

City of Bristol, Virginia

Revised TMDL Action Plan for Benthic and Bacteria Impairments

Prepared in compliance with General Permit No. VAR040048

Department of Public Works, Engineering Division

300 Lee Street

Bristol, VA

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."



Name



Title



Date

City of Bristol, Virginia

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City of Bristol, Virginia

TMDL Action Plan for Benthic and Bacteria Impairments

1. Introduction

1.1 Purpose

This TMDL Action Plan documents how the City of Bristol, Virginia (City) intends to meet the “Special Condition for Approved TMDLs Other Than the Chesapeake Bay TMDL” in Section I, Part B of the General Permit for Discharges from Small Municipal Separate Storm Sewer Systems (MS4s), henceforth referred to as “the MS4 permit”. The City’s most recent MS4 permit (VAR040048) was issued by the Virginia Department of Environmental Quality (DEQ) effective July 1, 2013 and will expire June 30, 2018. The TMDL Action Plan was originally approved by DEQ on January 25, 2016. The action plan has subsequently been updated to address a revised TMDL for the Beaver Creek watershed and observations noted by DEQ in a letter dated March 7, 2018.

The MS4 permit requires the development and implementation of action plans for impaired streams where a Total Maximum Daily Load (TMDL) assigns a waste load allocation (WLA) to the City that has been approved by the State Water Control Board. A TMDL establishes the maximum amount of a pollutant that can enter a water body without violating water quality standards.

The City is subject to two TMDLs for Aquatic Life Use (benthic) and *E. coli* (bacteria) impairments to Beaver Creek. Both TMDLs were originally addressed in a single publication entitled *TMDL Development for the Beaver Creek Watershed*. The publication was approved by the State Water Control Board on December 2, 2004. In 2016, the TMDLs were reassessed and revised. A publication entitled *Bacteria and Benthic Total Maximum Daily Load (TMDL) Revision for Beaver Creek Located in Bristol City and Washington County, Virginia* (henceforth referred to as TMDL document) was approved by the State Water Control Board on December 12, 2016. This TMDL document assigns revised WLAs to the City for sediment and *E. coli*. However, it is important to note that the TMDL document does not impose a reduction requirement on the City for either pollutant.

A TMDL was also developed for Little Creek for bacteria impairments, but a WLA was not assigned to the City. Therefore, the Little Creek TMDL is not addressed in this TMDL Action Plan.

1.2 Permit Compliance Crosswalk

Table 1-A provides an overview of the organization of this plan and how each section addresses the City’s MS4 permit and the draft guidance provided by DEQ dated April 2015.

Table 1-A - Action Plan and Permit Compliance Crosswalk

Action Plan	Action Plan Element	DEQ Action Plan Guidance	MS4 Permit
Section 1	Introduction	1. The name(s) of the final TMDL report(s)	Section I.B
		2. The pollutant(s) causing the impairment(s)	Section I.B.2.a
Section 2	TMDL	3. The WLA(s) assigned to the MS4	Section I.B.2.b
Section 3	Evaluation of Significant Sources of Sediment and Bacteria	4. Significant sources of Pollutants of Concern (POC) from facilities of concern owned or operated by the MS4 operator that are not covered under a separate Virginia Pollutant Discharge Elimination System (VPDES) permit. A significant source of pollutant(s) from a facility of concern means a discharge where the expected pollutant loading is greater than the average pollutant loading for the land use identified in the TMDL;	Section I.B.2.d
Section 4	Existing and Planned Management Controls	5. Existing or new management practices, control techniques, and system design and engineering methods that have been or will be implemented as part of the MS4 Program Plan that are applicable to reducing the pollutant identified in the WLA;	Section I.B.2.b
Section 5	Legal Authorities	6. Legal authorities such as ordinances, state and other permits, orders, specific contract language, and inter-jurisdictional agreements applicable to reducing the POCs identified in each respective TMDL;	Section I.B.2.a
Section 6	Enhanced Education, Outreach, and Training	7. Enhancements to public education, outreach, and employee training programs to also promote methods to eliminate and reduce discharges of the POC(s) for which a WLA has been assigned;	Section I.B.2.c
Section 7	Schedule and Milestones	8. A schedule of interim milestones and implementation of the items in 5, 6, and 7;	Section I.B.2.e
Section 8	Assessment of Effectiveness	9. Methods to assess TMDL Action Plans for their effectiveness in reducing the pollutants identified in the WLAs; and	Section I.B.2.e
		10. Measurable goals and the metrics that the permittee and Department will use to track those goals (and the milestones required by the permit). Evaluation metrics other than monitoring may be used to determine compliance with the TMDL(s).	Section I.B.2.e

2. TMDL

The TMDL equals the sum of the point source waste load allocation (WLA), the nonpoint source load allocation (LA), and margin of safety (MOS). The City of Bristol MS4 is considered a point source and is therefore assigned a WLA for sediment and bacteria. The difference between the existing total load from the City's MS4 and the allocated WLA is the target reduction for which the City is responsible.

The Beaver Creek watershed has an area of 22,598 acres, with ~1% contributed from Tennessee¹. The watershed area within the City is approximately 5,538 acres.

The impaired segments of Beaver Creek total 14.7 miles in length and extend from the Route 611 Bridge, near the headwaters (in Washington County), to the Virginia/Tennessee state line (within the City of Bristol). This includes approximately 8.23 miles of impaired segment located within the City.

The watershed area and impaired segments that are addressed by the TMDLs are shown in Map 2-A. The details of each WLA are provided in the remainder of this section. For MS4/VSMMP permits, the permittee may address the TMDL WLAs for stormwater through iterative implementation of programmatic BMPs. Each City of Bristol MS4 load was aggregated with a portion of the adjacent VDOT MS4 load due to continuity of the system.

2.1 WLA for Beaver Creek – Benthic Impairment

The TMDL document indicates that the benthic impairment is caused by sediment. The TMDL document states that the total existing sediment loading in Beaver Creek is calculated at 2,592.64 tons per year (t/yr). The TMDL for Beaver Creek is set to 2,551.90 t/yr (1 of 3 scenarios), which equals a 1.57% reduction. However, both the existing sediment load and the WLA for the City of Bristol MS4 are 159.97 t/yr. This results in a 0% reduction from existing conditions to achieve the TMDL. The total sediment loading allocations for Beaver Creek are summarized in Table 2-A while the City's WLA and target reduction are summarized in Table 2-B.

¹ As noted in the TMDL document, a portion of the Beaver Creek watershed within Tennessee is used for modeling and estimating loads. Regulatory application is limited to Virginia. DEQ determined that the TMDL can be attained without reductions from the Tennessee portion of the watershed.

Map 2-A – Beaver Creek Impairment and Watershed Delineation

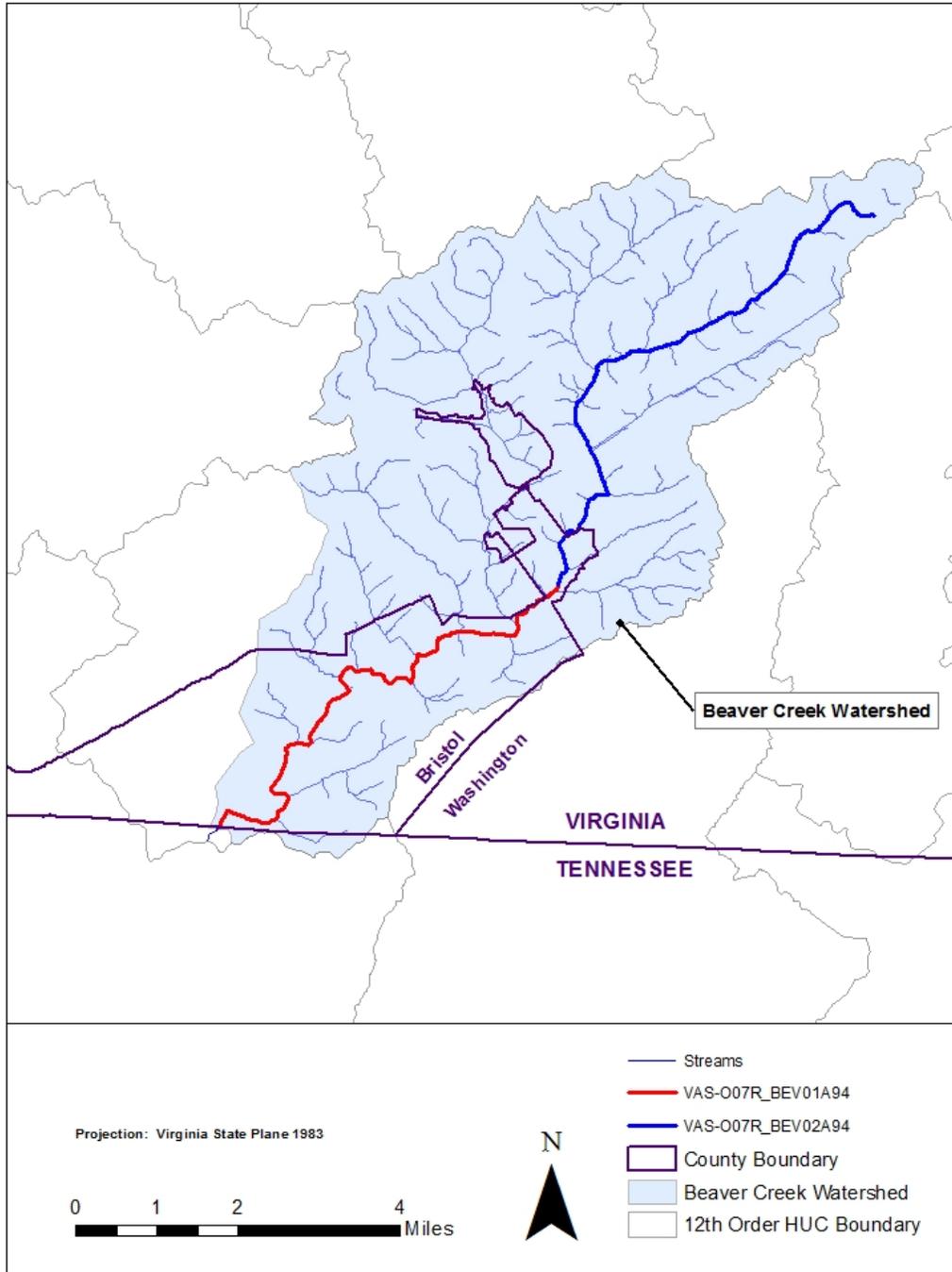


Table 2-A – Beaver Creek WLA for the City of Bristol MS4 (Sediment)

Sediment Source	Existing (t/yr)	TMDL WLA (t/yr)	Scenario 1 Reduction %
City of Bristol, VA MS4	159.97	159.97 ²	0%

2.2 WLA for Beaver Creek – Bacteria Impairment³

The TMDL sets both the existing *E. coli* load and the WLA for the City of Bristol MS4 at 1.30E+12 cfu/year. This results in a 0% reduction from existing conditions to achieve the TMDL. This information is summarized in Table 2-C.

Table 2-B – Beaver Creek WLA for the City of Bristol MS4 (*E. coli*)

Total Annual Loading for Existing Conditions for Bristol MS4 (cfu/yr) ⁴	Total Annual Load Allocation (cfu/yr) Assigned to Bristol MS4 Permit No. VAR040048	MOS	% Reduction
1.30E+12	--	Implicit	0%

3. Evaluation of Significant Sources of Sediment and Bacteria

Although the City has a 0% reduction assigned in the December 2016 TMDL document, this revised TMDL Action Plan identifies actions to be taken by the City to address potentially significant sources of sediment or bacteria to Beaver Creek. The first step in development of the action plan was to identify the Bristol MS4 service area that is subject to the Beaver Creek TMDL and to evaluate whether City facilities and activities subject to the TMDL are considered significant sources of sediment or bacteria.

3.1 MS4 Service Area Delineation Methodology

The Bristol MS4 service area is the area that drains to an outfall owned and/or operated by the City. Storm sewer system maps were used in conjunction with hydrologic features, local topographic data, and high-resolution aerial photos to delineate the City’s MS4 and to create an MS4 polygon layer. Drainage features were reviewed by engineers and planners using a GIS environment to account for storm sewer drainage areas and determine break points between the manmade and natural hydrologic systems. Excluded areas

² Beginning 2007, USEPA mandated that TMDL documents include a maximum daily load (MDL) as well as the annual limit as shown. The City of Bristol MS4 was assigned a WLA of 0.438 tons per day (t/day), but the reduction goal of 0% remains unchanged.

³ Virginia adopted an *E. coli* and *enterococci* standard in 2003, and updated in 2009. Refer to Section 9 VC25-260-170 or the TMDL document for detailed information with respect to state standards.

⁴ MDL for City of Bristol MS4 is 3.56E+09, reduction requirement is 0%.

are those that sheet flow directly to natural channels of major drainage sheds such as streams or creeks without the benefit of an engineered system. The City’s storm sewer system and jurisdictional boundary is shown in relation to the Beaver Creek Watershed on Map 2.A.

In accordance with DEQ’s Chesapeake Bay TMDL Special Guidance, the City may exclude from its MS4 service area land regulated under any general VPDES permit that addresses industrial stormwater and forested land of one half contiguous acre or more that meets specific criteria. The City identified 14 VPDES permitted facilities within its boundary. These facilities, listed in Table 3-A, are excluded from the City’s MS4 area⁵.

Table 3-A – VPDES Permit Holders Within Bristol

Permit Holder	VPDES Permit	Address
Universal Fibers Inc	VAR050028	14401 Industrial Park Rd.
Bristol Integrated Solid Waste Management Facility	VAR050053	2125 Shakesville Rd.
Strongwell Corporation-Bristol Div	VAR050034	400 Commonwealth Ave.
Bristol Compressors, Inc	VAR050043	15185 Industrial Park Rd.
Snack Alliance Inc	VAR050047	225 Commonwealth Ave. Ext.
Federal Pacific Transformer Co	VAR050080	601 Old Airport Rd.
Line Power Manufacturing Corp	VAR050081	329 Williams St.
Associated Asphalt Bristol LLC	VAR050082	10 Spurgeon Ln
Hirschfeld Industries Bridge LLC-Bristol	VAR050084	15083 Industrial Park Rd.
United Parcel Service	VAR050104	873 Bonham Rd.
Sandvik Mining and Construction USA	VAR050468	15020 Industrial Park Rd.
AZZ Galvanizing-Bristol	VAR051522	14781 Industrial Park Rd.
Wise Recycling-Bristol	VAR51907	8 Coronet Dr.
Reclaimed Resources Inc	VAR052241	191 Williams St.
JD Watson and Assoc Inc	VAR052289	14400 Industrial Park Rd.

⁵ This information includes current permit holders, which may or may not be listed as point sources in the TMDL document.

3.2 Evaluation of City-Owned Facilities Subject to the Beaver Creek TMDL

An evaluation of City-owned facilities within the regulated MS4 service area was completed by Wood Environment and Infrastructure Solutions, Inc. (dba AMEC Earth & Environmental, Inc. in 2010) to determine whether any facility should be considered a significant source of sediment or bacteria to Beaver Creek. The MS4 permit defines a significant source as a facility that has a “discharge where the expected pollutant loading is greater than the average pollutant loading for the land use identified in the TMDL.” The evaluation consisted of a desktop survey of City-owned facilities within the Beaver Creek watershed. Aerial imagery for each facility was observed for indications of conditions or activities that could constitute a significant source of sediment or bacteria⁶. Additionally, field checks have occurred to verify active construction areas and large sections of disturbed soil are carried out with the proper erosion and sedimentation control techniques in place, and how sanitary waste disposal was handled at each facility. Facilities evaluated are listed in Table 3-B and include several parks and the Clear Creek Golf Course.

Table 3-B – Bristol Facilities Subject to the Beaver Creek TMDL Where Site Visits Were Performed

Type	Address	Description
Park	21361 Sugar Hollow Dr.	Parks and Recreation Office
Park	3600 Lee Hwy	Sugar Hollow Park
Park	E. Valley Dr.	Jim Slagle Park/Eastern LL
Park	211 Lee St.	Veterans Memorial Park
Park	Spencer St.	Fred Hayes Park
Park	Avondale Ln	Springdale Park
Park	Cumberland St. & Lee St.	Veterans Memorial Park
Park	429 Moore St.	Moore St. Park
Park	Washington St	Washington St. Park
Park	MKL Jr. Blvd @ Douglas Center	Breedlove Charles Park
Park	Columbia Ave. & Mumpower Dr.	Mumpower Park
Park	Rhode Island Ave & Hillside Ave	Highlandview Park
Park	Portsmouth Ave.	Portsmouth Park
Park	Suncrest Dr.	Suncrest Park
Park	Piedmont & Scott St.	Un-named
Vacant	On Stage Coach Rd. north of intersection with Hassan Heights Rd.	Vacant
Golf Course	732 Harleywood Rd.	Clear Creek Golf Course

⁶ Facilities considered to have a low potential for discharge had to meet all three of the following criteria: 1) developed and stable (offices, courts, schools, etc.); 2) served by sanitary sewer; and 3) does not routinely have construction activities, open ground or other exposed, erodible materials.

Sediment

Several potential sources of sediment were considered in the evaluation. These include land disturbance from construction activities and large areas of exposed soil. In addition, while sediment loads from bank erosion occur outside of the regulated MS4, the TMDL establishes a link between increased stormwater flow from impervious surface areas and accelerated stream bank erosion. No large, un-managed areas of exposed soil were identified on City property. Any exposed soil identified by the City is addressed at the time of discovery and stabilized appropriately. The City addresses land disturbance from construction activities at its facilities through enforcement of its Erosion and Sediment Control Ordinance (Code of Bristol, Virginia, Chapter 50, Land Use, Article IV, Stormwater Management and Erosion and Sediment Control). Stormwater flow at City facilities is addressed through the City's adherence to the requirements of the Virginia Stormwater Management Act and attendant regulations as described in Section 4.

The following additional efforts have been completed to address sediment at Clear Creek Golf Course:

- Program to address streambanks even though they are outside the City's MS4 (coir logs installed around the lake).
- Restored existing wetland area at Clear Creek Golf Course.
- "No Mow" buffer strips along streams.
- Pervious pavement at Sugar Hollow Park.
- Rain gardens at Sugar Hollow Park.

Based on this evaluation, the City determined that no City-owned facility within the MS4 service area is currently a significant source of sediment to Beaver Creek.

Bacteria

Section 3 of the TMDL document indicates the City of Bristol MS4 has a contribution of bacteria from land-based sources (wildlife, pet waste, and human). The majority of City facilities within the MS4 service area are green spaces, which have the capacity to infiltrate stormwater runoff. These properties are typically open spaces where both wildlife and pet wastes can contribute bacteria, but that also have the capacity to sheet flow and infiltrate stormwater runoff, rather than directly introduce pollutants to nearby streams.

To reduce the potential for pet waste or human sources of bacteria to the MS4 and local streams, the City engages in the following:

- Restroom facilities with sewer access or portable toilet units that are regularly serviced (weekly) are provided at larger City-owned properties for public use (i.e., Clear Creek Golf Course, parks, etc.).
- The septic tank at Sugar Hollow Park near the recreation vehicle pump-out connection is regularly pumped once per year, which is sufficient for its use, and is routinely checked for failure.

- Clear Creek Golf Course utilizes compost material, which has been processed in a manner that eliminates the presence of pathogens⁷. Additionally, appropriate erosion prevention and sediment control practices are used when the compost/soil mixture is used at the golf course.
- Pet waste stations and signage are provided in several parks. See Section 4 for details.

Based on this evaluation, the City determined that no City-owned facility within the MS4 service area is a significant source of bacteria to Beaver Creek.

4. Existing and Planned Management Controls

This section describes the City’s continued commitment to address sediment and bacteria pollution even through the revised TMDL document does not require a reduction from existing conditions to meet the City’s WLA. Since numeric reduction targets have been reduced to 0%, load reduction calculations and estimates are for informational, and not regulatory compliance, purposes.

As provided for in the MS4 permit and TMDLs, the actions in this plan will be implemented in an iterative manner over multiple permit cycles. The City’s actions for addressing sediment and bacteria will continue to be carried out through a combination of the City’s MS4 Program Plan (Section 4.1), City-initiated projects (Section 4.2), and street sweeping (Section 4.3). Section 5 addresses legal authorities applicable to reducing sediment loads, including erosion and sediment control and post-development stormwater management. Section 6 addresses enhancements to public education, outreach, and employee training.

4.1 MS4 Program Plan

Bristol has adopted an MS4 Program Plan that documents implementation of all MS4 permit requirements, including the programmatic and legal authority required to meet the “Special Condition for TMDLs Other Than the Chesapeake Bay TMDL” permit requirement. Relevant portions of the City’s MS4 Program Plan are summarized in this document. The full MS4 Program Plan can be found at http://www.bristolva.org/DocumentCenter/View/967/MS4ProgramPlan_WAppendices_revDec2016.

Table 4-A provides a summary of elements of the six minimum control measures (MCMs) implemented by the City under the MS4 permit that relate to meeting the TMDL.

Table 4-A - MS4 Program Plan Components Related to Addressing the Benthic and Bacteria TMDLs

Minimum Control Measure	MS4 Program Plan Elements Related to Controlling Total Suspended Solids and Bacteria
Public Education and Outreach on Stormwater Impacts.	The City’s MS4 Public Education and Outreach Plan identifies bacteria (from pet waste) and sediment (from land-disturbing activities) as two high-priority pollutants for the focus of the City’s public education program.

⁷The compost is processed for an appropriate length of time at a temperature above 145°F, and is monitored continuously for moisture content, temperature, and oxygen.

Minimum Control Measure	MS4 Program Plan Elements Related to Controlling Total Suspended Solids and Bacteria
Illicit Discharge Detection and Elimination	The City has integrated into its MS4 Program Plan an Illicit Discharge Detection and Elimination (IDDE) Program. This program includes preventing, identifying, and eliminating sources of bacteria and sediment.
Construction Site Stormwater Runoff Control	Legal authority for the City’s program is contained in <i>Chapter 50 Land Use, Article IV, Stormwater Management and Erosion and Sediment Control</i> . The City was approved as a Virginia Stormwater Management Program July 1, 2014.
Post-Construction Stormwater Management	The City’s post-construction stormwater management program is designed to meet all applicable local, state and federal requirements to minimize the long-term water quality impacts associated with development and redevelopment. The City of Bristol Supplemental Requirements to the Virginia Stormwater Management Handbook and Virginia Erosion and Sediment Control Handbook, <i>Chapter 50, Article IV</i> , and the Fee Schedule consistent with the obligations and requirement set forth in the Virginia Stormwater Management Regulations (9VAC25-870 et seq). The City was approved as a VSMP authority by DEQ on July 1, 2014.
Pollution Prevention and Good Housekeeping for Municipal Operations	The City maintains an active street sweeping program and training program for personnel on illicit discharges, good housekeeping and pollution prevention. These activities are intended to eliminate the discharge of sediment and other pollutants from City facilities, as well as guide staff who may observe discharges or potential discharges to the MS4 while working in the field.

4.2 City-Initiated Projects

Urban Stream Restoration Projects (Benthic Impairment)

This section summarizes urban stream restoration projects intended to reduce sediment loads. Three projects were implemented in 2012 in the Beaver Creek watershed. The projects were located in Sugar Hollow Park and Pal’s Restaurant within the City of Bristol in a portion of Beaver Creek subject to the benthic TMDL.

Urban stream restoration projects installed on or after January 1, 2006 may use the interim approved sediment removal rates developed by the Chesapeake Bay Program to calculate credits for use in TMDL implementation for the Chesapeake Bay area. DEQ recommends that permittees use the interim approved removal rates to calculate reductions for stream restoration projects. The approved removal rates are shown in Table 4-B.

Table 4-B - Urban Stream Restoration Removal Rates

BMPs	How Credited	Total Suspended Solids (lb/ft/yr)
Stream Restoration	Mass reduction/length (lbs/linear ft/yr)	44.88

The sediment delivery ration of 44.88 lbs/ft/yr is intended to address the Chesapeake Bay. Guidance memo GM16-2006 allows use of a credit for local TMDLs. Information on sediment delivery ratios can be found in a paper titled: *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Projects* (Chesapeake Stormwater Network and Center for Watershed Protection, 2014). Using Table 3 and Section 2.5, the credit allowed for the local TMDL is determined to be 247.96 lb/ft/yr.

The urban stream restoration project located at the Pal’s Restaurant restored 160 linear feet of stream channel in Beaver Creek. The projects in Sugar Hollow Park restored 690 linear feet of stream channel in Beaver Creek and 520 feet of stream channel in an unnamed tributary to Beaver Creek. Both projects involved restoring the pool riffle sequence by installing rock cross vanes and J-Hooks within the stream channel. The channel banks were restored with native trees and grasses by means of live staking and brush mattresses. Table 4-C shows the calculated Total Suspend Solids (TSS) removed in pounds per year (lbs/year) for each project. The total estimated annual TSS removed as a result of these projects is 339,702 lbs/year.

Table 4-C - Urban Stream Restoration Projects

Date Installed	BMP Name	Type	Contributing Drainage Area (acres)	Stream Length Restored (ft)	TSS Removed (lbs/yr)	Local TMDL TSS Removed (lbs/yr)
3/23/12	Beaver Creek (Pal's Reach)	Stream Restoration	17,559	160	7,181	39,673.22
5/20/12	Beaver Creek (Sugar Hollow Park Reach)	Stream Restoration	8,871	690	30,967	171,091
5/20/12	Unnamed Tributary to Beaver Creek	Stream Restoration	1,205	520	23,338	128,938
Total				1,370	61,486	339,702

Structural Stormwater Projects (Benthic Impairment)

The January 25, 2016 version of this TMDL Action Plan identified several stormwater retrofit projects that were either under construction or were to be completed prior to the end of the current MS4 permit cycle. The projects were intended to help the City reach the numeric pollutant reduction targets assigned in the 2004 TMDL document. Some of these projects were not constructed. Although no longer needed to meet

the reduction targets, DEQ notified the City that the discrepancy could result in an enforcement action since the TMDL Action Plan is considered an enforceable part of the MS4 permit. Based on discussions with DEQ it was determined that this TMDL Action Plan needed to be updated and approved by DEQ to reflect the revised target reduction for the City’s MS4 of 0%. The rectification between the 2016 TMDL document and the City’s TMDL Action Plan is accomplished in this June 2018 revision.

The City recognizes it has unique opportunities to implement projects that may reduce sediment loads from its MS4 to Beaver Creek. Going forward, should the City engage in retrofits, it will provide project descriptions and any information about reductions to DEQ in its MS4 annual reports.

Pet Waste Receptacles and Education (Bacteria Impairment)

The City currently implements a pet waste education and outreach program in a number of City parks, including the provision of pet waste stations the posting of signage, and the distribution of flyers at local events about the importance of proper disposal of pet waste. These activities are included in the City’s MS4 Program Plan as an effective strategy for reducing pet waste as a source of bacteria pollution in stormwater runoff. Efforts to educate the community about proper disposal of pet wastes are described further in Section 6. Parks and the number of pet waste stations located in each is provided in Table 4-E. The City will continue to assess whether additional pet waste stations are needed to address an identified problem or underserved areas.

Table 4-D – Pet Waste Stations

Park	Number of Pet Waste Stations
Bell Meadows Park	1
Moore St. Park	1
Sugar Hollow Park	11
Veterans War Memorial Park	5

The City will define a process for determining problems and when to deploy additional stations or alternative strategies, and report progress in its MS4 annual report.

4.3 Street and Parking Lot Sweeping Expansion (Benthic Impairment)

The City implements a street sweeping program of City-owned properties. The DEQ *Chesapeake Bay TMDL Special Condition Guidance* identifies street sweeping programs as a control measure for the reduction of sediment loads. Although the City is not subject to the DEQ Chesapeake Bay TMDL Special Condition, it sweeps streets and parking lots on a regular schedule identified in the MS4 Program Plan. The City tracks the amount of solids collected from street sweeping on an annual basis as shown in Table 4-F. A fraction of the solids collected can be credited to TSS removal per DEQ Guidance Memo No. 15-2005. The annual solids collected are multiplied by a factor to convert to dry weight and account for the TSS fraction as shown in Table 4-F. Table 4-F shows that street sweeping removes an average of 46.737 tons/year of TSS.

Table 4-E – Urban Street Sweeping

Fiscal Year	Street Sweeping Solids Collected (tons)	Dry Solids Collected (tons/yr)¹	TSS Collected (tons/yr)²
FY 2007	171.08	119.76	35.93
FY 2008	237.58	166.31	49.89
FY 2009	193.26	135.28	40.58
FY 2010	150.86	105.60	31.68
FY 2011	252.15	176.51	52.95
FY 2012	169.13	118.39	35.52
FY 2013	254.44	178.11	53.43
FY 2014	144.5	101.15	30.35
FY 2015	177.59	124.31	37.29
FY 2016	257.00	179.90	53.97
FY 2017	218.00	152.60	45.78
Average (tons/year)	222.559	155.792	46.737
¹ Weight of solids collected multiplied by 0.7 to determine dry weight			
² Weight of dry solids multiplied by 0.3 to determine TSS removed			

The City will continue to provide information on the amount of sediment removed as a result of street sweeping and not discharged to Beaver Creek in its MS4 annual reports to DEQ.

5. Legal Authorities

The MS4 permit requires the City to identify ordinances and legal authorities, BMPs policies, plans procedures, and contracts that are applicable to the TMDL. The table below provides a summary of these items as they relate to sediment and bacteria.

After review of the City’s existing MS4 Program Plan and legal authorities, no additional legal authorities are required for compliance with the “Special Condition for TMDLs Other Than the Chesapeake Bay TMDL.”

Title	Applicability
<i>Chapter 50 Land Use, Article IV, Stormwater Management and Erosion and Sediment Control</i>	The Stormwater Management Ordinance, modified in 2014, established the City’s authority to implement and enforce a comprehensive stormwater management program. Components include: (a) Illicit Discharge Detection and Elimination; (b) Construction Site Stormwater Runoff Control, (c) Post-Construction Stormwater Management; and (d) Stormwater Management System Maintenance. Specific to sediment control:

Title	Applicability
	<p>Sec. 50-439 (a) (1) requires persons engaged in land disturbing activities which result in disturbances that exceed 10,000 square feet to obtain a land disturbing permit prior to commencement of such activities.</p> <p>Sec. 50-439 (a) (2) the land disturbing permit application shall include an erosion and sediment control plan and comply with the standards.</p> <p>Sec. 50-439 (a) (3) requires all regulated development and redevelopment within the City to develop a stormwater management plan.</p>
<i>Chapter 90 Utilities, Article IV, Stormwater System</i>	<p>Sec. 90-231 requires the notification of known or suspected release of materials that may result in illicit discharges or pollutants discharging into stormwater or the MS4.</p> <p>Sec. 90-241 prohibits illicit discharges into the storm sewer system.</p> <p>Sec. 90-242 prohibits illicit connections and requires abatement for such connections.</p> <p>Sec. 90-243 requires the elimination of illicit discharges and connections.</p>
Stormwater Pollution Prevention Plan	<p>The Bristol Integrated Solid Waste Management Facility and Transit Facility maintains a SWPPP in accordance with its VPDES industrial permit. The SWPPP contains BMPs for stormwater pollution prevention training, including identifying and eliminated illicit discharges, and erosion and sediment control.</p>

6. Enhanced Education, Outreach, and Training

As noted in Section 3.4, the City adopted and integrated a Public Education and Outreach Plan into its MS4 Program Plan. The plan includes specific education, outreach, and training on subjects related to the reduction of sediment and bacteria in stormwater runoff. Of particular note is the IDDE, VESCP, and VSMP programs and related training that specifically includes potential sources of sediment and bacteria. These programs leverage annual training efforts that underpin the City’s ability to proactively address pollutant sources. The City will continue to assess whether additional enhancement of education, outreach and training would be beneficial to reducing sediment loads within the Beaver Creek watershed.

7. Schedule and Milestones

This Beaver Creek TMDL Action Plan will be implemented in accordance with the following schedule and milestones.

Table 7-A - Schedule and Milestones

Implementation Item	Description	Schedule and Milestones
MS4 Program Plan	<p>The MS4 Program Plan will be updated to reflect the revised Beaver Creek Action Plan.</p> <p>The City will continue to implement the MS4 Program Plan, including elements related to sediment and bacteria, in accordance with the schedule provided for in the MS4 Program Plan.</p>	The MS4 Program Plan update submitted to DEQ with annual report.
City-Initiated Stream Projects – Sediment WLA	The City implemented three in-stream projects on City properties within the Beaver Creek watershed.	Three projects were implemented in 2012.
Planned Structural Projects – Sediment WLA	Projects designed to reduce volume through infiltration or other strategies.	Projects will be assessed and constructed on an as-needed basis.
Pet Waste Receptacles and Education-Bacteria WLA	Signage/pet waste stations provided in parks.	Seventeen stations installed since 2007. The City will monitor the need for additional signage/pet waste stations and report any new facilities in the MS4 annual reports.
Estimate TSS Removed by Street Sweeping	The City will continue to remove sediment through its street sweeping program.	Report removal amounts in the MS4 annual report.

8. Assessment of Effectiveness

The effectiveness of this TMDL Action Plan is assessed in terms of progress toward meeting the reduction targets established for the City’s MS4 in the TMDL document. Since the reduction target is 0%, all actions in this TMDL Action Plan exceed effectiveness targets.

For the purposes of this plan, the measure of assessing the effectiveness of programmatic BMPs will include specific documentation related to those efforts (sign-in sheets for training, results of IDDE dry weather

outfall monitoring, etc.). The measure of assessing the effectiveness of stream projects, structural stormwater projects, and street sweeping above and beyond regulatory requirements is the reduction in pounds of sediment per year. All measures will be summarized in the annual reports to DEQ.

Table 8-A summarizes the existing sediment load, the City's assigned sediment WLA, and anticipated load reductions as a result of strategies outlined in this TMDL Action Plan. With new criteria expressed as 0% reduction in the revised TMDL document, the City removed percent reduction estimates and instead has focused on pounds or tons removed, where applicable, through its TMDL actions.

Table 8-A – Sediment Reduction - Summary

TMDL	TSS (t/year)
Existing Bristol MS4 Sediment Load	159.97
Bristol MS4 WLA allocation	159.97
Reductions	TSS (lbs/year)
TSS Removed from Stream Restoration	339,702
TSS Removed from Structural Stormwater Projects, if applicable	TBD
TSS Removed from Street Sweeping	46.737
Total Sediment Reduction*	339,749
*Not tied to regulatory requirement	

The City’s effort to reduce bacteria is tied to meeting the goals and actions in the MS4 Program Plan. The City of Bristol recognizes its potential to influence bacterial conditions through various activities related to wildlife and human inputs. The City will continuously assess opportunities to reduce bacteria pollution from these sources and report on these efforts in annual reports to DEQ.

As noted previously, TMDL actions will be implemented over multiple permit cycles and comprise the City’s effort to reduce sediment and bacteria from the MS4 to Beaver Creek.

The City will report progress toward implementing TMDL actions and will report results or changes in its MS4 annual report. The TMDL Action Plan may be updated with strategies for the next permit cycle based on progress and effectiveness of strategies implemented to-date.