Blacks Run & Cooks Creek TMDL Action Plan

Permit Number: VAR040112

In compliance with the general Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4)

Revised April 2026

JMU Stormwater Management

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ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practice
DEQ	Department of Environmental Quality
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
FM	Facilities Management
HUC	Hydrologic Unit Code
IDDE	Illicit Discharge Detection and Elimination
JMU	James Madison University
MEP	Maximum Extent Practicable
MCM	Minimum Control Measure
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollution Discharge Elimination System
POC	Pollutants of Concern
SWCB	Soil & Water Conservation Board
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
WLA	Waste Load Allocation

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BACKGROUND

James Madison University occupies approximately 785 acres and is located within the border of the City of Harrisonburg, with property also located in Rockingham County. The University is situated within the Blacks Run watershed. This watershed drains to the North River where Cooks Creek and Blacks Run meet in Rockingham County, just south of the City of Harrisonburg. The North River flows to the South Fork of the Shenandoah River and ultimately discharges via the Potomac River to the Chesapeake Bay. The Blacks Run watershed is approximately 12,430 acres and includes the majority of the City of Harrisonburg and all of the University's campus located within the City's limits. Blacks Run is 11.64 miles in length and flows into Cooks Creek south of Harrisonburg. The Cooks Creek watershed is approximately 28,216 acres, including Blacks Run. Cooks Creek is located west of Harrisonburg and flows 14.37 miles before draining into the North River.

As a predominately urbanized state agency with separate storm and sanitary sewer conveyance systems, the University is classified as a Small Municipal Separate Storm Sewer System (MS4). Therefore, JMU is mandated to follow the regulations of the Environmental Protection Agency (EPA) as outlined in the Clean Water Act, the Virginia Stormwater Act, and the MS4 General Permit granted by the Department of Environmental Quality (DEQ). In compliance with Part II.B of the November 1, 2023 General Permit for Discharges of Stormwater from Small MS4s (Permit No.: VAR040112) James Madison University has developed a Blacks Run & Cooks Creek Total Maximum Daily Load (TMDL) Action Plan.

The TMDL for the Blacks Run & Cooks Creek watershed sets limits on the amount of pollutants of concern (POCs), including total suspended solids (TSS) and phosphorus, that can be discharged to the river without detrimentally impacting water quality. The MS4 Permit Special Condition for local TMDLs requires all MS4 operators to reduce existing levels of these POCs to a level that will be protective of water quality. This

process typically requires that the MS4 operator install best management practices (BMPs) that will, through various means, lower the contaminant levels in stormwater discharged to local streams and other water bodies.

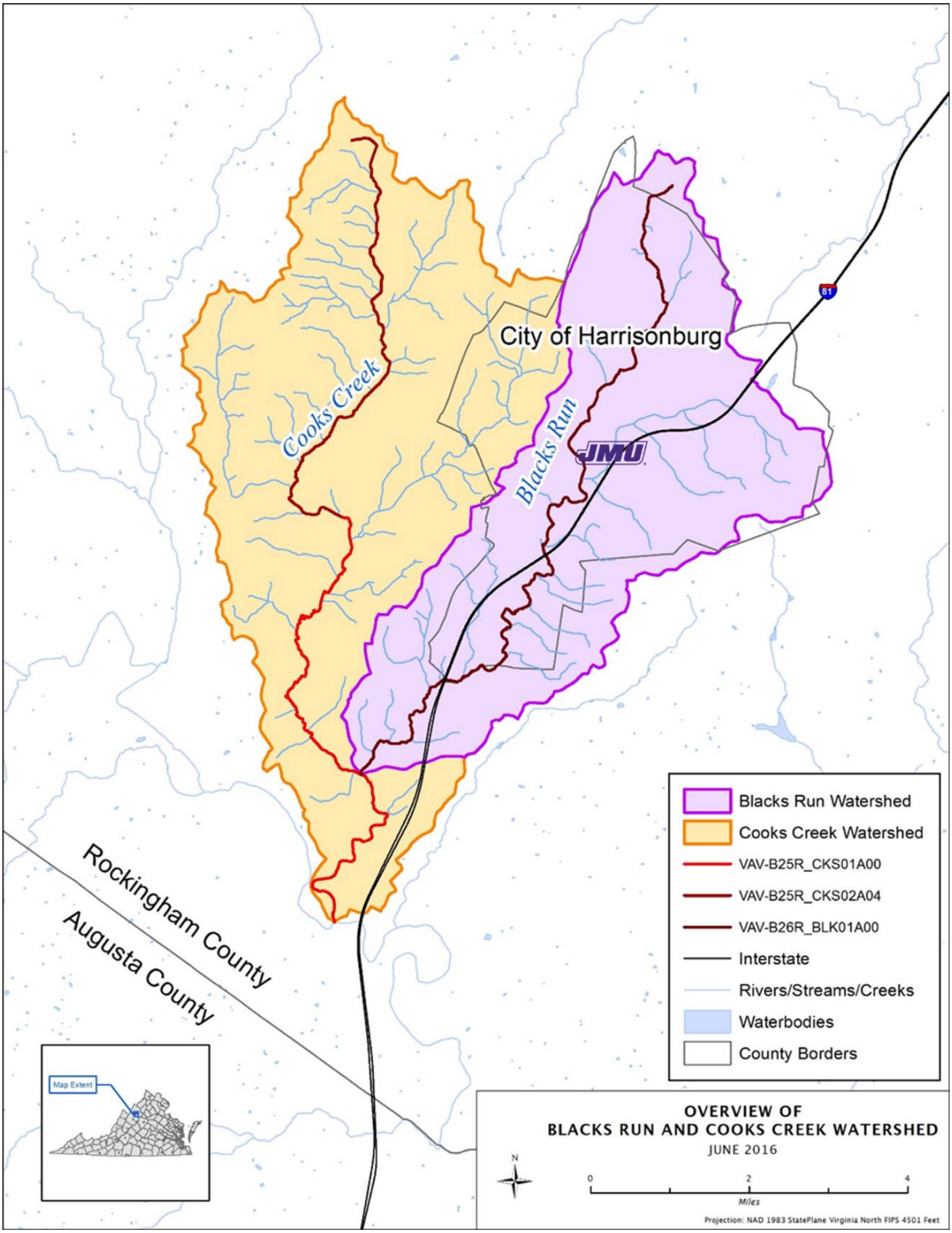

FIGURE 1. LOCATION OF BLACKS RUN AND COOKS CREEK WATERSHEDS AND ASSOCIATED STREAM IMPAIRMENTS

1. TMDL Project Names and EPA Approval Dates

Wasteload allocations (WLAs) were assigned to the University for the Blacks Run/Cooks Creek Watershed in the approved Final TMDL report as follows:

Project Name:
Revision of the Benthic Total Maximum Daily Load (TMDL) Developed for the Blacks Run and Cooks Creek Watershed Located in the City of Harrisonburg and Rockingham County.
EPA Approval:
July 10, 2019

TMDL Watershed	305(b) Segment ID	Cause Group Code 303(d) Impairment ID	Year First Listed
Blacks Run	VAV-B26R_BLK01A00 (11.6 mi)	B26R-01-BEN	1996
Cooks Creek	VAV-B25R_CKS01A00 (7.74 mi) VAV-B25RCKS02A04 (6.63 mi)	B25R-01-BEN	1996

FIGURE 2. IMPAIRED STREAM SEGMENTS ADDRESSED IN THE ABOVE REFERENCED TMDL STUDY

The TMDL was prepared by James Madison University and EEE Consulting, Inc. and prepared for the Virginia Department of Environmental Quality (DEQ) on January 31, 2019. The Soil and Water Conservation Board (SWCB) approved the TMDL on June 27, 2019 and the Environmental Protection Agency (EPA) approved the TMDL on July 10, 2019.

A previous TMDL report contained sediment and phosphorus TMDLs for the Blacks Run and Cooks Creek watersheds. The report as referenced above and as submitted on July 1, 2019, will supersede the previous 2002 sediment and phosphorus TMDLs, which were approved by EPA on June 5, 2002.

2. Waste Load Allocations (WLAs) Assigned to the Permittee

Loading sources, including municipalities and regulated entities, within the watershed have been provided with Waste Load Allocations (WLA) for both Total Suspended Solids (TSS) or Sediment and Phosphorus (P) in the approved TMDL referenced above. The numbers below were calculated and recorded at the time the TMDL revision was being produced taking into account BMPs installed for sediment (TSS) reduction post-2009 and for phosphorus (TP) reduction post-2016 and prior to approval of the TMDL revision.

Blacks Run Watershed			
Pollutant	Wasteload Allocation (lbs/yr)	Reduction Amount Required (lbs/yr)	Reduction %
Sediment	64,600	153,400	70.4
	Pre-Allocation Load with BMPs	Reductions Achieved Post-2009	Remaining %
	218,000	172,015.61	0
Cooks Creek and Blacks Run Watersheds			
Pollutant	Wasteload Allocation (lbs/yr)	Reduction Amount Required (lbs/yr)	Reduction %
Phosphorus	28	78	73.2
	Pre-Allocation Load with BMPs	Reductions Achieved Post-2016	Remaining %
	106	0	73.2

FIGURE 3. WASTELOAD ALLOCATIONS AND PERCENT REDUCTIONS ASSIGNED TO JMU

Fortunately, implementing measures going well above the required reductions for the Chesapeake Bay TMDL has allowed for no additional WLA reductions for the University concerning sediment (TSS) as seen in Figure 3. For phosphorus (TP), the Chesapeake Bay TMDL required a reduction of 78.90 lbs/yr. JMU implemented measures to reduce 342.79 lbs/yr. These phosphorus reductions for the Chesapeake Bay TMDL were considered part of the existing conditions when the load allocations were calculated in the revised Blacks Run and Cooks Creek TMDL.

As seen in Figure 2, the Blacks Run and Cooks Creek TMDL has determined an additional 73.2% reduction of the calculated 106 lb/yr load of TP, requiring further measures to reduce the phosphorus load by approximately 78 lbs/yr. This Action Plan has been developed to meet the reduction goals still needed for phosphorus.

3. Significant Sources of Pollutants of Concern (POCs)

This section identifies significant sources of pollutants of concern (POCs) to the JMU MS4 that are not covered under a separate VPDES permit. The MS4 permit states: "a significant source of pollutants 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."

Virginia's 1998 303(d) list identifies urban runoff as the primary source of pollutants in the Blacks Run watershed. Cooks Creek was listed as impacted by agricultural nonpoint sources with the lower three miles also affected by urban runoff contributed by Blacks Run. Both watersheds were assessed by the 2002 TMDL as having a high potential for nonpoint source pollution based on land use, soils, and other watershed characteristics.

The surrounding City of Harrisonburg, James Madison University, and other urban areas contribute to the high percentage of urban land in the Blacks Run and Cooks Creek watersheds. Urban land uses represented in the 2002 TMDL land use coverage data include commercial, industrial, transportation, and residential areas. The primary sources of sediment and phosphorus are construction sites, impervious surfaces, and other pervious lands.

Construction sites have high erosion rates due to the removal of vegetation and topsoil. Typical erosion rates for construction sites are 35 to 45 tons per acre per year as compared to 1 to 10 tons per acre per year for cropland. The University is required to implement a construction and post-construction stormwater management program to regulate land disturbing activities on campus. While JMU has not been assigned a WLA for sediment due to meeting the reduction requirements prior to the writing of the revised TMDL by installing several stream restoration practices which went above and beyond TSS reductions, construction sites are a potential source of sediment.

Residential lawns and other green spaces contribute sediment in the same fashion as low-intensity pasture areas or other similar land uses. Fertilizer application on lawns can be a significant source of phosphorus and other pollutants. The University holds a current, unexpired Nutrient Management Plan (NMP) which it follows when applying any fertilizers on campus. JMU's NMP includes areas where no fertilizer applications are allowed due to proximity to a waterway or a stormwater management facility.

4. BEST MANAGEMENT PRACTICES DESIGNED TO REDUCE POCS

The University shall reduce the loads associated with sediment, phosphorus, or nitrogen through implementation of one or more of the following:

1. One or more of the post-construction BMPs from the latest version of the DEQ Virginia Stormwater Management Handbook.
2. One or more BMPs approved by the Chesapeake Bay Program and listed in the *Chesapeake Bay TMDL Special Condition DEQ Guidance Memo 20-2003* document. Pollutant load reductions generated by annual practices, such as street and storm drain cleaning, shall only be applied to the compliance year in which the annual practice was implemented.
3. Land disturbance thresholds lower than Virginia's regulatory requirements for erosion and sediment control and post development stormwater requirements.

JMU may meet the local TMDL requirements for sediment, phosphorus, or nitrogen through BMPs implemented or sediment, phosphorus, or nitrogen credits acquired. BMPs implemented and nutrient and sediment credits acquired to meet the requirements of the Chesapeake Bay TMDL in Part II A may also be utilized to meet local TMDL requirements as long as the BMPs are implemented or the credits are generated in the watershed for which local water quality is impaired and these BMPs were not accounted for existing conditions of the WLA for Blacks Run and Cooks Creek Watersheds.

The University has taken a proactive stance and made great efforts to reduce POCs within its watershed. In addition to the installation of new BMPs or annual practices, the University's MS4 Program Plan and Annual MS4 Reports include a wide array of best management practices (BMPs) that aim to reduce pollutants including sediment and phosphorus and correlate with the minimum control measures.

1. **Illicit Discharge Program (Sediment and Phosphorus)** – The University's program involves monitoring, detection, and elimination of illicit discharges. The University maintains a SPCC Plan and response plan for any oil type discharges, including other spills and illicit discharges. Additionally, the FM stormwater website provides an online reporting option for illicit discharges which are distributed to the stormwater team. Utility mapping is updated regularly, and illicit discharges are discouraged through public education. The University follows procedures for reporting and tracking illicit discharges and procedures for enforcing policies. An SOP has been written for illicit discharge detection and response and is applicable to anyone on campus.

2. **MS4 Outfall Inspections/Dry Weather Discharge Inspections (Sediment and Phosphorus)** – An inspection program for all stormwater outfalls utilizes written procedures to detect, investigate and report illicit discharges, and document the investigation. The procedures set forth in BMP 5 are followed if any suspicious discharges are noted.

3. **Erosion and Sediment Control Program (Sediment)** – JMU follows DEQ-approved Standards and Specifications (S&S) for E&SC in compliance with the Virginia Erosion and Stormwater Management Regulation. E&SC Plans are required for all land disturbances over 10,000 square feet (sf) on campus. Plan approval is required prior to commencement of any regulated land disturbing activity. JMU also requires E&SC controls to be installed on all land disturbing projects, even if a formal E&SC plan is not required.

4. **Construction General Permit Compliance (Sediment and Phosphorus)** - Land disturbances over 1 acre require a construction site Virginia Stormwater Management Program (VSMP) permit

issued by DEQ, which requires the project to develop a Stormwater Pollution Prevention Plan (SWPPP). JMU has provided a SWPPP template for construction activities to help guide contractors to plan for appropriate controls to prevent non-stormwater discharges.

5. **Construction Site Inspections (Sediment and Phosphorus)** - JMU inspectors conduct E&SC inspections for applicable land disturbing activities: 1) upon initial installation, 2) at least once within every 2-week period, 3) within 48 hours of a runoff producing storm event, and 4) upon completion of the project. Pollution-generating activities are addressed during E&SC inspections, and full SWPPP audits are conducted routinely.

6. **Stormwater Management Project Review (Sediment and Phosphorus)** – JMU follows S&S for SWM in compliance with the Virginia Erosion and Stormwater Management Regulation as related to MS4s and construction activities. SWM Plans are required for all land disturbances over 10,000 sf on campus. Plan approval is required prior to commencement of any regulated land disturbing activity.

7. **Structural BMP Implementation (Sediment and Phosphorus)** – JMU has installed various structural BMPs that reduce the pollutant load to local streams and is actively installing more. Additionally, construction projects occurring within the MS4 are encouraged to oversize their proposed BMPs to generate additional pollutant reductions. All newly constructed or retrofitted BMPs will be built in accordance with the latest version of the Virginia Stormwater Management Handbook or as specified in DEQ GM15-2005.

8. **Stormwater Management Facilities Inspections (Sediment and Phosphorus**) - JMU inspects and maintains all permanent stormwater BMPs on its property, unless subject to a long-term lease to another entity. In these cases, the other entity leasing the property is responsible for the maintenance. Inspectors conduct routine inspections and maintenance is completed as needed.

9. **Street Sweeping and Vacuuming (Sediment and Phosphorus) -** JMU is responsible for the cleaning of streets (under its control), parking lots and permeable pavement which includes the removal of trash and leaves. Parking lots are monitored and cleaned as needed.

10. **Municipal Facility Pollution Prevention (Sediment and Phosphorus)** – JMU has developed and implemented site-specific SWPPPs for all its municipal high priority facilities. These are facilities that have an increased potential for pollution due to those facilities' operations. Part of JMU's MS4 compliance requirements were to identify "high priority facilities" and develop Stormwater Pollution Prevention Plans (SWPPP) for those facilities. These locations are listed in JMU's MS4 Plan, and each SWPPP provides a summary description of the facility and activities associated with that facility such as a description of potential pollutants and sources, procedures for reducing and preventing pollutant discharges, and procedures for inspections and maintenance. SWPPP's will continue to be maintained and implemented, and facilities inspected on a regular basis. Newly constructed facilities or facilities with updated activities meeting the criteria for a high-priority facility will have a SWPPP developed and recorded in MS4 annual reporting to DEQ.

11. **Nutrient Management Plans or NMPs (Phosphorus)** - JMU implements Nutrient Management Plans (NMPs) to outline the rates and frequencies that nutrients may be applied, who may apply them, and covers best management practices to follow regarding the application of these nutrients. By following this Department of Conservation and Recreation (DCR) approved plan, it

can be ensured that nutrients are applied in a manner that will minimize their impact on stormwater quality. NMPs are updated every 3 years, and FM staff keep applicator certifications up to date with required continuing education classes.

5. Calculations for Reducing POCs

Calculations for BMPs that have been installed, are being proposed for this permit cycle to be utilized for reduction of phosphorus and sediment, the pollutants of concern for this TMDL, are located in the Appendices listed below by BMP category. As other future BMPs and BMP strategies are added to this action plan to meet POC reductions, the calculation methodology will be added to the action plan, as applicable.

- Appendix A: Calculation of Pollutant Removal: Land Use Conversion
- Appendix B: Calculation of Pollutant Removal: Forest Buffers
- Appendix C: Newman Lake Pollution Reduction Credit Feasibility Study

6. Legal Authority for TMDL Implementation

James Madison University falls under the Phase II MS4 regulations as a small municipal storm sewer system operator, based on the definition found in 40 CFR 122.26(b)(8). As an operator of a small MS4, JMU must develop, implement, and enforce an MS4 Program designed to reduce the discharge of pollutants from the small MS4 to the maximum extent practicable, to protect water quality, to ensure compliance with water quality standards, and to satisfy the water quality requirements of the Clean Water Act and its attendant regulations.

As the operator of the MS4, and other campus infrastructure, University Administration has assigned the Facilities Management Department the responsibility of, and authority to administer a comprehensive and compliant Stormwater Management Program. JMU has developed and administered a compliant MS4 program since it was first permitted in 2007. The core of the program revolves around the six minimum controls measures (MCM) found in the Phase II MS4 General Permit. Best management practices implemented to comply with the minimum control measures and outcomes achieved can be found in JMU's MS4 Program Plan and annual reports, respectively. The MCMs include:

1. Public education and outreach on stormwater impacts
2. Public involvement/participation
3. Illicit discharge detection and elimination (IDDE)
4. Construction site stormwater runoff control
5. Post-construction stormwater management
6. Pollution prevention/good housekeeping for municipal operations

The Facilities Management Department maintains four stormwater policies that provide it with the authority to administer the program and comply with the MCMs. The policies describe in detail their purpose, definitions, responsibilities, and procedures. They provide guidance to faculty, staff, students and the public, which results in the efficient administration of the program, and continuity of operations within the Stormwater Division. These policies can be found in the Appendices of the MS4 Program Plan, and are reviewed annually – this plan and the policies below can be viewed at www.jmu.edu/stormwater. The existing policies and their most recent version include:

- Policy 4310 Illicit Discharge Detection and Elimination (IDDE)
- DEQ-approved JMU Standards & Specifications for ESC & SWM

- FM IV 11 Land-Disturbing Activities Policy
- FM IV 10 Stormwater Management Facilities Policy
- FM IV 12 Daily Operating Procedures for Stormwater Control Best Management Practices

MCMs 4 and 5 regulate construction and post-construction stormwater management, respectively. § 62.1-44.15:54 of the Virginia Administrative Code allows state agencies to adopt their own Virginia Erosion and Sediment Control (ESC) Program. JMU has administered its own ESC program since 2009, with the oversight of the Virginia Department of Conservation and Recreation (DCR), and now DEQ. As of July 1, 2014, the University now also administers its own Virginia Stormwater Management Program (VSMP), as allowed by § 62.1-44.15:27. JMU submits ESC and stormwater management Annual Standards & Specifications for approval by DEQ to ensure all development on the campus conforms with the intent of the Virginia Erosion and Sediment Control Law, the Virginia Stormwater Management Act, and attendant regulations.

Regarding legal authority over contractor activities, all contractors performing land disturbing activities on JMU properties are required, through contract documents, to obtain all applicable permits before construction activity commences, and to follow JMU's DEQ approved Standards and Specifications. CO-7 of the General Conditions of the Construction Contract addresses requirements related to land disturbance. The existing program provides adequate authority to address the requirements in the Cooks Creek & Blacks Run TMDL. The required deliverables will be produced with existing Facilities Management staff, and outside support available to staff.

Projects implemented to achieve pollutant reduction targets, and strategies to fund them, will be developed and managed by existing staff. A robust recordkeeping system will provide long-term continuity for managing load reductions and maintenance activities. Funds to implement projects to meet the WLAs assigned may continue to be requested from the University General Fund, or be supplemented by grant funding.

7. Outreach Strategies to Reduce Local POCs

An outreach strategy to enhance the public's education (including employees) on methods to eliminate and reduce discharges of the pollutants of concern (POCs) will be implemented using Public education, outreach, and employee training for the impairments (Phosphorus and Sediment) of this TMDL is being met through measures already implemented in JMU's MS4 Plan. These measures include:

1. **Websites and Online Media (Sediment and Phosphorus)** – Information on erosion and sediment control (E&SC) and stormwater management (SWM) can be found on the JMU Facilities Management (FM) Stormwater website (www.jmu.edu/stormwater).

2. **Public Awareness Events (Sediment and Phosphorus)** – The University tables at events such as Quad Fest, EJC Arboretum Harvest Festival, Earth Week and Blacks Run Clean Up Day for education and outreach to make the campus community aware of POCs and strategies to prevent these from entering waterways.

3. **Educational Lectures & Guest Speaking (Sediment and Phosphorus)** – Members of the Facilities Management Stormwater team routinely guest lecture in classes for Geography, GIS, Integrated Sciences and Technology (ISAT) and Environmental Science at the University to talk about the

importance of POC awareness and reductions. Staff are also occasionally requested to guest speak on these topics on campus and in the community as part of a workshop or field trip.

4. **Storm Drain Stenciling Program (Sediment and Phosphorus)** - Staff and volunteers label stormwater catch basins and inlets to raise awareness that they lead directly to local creeks in an effort to prevent illicit discharges.

5. **Stream Cleanups (Sediment and Phosphorus)** – JMU students, faculty, and staff are encouraged to participate in stream enhancement and cleanup programs where possible.

6. **Biennial Staff Training Plan (Sediment and Phosphorus)** – JMU implements a training plan on IDDE, good housekeeping, pollution prevention, spill prevention, environmental awareness, and other required topics. Training is provided to appropriate staff at least every two years. Training will occur for the appropriate personnel at the required frequencies as described in JMU's MS4 Program Plan.

8. MILESTONE IMPLEMENTATION SCHEDULE

Milestones for the Blacks Run/Cooks Creek TMDL will plan to be completed via the allowable adaptive iterative approach over multiple permit cycles provided adequate progress is achieved in the implementation of BMPs designed to reduce pollutant discharges in a manner that is consistent with the assumptions and requirements of the TMDL.

BMP/Milestone Activity	***Schedule***	***Estimated lbs P Removal Annually***
Newman Lake Improvements & Aquatic Bench	2016-2023	45.00
2023-2028 Permit Cycle		
Triangle Meadow – Land Use Conversion	2023	0.46
East Campus Forest Buffer	2023	6.14
Oversized BMP at Village Phase 1	2026	0.76
Oversized BMP at Carrier Library	2026	2.64
University Boulevard Reforestation	2027/28	6.25
	Total	**61.25**
2028-2033 Permit Cycle		
BMP Retrofit	TBD	TBD
Oversized BMP from capital project	TBD	TBD
Land Use Conversion	TBD	TBD
New BMP - Bioretention	TBD	TBD
New BMP – Grass Swale	TBD	TBD
	Estimated Total	***6.75-8.75***
2034-2040 Permit Cycle		
Oversized BMP from capital project	TBD	TBD
New BMP - Bioretention	TBD	TBD
Land Use Conversion	TBD	TBD
New BMP - Stream Restoration	TBD	TBD
Street Sweeping (Annual Practice)	TBD	TBD
Storm Drain Cleaning (Annual Practice)	TBD	TBD
	Estimated Total	***8-10***
Total Estimated Phosphorus Removal by 2040		***78 (or more)***

TABLE 1. MILESTONE AND BMP IMPLEMENTATION SCHEDULE

The University will demonstrate its adequate progress on implementation of this Action Plan by tracking and reporting on BMP implementation in its Annual MS4 Report submitted to the DEQ on or before October 1st of each permit year. In accordance with the adaptive iterative approach referenced here, the University may modify/replace BMPs, as necessary and as new opportunities present themselves, to achieve the most effective plan for reducing the discharge of POCs from the University's MS4 and meeting assigned TMDL WLAs.

By the end of the current permit cycle (2023-2028) the University is anticipating 78% progress on meeting our total WLA of 78 lbs of P/year. BMPs installed to date and anticipated to be installed by the end of the current cycle will total an estimated 61.25 lbs/year of phosphorus removal from the TMDL watershed.

A retrofit study by Colman Engineering is in the process of wrapping up this spring (2026). This study is for the University to explore opportunities for new BMPs, opportunities for BMP retrofits, and areas where land use could be converted to forest or mixed open (meadow) to address the remaining 16.75 lbs/year of phosphorus removal required. Once completed the study will be included in the Appendices as, Appendix D: JMU BMP Retrofit Study for Blacks Run TMDL.

9. Public Comment Period for TMDL Action Plan

A 15-day public comment period was held April 15 – April 29, 2026. Any additional edits to the Action Plan will have a 15-day public comment period. Public comment periods will be noted in this section below as applicable. An opportunity for receipt and consideration of public comment regarding the draft Cooks Creek & Blacks Run TMDL Action Plan will be provided through the following mediums:

- JMU Stormwater Website: www.jmu.edu/stormwater
- Circulated via a JMU News Annoucement to campus via email.
- Circulated via a JMU Environment-interest email listserv.

Comments will be accepted by phone call, hardcopy mediums, and/or email correspondence. Additionally, public comments may be received at any time as noted on our website linked above. Specfically, questions or comments may be emailed to stormwater@jmu.edu, mailed to the JMU Stormwater Coordinator at 181 Patterson Street, Harrisonburg, VA 22807, or directed to 540-568-3174.

The following is a summary of comments received and responses to those comments.

Public Comment Period: April 15 – April 29

Comment #1: TBD

Comment #2: TBD

APPENDIX A: CALCULATION OF POLLUTANT REMOVAL: LAND USE CONVERSION

(Text from GM20-2003)

Permittees may receive credit for land use change conversions based on the number of acres converted. Conversion efficiencies for land use change are dependent on basin and are listed in Table V.H.1. Permittees may receive 100% credit for converting lands within their regulated MS4 area, but must deduct the L2 as the baseline within the unregulated area before taking any credit for the unregulated area. Please note that these numbers should be used for land use changes in urban areas only. If the land use change involves agricultural lands, contact DEQ and we will provide additional information on the calculation methodology.

1. *Impervious to Forest – Permittees may receive credit for converting any Impervious Surface to Forest. To receive credit for the "Forest" land use, permittees should meet the tree density per acre described in the Virginia Department of Forestry's Land Use Tax Assessment Standards (Table V.H.2), which can be found on the Virginia Department of Forestry's website.*
2. *Impervious to Mixed Open – Permittees may receive credit for converting any Impervious Surface to Mixed Open. "Mixed Open" would be defined as herbaceous cover that is minimally disturbed (periodically bush hogged, meadows, etc.). To qualify for this credit, the "Mixed Open" must be unmanaged (i.e. no nutrient application).*
3. *Impervious to Turf – Permittees may receive credit for converting any Impervious Surface to a Turf Surface (managed grass or lawns).*
4. *Turf to Forest – Permittees may receive credit for converting any Turf Surface (managed grass or lawns) to Forest.*
5. *Turf to Mixed Open – Permittees may receive credit for converting any Turf Surface (managed grass or lawns) to Mixed Open.*
6. *Mixed Open to Forest – Permittees may receive credit for converting any Mixed Open Surface to Forest.*

Land Use Change Conversion Efficiency Table					
Basin	***Land Use From***	***Conversion***	***TN (lbs/ac/year)***	***TP (lbs/ac/year)***	***TSS (lbs/ac/year)***
Potomac	*Turf*	*Forest*	*5.58*	*1.46*	*557*
Potomac	*Turf*	*Mixed Open*	*5.28*	*1.15*	*0.00*

Triangle Meadow – Land Use Conversion: The University has converted 0.40 acres of contiguous land within the MS4 service area from turf to mixed open (meadow).

Triangle Meadow Project at JMU East Campus Hillside					
Basin	*Land Use from*	*Conversion*	*TN (lbs/ac/yr)*	*TP (lbs/ac/yr)*	*TSS (lbs/ac/yr)*
Potomac	Turf	Mixed Open	5.28	1.15	0
Regulated (MS4 Area) Converted			*0.4*	*0.4*	*0.4*
Total Reduction for 0.4 Acre Project			**2.11**	**0.46**	**0**

University Boulevard Reforestation – Land Use Conversion: The University plans to convert at total of 4.28 acres from turf to forest along a shared use path and roadway. There are seven sections of plantings proposed, with the smallest contiguous planting area 0.26 acres. The trees will be planted at a density

consistent with the size of the plantings and the stocking rate required by DEQ and GM20-2003 at 400 seedlings per acre. This project is planned to be installed in fall of 2026 and be completed by fall of 2027.

University Boulevard JMU Reforestation Project					
Basin	*Land Use from*	*Conversion*	*TN (lbs/ac/yr)*	*TP (lbs/ac/yr)*	*TSS (lbs/ac/yr)*
Potomac	Turf	Forest	5.58	1.46	557
Regulated (MS4 Area) Acreage Converted			4.28	4.28	4.28
Total Reduction for 4.28 Acre Project			**23.88**	**6.25**	**2,383.96**

APPENDIX B: CALCULATION OF POLLUTANT REMOVAL: FOREST BUFFERS

(Text from GM20-2003)
Forest Buffers can be credited as both a land use change and efficiency BMP. The land use change component should be credited in accordance with the applicable section of Table App B.1. Efficiency is applied at up to a 2-to-1 ratio for upland acres that drain to the buffer as sheetflow (i.e. if a one acre buffer is installed, but only 1.5 upland acres drain to the buffer as sheetflow, the permittee may only receive the efficiency credit for 1.5 acres). The following established efficiencies for TP, TN, and TSS should be used (Table App B.1):

Table App B.1 - Efficiencies for Forest Buffers Applied to Two Upland Acres per Acre of Buffer

Practice	TN	TP	TSS
Forest Buffer	25%	50%	50%

East Campus Stream – Forest Buffer: In the fall of 2022 and the spring of 2023 a tree planting was completed in partnership with the City of Harrisonburg along 1,034 linear feet of the East Campus stream, which is a tributary to Siebert Creek and Newman Lake. The new forest buffer width varies from 35 feet wide to 100 feet wide for a total of 3.03 acres of forested buffer.

EAST CAMPUS STREAM FOREST BUFFER LAND CONVERSION	
Description	***Inputs***
Tree buffer area (acres)	*3.03*
Potential Upland Treated Acres (buffer x2)	6.06
Actual Upland Drainage Area: Total	10.19
Actual Upland Drainage Area: Impervious	0.79
Actual Upland Drainage Area: Pervious	9.4
Allowable Upland Drainage Area: Impervious	0.79
Allowable Upland Drainage Area: Pervious	5.27
Allowable Upland Drainage Area: Total	6.06

Calculations for Forest Buffer Reductions	***TN lbs/ac/yr***	***TP lbs/acre/yr***	***TSS lbs/acre/yr***
Turf to Forest Land Use Change Reductions	5.58	1.46	577.00
Pollutant Reductions for 3.03 ac of Forest	**16.91**	**4.42**	**1,748.31**
Regulated MS4 Loading Rate: Pervious	10.07	0.41	175.80
Regulated MS4 Loading Rate: Impervious	16.86	1.62	1,171.32
Loading Rate: Pervious Upland Drainage (5.27 ac)	53.07	2.16	926.47
Loading Rate: Impervious Upland Drainage (0.79 ac)	13.32	1.28	925.34
Total Loading Rates (Reductions) for Upland Drainage	66.39	3.44	1,851.81
Forest Buffer Efficiencies	0.25	0.50	0.50
Total Reductions of Upland Drainage with Efficiencies	***16.60***	***1.72***	***925.90***
Total Project Allowable Reductions	**33.50**	**6.14**	**2,674.21**

APPENDIX C: NEWMAN LAKE POLLUTION REDUCTION CREDIT FEASIBILITY STUDY

To access and view the Newman Lake Dam Improvements Design referenced in the feasibility study, please reach out directly to stormwater@jmu.edu or call (540) 568-3174.

NEWMAN LAKE POLLUTION REDUCTION CREDIT FEASIBLITY STUDY

JULY 14, 2022

PREPARED FOR:

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Section 1.0 Introduction and Purpose

This study was prepared for James Madison University (JMU) to assess potential water quality credits associated with the Newman Lake Dam Renovations project completed in 2015. The project included design enhancements to the lake consistent with Virginia's wet pond design specifications, including the addition of an aquatic bench, the implementation of inlet protection, and the establishment of a sediment forebay. A copy of the as-built plans is included in Appendix A for reference. Newman Lake serves a drainage area of 2,585.04 acres in the Blacks Run and Cooks Creek watershed, as illustrated in Figure 1 below.

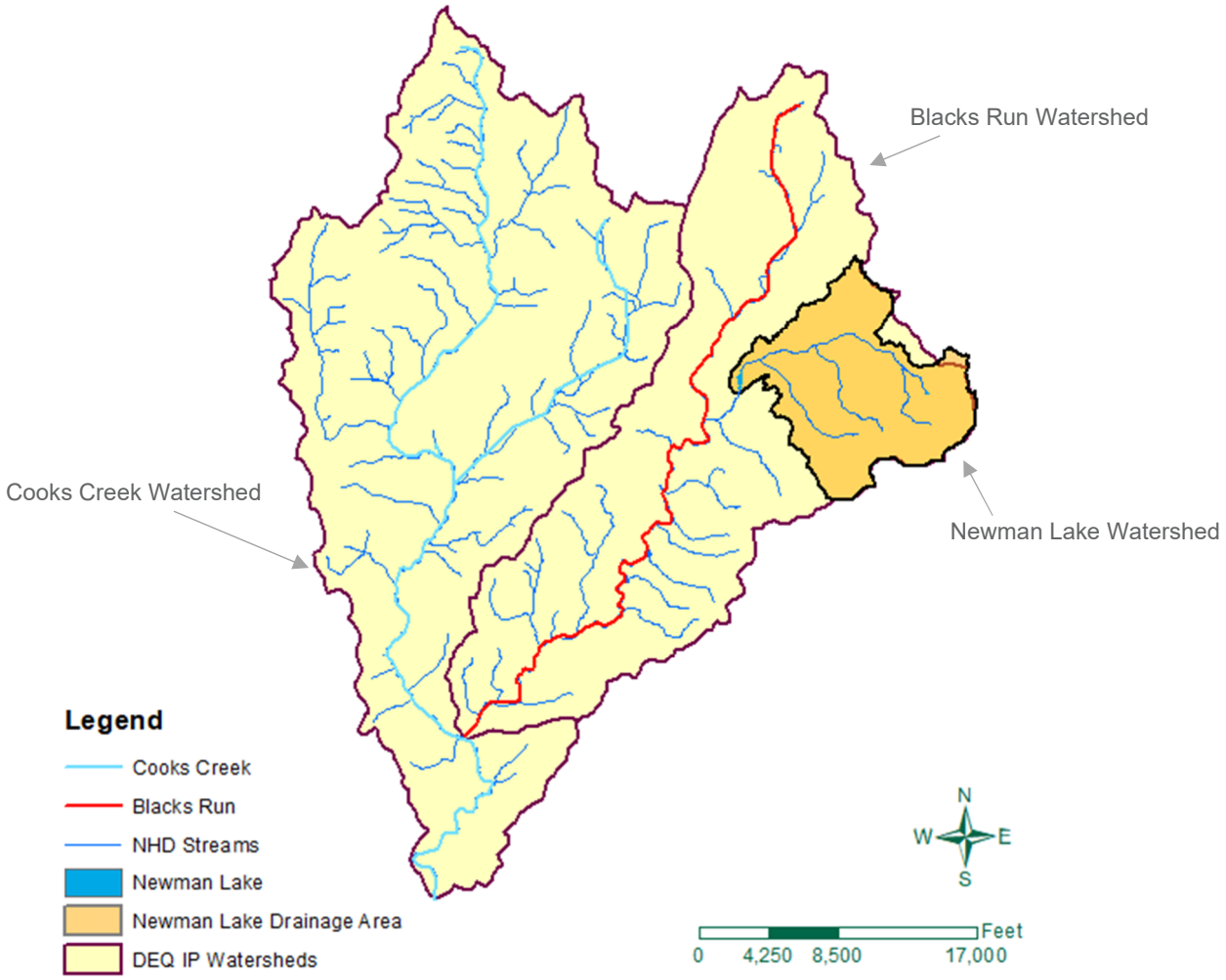

Figure 1: Newman Lake within DEQ's IP Watersheds.

Blacks Run has been impaired since 1996 for recreational use based on *e. coli* violations (bacteria) and aquatic life based on benthic surveys. Blacks Run is included in two EPA approved TMDLs: ID VAV-B26R-01 00082 (bacteria) and 00084 (benthic).

The fecal coliform TMDL (bacteria) was completed prior to the initial issuance of JMU's MS4 permit, so it does not include a waste load allocation. However, the Commonwealth intends for the TMDL to be implemented through best management practices in the watershed, such as rain gardens and bioretention filters, as identified in the Watershed Implementation Plan developed in 2006 by the Virginia Department of Conservation and Recreation in cooperation with the Virginia Department of Environmental Quality.

The benthic TMDL was revised in 2019 and includes waste load allocations (WLAs) for sediment and phosphorus. Presented in the following table are the pollutants of concern (POC) and load reduction targets as determined in the Fecal Coliform and Revised Benthic TMDLs. Though a total load reduction requirement was determined and a WLA prescribed to JMU in the Revised Benthic TMDL, credit was attributed to BMPs installed after the monitoring date. Credit for BMPs installed after the monitoring date for sediment (1/1/2009) exceed the removal requirement; thus, the parenthetic requirement for JMU is zero lb/yr.

Table 1. POC Allocations and Reduction Targets as Determined in the Fecal Coliform and Revised Benthic TMDLs.

	WLA (lb/yr)	Pre-Allocation Load with BMPs (lb/yr)	Total Reduction Required (lb/yr)	Total Reduction Required (%)
Sediment[1]	0	218,000	0	0
Phosphorus	28	106	78	73.2
Bacteria[2]	N/A	3.99E+14 (col/yr)	2.52E+14 (col/yr)	94% from pervious 98% from impervious

[1]TSS load reduction requirement was met with BMPs installed after the monitoring period (1/1/2009).
[2]Watershed-wide as no WLA was prescribed for JMU.

Presented in the subsequent sections are the methodology, calculations, results, and summary of potential pollutant reduction credits that can be attributed to the Newman Lake Dam Renovations project.

Section 2.0 Methodology

The following reference documents were utilized to develop a methodology for determining the appropriate amount of pollutant reduction credits to attribute to the Newman Lake Dam Renovations project:

- *"General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems*," Effective November 1, 2018.
- *"Guidance Memo No. GM-16-2006, TMDL Action Planning for Local Total Maximum Daily Loads as Required in the Small MS4 General Permit (VAR04) Effective July 1, 2013 and MS4 Individual Permits*."
- "*Guidance Memo No. 20-2003 – Chesapeake Bay TMDL Special Condition Guidance*," issued by the Virginia Department of Environmental Quality, dated February 6, 2021.
- "*Fecal Coliform TMDL For Blacks Run, Rockingham County, Virginia, Submitted by Virginia Department of Environmental Quality and Virginia Department of Conservation and Recreation*," April 2002.
- "*Water Quality Implementation Plan for Blacks Run and Cooks Creek (Fecal Coliform and Aquatic Life TMDLs) Submitted to the Stakeholders of Blacks Run and Cooks Creek*." Prepared by Virginia Department of Conservation and Recreation in cooperation with the Virginia Department of Environmental Quality. May 25, 2006.
- "*Revision of the Benthic Total Maximum Daily Load (TMDL) Developed for the Blacks Run and Cooks Creek Watershed Located in the City of Harrisonburg and Rockingham County*." Prepared by James Madison University and EEE Consulting, Inc. Prepared for Virginia Department of Environmental Quality. January 31, 2019.

The WIP for Blacks Run includes stated efficiency values for phosphorus (TP) and total suspended solids (TSS) removal from wet ponds; however, a more detailed process for determining TP, nitrogen (TN), and TSS credit for Best Management Practice (BMP) enhancement, conversion, and restoration is outlined in Appendix V.D. of the Chesapeake Bay TMDL Special Condition Guidance Memo (Guidance Memo). Due to its relevance

and specificity, as well as the applicability specifically authorized in the Local TMDL Guidance, this process was used to determine phosphorus and sediment credits associated with the Newman Lake Dam Renovations project. Generally, the process involves first calculating a removal efficiency given the initial conditions of the BMP, and then calculating an updated efficiency given the benefits of the enhancements. A downward modification to the initial efficiency can also be applied for any crucial elements of the BMP which may have been missing in its initial construction and added during the enhancements.

Regarding bacteria removal, the WIP for Blacks Run provides a removal efficiency for wet ponds as related to bacteria, which is cited as being estimated based on sediment removal efficiency. The Chesapeake Bay Guidance Memo does not reference the removal of bacteria in its process because it focuses on the Bay TMDL pollutants of concern: TN, TP, and TSS. In general, there is limited quantitative data of BMPs' capacity to reduce bacteria; however, there is specific reference made in Virginia's Stormwater Design Specifications that refer to design features that can reduce bacteria. Due to bacteria removal being associated with sediment removal in the WIP, in combination with lower estimates from the handful of studies found on bacterial removal for wet ponds, it was determined that the efficiency of the bacteria removal from Newman Lake could be associated with the TSS removal efficiency provided by the Bay Program Curves. Thus, the process for determining enhanced bacteria removal efficiency associated with the Newman Lake Dam Renovations project will mirror the TSS removal efficiency calculations in the subsequent report.

Section 3.0 Calculations

3.1 Initial Conditions Removal Efficiency

For this study, initial conditions will refer to the capacity of Newman Lake prior to the enhancements completed in 2015 associated with the Newman Lake Dam Renovations project. The first step in the process to establish the removal efficiency of the initial conditions is to determine the drainage area and corresponding impervious portion of that drainage area to calculate the runoff depth for use in the Chesapeake Bay Retrofit Equations. The Guidance Memo recommends using Chesapeake Bay Program efficiencies when the BMP does not meet VA DEQ Stormwater Design Specifications (No. 14, Wet Ponds); however, as Newman Lake is a regulated dam according to VA Department of Conservation and Recreation, but is significantly undersized to serve as a traditional wet pond for the large drainage area (~2,500 acres), the Retrofit Equations are the most suitable tool for use in determining pollutant removal efficiencies of Newman Lake in its initial conditions.

To determine the impervious area, the drainage area determined during the Renovation project was used and VGIN land use data was overlaid, as presented below in Figure 2. This data was then downloaded to Excel and sorted and filtered to extract the impervious area (sum of developed impervious and impervious local dataset) resulting in a total impervious area of 951.28 acres, which is 37% of the total drainage area (2,585.04 acres).

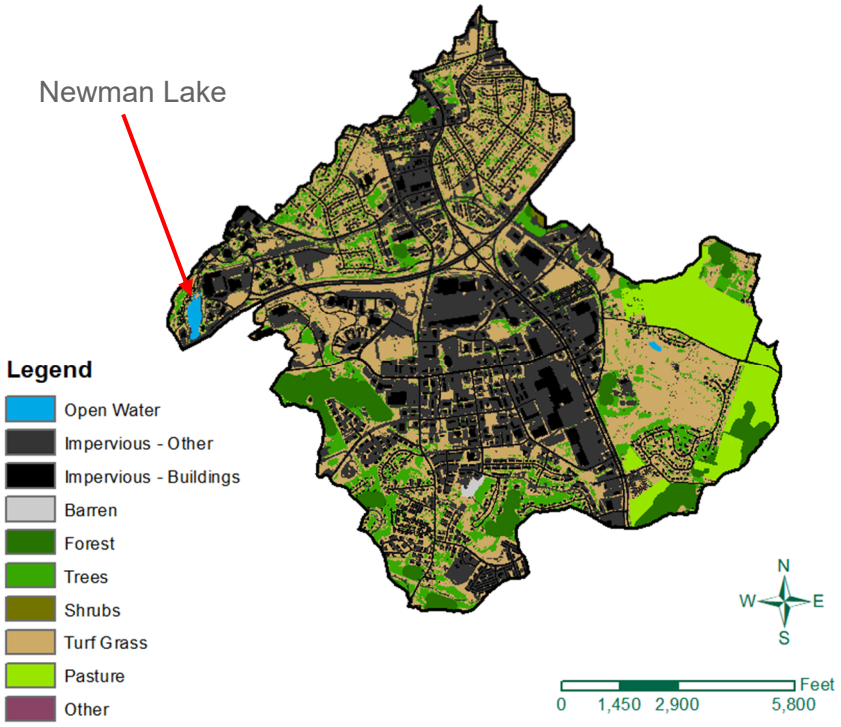

Figure 2. Land Use Data within Newman Lake Drainage Area.

Per the Guidance Memo, the Retrofit Equations were used to calculate the initial conditions efficiency of Newman Lake given its treatment volume. The original volume was found by comparing the topography of the lake to a flat surface at the permanent pool water surface elevation, which resulted in a volume of 33.26 acre-feet. Once a treatment volume was determined, Equation 1 (Equation 55 from the Chesapeake Bay TMDL Special Conditions Guidance) was used to calculate the runoff depth treated of the initial conditions (Table 2), where:

$$RD = \frac{(RS)(12)}{IA} \quad (1)$$

where RD = Runoff Depth Treated (inches)
RS = Runoff Storage (acre-feet)
IA = Impervious Area (acres

Table 2: Calculation of Initial Runoff Depth Treated.

		Notes:
Runoff Storage (acre-ft) =	33.26	Volume of Permanent pool
Total Impervious Area (acres) =	951.28	Impervious Area Draining to Basin - 2014 VGIN Landcover
Runoff Depth Treated (inches) =	0.42	Computed using Eq. from Page 55 of the Guidance Memo

The runoff depth treated was applied to the Stormwater Treatment (ST) Retrofit Equations (Figure 3) from the Guidance Memo to calculate the efficiency of the wet pond at removing TN, TP, and TSS. ST was chosen as wet ponds are optimized for treatment, as opposed to Runoff Reduction (RR).

Table V.B.2 – Retrofit Equations

TN	RR	$y = 0.0308x^5 - 0.2562x^4 + 0.8634x^3 - 1.5285x^2 + 1.501x - 0.013$
	ST	$y = 0.0152x^5 - 0.131x^4 + 0.4581x^3 - 0.8418x^2 + 0.8536x - 0.0046$
TP	RR	$y = 0.0304x^5 - 0.2619x^4 + 0.9161x^3 - 1.6837x^2 + 1.7072x - 0.0091$
	ST	$y = 0.0239x^5 - 0.2058x^4 + 0.7198x^3 - 1.3229x^2 + 1.3414x - 0.0072$
TSS	RR	$y = 0.0326x^5 - 0.2806x^4 + 0.9816x^3 - 1.8039x^2 + 1.8292x - 0.0098$
	ST	$y = 0.0304x^5 - 0.2619x^4 + 0.9161x^3 - 1.6837x^2 + 1.7072x - 0.0091$

Figure 3: Retrofit Equations from Chesapeake Bay TMDL Special Conditions Guidance Memo.

Initial condition pollutant removal efficiencies were then determined, as presented below in Table 3. It should be noted that the calculated efficiencies determined from Retrofit Equations are lower than the Bay Program Pollutant Removal Efficiencies for Wet Ponds for both phosphorus and sediment, so use of the equations provides a more conservative starting point.

Table 3: Initial Conditions Pollutant Removal Efficiencies for Newman Lake.

Calculation	POC Removal Efficiency			
	TN	TP	TSS	Bacteria*
Bay Program Pollutant Removal Efficiency for Wet Ponds	20%	45%	60%	60%
Initial Condition Pollutant Removal Efficiencies	24%	37%	47%	47%

*Bacteria efficiencies mimic TSS per the narrative presented previously.

Per the Guidance Memo, downward modifications in initial efficiencies can be used to adjust the treatment capacity of BMPs in the absence of standard design criteria. Though the Guidance Memo states that the use of the Bay Program Curves (the Retrofit Equations) "should not require additional modification to account for missing design elements," and that "any deficiencies should be captured in a reduced initial runoff storage value for the practice," in the case of Newman Lake, the calculated pollutant removal efficiencies for the initial conditions only accounts for the pond's volume shortcomings and do not address the additional missing design elements that were added during the Newman Lake Dam Renovations project, including the forebay, inlet protection, and the aquatic benches. Based on the standard design criterion, the enhancements to Newman Lake should be considered significant and warrant consideration for crediting; likewise, downward modifications are justified to be able to account for credit of the enhancements. According to the Guidance Memo, MS4 permittees are authorized to apply downward modifications of up to 10% per missing design element for a maximum of 50% reduction. In the absence of specific data that breaks down the performance and associated pollutant removal potential of each design criterion, permittees must use their best professional judgement to designate an appropriate downward modification for each missing design element. As illustrated below in Figure 4, forebay, pond dimensions, and aquatic benches are key design elements of the VA DEQ Stormwater Design Specification No. 14, Wet Ponds.

VA DEQ STORMWATER DESIGN SPECIFICATION NO. 14 WET POND

Table 14.2. Level 1 and 2 Wet Pond Design Guidance

Level 1 Design (RR:0 [1]; TP: 50 [5]; TN:30 [5])	Level 2 Design (RR:0 [1]; TP: 75 [5]; TN:40 [5])
Tv = [(1.0)(Rv)(A)/12] – volume reduced by upstream BMP	Tv = [1.5 (Rv) (A) /12] – volume reduced by upstream BMP
Single Pond Cell (with forebay)	Wet ED [2] (24 hr) and/or a Multiple Cell Design [3]
Length/Width ratio OR Flow path = 2:1 or more	Length/Width ratio OR Flow path = 3:1 or more
Length of shortest flow path / overall length [4] = 0.5 or more	Length of shortest flow path/overall length[4] = 0.8 or more
Standard aquatic benches	Wetlands more than 10% of pond area
Turf in pond buffers	Pond landscaping to discourage geese
No Internal Pond Mechanisms	Aeration (preferably bubblers that extend to or near the bottom or floating islands

[1] Runoff volume reduction can be computed for wet ponds designed for water reuse and upland irrigation.
[2] Extended Detention may be provided to meet a maximum of 50% of the Treatment Volume; Refer to Design Specification 15 for ED design
[3] At least three internal cells must be included, including the forebay
[4] In the case of multiple inflows, the flow path is measured from the dominant inflows (that comprise 80% or more of the total pond inflow)
[5] Due to groundwater influence, slightly lower TP and TN removal rates in coastal plain (**Section 7.2**) and CSN Technical Bulletin No. 2. (2009)

Sources: CSN (2009), CWP and CSN (2008), CWP (2007)

Figure 4. Design Guidance for Wet Ponds in Virginia.

Therefore, it is reasonable to account for these changes that are not otherwise reflected in calculations that only consider storage volume. Proposed downward modifications to the initial conditions are presented below in Table 4.

Table 4: Downward Efficiency Modification Table.

Downward Efficiency Modification Table			
BMP Type	**BMP Location**	**Modification Type**	**Downward Modification Applied (%)**
Wet Pond	38.301958, -77.491741	Absence of sediment forebay(s)	4%
		Absence of inlet protection for pipes not entering through forebay	2%
		No safety/aquatic benching	4%
		Total =	10%

3.2 Removal Efficiencies Resulting from the Newman Lake Dam Renovations Project Enhancements

Though significant grading on the pond bottom was initially proposed as part of the Dam Renovation project, ultimately budget constraints limited the full implementation; however, as illustrated in green below in Figure 5, an aquatic bench was added, as well as a defined forebay, in addition to inlet protection around the lake. The final pond volume post enhancement is estimated to be 31.71 acre-ft.

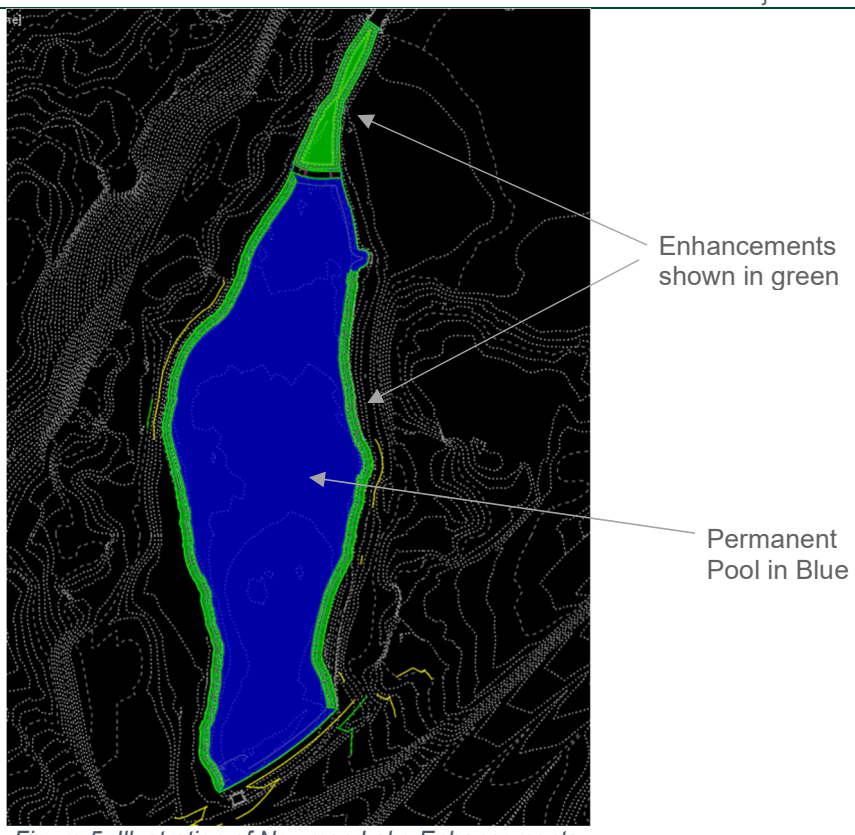

Figure 5: Illustration of Newman Lake Enhancements.

Equation 1 was applied for the renovated pond volume, and the resulting calculated Runoff Depth Treated for the Newman Lake drainage area is presented below in Table 5.

Table 5: Calculation of Runoff Depth Treated by Newman Lake Enhancements.

		Notes:
Runoff Storage (acre-ft) =	31.71	Volume of Permanent pool
Total Impervious Area (acres) =	951.28	Impervious Area Draining to Basin - 2014 VGIN Landcover
Runoff Depth Treated (inches) =	0.40	Computed using Eq. from Page 55 of TMDL Action Plan Guidance

The runoff depth treated was again applied to the Stormwater Treatment (ST) Retrofit Equations (Figure 3) from the Guidance Memo to calculate the efficiency of the wet pond at removing TN, TP, TSS and bacteria following retrofits. After these efficiencies were calculated, the enhanced efficiency at removing TN, TP, TSS, and bacteria due to the Dam Renovations project was calculated as the difference between the ST Retrofit Equation reduction efficiencies and the modified initial reduction efficiencies, as presented below in Table 6.
.

Table 6: TN, TP, and TSS Removal Efficiency Calculations.

Calculation	POC Removal Efficiency			
	TN	TP	TSS	Bacteria
Initial Conditions (ST Retrofit Equations)	24%	37%	47%	47%
Revised for Downward Modifications	21%	33%	42%	42%
Final Conditions (ST Retrofit Equations)	23%	36%	46%	46%
BMP Enhancement Credit	2%	3%	3%	3%

3.3 Loading Rates for Pollutants of Concern

DEQ provided phosphorus (TP) and sediment (TSS) pollutant loading rates for various VGIN land cover types consistent with those used for calculations in the "*Revision of the Benthic Total Maximum Daily Load (TMDL) Developed for the Blacks Run and Cooks Creek Watershed Located in the City of Harrisonburg and Rockingham County*." The loading rates were then applied to the areas for each land cover in the Newman Lake watershed to determine a calculated pollutant loading for the Newman Lake watershed in lb/yr, as presented below in Table 7.

Table 7. Pollutant Loading for the Newman Lake Watershed.

VGIN Land Cover Code	Land Cover Type	Watershed			Pollutant Loading Rates*		Ratio*	Calculated Pollutant Loading - Newman Lake Watershed	
		BlacksRun*	JMU*	Newman Lake	TSS	TP		TSS	TP
		area (ac)	area (ac)	area (ac)	lb/ac/yr	lb/ac/yr		lb/yr	lb/yr
82	High_till	385.58	8.38	--	2438.18	1.98	0.39	0.00	0.00
82	Low_till	615.92	13.39	--	274.15	1.03	0.62	0.00	0.00
81	Hay	241.71	0.00	166.97	52.34	0.35	0.28	2438.04	16.43
81	Pasture_Manure Applied	158.52	0.00	166.97	141.01	0.15	0.18	4308.43	4.48
81	Pasture_Grazed	237.75	0.00	166.97	640.27	0.43	0.27	29291.59	19.89
81	Pasture_Unimproved	229.45	0.00	166.97	1393.47	1.18	0.26	61539.35	52.25
41	Forest	605.08	41.59	135.54	19.16	0.01	1.00	2597.34	0.70
42	Trees	1010.09	40.11	262.54	193.84	0.03	1.00	50890.35	8.91
51	Shrub	100.28	0.00	2.27	89.93	0.02	1.00	204.21	0.04
11	Water	26.17	0.00	7.67	0.00	0.00	1.00	0.00	0.00
91	Wetland	10.45	0.08	0.03	69.23	0.01	1.00	2.10	0.00
31	Barren	183.97	0.00	3.41	10566.53	1.21	1.00	35993.40	4.13
71	Turfgrass	3813.88	220.12	812.57	47.56	0.20	1.00	38645.61	166.09
21	Developed pervious	987.14	64.25	809.23	108.86	0.14	0.30	26426.77	35.11
21	Developed impervious	2303.34	149.91	809.23	889.48	1.93	0.70	503856.37	1093.37
22	Impervious local dataset	1520.61	79.03	384.82	401.70	0.87	1.00	154580.37	335.44
Totals		**12429.93**	**616.86**	**2585.04**				**910773.92**	**1736.85**

*Provided by DEQ's Consultant via email communication.

Section 4.0 Results

The resulting BMP Enhancement Load Reduction credits that can be applied to the Newman Lake Dam Renovations project are summarized below in the table. The credits represent an incremental improvement in water quality treatment provided by the enhancements, factoring in the downward modifications of efficiencies in pollutant removal of the initial pond, as well as calculated removal efficiencies using the Bay Program Retrofit Equations for BMPs that do not meet VA DEQ Stormwater Design Specifications, but still provide water quality treatment for the watershed in which they serve. Additionally, the Chesapeake Bay Guidance Memo methodology was extrapolated and applied for bacteria to use for informational purposes in the absence of a required WLA.

Table 8: BMP Enhancement Load Reduction Calculations.

Pollutant	Total Pollutant Load (lb/yr)	BMP Enhancement Efficiency	BMP Enhancement Load Reduction Credit (lb/yr)
Phosphorus (TP)	1,737	3%	45
Total Suspended Solids (TSS)	910,774	3%	30,044

Section 5.0 Summary

This study included a review of local and state TMDL requirements and crediting guidance to determine appropriate pollutant removal credit to apply to the enhancements of Newman Lake completed during the dam renovation project in 2015. All calculations for credit applied assume that renovations are being maintained as designed and constructed as referenced in the as-built plans included in Appendix A. The calculation process relied upon the latest and most relevant guidance and accounted for missing design criterion associated with Virginia DEQ's Stormwater Design Specifications. As a result, enhancement efficiencies were determined for the significant improvements associated with the Newman Lake Dam Renovations project for removing nitrogen, phosphorus, suspended solids, and bacteria, as presented in Section 4. As the University has documented compliance with and exceeded the Chesapeake Bay TMDL POC reduction targets, presented in Table 9 below are the credits that could be applied to the Blacks Run Benthic TMDL that was revised in 2019.

Table 9: Reductions of Pollutants to be Credited

Pollutant	BMP Enhancement Load Reduction (lb/yr)	Total Reduction Required (lb/yr)	% of Required Reduction
Phosphorus (TP)	45	78	58%

According to the BMP Crediting Methodology section in the Revised Benthic TMDL, sediment BMPs installed before 1/1/2009 and phosphorus BMPs installed before 12/31/2016 are included as part of existing conditions. As construction wasn't fully complete until June 2015 and the aquatic bench plants not fully established until months later, the cumulative effects of the renovations likely weren't fully realized until at or after the

phosphorus monitoring period referenced in the TMDL had concluded (12/31/2016). Thus, credit for phosphorus reduction was calculated and reported herein.

Should the University wish to realize substantial more compliance credit, an opportunity exists to quantify the enhanced capacity associated with the original pond dredging and grading plan. As the calculations for the Chesapeake Bay TMDL Retrofit Equations rely heavily on treatment volume to determine potential pollution removal efficiency and resulting credit, any increase in pond treatment volume will significantly enhance the pond's capacity for watershed treatment.

References

James Madison University and EEE Consulting, Inc. 2019. “Revision of the Benthic Total Maximum Daily Load (TMDL) Developed for the Blacks Run and Cooks Creek Watershed Located in the City of Harrisonburg and Rockingham County.”

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VADEQ. 2016. “Guidance Memo No. GM-16-2006, TMDL Action Planning for Local Total Maximum Daily Loads as Required in the Small MS4 General Permit (VAR04) Effective July 1, 2013 and MS4 Individual Permits.”

VADEQ. 2021. “Guidance Memo No 20-2003 - Chesapeake Bay TMDL Special Condition Guidance.”

APPENDIX D: JMU BMP RETROFIT STUDY FOR BLACKS RUN TMDL

This study will be added to the Appendix once it is completed in early May 2026. A second public comment period will be posted once this study is complete and added to this action plan document.