quality standard for fecal coliform bacteria. Since the initial listing, the state water quality standard has been changed from fecal coliform bacteria to E.coli bacteria. The Town's WLA for Roanoke River was set at 33,200,000,000 (3.32E+10) colony forming units per year. The WLAs for Tinker Creek and Glade Creek are nested within the Roanoke River WLA. The Town's WLA for Tinker Creek was set at 342,000,000,000 (3.42E+11) colony forming units per year. The WLA for Glade Creek is nested within the Tinker Creek WLA. Town's WLA for Glade Creek was set at 87,800,000,000 (8.78E+10) colony forming units per year.

The Town's strategy is to progressively implement Best Management Practices (BMPs) to decrease the amount of sediment and E. coli that enter Town waters in order to meet Virginia state water quality standards for aquatic life. The Town has and will continue implement BMPs over multiple state permit cycles and demonstrate that adequate progress is being made to reduce sediment and E. coli discharges. As additional information is obtained from Virginia Department of Environmental Quality (DEQ) monitoring or other sources, an adaptive iterative approach will be used to modify BMPs implementation as appropriate.

### **A. TMDL ACTIVITIES**

The Town undertakes a number of activities to enhance its stormwater program to address its TMDL wasteload allocations. These activities are described in the MS4 Program Plan and specific TMDL Action Plans.

Following is the tabulation of the Best Management Practices (BMPs) that the Town currently has in place under the MS4 General Permit MCMs BMPs and plans to implement to decrease discharges of sediment and bacteria to the maximum extent practicable, along with their anticipated estimated implementation schedule. Please note the change in the implementation schedule for some of the tasks due to limited staff and resources.

- Note that all of the BMPs used to address sediment are also effective in addressing the Town's E.coli wasteload allocations and are also included in the Town of Vinton TMDL Action Plan for

Bacteria/E.coli Reduction in the Roanoke River, Tinker Creek, and Glade Creek (Bacteria Action Plan).

<b>BMP Designation</b>	<b>BMP Name/Task</b>	<b>Implementation Dates (Start – Finish)</b>
BMP 3-3	MS4 Outfall Inspection	Underway
BMP 3-4	Illicit Discharge Detection and Elimination Program	Underway
BMP 4-3	Erosion and Sediment Control (ESC) Plan Review	Underway – ROCO
BMP 4-4	Erosion and Sediment Control (ESC) Inspection	Underway – ROCO
BMP 4-5	Erosion and Sediment Control (ESC) Compliance and Enforcement	Underway – ROCO
BMP 5-1	Stormwater Management (SWM) Ordinance and Manual	Underway – ROCO
BMP 5-2	Stormwater Management (SWM) Plan Review	Underway – ROCO
BMP 5-3	Stormwater Management Facility (SWMF) Construction Inspection	Underway – ROCO
BMP 5-4	Stormwater Management Facility (SWMF) Post-Construction Inspection	Underway – ROCO
BMP 5-6	Strategies to Encourage Long-Term Maintenance of Single-Family Residential Structure Stormwater Control Measures	Underway – ROCO
T-1*	Initial Streams Assessment and BMP Planning	<b>Begin Fall of 2017 Anticipated completion Fall of 2019</b>
BMP 1-1 to BMP 1-7: T-2*	Enhanced Public Education and Outreach – Sediment, Bacteria, Nutrients	Underway – ROCO & TOV
BMP 6-2	Public Street Sweeping	Underway
BMP 6-3: T-3*	Enhanced Stormwater Training Program for Town Employees	Underway
BMP 6-5	Standard Operating Procedures (SOPs)	Underway
BMP 6-6: T-4*	Stormwater Pollution Prevention Plans (SWPPPs) for Municipal Facilities  <u>Town Facilities Assessments and Corrections</u> <u>Screen Facilities/Schedule Assessments</u> Perform Assessment – Public Works Building: Facility # 1 – Outdoor Storage of Construction Materials: Facility # 2  Perform Assessment –Road Salt & Vehicle/Equipment Storage: Facility # 3	Underway  <u>Completion Date:</u>  Completed in June 2015  <b>By June 2018</b>

	Perform 2 Assessments – Organic Materials Collection Site: Facility # 4 and Vehicles & Equipment Storage: Facility # 5	Completed in June 2017
BMP 6-7	Nutrient Management Plan (NMP)	Completed: Vinton War Memorial.
BMP 6-8	Responsible Land Disturber	Underway – ROCO & TOV
T-5	Enhanced Illicit Discharge Detection and Elimination Program	Begin July 2017
T-6*	Erosion and Sediment Control Enhanced Enforcement Evaluate Policies Implement Changes (If Needed)	ROCO Underway/Ongoing
T-7	Dog Waste Stations Determine Needs  Installation at Wolf Creek Greenway Installation at Gladetown Trail Installation at Roland E. Cook Lofts Installation at Vinton Farmers Market	Underway/Ongoing  Completed Completed Completed By December 2017
T-8	Dog Waste Ordinance  Research Ordinances and Obtain Public Input Discuss with Town Council Prepare Ordinance for Town Council Consideration	By December 2017 By Spring 2018 By June 2018
T-10*	Stream Buffers  Research Ordinances Identify Possibly Impacted Properties Obtain Public Input Discuss with Town Council Prepare Ordinance for Town Council Consideration	Underway/Ongoing Underway/Ongoing By December 2017 By December 2017 By June 2018
*	Capital Improvements Identify Feasible Capital Projects  Construction	Identify Initial Capital Project by July 2017  To Be Determined

## B. TMDL ACTION PLANS

Section 1.B.1 of the MS4 General Permit requires that the Town's MS4 Program Plan prepare and implement a specific TMDL Action Plan for pollutants allocated to the MS4 in approved TMDLs. The Town



has approved wasteload allocations for E. coli and Sediment. Specific TMDL Action Plans for E. coli and Sediment were completed July 1, 2015, and implementation began last permit year.

### **C. BMPs DEVELOPED to ADDRESS Sediment (SED) and E. coli (EC) TMDLs**

The BMPs developed to address Sediment (SED) and E. coli (EC) TMDLs are listed below:

#### **T-1: Initial Stream Assessments and BMP Planning (SED and EC) – To Start Fall 2017**

Perform initial stream assessments in order to better understand their conditions and to assist in determining the most cost-effective means of lowering pollutant loads.

#### **T-2: Enhanced Public Education and Outreach (SED and EC)**

Enhance **BMPs 1-5, 1-7 and 2-3** to ensure that they address bacteria and sediment as high priority water quality issues.

#### **T-3: Enhanced Employee Training (SED and EC)**

Enhance **BMP 6-4** to ensure that it addresses bacteria and sediment as high priority water quality issues.

#### **T-4: Town Facilities Assessments and Corrections (SED and EC)**

As a part of **BMP 6-6**, all Town facilities have been assessed for conditions that could result in elevated discharges of bacteria or sediment. Where sources of elevated discharges are discovered, they will be eliminated. A Stormwater Pollution Prevention Plan (SWPPP) will be prepared where appropriate.

#### **T-5: Enhanced Illicit Discharge Detection and Elimination Program (SED and EC)**

Visit selected businesses that have a possible elevated potential to discharge bacteria or sediment to observe conditions. Take corrective actions where illicit discharges are observed.

#### **T-6: Erosion and Sediment Control Enhanced Enforcement (SED and EC) – Implemented and Administered by Roanoke County as the County is the Town's ESC Administrator**

Evaluate the need to strengthen the erosion and sediment control program enforcement activities.

#### **T-7: Dog Waste Stations (EC)**

Increase the number of dog waste stations along Town's greenways and on Town's civic facilities.

#### **T-8: Dog Waste Ordinance (EC)**

Consider a new dog waste ordinance to strengthen the requirements to pick up dog waste.

#### **T-9: Onsite Sewage Disposal System Maintenance Ordinance (EC) – To Start July 2017**

Evaluate the advisability of enacting a sewage disposal system maintenance ordinance.

#### **T-10: Stream Buffers (SED and EC) – To Start June 2017**

Evaluate the possibility of enacting stream buffer requirements.

#### **Capital Improvements (SED and EC) – Identify Initial Capital Project by July 2018**

Construct cost-effective capital improvements to address impairments utilizing 50% Virginia Stormwater Local Assistance Fund grants.

### **T-1: Initial Stream Assessments and BMP Planning (SED and EC) – To Begin Fall 2017**

**Goal:** The goal of this BMP is to perform field and office investigations of streams within the MS4 area to document existing conditions and identify opportunities for implementation of cost-effective BMPs.

**Measurable Goals:** N/A

**TMDL Consistency:** The stream assessment will identify locations where Town efforts should be concentrated, to lower bacteria and sediment discharges (SED& EC).

**Evaluation and Modification:** The initial stream assessment will be valuable in understanding existing stream conditions and in prioritizing the Town's efforts.

### **T-2: Enhanced Public Education and Outreach (SED and EC)**

**Goal:** Raise awareness of the water quality issues involving Sediment and E. coli in target audiences and the general public.

**Measurable Goals:** Incorporate information concerning sediment and E. coli into the MS4 Program public education and outreach efforts in accordance with Table 4-A of the MS4 Annual Report in **BMP 1-7** for detailed assessment of compliance with goals.

**TMDL Consistency:** The enhanced Public Education and Outreach goals were specifically tailored to address Sediment and E-coli water quality issues.

**Evaluation and Modification:** Use of messages tailored to address Sediment and E. coli that are focused on the proper target audiences is an effective means to raise awareness, improve individual's actions, and increase support for water quality programs. The Town believes that its current activities in this area are robust and do not require modifications at this time.

### **T-3: Enhanced Employee Training (SED and EC)**

**Goal:** Raise awareness of the water quality issues involving Sediment and E. coli in Town's employees that receive employee training as a part of **BMP 6-3**.

**Measurable Goals:** Compliance with **BMP 6-4** training goals for:

- Recognition and Reporting of Illicit Discharges
- Good Housekeeping and Pollution Prevention Practices
- Contractor Oversight for Environmental Compliance
- Hazardous Materials (HAZ-MAT) Training

This training began in permit year 2014 - 2015 and will be performed every two years, in accordance with the MS4 Permit requirements. See **BMP 6-3** in the MS4 Annual Report for documentation of compliance.



**TMDL Consistency:** The Enhanced Employee Training was specifically tailored to address Sediment and E-coli water quality issues (SED and EC).

**Evaluation and Modification:** This training is important to give Town's employees the understanding of why certain procedures must be followed. The Town does not believe any modifications are needed at this time.

#### **T-4: Town Facilities Assessments and Corrections (SED and EC)**

**Goal:** Reduce discharges of Sediment and E.coli from Town facilities. Screen Town facilities for conditions that could result in elevated discharges of E-coli and Sediment.

**Measurable Goals:** The Town has identified all of its high-priority facilities that have a high potential to discharge pollutants in stormwater. Stormwater Pollution Prevention Plans (SWPPPs) will be prepared, implemented, and maintained for each of them. Annual inspections of all facilities that have a SWPPP will be conducted to ensure that any sources of E-coli and Sediment are identified and eliminated. Documentation of these inspections will be kept in each of the SWPPPs.

**TMDL Consistency:** Screening County facilities, performing site inspections, preparing and implementing SWPPPs, and eliminating potential sources of elevated E-coli and Sediment discharge are consistent with the E-coli and Sediment TMDLs (SED& EC).

**Evaluation and Modification:** No modifications are planned for this BMP at this time. The Town will continue to develop and implement the remaining SWPPPs, as previously identified and reported under BMP 6-6.

#### **T-5: Enhanced Illicit Discharge Detection and Elimination Program (SED & EC)**

**Goal:** Identify and eliminate Illicit Discharges by proactively visiting and observing conditions at businesses that may have the potential to discharge elevated levels of E. coli into receiving waters.

**Measurable Goals:** Beginning in permit year 2017 - 2018, a minimum of 5 businesses will be visited to perform site surveys to observe conditions. Initial businesses to be visited include: veterinary clinic, pet related businesses, and restaurants.

**TMDL Consistency:** Actively looking for illicit discharges of Sediment and E.coli is consistent with the TMDLs (SED& EC).

**Evaluation and Modification:** This activity will begin in permit year 2017 - 2018. Evaluation and modification are not appropriate at this time.

#### **T-6: Erosion and Sediment Control Enhanced Enforcement (SED and EC) – Administered by Roanoke County**

**Goal:** Reduce offsite discharge of silt and sediment from construction sites.

**Measurable Goals:** In permit year 2016 - 2017, evaluate current enforcement procedures and policies to determine if there is a need to revise them in order to obtain shortened corrective action times. If the evaluation determines that changes are advisable, any revisions to procedures and policies expect to be implemented in permit year 2017- 2018.

**TMDL Consistency:** Actions that result in lowering discharges of silt and sediment from construction sites are consistent with the TMDLs (SED& EC).

**Evaluation and Modification:** This activity will begin in permit year 2016 - 2017. Evaluation and modification are not appropriate at this time.

### **T-7: Dog Waste Stations (EC)**

**Goal:** Increase the number of maintained dog waste stations in the greenways and civic facilities to reduce discharge of E. coli from dog waste.

**Measurable Goals:** In permit year 2016 - 2017, the locations of the three existing dog waste stations have been documented and future locations continue to be identified.

**TMDL Consistency:** Actions that decrease discharges of E. coli are consistent with the TMDL (EC).

**Evaluation and Modification:** No modifications are planned for this BMP at this time. The Town will continue to maintain the dog waste stations, as outlined in the tabulation above.



### **T-8: Dog Waste Ordinance (EC)**

**Goal:** Reduce discharge of E. coli from dog waste.

**Measurable Goals:** In permit year 2017 - 2018, Town staff will research existing dog waste ordinances in other Virginia localities and will consider the need to revise the Town existing ordinance, if needed. In the event that it appeared to be advisable, a proposed dog waste ordinance would be presented to the Vinton Town Council for consideration in permit year 2017– 2018.

**TMDL Consistency:** Actions that decrease discharges of E. coli are consistent with the TMDL (EC).

**Evaluation and Modification:** This activity will begin in permit year 2016-2017.

### **T-9: Onsite Sewage Disposal System Maintenance Ordinance (EC)**

**Goal:** Reduce the discharge of E. coli due to mal-functioning onsite sewage disposal systems.

**Measurable Goals:** Beginning permit year 2016 - 2017, staff will research onsite sewage disposal system locations within the Town, and also research the ordinances of other Virginia localities. In permit year 2017



- 2018, staff will consult with the Town Council; if the Town Council gives general concurrence, then public input will be sought and a draft ordinance may be submitted for the Council's consideration.

**TMDL Consistency:** Actions that decrease discharges of Sediment and E. coli are consistent with the TMDLs(EC).

**Evaluation and Modification:** This activity will begin in permit year 2016-2017.

#### **T-10: Stream Buffers (SED and EC)**

**Goal:** Reduce discharges of Sediment and E. coli by filtering sheet flow through vegetated buffers along streams.

**Measurable Goals:** In permit year 2016 - 2017, Town staff will research similar ordinances in Virginia, identify properties that border waterways in the Town, and develop possible stream buffer criteria for new development. In permit year 2017 - 2018, public input will be sought and discussions with the Town Council will be held to obtain direction. If the Council provides general concurrence, staff will work towards submitting an ordinance to the Council for its consideration near the end of permit year 2017 - 2018.

**TMDL Consistency:** Actions that decrease discharges of Sediment and E. coli are consistent with the TMDLs. (EC & SED)

**Evaluation and Modification:** This activity will begin in permit year 2016 - 2017. Evaluation and modification are not appropriate at this time.

#### **Capital Improvement Projects – Feasibility and Construction to be Determined**

### **D. STORMWATER VOLUME AND POLLUTANT LOAD ESTIMATION FOR YEAR FOUR**

The volume of stormwater discharged and the quantity of pollutants is estimated for all water bodies with a Wasteload Allocation (WLA). These calculations are the same as those used in Year Five of the previous permit as no significant changes have occurred.

In this section, the methods used and results of the calculations are described:

1. Estimated Drainage Area and Percent Impervious, for Sediment and E. coli
2. Annual Precipitation
3. Estimation of Volume of Stormwater Discharged, for Sediment and E. coli Analysis
4. Estimation of Colony Forming Units of E. coli
5. Estimation of Total Suspended Solids Discharged Annually
6. Sediment and E. coli TMDL Studies and Wasteload Allocations
7. Comparison of Discharges to Wasteload Allocations for Sediment and E. coli
8. Issues for Further Study and Clarification

The Town recognizes the need for a better pollutant load estimation methodology. The Town, with the cooperation of the County of Roanoke, anticipates changing its plan assessment methodology to the Watershed Treatment Model, developed by the Center for Watershed Protection, for submission of the next annual report, due by October 1, 2018.

**Estimated Drainage Area and Percent Impervious, for Sediment, and E. coli**

As part of the Town of Vinton Permit Year Four Annual Report – July 1, 2016 through June 30, 2017, this information is being submitted to report the estimate volume of stormwater discharged and the quantity of pollutants identified in the Town's Wasteload Allocations (WLAs) that is discharged by the regulated small MS4 for each pollutant identified in the local creeks that have a TMDL completed in 2004 and 2006.

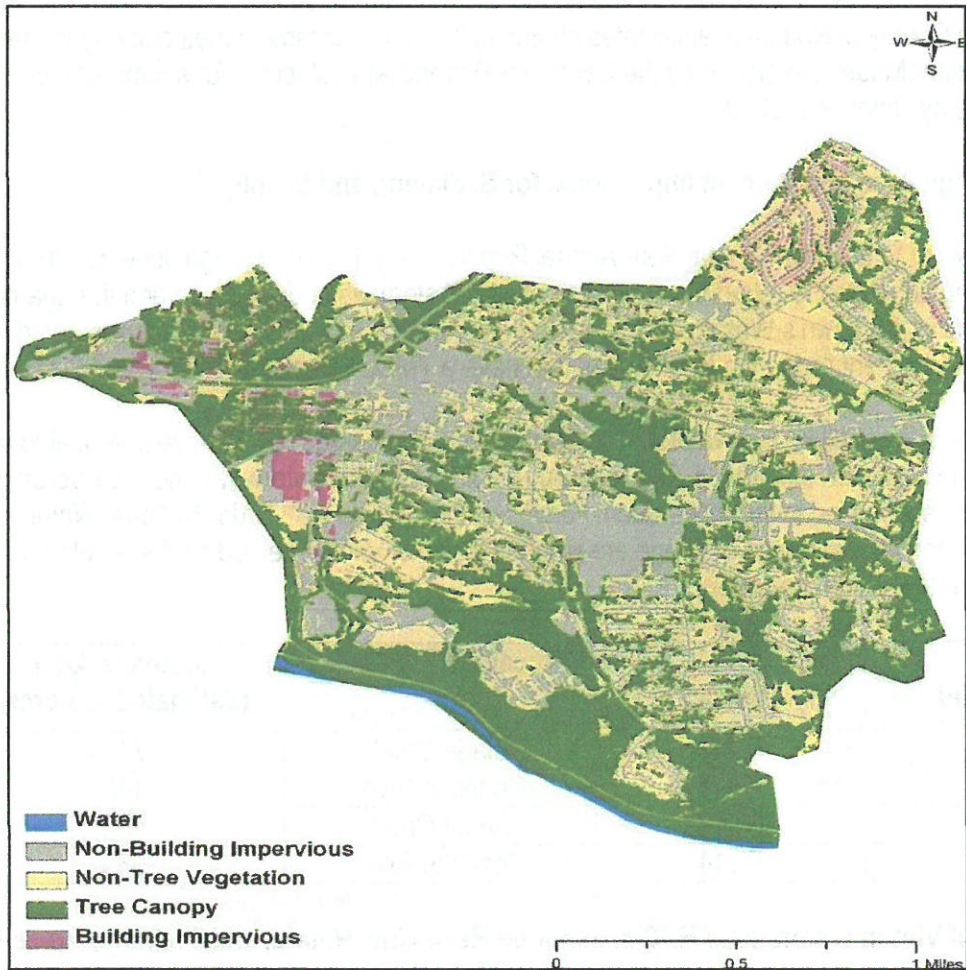
This section details a list of all known waters currently receiving discharges or that have potential to receive discharges from the regulated small MS4. The following Table 9 lists the waterways and the Hydrologic Unit Codes (HUC) as identified in the most recent version of the Virginia's 6<sup>th</sup> Order National Watershed Boundary Dataset and the estimated drainage areas in the Town of Vinton, served by the regulated small MS4 discharging to these surface waters.

Watershed	Hydrologic Unit	Impaired Receiving Waters	Drainage Area (Estimated in Acres)
Glade Creek	RU13	Glade Creek	711
Roanoke River	RU14	Roanoke River	148
Tinker Creek	RU13	Tinker Creek	489
Wolf Creek	RU14	Roanoke River	663

**Table 9. Town of Vinton Watersheds HUC's, Impaired Receiving Waters, and Drainage Areas inside Town of Vinton**

The Percent Impervious for the Town of Vinton was derived from the Town of Vinton Urban Tree Canopy (UTC) Report carried out by the Virginia Department of Forestry in collaboration with the Town and Roanoke Valley Alleghany Regional Commission. The data analysis utilized high resolution (1 meter) aerial imagery acquired in the summer of 2008 and incorporated parcel specific zoning and land use data provided by the Town of Vinton. The UTC report provided the town with an estimate of total impervious cover of **29.4%**.





**Figure 2.**  
**2008 Land**  
**Cover For the**  
**Town of**  
**Vinton,**  
**Urban Tree**  
**Canopy**  
**(UTC) Report**

While the focus of the Town's VSMP permit is on pollution prevention, the permit requires special measures to

address water bodies that are already identified as impaired on the DEQ's 303(d) list. In addition, the permit provides for specific action when a Total Maximum Daily Load (TMDL) Wasteload Allocation (WLA) has been assigned for a specific pollutant of concern. A TMDL establishes the maximum amount of a pollutant that can enter a water body without violating water quality standards.

The Town has several local creeks that have a TMDL completed at the time when the MS4 permit was issued. The creeks, associated pollutants, and wasteload allocations are listed below.

TMDL Waterways and Tributaries*	Year Completed	Parameter	WLA
<i>Tinker Creek Watershed</i>	<b>2004</b>	<b>E. coli (EC)</b>	
Glade Creek			8.78E+10 cfu/year
Tinker Creek			3.42E+11 cfu/year
<i>Roanoke River Watershed</i>	<b>2006</b>	<b>E. coli (EC)</b>	
Roanoke River			3.32E+10 cfu/year
<i>Roanoke River Watershed</i>	<b>2006</b>	<b>Sediment (SED)</b>	
Roanoke River			119.3tons/year



**Table 10. Wasteload Allocations for the Town of Vinton Watershed with Completed TMDLs**  
 \*This information is based upon DEQ list of approved and draft TMDL's at <http://www.deq.state.va.us/tmdl/develop.html> for streams located within the urbanized Town of Vinton as defined by the 2010 Census

**Annual Precipitation for the Reporting Period**

The Town of Vinton gathers its annual precipitation from the Local Climatological Data from NOAA's National Climatic Data Center (NCDC). The Town of Vinton used the data from the Roanoke Regional/Woodrum Field Airport (KROA) due to its close proximity to the Town. This data was collected on a monthly basis from July 1, 2016 through June 30, 2017, and compiled for this report. The total precipitation for the July 1, 2016, through June 30, 2017, period was 39.66 inches.

**Estimation of Volume of Stormwater Discharged**

Using the Town of Vinton's impervious percentage estimate and annual precipitation, the Town of Vinton has used the formula below to derive the volume, in cubic feet, of runoff from the regulated MS4 for each of the watersheds with an identified wasteload allocation. The results are shown below:

$$R_{cuf} = 36.3021 * X * Y * Z$$

$$36.3021 = \left( \frac{1}{100\%} \right) \left( \frac{1ft}{12in} \right) \left( \frac{0.0015625mi^2}{1acre} \right) \left( \frac{27,880,000ft^2}{1mi^2} \right)$$

- Where:
- R = Runoff Volume Estimate, cubic feet
  - X = 29.4%, Estimated percentage of impervious for Town of Vinton MS4
  - Y = 39.66 inches, Annual precipitation in inches of reporting period July 1, 2016 – June 30, 2017: Data from NOAA, Roanoke Regional Airport Station
  - Z = Area of MS4 (in acres)

Watershed with WLA	Drainage Area of MS4 (ac)	Volume (cubic feet)
Roanoke River	148	6.26E+06
Tinker Creek	489	2.07E+07
Glade Creek	711	3.01E+07

**Table 11. Stormwater Runoff Volume Estimation**

### Estimation of Colony Forming Units of E. Coli

Town of Vinton has utilized the Simple Method (Schueler, 1987) to calculate urban stormwater loading for bacteria. This method is originally derived to calculate bacteria in the form of Fecal Coliform using the National Median Concentration for Chemical Constituents in stormwater factor for fecal coliform. To convert to the E. Coli standard for bacteria to make this calculation consistent with the WLA, Town of Vinton has converted Fecal Coliform to E. Coli using the regression model developed by the Virginia Department of Environmental Quality (DEQ). These methods and results are detailed below.

*The Simple Method:*

$$L \text{ (cfu/year)} = 103 * R * C_b * A \text{ (Fecal Coliform)}$$

Where: L = Annual load (cfu/year)  
 $R_{in} = 39.66$  inches, Annual Runoff Estimate  
 = X \* Y  
 $C_b$  = Bacteria Concentration (1000/mL)  
 = 15,000/mL (factor for fecal coliform)  
 A = Area (acres)  
 Note: 103 is the conversion Factor for Bacteria

*The Virginia Department of Environmental Quality Conversion from Fecal Coliform to E. Coli*

$$E \text{ coli} = 2^{[-0.0172+0.91905*\log_2(\text{fecal coliform})]}$$

Watershed with WLA	Drainage Area of MS4 (acres)	Calculated Fecal Coliform (L) (cfu/year) (2014-2015)	Calculated E. Coli (cfu/year) (2014-2015)
Roanoke River	148	2.67E+09	4.55E+08
Tinker Creek	489	8.81E+09	1.36E+09
Glade Creek	711	1.28E+10	1.92E+09

**Table 12. Colony Forming Units of E. Coli Estimation**

### Estimation of Total Suspended Solids (TSS) Discharged Annually



Town of Vinton has utilized the simple method (Schueler, 1987) to calculate urban stormwater loading for total suspended solids. This method identified to the method used for Fecal Coliform with different values for potential concentration and conversion factors. The method and results are detailed below.

The Simple Method:

$$L = 0.226 * R_{in} * C_p * A$$

Where: L = Annual Load (lbs/year)

$R_{in}$  = 39.66 inches, Annual Runoff Estimate  
= X \* Y

$C_p$  = Pollutant Concentration (mg/L)  
= 54.51 mg/L (factor for TSS)

A = Area (acres)

Note: 0.226 is the Conversion Factor for TSS

$$L \text{ annual load (tons)} = \frac{L \text{ lbs (annual load)}}{2000 \text{ lbs}}$$

Watershed with WLA	Drainage Area of MS4 (ac)	Calculated Total Suspended Solids (tons/year) (2016-2017)
Roanoke River	148	10.6 tons/year

**Table 13. Total Suspended Solids (TSS) Discharged Annually Estimation**

Through its reissued MS4 Permit, effective July 1, 2013, the Town of Vinton has developed TMDL Action Plans for sediment and E. coli as of July 1, 2015. These Action Plans include the steps that the Town intends to take to meet its wasteload allocations. Therefore, a clear understanding of the TMDL studies that developed the wasteload allocations and the Town's current yearly pollutant discharges are critical to ensure that the Town develops effective Action Plans that meet the regulatory requirements and are cost-effective for its citizens.

The calculated E. Coli and Sediment discharges are based solely on land use and precipitation values. Impacts from existing BMPs are not reflected in these calculations. As the County's GIS system is improved to include the Town's BMP data, to better locate and quantify the beneficial effects of BMPs, such BMPs will be integrated into future water quality calculations.

As of October 1, 2015 reporting period, the Town's TMDL Action Plan for Sediment Reduction in the Roanoke River and the TMDL Action Plan for E. Coli Reduction in the Roanoke River, Tinker Creek, and Glade Creek were included as separate documents.