Alabama Department of Environmental Management

Draft

Total Maximum Daily Load (TMDL)
for
Fivemile Creek

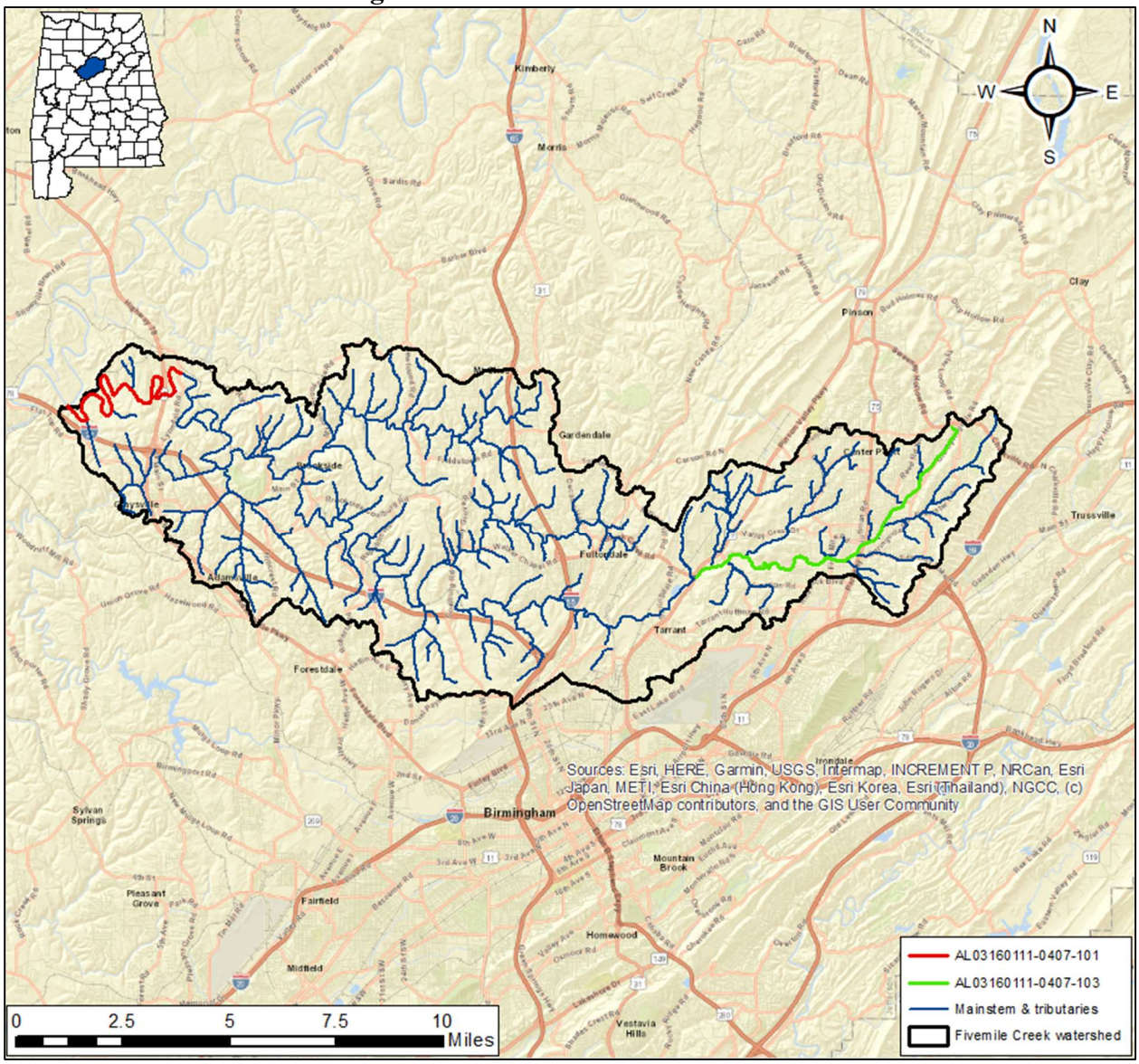
Assessment Unit ID Numbers:
AL03160111-0407-101
AL03160111-0407-103

Pathogens (*E. coli*)

Jefferson County

Alabama Department of Environmental Management
Water Quality Branch
Water Division
June 2025

Figure 1: Fivemile Creek watershed



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1.0 Executive Summary

Section 303(d) of the Clean Water Act and the Environmental Protection Agency (EPA) Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated uses and to determine the total maximum daily load (TMDL) for pollutants causing the use impairment. A TMDL is the sum of individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS).

Fivemile Creek is a tributary to the Locust Fork in the Black Warrior River basin. There are two segments of Fivemile Creek currently listed as impaired for pathogens: AL03160111-0407-101 (lower segment) and AL03160111-0407-103 (upper segment). The lower segment starts at the mouth of Fivemile Creek and extends 7.54 miles to Old Jasper Highway. The upper segment begins at Alabama Highway 79 and extends 9.07 miles to the headwaters of Fivemile Creek. Both segments are currently included on Alabama's §303(d) list as impaired for pathogens (*E. coli*). The upper and lower segments of Fivemile Creek are both assigned a use classification of Swimming and Other Whole Body Water-Contact Sports/Fish & Wildlife (Swimming/F&W). This TMDL addresses the pathogen impairments for both segments.

The lower segment (AL03160111-0407-101) of Fivemile Creek was originally included on the §303(d) list for pathogens (*E. coli*) in 2022 based on data collected by the Alabama Department of Environmental Management (ADEM) at station FMCJ-6 during 2015 to 2019. The upper segment (AL03160111-0407-103) of Fivemile Creek was originally included on the §303(d) list for pathogens (*E. coli*) in 2018 based on data collected by ADEM at station FMCJ-1B during 2013 to 2017.

Follow-up sampling on Fivemile Creek was performed by ADEM in 2021 (upper segment only) and 2024 to further assess the water quality of the impaired stream. For purposes of this TMDL, the 2021 and 2024 data will be used because it is the most current data and provides the best picture of the current water quality conditions of the stream. The 2024 edition of *Alabama's Water Quality Assessment and Listing Methodology*, prepared by ADEM, provides the rationale for the Department to use the most recent data to prepare a TMDL for an impaired waterbody. ADEM collected 35 samples from the impaired segments of Fivemile Creek between 2021 and 2024. According to the data, Fivemile Creek was not meeting the pathogen criteria applicable to its use classification of Swimming/F&W. Therefore, this TMDL has been developed for pathogens (*E. coli*) for Fivemile Creek segments AL03160111-0407-101 and AL0316011-0407-103.

A mass balance approach was used for calculating the pathogen TMDL for Fivemile Creek. The mass balance approach utilizes the conservation of mass principle. The TMDL was calculated using the single sample or geometric mean sample exceedance event that resulted in the highest percent reduction. Existing loads were calculated by multiplying the *E. coli* concentrations times the respective in-stream flows and a conversion factor. In the same manner as existing loads were calculated, allowable loads were calculated for the single sample *E. coli* target of 211.5 colonies/100 ml (235 colonies/100 ml – 10% Margin of Safety) and geometric mean *E. coli* target of 113.4 colonies/100 ml (126 colonies/100 ml – 10% Margin of Safety).

Table 1 is a summary of the estimated existing load, allowable load, and percent reduction for the single sample criterion and the geometric mean criterion for Fivemile Creek (AL03160111-0407-101). Table 2 lists the TMDL, defined as the maximum allowable *E. coli* loading under critical conditions for Fivemile Creek (AL03160111-0407-101).

Table 1: *E. coli* loads and required reductions for Fivemile Creek (AL03160111-0407-101)

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	2.75E+13	1.20E+12	2.63E+13	96%
Geometric Mean Load	1.76E+12	4.56E+11	1.31E+12	74%
Five Mile Creek WRF (AL0026913)	2.34E+10	3.39E+11	0	0%
Forestdale Mobile Home Park (AL0027642)	0	3.39E+8	0	0%
Minor Middle School Lagoon (AL0051161)	0	1.92E+8	0	0%
Prudes Creek WRF (AL0056120)	0	1.02E+10	0	0%
Sharon Heights Mobile Home Park (AL0057827)	0	3.39E+8	0	0%
Brookside Village WWTP (AL0062251)	1.74E+5	2.49E+8	0	0%
Brookside Square CWF (AL0084271)	0	5.09E+8	0	0%

Table 2: *E. coli* TMDL for Fivemile Creek (AL03160111-0407-101)

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
1.33E+12	1.33E+11	3.50E+11	96%	0	8.50E+11	96%

a. TMDL was established using the single sample criterion of 235 colonies/100ml.
b. Future CAFOs in the watershed will be assigned a waste load allocation (WLA) of zero.
c. Current and future WWTPs must meet the applicable instream water quality criteria for pathogens at the point of discharge.
d. Current and future MS4 areas and other NPDES stormwater sources will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation and maintenance of BMPs on a case-by-case basis. For the purposes of this TMDL, the 96% reduction for MS4s and other stormwater sources should not be interpreted as a numeric permit limitation.
e. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.

Table 3 is a summary of the estimated existing load, allowable load, and percent reduction for the single sample criterion and the geometric mean criterion for Fivemile Creek (AL03160111-0407-103). Table 4 lists the TMDL, defined as the maximum allowable *E. coli* loading under critical conditions for Fivemile Creek (AL03160111-0407-103).

Table 3: *E. coli* loads and required reductions for Fivemile Creek (AL03160111-0407-103)

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	1.65E+11	1.27E+11	3.84E+10	23%
Geometric Mean Load	1.34E+10	1.66E+10	0	0%

Table 4: *E. coli* TMDL for Fivemile Creek (AL03160111-0407-103)

TMDL[a]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[b]			Load Allocation (LA)	
		WWTPs[c]	Stormwater (MS4s and other NPDES sources)[d]	Leaking Collection Systems[e]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
1.41E+11	1.41E+10	0	23%	0	1.27E+11	23%

a. TMDL was established using the single sample criterion of 235 colonies/100ml.
b. Future CAFOs in the watershed will be assigned a waste load allocation (WLA) of zero.
c. Future WWTPs must meet the applicable instream water quality criteria for pathogens at the point of discharge.
d. Current and future MS4 areas and other NPDES stormwater sources will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation and maintenance of BMPs on a case-by-case basis. For the purposes of this TMDL, the 23% reduction for MS4s and other stormwater sources should not be interpreted as a numeric permit limitation.
e. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.

Compliance with the terms and conditions of existing and future National Pollutant Discharge Elimination System (NPDES) permits will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and may be eligible for CWA §319 grants.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria, and we are committed to targeting the load reductions to improve water quality in the Fivemile Creek watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL accordingly.

2.0 Basis for §303(d) Listing

2.1 Introduction

Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated uses and to determine the TMDL for pollutants causing use impairment. The TMDL process establishes the allowable loading of pollutants for a waterbody based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water-quality based controls to reduce pollution and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Alabama has identified two segments of Fivemile Creek, totaling 16.61 miles, as impaired for pathogens (*E. coli*). The listings were originally reported on Alabama's 2018 (upper segment) and 2022 (lower segment) §303(d) Lists of Impaired Waters based on data collected from 2013-2019 and have been included on all subsequent lists. Pasture grazing, collection system failures, and urban runoff/storm sewers are listed as the potential sources of impairment on the 2024 §303(d) list.

2.2 Problem Definition

Waterbodies Impaired:	Fivemile Creek (AL03160111-0407-101) – from Locust Fork to Old Jasper Highway Fivemile Creek (AL03160111-0407-103) – from Alabama Highway 79 to its source
Impaired Reach Lengths:	7.54 miles (AL03160111-0407-101) 9.07 miles (AL03160111-0407-103)
Impaired Drainage Area:	102.47 square miles
Water Quality Standard Violation:	Pathogens (Single sample maximum and geometric mean)
Pollutant of Concern:	Pathogens (*E. coli*)
Water Use Classification:	Swimming and Other Whole-Body Water-Contact Sports/Fish & Wildlife (Swimming/F&W)

Usage Related to Classification:
The pathogen-impaired segments are classified as Swimming/F&W. Usage of waters in the Swimming classification is described in ADEM Admin. Code R. 335-6-10-.09(3)(a) and (b).

> *(a) Best usage of waters: swimming and other whole-body water-contact sports.*

(b) Conditions related to best usage: the waters, under proper sanitary supervision by the controlling health authorities, will meet accepted standards of water quality for outdoor swimming areas and will be considered satisfactory for swimming and other whole-body water-contact sports. The quality of waters will also be suitable for the propagation of fish, wildlife and aquatic life. The quality of salt waters and estuarine waters to which this classification is assigned will be suitable for the propagation and harvesting of shrimp and crabs.

Usage of waters in the F&W classification are described in ADEM Admin. Code R. 335-6-10-.09(5)(a), (b), (c), and (d).

(a) Best usage of waters: fishing, propagation of fish, aquatic life, and wildlife.

(b) Conditions related to best usage: the waters will be suitable for fish, aquatic life and wildlife propagation. The quality of salt and estuarine waters to which this classification is assigned will also be suitable for the propagation of shrimp and crabs.

(c) Other usage of waters: it is recognized that the waters may be used for incidental water contact year-round and whole-body water-contact recreation during the months of May through October, except that water contact is strongly discouraged in the vicinity of discharges or other conditions beyond the control of the Department or the Alabama Department of Public Health.

(d) Conditions related to other usage: the waters, under proper sanitary supervision by the controlling health authorities, will meet accepted standards of water quality for outdoor swimming areas and will be considered satisfactory for swimming and other whole-body water-contact sports.

<u>*E. coli* Criteria:</u>
Criteria for acceptable bacteria levels for the Swimming classification are described in ADEM Admin. Code R. 335-6-10-.09(3)(c)6(i), (ii), and (iii) as follows:

6. Bacteria:

(i) Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these wastes, are not acceptable for swimming or other whole-body water-contact sports.

(ii) In all other areas, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean E. coli organism density does not exceed 126 colonies/100 ml nor exceed a maximum of 235 colonies/100 ml in any sample in non-coastal waters. In coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 colonies/100 ml nor exceed a maximum of 104 colonies/100 ml in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric mean bacterial organism density exceeds these levels, the bacterial

water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters.

(iii) The policy of nondegradation of high quality waters shall be stringently applied to bacterial quality of recreational waters.

Criteria for acceptable bacteria levels for the F&W classification are described in ADEM Admin. Code R. 335-6-10-.09(5)(e)7(i) and (ii) as follows:

7. Bacteria:

(i) In non-coastal waters, bacteria of the E. coli group shall not exceed a geometric mean of 548 colonies/100 ml; nor exceed a maximum of 2,507 colonies/100 ml in any sample. In coastal waters, bacteria of the enterococci group shall not exceed a maximum of 275 colonies/100 ml in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours.

(ii) For incidental water contact and whole body water-contact recreation during the months of May through October, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean E. coli organism density does not exceed 126 colonies/100 ml nor exceed a maximum of 298 colonies/100 ml in any sample in non-coastal waters. In coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 colonies/100 ml nor exceed a maximum of 158 colonies/100 ml in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric bacterial coliform organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters. Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these wastes, are not acceptable for swimming or other whole-body water-contact sports.

<u>Criteria Exceeded:</u>

Data collected during 2013-2019 was used as the basis for including the two segments of Fivemile Creek on Alabama's §303(d) list for pathogens (*E. coli*). The Swimming criteria are applicable for both segments since they are the more stringent criteria. Segment AL03160111-0407-101 (lower segment) had three exceedances out of 15 samples collected during 2015-2019. Segment AL03160111-0407-103 (upper segment) had five exceedances out of 11 samples collected during 2013-2016. The data used for the original listings can be found in Appendix 7.2.

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

For this TMDL, a single sample maximum *E. coli* target of 211.5 colonies/100 ml will be used. This target was derived by using a 10% explicit margin of safety from the single sample maximum criterion of 235 colonies/100 ml. This target is considered protective of water quality standards and should not allow the single sample maximum of 235 colonies/100 ml to be exceeded. In addition, a geometric mean target of 113.4 colonies/100 ml will be used for a series of at least five samples taken no less than 24 hours apart over the course of 30 days. This target was also derived by using a 10% explicit margin of safety from the geometric mean criterion of 126 colonies/100 ml. This target is considered protective of water quality standards and should not allow the geometric mean criterion to be exceeded.

3.2 Source Assessment

3.2.1 Point Sources in the Fivemile Creek Watershed

A point source can be defined as a discernible, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Point source contributions can typically be attributed to municipal wastewater facilities, illicit discharges, and leaking sewer systems in urban areas. Municipal wastewater treatment facilities are permitted through the NPDES process administered by ADEM. In urban settings, sewer lines typically run parallel to streams in the floodplain. If a leaking sewer line is present, high concentrations of bacteria can flow into the stream or leach into the groundwater. Illicit discharges are found at facilities that are discharging bacteria when not permitted, or when the pathogens criterion established in the issued NPDES permit is not being upheld.

Continuous Point Sources

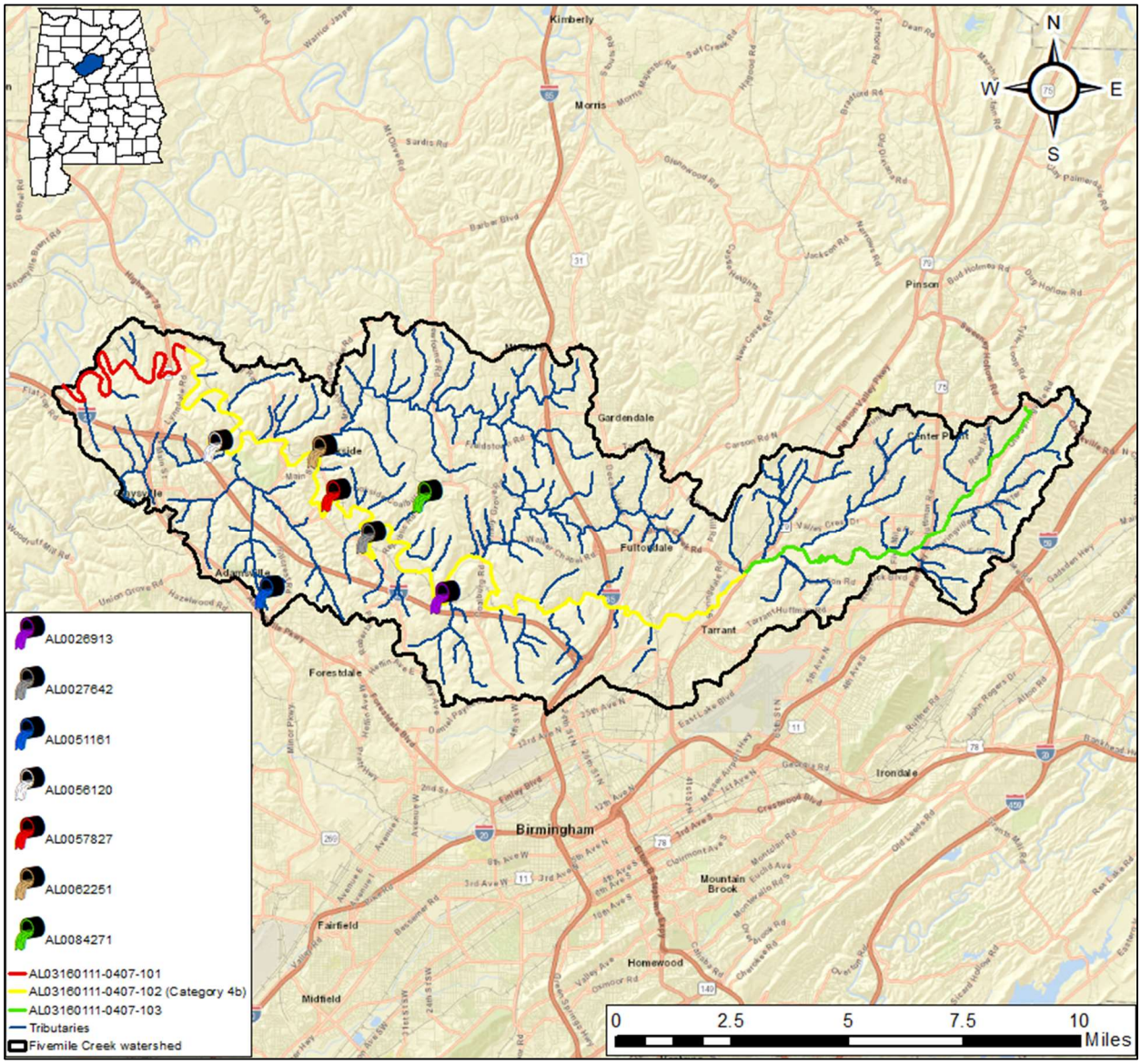
Currently, there are seven NPDES-regulated continuous point source discharges with *E. coli* limitations located within the TMDL watershed. These continuous point sources can be seen in the table and map below. None of these facilities discharge directly to the impaired segments of Fivemile Creek. These dischargers are located on a segment of Fivemile Creek (in between the two impaired segments) that is not listed as impaired for pathogens. This segment of Fivemile Creek has a use classification of Fish and Wildlife. All the noted permitted facilities have daily maximum and monthly average *E. coli* limits. The permit limits are the applicable pathogen criteria for the Fish and Wildlife use classification and are as follows:

Monthly average (May-October): 126 colonies/100ml
Monthly average (November-April): 548 colonies/100ml
Daily maximum (May-October): 298 colonies/100ml
Daily maximum (November-April): 2507 colonies/100ml

Table 5: NPDES-regulated continuous point sources in the Fivemile Creek watershed

Permit Number	Facility Name	Receiving Stream	Design Flow (MGD)
AL0026913	Five Mile Creek WRF	Fivemile Creek	30
AL0027642	Forestdale Mobile Home Park	Fivemile Creek	0.03
AL0051161	Minor Middle School Lagoon	UT to Prudes Creek	0.017
AL0056120	Prudes Creek WRF	Fivemile Creek	0.9
AL0057827	Sharon Heights Mobile Home Park	Fivemile Creek	0.03
AL0062251	Brookside Village WWTP	Newfound Creek	0.022
AL0084271	Brookside Square CWF	UT to Fivemile Creek	0.045

Figure 2: Continuous point sources in the Fivemile Creek watershed



Any future NPDES-regulated continuous discharges that are considered by the Department to be a pathogen source will be required to meet the in-stream water quality criteria for pathogens at the point of discharge.

Non-Continuous Point Sources

The Five Mile Creek WRF is also permitted through the NPDES program to discharge stormwater runoff in the Fivemile Creek watershed. The facility will be required to comply with the provisions of this TMDL through implementation of Best Management Practices (BMPs) for the permitted stormwater outfalls.

There are numerous facilities with mining, construction, and industrial (individual and general) NPDES permits located within the TMDL watershed. These facilities are not required to monitor for *E. coli* and are not considered to be a source of pathogens due to the nature of their operations. As such, no *E. coli* loading will be attributed to these facilities, nor will they receive an allocation in this TMDL.

Urban areas designated as part of the Municipal Separate Storm Sewer System (MS4) program are regulated by NPDES, and as such, are considered to be point sources by EPA and WLAs in TMDLs. The EPA defines an MS4 as *"a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):*

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law);
(ii) Designed or used for collecting or conveying stormwater;
(iii) Which is not a combined sewer; and
(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2."

During rain events in an urbanized watershed, stormwater runoff has the potential to collect pollutants which are transported through MS4 systems before discharging into state waters. Therefore, in 1990 the EPA developed the NPDES stormwater program, which promulgated rules, in two different phases, in order to address the potential negative water quality effects associated with stormwater runoff. In 1990, the EPA issued Phase I regulations under the NPDES stormwater program, which required both medium and large cities and also counties with populations of 100,000 or more to obtain NPDES permit coverage specifically for their stormwater discharges. In 1999, the second phase of the NPDES stormwater program amended existing regulations in addition to requiring NPDES permits for stormwater discharges from certain small MS4 systems.

There are six Phase I MS4 permits and two Phase II MS4 permits within the Fivemile Creek watershed. Contributions from the MS4 areas drain to the pathogen-impaired segments of Fivemile Creek and will be allocated as an MS4 WLA in the TMDL. Table 6 below lists the current MS4 permits contained within the Fivemile Creek watershed. Current and future MS4s will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation of BMPs on a case-by-case basis.

Table 6: MS4 permits in the Fivemile Creek watershed

Permit Number	Name	Phase
ALR040038	City of Graysville	II
ALR040037	City of Fultondale	II
ALS000001	Jefferson County	I
ALS000020	City of Tarrant	I
ALS000021	City of Adamsville	I
ALS000024	Town of Brookside	I
ALS000026	City of Gardendale	I
ALS000032	City of Birmingham	I

The Fivemile Creek watershed currently contains no Voluntary Animal Feeding Operations (AFOs)/Concentrated Animal Feeding Operations (CAFOs). The ADEM AFO/CAFO rules prohibit discharges of pollutants from the facilities and their associated waste land application activities. As a result, future AFOs/CAFOs will receive a waste load allocation of zero.

Any future NPDES-regulated discharges that are considered by the Department to be a pathogen source will be required to demonstrate consistency with the assumptions and requirements of this TMDL.

There are currently no registered sites in the Fivemile Creek watershed where land application of by-products for beneficial use is present. Beneficial use sites are regulated by ADEM's Land Division and are required to implement appropriate BMPs and agronomic application rates to protect the environment.

Sanitary sewer overflows (SSOs) have the potential to severely impact water quality and can often result in the violation of water quality standards. It is the responsibility of the NPDES wastewater discharger or collection system operator for non-permitted "collection only" systems to ensure that releases do not occur. Unfortunately, releases to surface waters from SSOs are not always preventable or reported. From review of ADEM files, it was found that numerous SSOs in the Fivemile Creek watershed were reported during 2019-2024. These SSOs are considered to be a source of pathogens to Fivemile Creek. The reported SSOs can be seen in Appendix 7.3.

3.2.2 Nonpoint Sources in the Fivemile Creek Watershed

Nonpoint sources of bacteria do not have a defined discharge point but rather occur over the entire length of a stream or waterbody. On the land surface, bacteria can accumulate over time and be washed into streams or waterbodies during rain events. Therefore, there is some net loading of bacteria into streams as dictated by the watershed hydrology.

Agricultural land can be a source of *E. coli* bacteria. Runoff from pastures, animal feeding areas, improper land application of animal wastes, and animals with direct access to streams are all mechanisms that can contribute bacteria to waterbodies. To account for the potential influence from animals with direct access to stream reaches in the watershed, *E. coli* loads can be calculated as a direct source into the stream.

E. coli bacteria can also originate from forested areas due to the presence of wild animals such as deer, raccoons, turkey, waterfowl, etc. Wildlife will deposit feces onto land surfaces, where it can be transported during rainfall events to nearby streams. Control of these sources is usually limited to land management BMPs and may be impracticable in most cases. As a result, forested areas are not specifically targeted in this TMDL.

E.coli loading from developed areas is potentially attributable to multiple sources including stormwater runoff, unpermitted discharges of wastewater, runoff from improper disposal of waste materials, failing septic tanks, and domestic animals. On-site septic systems may be direct or indirect sources of bacterial pollution via ground and surface waters due to system failures and malfunctions.

3.3 Land Use Assessment

Land use for the Fivemile Creek watershed was determined using ArcMap with land use datasets derived from the 2021 National Land Cover Dataset (NLCD). Figure 3 displays the land use areas within the watershed. Table 4 depicts the primary land uses in the Fivemile Creek watershed.

The major land uses in the Fivemile Creek watershed are forested/natural and developed land, which make up 55.51% and 42.94% of the total watershed area, respectively. Agricultural land (1.23%) and open water (0.32%) make up the remaining land use in the watershed.

Figure 3: Land use in the Fivemile Creek watershed

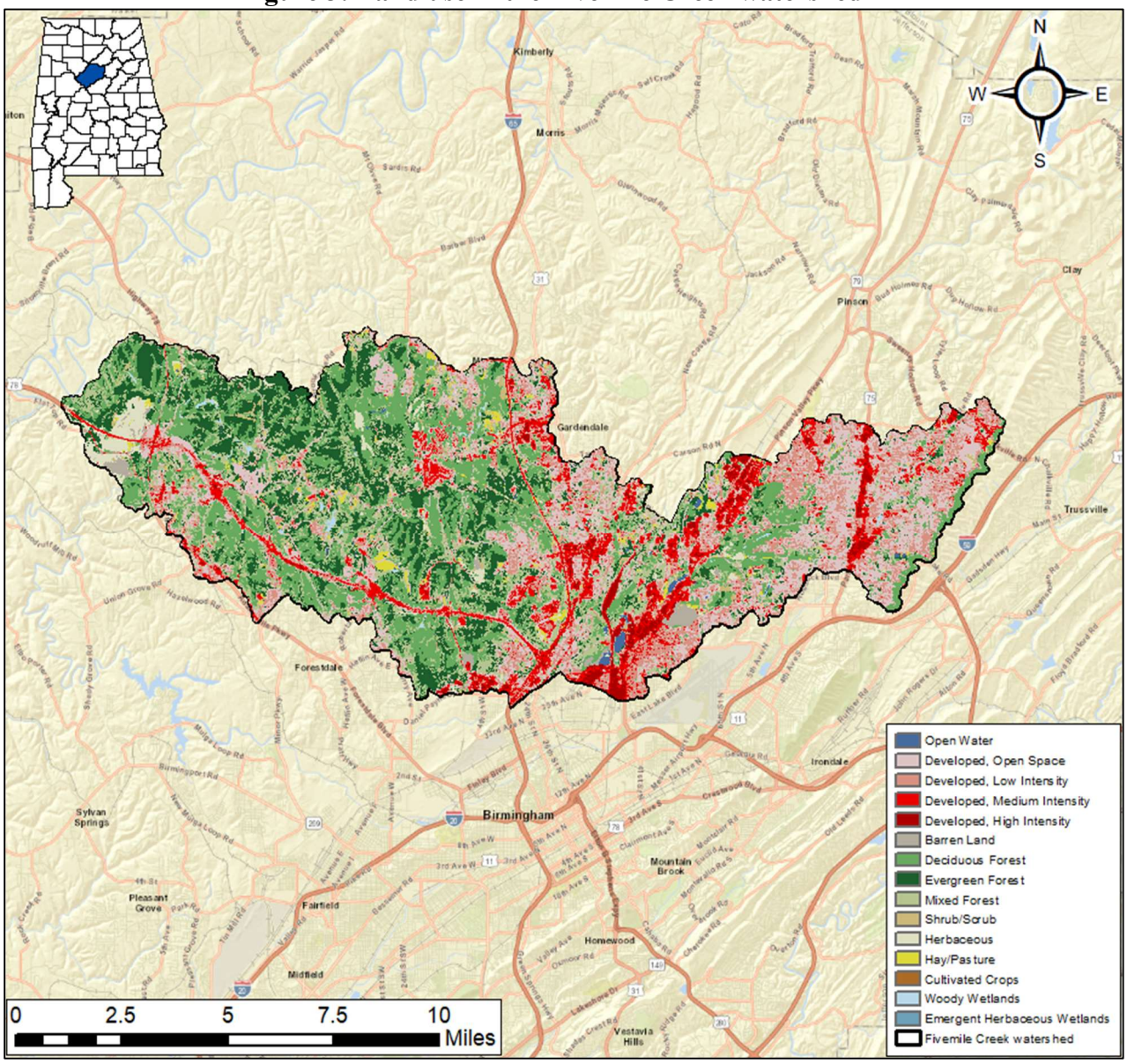
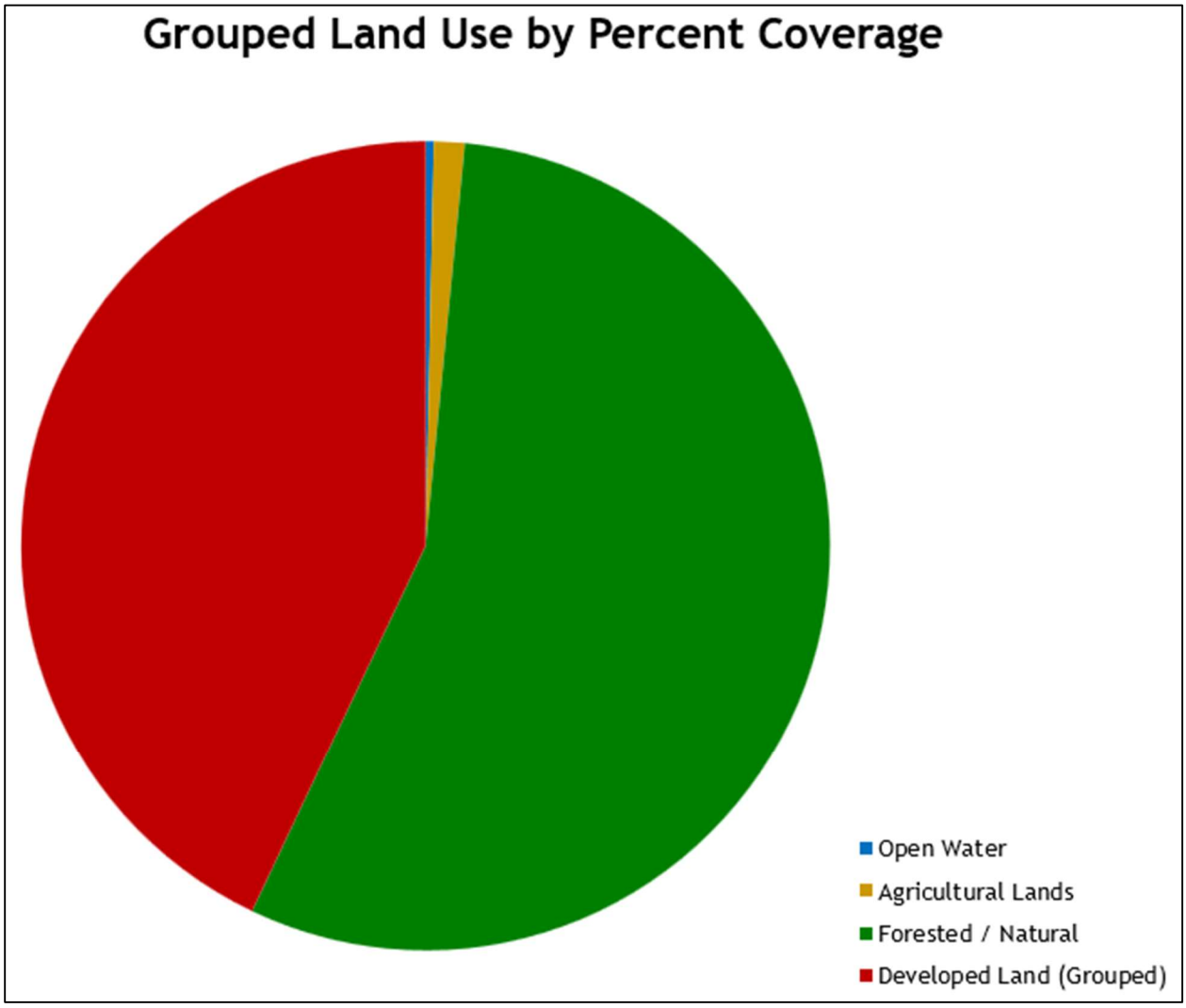


Table 7: Land use (2021) in the Fivemile Creek watershed

Land Use	Miles^2	Acres	Percent
Open Water	0.33	211.50	0.32%
Developed, Open Space	18.19	11638.81	17.75%
Developed, Low Intensity	14.35	9185.35	14.01%
Developed, Medium Intensity	7.97	5103.96	7.78%
Developed, High Intensity	2.53	1617.26	2.47%
Barren Land	0.96	611.81	0.93%
Deciduous Forest	22.99	14710.75	22.43%
Evergreen Forest	16.17	10349.81	15.78%
Mixed Forest	13.84	8855.09	13.50%
Shrub/Scrub	1.14	731.23	1.12%
Herbaceous	2.38	1522.96	2.32%
Hay/Pasture	1.25	802.40	1.22%
Cultivated Crops	0.00	3.11	0.00%
Woody Wetlands	0.35	225.51	0.34%
Emergent Herbaceous Wetlands	0.01	8.90	0.01%
Totals→	**102.47**	**655578.45**	**100.00%**
Class Description	**Miles^2**	**Acres**	**Percent**
Open Water	0.33	211.5	0.32%
Agricultural Lands	1.26	805.51	1.23%
Forested/Natural	56.88	36404.25	55.51%
Developed Land (Grouped)	44.00	28157.19	42.94%
Totals→	**102.47**	**65578.45**	**100.00%**

Figure 4: Pie graph of land use in the Fivemile Creek watershed



3.4 Linkage between Numeric Targets and Sources

The predominant land usages in the Fivemile Creek watershed are forested/natural and developed land. Pollutant loadings from forested areas tend to be low due to their filtering capabilities and will be considered as background conditions. The most probable sources of pathogen loadings within the watershed are urban runoff, collection system failures, and pasture grazing. It is not considered a logical approach to calculate individual components for nonpoint source loadings. Hence, there will not be individual loads or reductions calculated for the various nonpoint sources. The loadings and reductions will only be calculated as a single total nonpoint source load and reduction.

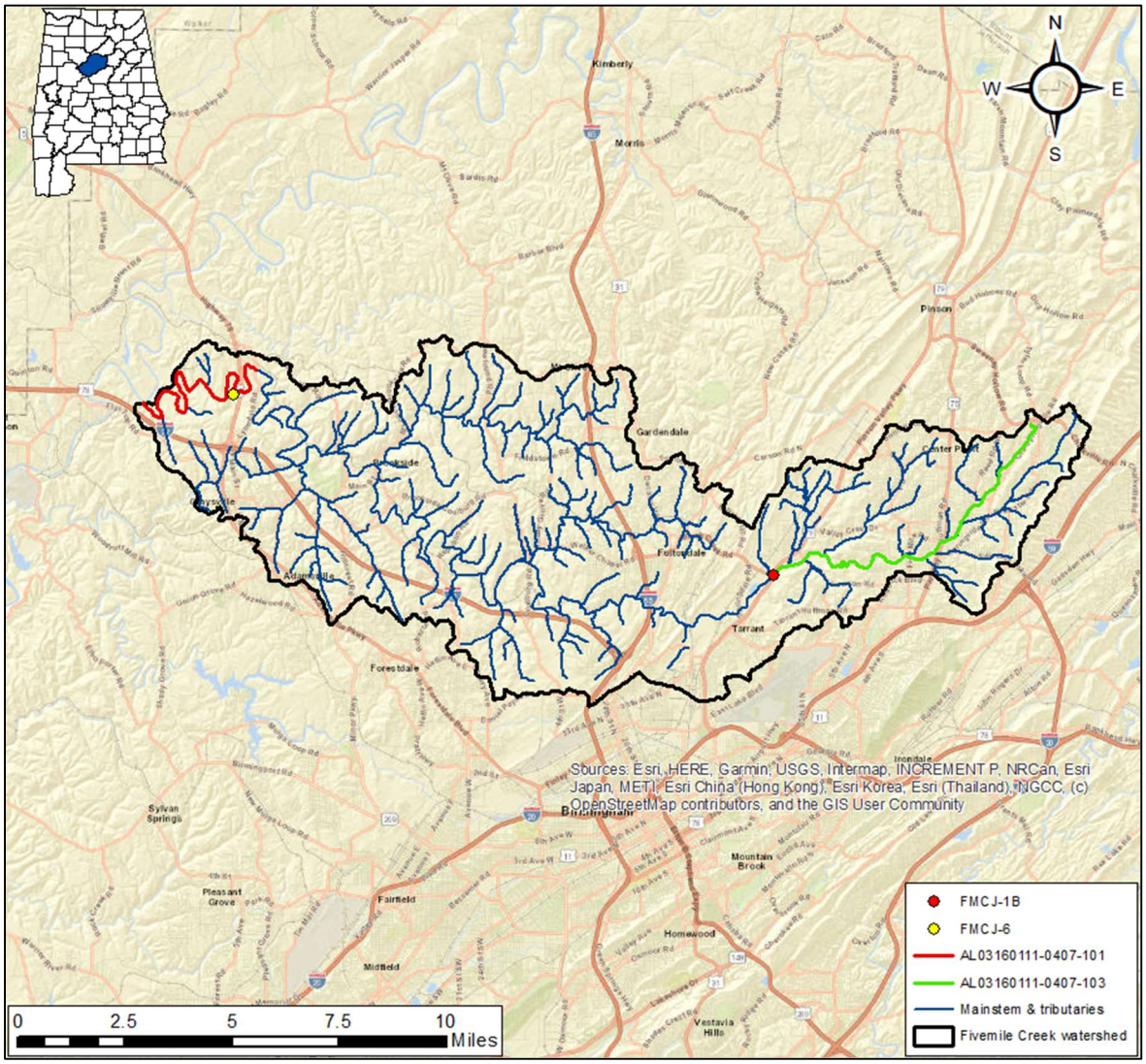
3.5 Data Availability and Analysis

During 2021 and 2024, ADEM collected data from stations FMCJ-1B and FMCJ-6 on the pathogen impaired segments of Fivemile Creek. A total of 35 *E. coli* samples were collected. There were three single sample exceedances and one geometric mean exceedance for the lower segment (AL03160111-0407-101). There was one single sample exceedance and no geometric mean exceedances for the upper segment (AL03160111-0407-103). Table 8 and Figure 5 show the location of the ADEM stations on Fivemile Creek. The 2021 and 2024 data can be seen below in Tables 9 and 10.

Table 8: ADEM sampling stations in the Fivemile Creek watershed

Station	Local Name	Latitude	Longitude
FMCJ-1B	Fivemile Creek	33.60191°	-86.75527°
FMCJ-6	Fivemile Creek	33.66341°	-86.9738°

Figure 5: ADEM sampling stations in the Fivemile Creek watershed



FMCJ-6: Sampling was conducted at station FMCJ-6 during 2021 and 2024. Single sample violations occurred on June 29, 2021, July 25, 2024, and July 29, 2024. In addition, sampling during July 2024 yielded a geometric mean violation of 438.3 col/100 ml. The geometric mean sampling event during September 2024 did not result in a geometric mean violation.

Table 9: 2024 *E. coli* data from FMCJ-6 (AL03160111-0407-101)

Visit Date	*E. coli* (col/100 mL)	*E. coli* Criterion (col/100 mL)	Geometric Mean (col/100 mL)	Geometric Mean Criterion (col/100 mL)	Flow (ft^3/s)
6/29/2021	387.3	235	-	-	131
8/30/2021	137.4	235	-	-	77.5
10/21/2021	137.6	235	-	-	109
3/14/2024	27.5	235	-	-	198
4/17/2024	29.8[J]	235	-	-	94.2
5/23/2024	39.9	235	-	-	35.3
6/13/2024	13.4	235	-	-	45
7/8/2024	75.4	235	438.3	126	50.7
7/15/2024	71.7	235			33.9
7/22/2024	218.7	235			59.3
7/25/2024	4839.2	235			232
7/29/2024	2827.2	235			446
8/22/2024	93.4	235	-	-	36.8
9/3/2024	62.4	235	65.4	126	32.5
9/9/2024	111.2	235			29.9
9/19/2024	88	235			64.1
9/23/2024	54.6	235			48.7
9/30/2024	35.9	235			46.8
10/17/2024	21.6	235	-	-	32.5

[J]Reported microbiological result is an estimate.

FMCJ-1B: Sampling was conducted at station FMCJ-1B during 2024. One single sample violation occurred on July 25, 2024, with an *E. coli* concentration at 275.5 colonies/100 ml. Geometric mean sampling in July and September 2024 yielded no geometric mean violations.

Table 10: 2024 *E. coli* data from FMCJ-1B (AL03160111-0407-103)

Visit Date	*E. coli* (col/100 mL)	*E. coli* Criterion (col/100 mL)	Geometric Mean (col/100 mL)	Geometric Mean Criterion (col/100 mL)	Flow (ft^3/s)
3/14/2024	33.1	235	-	-	25.8
4/17/2024	48.9[J]	235	-	-	15.8
5/23/2024	52.9	235	-	-	2.5
6/13/2024	37.9	235	-	-	6.9
7/8/2024	141.4	235	81.9	126	5.9
7/15/2024	30.9	235			5.2
7/22/2024	13.4	235			8.3
7/25/2024	275.5	235			24.5
7/29/2024	228.2	235			25.1
8/22/2024	66.3	235	-	-	5.6
9/3/2024	123.6	235	91.3	126	6.4
9/9/2024	93.2	235			3.4
9/19/2024	65.7	235			6.9
9/23/2024	115.3	235			6.5
9/30/2024	72.7	235			6.9
10/17/2024	114.5	235	-	-	5.1

[J]Reported microbiological result is an estimate.

3.6 Critical Conditions/Seasonal Variation

Critical conditions typically occur during the summer months (May-October). This can be explained by the nature of storm events in the summer versus the winter. In summer, periods of dry weather interspersed with thunderstorms allow for the accumulation and washing off bacteria into streams, resulting in spikes of bacteria counts. In winter, frequent low intensity rain events are more typical and do not allow for the build-up of bacteria on the land surface, resulting in a more uniform loading rate.

Fivemile Creek generally follows the trends described above for the summer months of May through October. The critical condition for this pathogen TMDL was taken to be the one with the highest *E. coli* single sample exceedance value (for each segment). For segment AL03160111-0407-103, that value was 4839.2 colonies/100ml and occurred on July 25, 2024, at FMCJ-6. For segment AL03160111-0407-101, that value was 275.5 colonies/100ml and occurred on July 25, 2024, at FMCJ-1B. The use of the highest exceedance to calculate the TMDL is expected to be protective of water quality in Fivemile Creek year-round.

3.7 Margin of Safety

There are two methods for incorporating a Margin of Safety (MOS) in the TMDL analysis: 1) by implicitly incorporating the MOS using conservative model assumptions to develop allocations, or 2) by explicitly specifying a portion of the TMDL as the MOS and using the remainder for allocations.

The MOS accounts for the uncertainty associated with the limited availability of data used in this analysis. An explicit MOS was applied to the TMDL by reducing the appropriate target criterion concentration by ten percent and calculating a mass loading target with measured or calculated flow data. The single sample *E. coli* maximum criterion of 235 colonies/100 ml was reduced by 10% to 211.5 colonies/100 ml, while the geometric mean criterion was reduced in the same fashion to 113.4 colonies/100 ml.

4.0 TMDL Development

4.1 Definition of a TMDL

A TMDL is the sum of individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS). The margin of safety can be included either explicitly or implicitly and accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. As discussed earlier, the MOS is explicit in this TMDL. A TMDL can be denoted by the equation:

$$TMDL = \Sigma\ WLAs + \Sigma\ LAs + MOS$$

The TMDL is the total amount of pollutant that can be assimilated by the receiving waterbody while achieving water quality standards under critical conditions.

For some pollutants, TMDLs are expressed on a mass loading basis (e.g., pounds per day). However, for pathogens, TMDL loads are typically expressed in terms of organism counts per day (colonies/day), in accordance with 40 CFR 130.2(i).

4.2 Load Calculations

A mass balance approach was used to calculate the *E. coli* TMDL for Fivemile Creek. The mass balance approach utilizes the conservation of mass principle. Total mass loads can be calculated by multiplying the *E. coli* concentrations times the in-stream flows times a conversion factor. Existing loads were calculated for the highest single sample exceedance and the highest geometric mean exceedance. In the same manner, allowable loads were calculated for both the single sample maximum criterion of 298 colonies/100 ml and the geometric mean criterion of 126 colonies/100 ml. There was only one exceedance of the geometric mean criterion (on the lower segment). The TMDL was based on the violation that produced the highest calculated percent reduction to achieve applicable water quality criteria. FMCJ-6 was chosen as the station representing the lower

impaired segment (AL03160111-0407-101) of Fivemile Creek. FMCJ-1B was chosen as the station representing upper impaired segment (AL03160111-0407-103) of Fivemile Creek.

Existing Conditions for Lower Segment (AL03160111-0407-101)

The **single sample** mass loading was calculated by multiplying the highest *E. coli* single sample exceedance (4839.2 colonies/100 mL) concentration by the flow on the day of the exceedance. The highest exceedance at FMCJ-6 was on July 25, 2024. A flow of 232 ft^3/s was measured at this location during the time of the exceedance. The product of the measured flow, pathogen concentration, and conversion factor gives the total mass loading (colonies per day) of *E. coli* to Fivemile Creek under the single sample exceedance condition. Below is the existing condition calculation for FMCJ-6.

$$\frac{232\ \text{ft}^3}{\text{s}} \times \frac{4839.2\ \text{colonies}}{100\ \text{mL}} \times \frac{24{,}465{,}755 * 100\ \text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.75 \times 10^{13}\ \text{colonies}}{\text{day}}$$

The **geometric mean** mass loading was calculated by multiplying the highest geometric mean exceedance concentration (438.3 colonies/100 ml) times the average of the five measured daily stream flows. This concentration was calculated based on measurements at FMCJ-6 between July 8, 2024, and July 29, 2024, and can be found above in Table 9. The average stream flow was calculated to be 164.4 ft^3/s. The product of these two values multiplied by the conversion factor gives the total mass loading (colonies per day) of *E. coli* in Fivemile Creek under the geometric mean exceedance condition.

$$\frac{164.4\ ft^3}{s} \times \frac{438.3\ colonies}{100\ ml} \times \frac{24{,}465{,}755 * 100\ ml * s}{ft^3 * day} = \frac{1.76 \times 10^{12} colonies}{day}$$

The **continuous point sources** mass loading was calculated by taking the average discharge flow from the month of July 2024 (since this is when the highest exceedance occurred) and multiplying that by the reported maximum daily *E. coli* value for the same month for each applicable facility. These numbers were found in the July 2024 DMRs submitted by the facilities.

Five Mile Creek WRF (AL0026913):

$$10.3\ MGD \times \frac{1.55\ ft^3}{s * MGD} \times \frac{60\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{2.34 \times 10^{10} colonies}{day}$$

Forestdale Mobile Home Park (AL0027642):

$$0\ MGD \times \frac{1.55\ ft^3}{s * MGD} \times \frac{0\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{0\ colonies}{day}$$

Minor Middle School Lagoon (AL0051161):

$$0\ MGD\ \times \frac{1.55\ ft^3}{s * MGD} \times \frac{0\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{0\ colonies}{day}$$

Prudes Creek WRF (AL0056120):

$$0.26\ MGD\ \times \frac{1.55\ ft^3}{s * MGD} \times \frac{0\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{0\ colonies}{day}$$

Sharon Heights Mobile Home Park (AL0057827):

$$0\ MGD\ \times \frac{1.55\ ft^3}{s * MGD} \times \frac{0\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{0\ colonies}{day}$$

Brookside Village WWTP (AL0062251):

$$0.0023\ MGD\ \times \frac{1.55\ ft^3}{s * MGD} \times \frac{2\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{1.74 \times 10^5 colonies}{day}$$

Brookside Square CWF (AL0084271):

$$0\ MGD\ \times \frac{1.55\ ft^3}{s * MGD} \times \frac{0\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{0\ colonies}{day}$$

Allowable Conditions for Lower Segment (AL03160111-0407-101)

The **allowable load** to the watershed was calculated under the same physical conditions as discussed above for the single sample and geometric mean criteria. This was done by taking the product of the flow and the allowable concentration. This value was then multiplied by the conversion factor to calculate the allowable load for Fivemile Creek. These calculations can be seen below.

For the **single sample** *E. coli* target concentration of 211.5 colonies/100 ml, the allowable *E. coli* loading is:

$$\frac{232\ ft^3}{s} \times \frac{211.5\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{1.20 \times 10^{12}\ colonies}{day}$$

The explicit margin of safety of 23.5 colonies/100 ml equals a daily loading of:

$$\frac{232\ ft^3}{s} \times \frac{23.5\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{1.33 \times 10^{11}\ colonies}{day}$$

For the **geometric mean** *E. coli* target concentration of 113.4 colonies/100 ml, the allowable *E. coli* loading is:

$$\frac{164.4\ ft^3}{s} \times \frac{113.4\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{4.56 \times 10^{11}\ colonies}{day}$$

The explicit margin of safety of 23.5 colonies/100 ml equals a daily loading of:

$$\frac{164.4\ ft^3}{s} \times \frac{12.6\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{5.07 \times 10^{10}\ colonies}{day}$$

The WLA portion of this TMDL was calculated by multiplying the design flow of each facility by the applicable in-stream single sample *E. coli* criterion. This value was then multiplied by a conversion factor to come up with the appropriate loading. The calculations for all 9 continuous point sources from Table 5 can be seen below.

Five Mile Creek WRF (AL0026913):

$$30\ MGD\ \times \frac{1.55\ ft^3}{s * MGD} \times \frac{298\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{3.39 \times 10^{11} colonies}{day}$$

Forestdale Mobile Home Park (AL0027642):

$$0.03\ MGD\ \times \frac{1.55\ ft^3}{s * MGD} \times \frac{298\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{3.39 \times 10^{8} colonies}{day}$$

Minor Middle School Lagoon (AL0051161):

$$0.017\ MGD \times \frac{1.55\ ft^3}{s * MGD} \times \frac{298\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{1.92 \times 10^{8} colonies}{day}$$

Prudes Creek WRF (AL0056120):

$$0.9\ MGD\ \times \frac{1.55\ ft^3}{s * MGD} \times \frac{298\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{1.02 \times 10^{10} colonies}{day}$$

Sharon Heights Mobile Home Park (AL0057827):

$$0.03\ MGD \times \frac{1.55\ ft^3}{s * MGD} \times \frac{298\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{3.39 \times 10^{8} colonies}{day}$$

Brookside Village WWTP (AL0062251):

$$0.022\ MGD \times \frac{1.55\ ft^3}{s * MGD} \times \frac{298\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{2.49 \times 10^8 colonies}{day}$$

Brookside Square CWF (AL0084271):

$$0.045\ MGD \times \frac{1.55\ ft^3}{s * MGD} \times \frac{298\ colonies}{100\ mL}\ \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{5.09 \times 10^8 colonies}{day}$$

The difference between the existing conditions (violation event) and the allowable conditions converted to a percent reduction represents the total load reduction needed to achieve the *E. coli* water quality criteria. The TMDL for this segment was calculated as the total daily *E. coli* load to Fivemile Creek as evaluated at station FMCJ-6. Table 11 shows the existing and allowable *E. coli* loads and required reduction at this station.

Table 11: Fivemile Creek - *E. coli* loads and required reductions (FMCJ-6)

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	2.75E+13	1.20E+12	2.63E+13	96%
Geometric Mean Load	1.76E+12	4.56E+11	1.31E+12	74%
Five Mile Creek WRF (AL0026913)	2.34E+10	3.39E+11	0	0%
Forestdale Mobile Home Park (AL0027642)	0	3.39E+8	0	0%
Minor Middle School Lagoon (AL0051161)	0	1.92E+8	0	0%
Prudes Creek WRF (AL0056120)	0	1.02E+10	0	0%
Sharon Heights Mobile Home Park (AL0057827)	0	3.39E+8	0	0%
Brookside Village WWTP (AL0062251)	1.74E+5	2.49E+8	0	0%
Brookside Square CWF (AL0084271)	0	5.09E+8	0	0%

The TMDL, WLA, LA and MOS values necessary to achieve the applicable *E. coli* criteria are provided in Table 12 below.

Table 12: *E. coli* TMDL for Fivemile Creek (AL03160111-0407-101)

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	Stormwater (MS4s and other NPDES sources)[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
1.33E+12	1.33E+11	3.50E+11	96%	0	8.50E+11	96%

a. TMDL was established using the single sample criterion of 235 colonies/100ml.
b. Future CAFOs in the watershed will be assigned a waste load allocation (WLA) of zero.
c. Current and future WWTPs must meet the applicable instream water quality criteria for pathogens at the point of discharge.
d. Current and future MS4 areas and other NPDES stormwater sources will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation and maintenance of BMPs on a case-by-case basis. For the purposes of this TMDL, the 96% reduction for MS4s and other stormwater sources should not be interpreted as a numeric permit limitation.
e. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.

Existing Conditions for Upper Segment (AL03160111-0407-103)

The **single sample** mass loading was calculated by multiplying the highest *E. coli* single sample exceedance concentration (275.5 colonies/100 mL) by the flow on the day of the exceedance. The highest exceedance at FMCJ-1B was on July 25, 2024. A flow of 24.5 ft^3/s was measured at this location during the time of the exceedance. The product of the estimated flow, pathogen concentration, and conversion factor gives the total mass loading (colonies per day) of *E. coli* to Fivemile Creek under the single sample exceedance condition. Below is the existing condition calculation for FMCJ-1B.

$$\frac{24.5\ ft^3}{s} \times \frac{275.5\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{1.65 \times 10^{11}\ colonies}{day}$$

The **geometric mean** mass loading was calculated by multiplying the highest geometric mean concentration (91.3 colonies/100 ml) times the average of the five measured daily stream flows. This concentration was calculated based on measurements at FMCJ-1B between September 3, 2024, and September 30, 2024, and can be found above in Table 10. The average stream flow was calculated to be 6.0 ft^3/s. The product of these two values times the conversion factor gives the total mass loading (colonies per day) of *E. coli* in Fivemile Creek under the geometric mean condition. The calculation below does not result in a geometric mean exceedance.

$$\frac{6.0\ ft^3}{s} \times \frac{91.3\ colonies}{100\ ml} \times \frac{24{,}465{,}755 * 100\ ml * s}{ft^3 * day} = \frac{1.34 \times 10^{10} colonies}{day}$$

Allowable Conditions for Upper Segment (AL03160111-0407-103)

The **allowable load** to the watershed was calculated under the same physical conditions as discussed above for the single sample criterion and geometric mean criterion. This was done by taking the product of the flow and the allowable concentration. This value was then multiplied by the conversion factor to calculate the allowable load for Fivemile Creek. These calculations can be seen below.

For the **single sample** *E. coli* target concentration of 211.5 colonies/100 ml, the allowable *E. coli* loading is:

$$\frac{24.5\ ft^3}{s} \times \frac{211.5\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{1.27 \times 10^{11}\ colonies}{day}$$

The explicit margin of safety of 23.5 colonies/100 ml equals a daily loading of:

$$\frac{24.5\ ft^3}{s} \times \frac{23.5\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{1.41 \times 10^{10}\ colonies}{day}$$

For the **geometric mean** *E. coli* target concentration of 113.4 colonies/100 ml, the allowable *E. coli* loading is:

$$\frac{6\ ft^3}{s} \times \frac{113.4\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{1.66 \times 10^{10}\ colonies}{day}$$

The explicit margin of safety of 23.5 colonies/100 ml equals a daily loading of:

$$\frac{6\ ft^3}{s} \times \frac{12.6\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{1.85 \times 10^{9}\ colonies}{day}$$

The difference between the existing conditions (violation event) and the allowable conditions converted to a percent reduction represents the total load reduction needed to achieve the *E. coli* water quality criteria. The TMDL was calculated as the total daily *E. coli* load to Fivemile Creek as evaluated at station FMCJ-1B. Table 13 shows the existing and allowable *E. coli* loads and required reduction at this station.

Table 13: Fivemile Creek - *E. coli* loads and required reductions (FMCJ-1B)

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	1.65E+11	1.27E+11	3.84E+10	23%
Geometric Mean Load	1.34E+10	1.66E+10	0	0%

The TMDL, WLA, LA and MOS values necessary to achieve the applicable *E. coli* criteria are provided in Table 14 below.

Table 14: *E. coli* TMDL for Fivemile Creek (AL03160111-0407-103)

TMDL[a]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[b]			Load Allocation (LA)	
		WWTPs[c]	Stormwater (MS4s and other NPDES sources)[d]	Leaking Collection Systems[e]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
1.41E+11	1.41E+10	NA	23%	0	1.27E+11	23%

NA = Not Applicable

a. TMDL was established using the single sample criterion of 235 colonies/100ml.

b. Future CAFOs in the watershed will be assigned a waste load allocation (WLA) of zero.

c. Future WWTPs must meet the applicable instream water quality criteria for pathogens at the point of discharge.

d. Current and future MS4 areas and other NPDES stormwater sources will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation and maintenance of BMPs on a case-by-case basis. For the purposes of this TMDL, the 23% reduction for MS4s and other stormwater sources should not be interpreted as a numeric permit limitation.

e. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.

4.3 TMDL Summary

Two segments of Fivemile Creek, AL03160111-0407-103 and AL03160111-0407-101, were placed on Alabama's §303(d) list for pathogens in 2018 and 2022, respectively, based on data collected during 2013-2019. Additional data collected by ADEM during 2021 and 2024 confirmed the pathogen impairment and provided the basis for TMDL development.

A mass balance approach was used to calculate the *E. coli* TMDL for Fivemile Creek. Based on the TMDL analysis, it was determined that *E. coli* reductions of 96% for AL03160111-0407-101 (lower segment) and 23% for AL03160111-0407-103 (upper segment) are necessary to achieve compliance with applicable water quality standards.

Compliance with the terms and conditions of existing and future NPDES sanitary and storm water permits will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL.

Required load reductions in the LA portion of this TMDL will be implemented through voluntary measures/best management practices (BMPs). Cooperation and active participation by the general public and various other groups is critical to successful implementation of TMDLs. Local citizen-led and implemented management measures offer the most efficient and comprehensive avenue for reduction of loading rates from nonpoint sources. Therefore, TMDL implementation activities

for nonpoint sources will be coordinated through interaction with local entities and may be eligible for CWA §319 grants through the Department's Nonpoint Source Unit.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria, and we are committed to targeting the load reductions to improve water quality in the Fivemile Creek watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL accordingly.

5.0 Follow-up Monitoring

ADEM has adopted a basin approach to water quality monitoring, an approach that divides Alabama's sixteen major river basins into three groups. Each year, ADEM's water quality resources are concentrated in one of the three basin groups and are divided among multiple priorities including §303(d) listed waterbodies, waterbodies with active TMDLs, and other waterbodies as determined by the Department. Monitoring will help further characterize water quality conditions resulting from the implementation of best management practices and load reductions in the watershed. This monitoring will occur in each basin according the schedule shown in Table 15.

Table 15: Follow-up monitoring schedule

River Basin Group	Years to be Monitored
Coosa, Escatawpa, Tennessee (Guntersville), Tombigbee	2025/2028
Alabama, Cahaba, Mobile, Tallapoosa, Tennessee (Bear and Pickwick)	2026/2029
Black Warrior, Blackwater, Chattahoochee, Chipola, Choctawhatchee, Escambia, Perdido, Tennessee (Wheeler and Elk), Yellow	2027/2030

6.0 Public Participation

As part of the public participation process, this TMDL will be placed on public notice and made available for review and comment. The public notice and subject TMDL will be made available on ADEM's website: www.adem.alabama.gov. In addition, the public notice will be submitted to persons who have requested to be on ADEM's postal and electronic mailing distributions. The public may also request paper or electronic copies of the TMDL by contacting Ms. Kimberly Minton at 334-271-7826 or kminton@adem.alabama.gov. The public will be given an opportunity to review the TMDL and submit comments to the Department in writing. At the end of the public review period, all written comments received during the public notice period will become part of the administrative record. ADEM will consider all comments received by the public prior to final completion of this TMDL and subsequent submission to EPA Region 4 for final approval.

7.0 Appendices

7.1 References

ADEM Administrative Code, 2021. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2021. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's Monitoring Program. 2013-2019, 2021, 2024. ADEM.

Alabama Department of Environmental Management (ADEM), *Alabama's Water Quality Assessment and Listing Methodology*, January 2024.

Alabama's §303(d) Lists and Fact Sheets. 2018-2024. ADEM.

Alabama Department of Environmental Management (ADEM) Laboratory QA Manual, Chapter 3: Definitions, January 24, 2022.

United States Environmental Protection Agency, 1991. Guidance for Water Quality-Based Decisions: The TMDL Process. Office of Water. EPA 440/4-91-001.

United States Environmental Protection Agency, 1986. Quality Criteria for Water. Office of Water. EPA 440/4-91-001.

7.2 Water Quality Data

Table 16: 2015-2019 *E. coli* listing data from station FMCJ-6

Activity Date	Flow (ft^3/s)	E. coli (col/100 mL)
6/18/2015	36.2	33.6
8/13/2015	40.2	39.9
10/22/2015	29	38.9
6/16/2016	-	770.1
8/11/2016	43.5	53
10/18/2016	35.3	57.6
6/15/2017	115.6	44.3
8/10/2017	201.1	613.1
10/17/2017	72.9	90.9
6/26/2018	137.2	296.6
8/16/2018	40.7	34.5
10/16/2018	32.6	150
6/11/2019	74.1	81.3
8/21/2019	32.8	18.5
10/9/2019	46.2	111.2

Table 17: 2013-2017 *E. coli* listing data from station FMCJ-1B

Activity Date	Flow (ft^3/s)	E. coli (col/100 mL)
5/14/2013	36	260.3
7/16/2013	16	93.3
9/11/2013	14	235.9
5/13/2014	21	156.5
9/9/2014	8.3	257.7
5/19/2015	15	119.8
7/21/2015	9.4	104.6
9/24/2015	6.9	275.5
5/17/2016	13	104.3
7/19/2016	10	275.5
9/20/2016	-	214.3

7.3 Sanitary Sewer Overflows (SSOs) in the Fivemile Creek Watershed

Table 18: SSOs from Village Creek WRF (AL0023647)

SSO Began	Estimated Release Volume (gallons)	Duration (hours)
4/3/2019	299	1
2/6/2020	0	0
4/13/2020	2079	4
7/10/2020	754	5
7/17/2020	0	1
9/9/2020	7600	4
6/19/2021	134865	60
10/7/2021	711360	90
6/8/2022	46200	51
8/11/2022	5320	3
3/3/2023	120	2
3/12/2023	1750	1
4/29/2024	500	0
5/13/2024	5675	19

Table 19: SSOs from Valley Creek WRF (AL0023655)

SSO Began	Estimated Release Volume (gallons)	Duration (hours)
12/12/2021	0	2
1/8/2024	0	2

Table 20: SSOs from Five Mile Creek WRF (AL0026913)

SSO Began	Estimated Release Volume (gallons)	Duration (hours)
1/2/19	270	1
1/3/19	79710	46
1/4/19	26569	48
1/4/19	255405	46
1/14/19	2816	23
1/14/19	2816	23
1/17/19	1328	21
1/17/19	1122	0
1/23/19	609940	41
1/23/19	79875	19
1/23/19	459532	23
2/21/19	1190621	102
2/22/19	743879	91
2/22/19	481085	72
2/22/19	20000	3
3/3/19	472337	24
3/3/19	326608	31
3/15/19	10400	2
3/28/19	142	2
4/1/19	2625	2
4/3/19	299	1
4/14/19	246	3
4/14/19	329014	16
4/19/19	1146443	85
4/22/19	810	2
4/23/19	7000	1
4/29/19	16830	5
5/2/19	375	2
6/3/19	15	2
6/18/19	35380	3
6/27/19	2	0
8/20/19	1305	22
8/28/19	1558	2
10/22/19	0	1
11/1/19	13	1
11/20/19	90	0
12/5/19	137	2
12/16/19	4180	2
1/7/20	38070	25
1/12/20	9487	5
2/3/20	79	1

SSO Began	Estimated Release Volume (gallons)	Duration (hours)
2/5/20	70	2
2/6/20	43758	21
2/6/20	168500	28
2/6/20	0	0
2/10/20	0	0
2/11/20	3771	7
2/11/20	138774	23
2/12/20	507826	38
2/28/20	1008	2
3/11/20	479	1
3/18/20	270	4
3/19/20	780	1
3/21/20	12754	19
4/3/20	1	4
4/13/20	4956	25
4/13/20	2079	4
4/15/20	497	9
4/20/20	34584	4
4/30/20	122	1
6/12/20	233	1
6/17/20	50	1
7/10/20	754	5
7/13/20	90	2
7/17/20	0	1
8/25/20	0	0
9/9/20	7600	4
9/15/20	5439	3
9/16/20	63600	1
10/5/20	150	1
10/11/20	6700	5
10/19/20	936	2
10/25/20	7	1
11/27/20	399	3
12/12/20	16	1
2/5/21	78	2
2/18/21	602	5
3/12/21	850	2
3/18/21	73710	23
3/18/21	504	8
3/24/21	13588	3
3/26/21	200000	0
3/26/21	240010	22

SSO Began	Estimated Release Volume (gallons)	Duration (hours)
4/4/21	756	2
4/4/21	567	1
4/6/21	15604	1
4/13/21	150	2
4/24/21	50	3
5/13/21	1053	2
6/7/21	273	2
6/7/21	2812	1
6/19/21	0	0
6/19/21	134865	60
6/21/21	1053	2
7/9/21	139	2
7/12/21	196	3
7/22/21	378	1
7/30/21	0	5
8/4/21	250	1
8/31/21	15300	2
9/20/21	7578	10
9/27/21	157	1
10/5/21	10260	17
10/7/21	711360	90
12/12/21	11900	2
12/12/21	0	2
12/27/21	10600	2
1/13/22	4825	3
1/17/22	71100	12
1/18/22	42428	17
1/25/22	2525	2
1/29/22	1500	21
2/7/22	55	1
2/8/22	18630	6
2/22/22	207	1
2/24/22	14000	2
3/1/22	675	1
3/7/22	423	2
3/16/22	546	9
4/19/22	945	14
6/8/22	46200	51
6/8/22	3000	2
6/17/22	2	2
7/1/22	1250	4
8/5/22	100	2

SSO Began	Estimated Release Volume (gallons)	Duration (hours)
8/11/22	5320	3
8/25/22	3255	4
9/21/22	40900	7
9/27/22	918	2
10/20/22	340	6
11/3/22	25	1
11/16/22	114	2
12/30/22	756	2
1/4/23	172744	10
2/17/23	500	3
3/3/23	120	2
3/12/23	1750	1
5/1/23	31232	2
5/10/23	3	1
5/25/23	366	7
6/19/23	10	30
6/19/23	0	20
6/26/23	1845	3
6/28/23	60024	5
7/3/23	95	2
7/12/23	15	2
8/1/23	5	0
9/12/23	41371	1
9/15/23	25000	0
9/27/23	1320	24
10/5/23	187	12
10/19/23	321	2
1/8/24	738	2
1/8/24	0	2
1/25/24	100	2
1/25/24	180	3
2/1/24	60	2
2/8/24	990	2
2/12/24	7808	28
2/12/24	14045	13
2/15/24	2059	3
3/8/24	500	1
3/25/24	1325	1
4/29/24	500	0
5/2/24	158.2	4
5/3/24	393	6
5/13/24	9234	3

SSO Began	Estimated Release Volume (gallons)	Duration (hours)
5/13/24	5675	19
6/14/24	49800	6
6/17/24	5940	2
7/10/24	110554	6

Table 21: SSOs from Forestdale Mobile Home Park (AL0027642)

SSO Began	Estimated Release Volume (gallons)	Duration (hours)
6/19/2023	10	30
6/19/2023	≤1000	20

Table 22: SSOs from Prudes Creek WRF (AL0056120)

SSO Began	Estimated Release Volume (gallons)	Duration (hours)
6/3/2019	15	2
2/11/2020	3771	7
12/27/2021	10600	2
4/19/2022	945	14

Table 23: SSOs from Brookside Village WWTP (AL0062251)

SSO Began	Estimated Release Volume (gallons)	Duration (hours)
6/8/22	3000	2

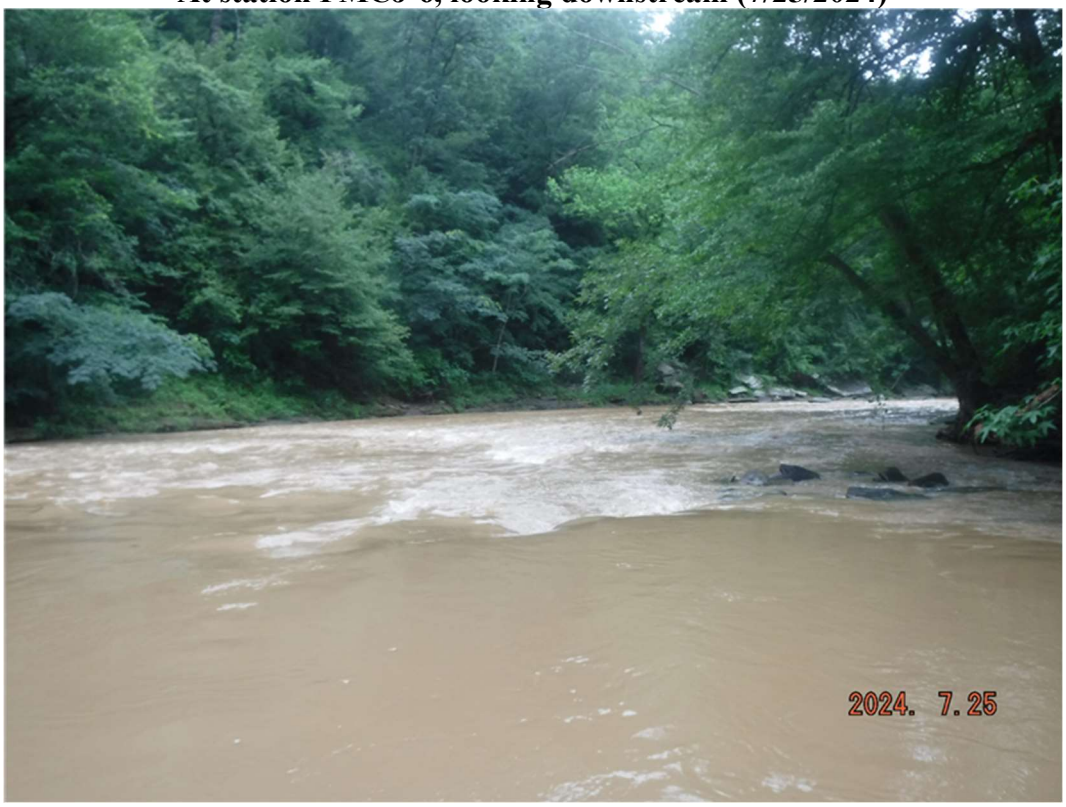
7.4 Fivemile Creek Photographs

At station FMCJ-6, looking upstream (6/16/2016)

At station FMCJ-6, looking downstream (6/16/2016)

At station FMCJ-6, looking upstream (7/25/2024)

At station FMCJ-6, looking downstream (7/25/2024)



At station FMCJ-1B, looking upstream (09/11/2013)

At station FMCJ-1B, looking downstream (09/11/2013)

At station FMCJ-1B, looking upstream (07/25/2024)

At station FMCJ-1B, looking downstream (07/25/2024)