Alabama Department of Environmental Management

Draft

Total Maximum Daily Load (TMDL) for Unnamed Tributary to Jackson Lake 3-C Assessment Unit ID # AL03140103-0102-700

Pathogens (E. coli)

Alabama Department of Environmental Management
Water Quality Branch
Water Division
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Figure 1: Unnamed Tributary to Jackson Lake 3-C Watershed

Contents

1.0 Executive Summary

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 Total Maximum Daily Load (TMDL) for pollutants causing the use impairment. A TMDL is the sum of individual waste load allocations for point sources (WLAs), load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS).

Unnamed Tributary to Jackson Lake 3-C (UT3-C) is on the §303(d) list for pathogens from Lake Frank Jackson to its source. UT3-C forms in Covington County and is included in the Perdido-Escambia River Basin. UT3-C flows southeast for approximately 1.05 miles until it empties into Lake Frank Jackson. The total drainage area for the UT3-C watershed is 0.56 square miles. Pursuant to ADEM Administrative Code Rule 335-6-11-.01(5), the primary use classification for UT3-C is considered to be Fish & Wildlife.

UT3-C was first listed on the §303(d) list in 1998 based on data collected in 1996 and 1997 by the Geological Survey of Alabama (GSA) which indicated the stream was impaired for fecal coliform. UT3-C was initially sampled in 1996 and was found to exceed the fecal coliform water quality criterion. UT3-C was subsequently sampled in 2004, 2006, 2007, and 2009 for fecal coliform, but the pathogen indicator was changed in December 2009 to Escherichia coli (E. coli). Due to this change, the creek was sampled in 2011 for E. coli, which will be the basis for this TMDL.

In 2011, §303(d) sampling studies were performed by ADEM on UT3-C to further assess the water quality of the impaired stream. For purposes of this TMDL, the 2011 data will be used to assess the water quality of UT3-C because it is the most current data and provides the best picture of the current water quality conditions of the stream. The January 2011 edition of ***Alabama's Water Quality Assessment and Listing Methodology*** section 4.8.2, prepared by ADEM, provides the rationale for the Department to use the most recent data to prepare a TMDL for an impaired waterbody when that data indicates a change in water quality has occurred. Also, as a result of the Alabama Environmental Management Commission's (EMC) adoption of the Escherichia coli (E. coli) criteria as the new bacterial indicator, this TMDL will be developed from E. coli data collected at station 3-C in 2011; even though the 1996-1997 data that prompted the listing of UT3-C was based on the fecal coliform criteria. The 2011 bacterial data is listed in 7.2 Appendix B for reference along with the 1996-1998 Fecal Coliform Data. ADEM collected 15 samples from UT3-C in 2011. According to the data collected in 2011, UT3-C was not meeting the pathogen criterion applicable to its use classification of Fish and Wildlife. Therefore, a TMDL will be developed for pathogens (E. coli) for UT3-C.

A mass balance approach was used for calculating the pathogen TMDL for UT3-C. The mass balance approach utilizes the conservation of mass principle. Existing loads were calculated by multiplying the E. coli concentrations times the respective in-stream flows and a conversion factor. The mass loading was calculated using the geometric mean sample exceedance event,

since in this case it was determined that the only sample violation was the geomean violation which occurred with the samples collected between June 30, 2011 and July 28, 2011. This violation calls for a reduction of 30%. In the same manner as existing loads were calculated, an allowable load was calculated for the geomean E. coli criterion of 113 colonies/100 ml (126 colonies/100 ml – 10% Margin of Safety).

The existing pathogen loading for this TMDL was calculated using the geometric mean sample exceedance concentration of 161.5 colonies/100 ml that was collected by ADEM in June and July of 2011. When these five samples were taken the flow was only sufficient to register on the meter two times. An average of these two flows, 0.0297 cfs, was utilized to determine the loading in this TMDL. The estimate was necessary due to flow on most of the sampling visits being described as "visible but not measurable by meter".

Table 1 is a summary of the estimated existing load, allowable load, and percent reduction for the geometric mean criterion. Table 2 lists the TMDL defined as the maximum allowable E. coli loading under critical conditions (June-September) for UT3-C. Using critical conditions for the TMDL development will ensure that water quality is maintained throughout the year.

Table 1: 2010 E. coli Loads and Required Reductions

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Nonpoint Source Load Geometric Mean	1.17×10^8	8.25×10^7	3.46×10^7	30%

Table 2: E. coli TMDL for UT3-C

TMDL	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)
9.16×10^7	9.16×10^6	NA	NA	0	8.25×10^6	30%

a. There are no CAFOs in the UT3-C watershed which discharge into the stream UT3-C. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. Future WWTPs must meet the applicable in-stream water quality criteria for E. coli at the point of discharge.
c. NA = not applicable, no regulated MS4 areas. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of zero 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.
e. TMDL was established using the geomean sample criterion of 126 colonies/100ml.

Compliance with the terms and conditions of existing and future 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 towards targeting the load reductions to improve water quality in the UT3-C 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 Total Maximum Daily Load (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 the 1.05 mile reach of UT3-C as impaired for pathogens. The §303(d) listing was originally reported on Alabama's 1998 List of Impaired Waters based on GSA data collected in 1996 and 1997 and included on subsequent lists. The source of the impairment is listed on the 2010 §303(d) list as pasture grazing and feedlots.

2.2 Problem Definition

Waterbody Impaired:	**Unnamed Tributary to Jackson Lake 3-C**
Impaired Reach Length:	**1.05 miles**
Impaired Drainage Area:	**0.56 square miles**
Water Quality Standard Violation:	**Pathogens (Geometric Mean, E. coli)**
Pollutant of Concern:	**Pathogens (E.coli)**
Water Use Classification:	**Fish and Wildlife**

Usage Related to Classification:

The impaired stream segment is classified as Fish and Wildlife (F&W). Usage of waters in this classification is 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, and any other usage except for swimming and water-contact sports or as a source of water supply for drinking or food-processing purposes.

(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 and recreation during June through September, 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 places and will be considered satisfactory for swimming and other whole body water-contact sports.

E. coli Criterion:

Criterion for acceptable bacteria levels for the F&W use classification is 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 recreation during June through September, 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 487 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.

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

On December 11, 2009, the Alabama EMC adopted the E. coli criteria as the bacterial indicator to assess the levels of bacteria in freshwater. Prior to the adoption of the E. coli criteria, the fecal coliform criteria were used by ADEM as the bacterial indicator for freshwater. The E. coli criteria was recommended by the EPA as a better correlation to swimming and incidental water contact associated health effects than fecal coliform in the 1986 publication ***Quality Criteria for Water***, (EPA 440/5-86-001). As a result of this bacterial indicator change, this TMDL will be developed from E. coli data collected at station 3-C in 2011; even though the 1996-1997 data that prompted the listing of UT3-C was based on the fecal coliform criteria.

For the purpose of this TMDL a geomean maximum E. coli target of 113.4 colonies/100 ml will be used. This target was derived by using a 10% explicit margin of safety from the geomean sample maximum of 126 colonies/100 ml criterion. This target is considered protective of water quality standards and should not allow the geometric mean criterion of 126 colonies/100 ml (June-September F&W criteria) to be exceeded.

3.2 Source Assessment

3.2.1 Point Sources in the UT3-C Watershed

A point source can be defined as a discernable, 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 National Pollutant Discharge Elimination System (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 E. coli can flow into the stream or leach into the groundwater. Illicit discharges are found at facilities that are discharging E. coli bacteria when not permitted, or when E. coli criterion established in the issued NPDES permit is not being upheld.

Continuous Point Sources

There are currently no NPDES permitted facilities in the UT3-C watershed. Any future NPDES regulated 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

Currently, there are no Municipal Separate Stormwater Sewer System (MS4) areas located within the UT3-C watershed. Future NPDES regulated stormwater discharges will be required to demonstrate consistency with the assumptions and requirements of this TMDL.

3.2.2 Nonpoint Sources in the UT3-C Watershed

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

Due to the absence of major point sources in the UT3-C watershed, nonpoint sources are believed to be the primary source of E. coli bacteria. Land use in this watershed is primarily agriculture and forest. Approximate land use proportions are 39% agricultural, 23% forested, and 6% developed, with the remaining 32% being spread among open water, shrub/scrub, and herbaceous.

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 is all mechanisms that can contribute E. coli bacteria to waterbodies.

E. coli bacteria can also originate from forested areas due to the presence of wild animals such as deer, raccoons, turkey, waterfowl, etc. The wildlife deposit feces onto the land surface, 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 urban areas is potentially attributable to multiple sources including storm water runoff, unpermitted discharges of wastewater, runoff from improper disposal of waste materials, failing septic tanks, and domestic animals. On-site septic systems are common in unincorporated portions of the watershed and 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 UT3-C watershed was determined using ArcMap with land use datasets derived from the 2006 National Land Cover Dataset (NLCD). Figure 2 depicts the land use areas for the UT3-C watershed. Table 3 summarizes the primary land uses in the UT3-C watershed.

The majority of the UT3-C watershed is split among forests and agriculture at 23% and 39% respectively. The remaining land use being approximately 6% developed, 13% open water, and 19% shrub/scrub and herbaceous. Developed land primarily consists of a chicken farm located within the watershed. A further break down of the agricultural land use reveals that about 96% of

the agricultural land is pasture/hay both of which can be utilized for cattle grazing during certain periods throughout the year and, in turn, contribute to pathogen run-off into streams if proper BMPs are not employed. It is not known if there are any on-site septic systems within the UT3-C watershed. On-site septic systems are common in unincorporated areas and may be direct or indirect sources of bacterial pollution via ground and surface waters due to system failures and malfunctions.

Table 3: Land Use in the UT3-C Watershed

Land Use	**Percent**
Open Water	12.6%
Developed Open Space	6.4%
Deciduous Forest	5.6%
Evergreen Forest	9.1%
Mixed Forest	8.6%
Shrub/Scrub	10.2%
Herbaceous	8.5%
Pasture/Hay	37.2%
Cultivated Crops	1.7%
Total	**100%**
Cumulative Land Use	
Developed	6.4%
Forested	23.3%
Agriculture	38.9%
Other	31.4%
Total	**100.00%**

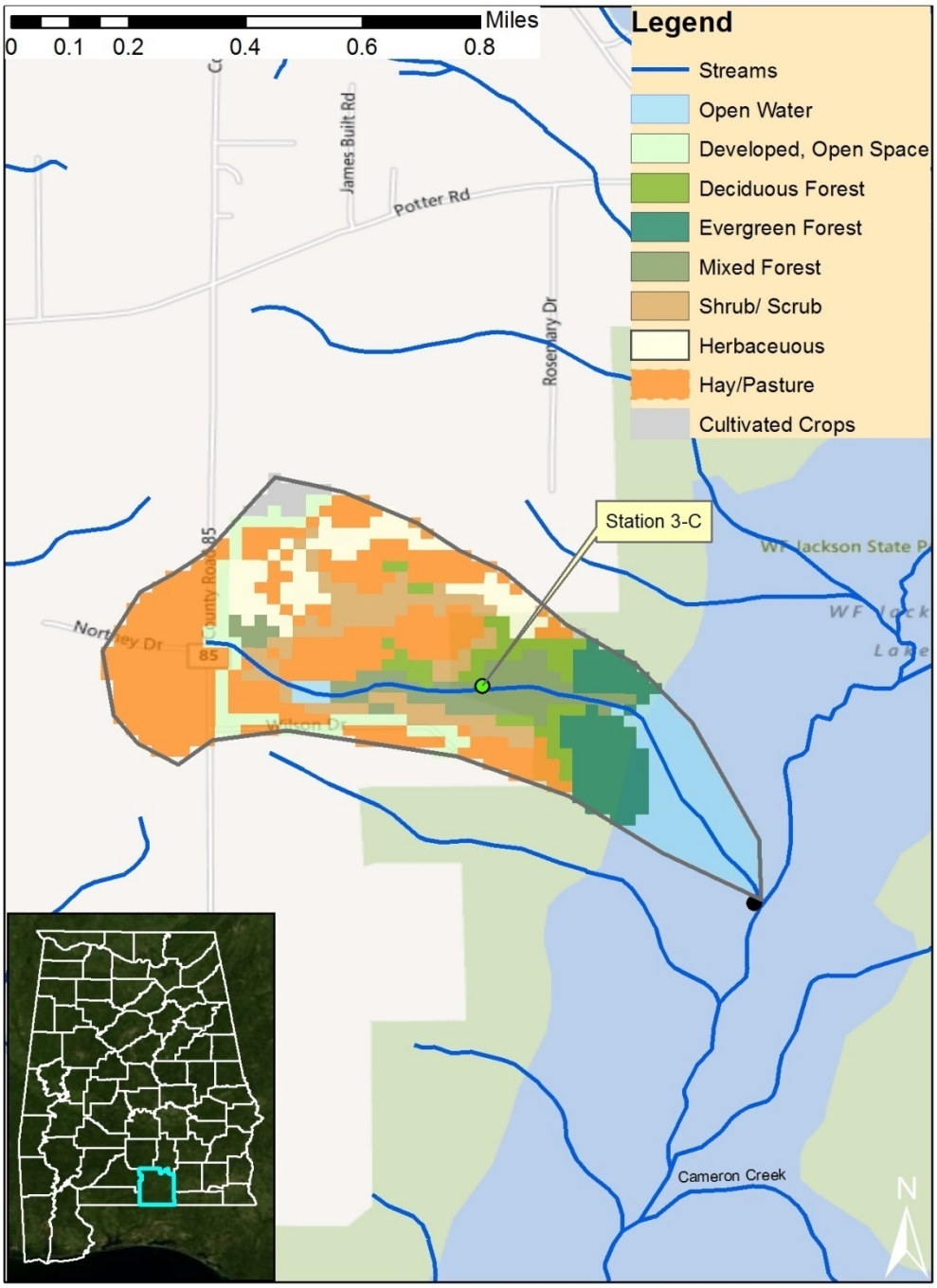

Figure 2: Land Use for the UT3-C Watershed

3.3.1 Linkage between Numeric Targets and Sources

The UT3-C watershed has three main land uses, namely agriculture, forest, and open water. Pollutant loadings from forested areas tend to be low due to their filtering capabilities and will be considered as background conditions. The most likely sources of pathogen loadings in the UT3-C watershed are from the agricultural land uses and failing septic systems. 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.

3.3.2 Data Availability and Analysis

ADEM collected water quality data for UT3-C at one station along the impaired water body in 2011, from which 15 samples were collected. Of the 15 samples, there were no single sample violations and one geometric mean violation. The geometric mean criterion for E. coli, 126 colonies/100 ml for summer months, was exceeded. This exceedance occurred between June and July of 2011. A geometric mean of 161.5 colonies/100 ml was recorded at the station,

Table 4: E. coli Geometric Mean Violations on UT3-C

Station	Violation	E.coli col/100ml	Date Range
C-3	GEOMETRIC MEAN =	161.5	6/30/2011-7/28/2011

Figure 3: ADEM Sampling Station on UT3-C

3.4 Critical Conditions

Summer months (June-September) are generally considered critical conditions. 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 of E. coli bacteria into streams resulting in spikes of E. coli bacteria counts. In winter, frequent low intensity rain events are more typical and do not allow for the build-up of E. coli bacteria on the land surface, resulting in a more uniform loading rate.

The UT3-C watershed generally follows the trends described above for the summer months of June through September. The critical condition for this pathogen TMDL was taken to be the one with the geomean exceedance violation. The geomean exceedance value was 161.5 colonies/100 ml and occurred in samples taken between June 20, 2011 and July 28, 2011, at station 3-C. Of the five samples taken, flows were only measurable on two occasions. Those flow values were 0.0111cfs on June 30, 2011 and 0.0482cfs on July 28, 2011. These two flow values were averaged together to give a flow value of 0.02965cfs, which was used as a basis for further calculations.

3.5 Margin of Safety

There are two methods for incorporating a Margin of Safety (MOS) in the TMDL analysis: 1) implicitly incorporate 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.

Both an explicit and implicit MOS was incorporated into this TMDL. The MOS accounts for the uncertainty associated with the limited availability of E. coli data used in this analysis. An explicit MOS was applied to the TMDL by reducing the E. coli target geometric mean criterion concentration by ten percent and calculating a mass loading target with measured flow data. An implicit MOS was also incorporated in the TMDL by basing the existing condition on the highest measured E. coli concentration that was collected during critical conditions.

4.0 TMDL Development

4.1 Definition of a TMDL

A total maximum daily load (TMDL) is the sum of individual waste load allocations for point sources (WLAs), 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 = □ WLAs + □□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 UT3-C. The mass balance approach utilizes the conservation of mass principle. Total mass loads can be calculated by multiplying the E. coli concentration and the estimated in-stream flow together. The existing load was calculated using the geomean value that caused the violation. This violation was a geometric mean exceedance. In the same manner, the allowable load was calculated for the geomean criterion of 126 colonies/100 ml. The June-July, 2011 geomean violation has been the only recorded violation for the waterbody, since E. coli was designated as the pathogen indicator species. As such it was used as the basis for calculating the percent reduction for this TMDL.

Existing Conditions

The **geomean** mass loading was calculated by multiplying the five E. coli sample results from June-July 2011 by each other, and taking that result to the one fifth power. The geomean was then multiplied by the estimated flow of 0.0297cfs. The product of these two values times the conversion factor gives the total mass loading (colonies per day) of E. coli to UT3-C under the geomean exceedance condition.

$$Geomean\_concentration = (152.9 * 214.2 * 224.7 * 77.1 * 193.5)^{\frac{1}{5}} = 161.5$$

$$Average\_Flow = \frac{0.0111cfs + 0.0482cfs}{2} = 0.0297cfs$$

$$ExistingLoad = \frac{0.0297\,ft^3}{s} * \frac{161.5colonies}{100ml} * \frac{24465755 * 100ml * s}{ft^3 * day} = \frac{1.17 * 10^8 colonies}{day}$$

Allowable Conditions

The **allowable load** to the watershed was calculated under the same physical conditions as discussed above for the geomean criterion. This is done by taking the product of the estimated flow and the allowable concentration. This value is then multiplied by the conversion factor to calculate the allowable load.

For the **geomean** E. coli concentration of 126 colonies/100 ml, the allowable E. coli loading is:

$$TMDL = \frac{0.0297\,ft^3}{s} * \frac{126 colonies}{100 ml} * \frac{24465755 * 100 ml * s}{ft^3 * day} = \frac{9.16 * 10^7\, colonies}{day}$$

The explicit margin of safety of 12.6 colonies/100 ml equals a daily loading of:

$$MOS = \frac{0.0297\,ft^3}{s} * \frac{12.6 colonies}{100 ml} * \frac{24465755 * 100 ml * s}{ft^3 * day} = \frac{9.16 * 10^6\, colonies}{day}$$

The difference in the pathogen loading between the existing condition (violation event) and the allowable condition converted to a percent reduction represents the total load reduction needed to achieve the E. coli water quality criterion. The TMDL was calculated as the total daily E. coli load to UT3-C as evaluated at station C-3. Table 5 shows the result of the E. coli TMDL and percent reduction for the geomean criterion.

Table 5: E. coli Load and Required Reduction

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Nonpoint Source Load Geometric Mean	$1.17x10^8$	$8.25x10^7$	$3.46x10^7$	30%
Point Source Load[a]	0	0	0	0%

a. No point sources were identified in the applicable watershed.

From Table 5, compliance with the geomean sample criterion maximum of 126 colonies/100 ml requires a reduction in the E. coli load of 29.5%. The TMDL, WLA, LA and MOS values necessary to achieve the applicable E. coli criterion are provided in Table 6 below.

Table 6: E. coli TMDL for UT3-C

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)
$9.16x10^7$	$9.16x10^6$	NA	NA	0	$8.25x10^7$	30%

a. There are no CAFOs in the UT3-C watershed which discharge into the stream UT3-C. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. Future WWTPs must meet the applicable in-stream water quality criteria for E. coli at the point of discharge.
c. NA = not applicable, no regulated MS4 areas. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of zero 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.
e. TMDL was established using the geomean sample criterion of 126 colonies/100ml.

4.3 TMDL Summary

UT3-C was placed on Alabama's §303(d) list in 1998 based on data collected by GSA in 1996 and 1997. In 2011, ADEM collected additional water quality data using the newly adopted pathogen impairment criteria, with E. coli serving as the primary pathogen indicator. The data collected by ADEM in 2011 confirmed the pathogen impairment and provided the basis for TMDL development.

A mass balance approach was used to calculate the E. coli TMDL for UT3-C. Based on the TMDL analysis, it was determined that a 30% reduction in E. coli loading was necessary to achieve compliance with applicable water quality standards.

Compliance with the terms and conditions of existing and future NPDES sanitary and stormwater 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 towards targeting the load reductions to improve water quality in the UT3-C 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 management; an approach that divides Alabama's fourteen major river basins into five groups. Each year, ADEM's water quality resources are concentrated in one of the five basin groups. One goal is to continue to monitor §303(d) listed waters. Monitoring will help further characterize water quality conditions resulting from the implementation of best management practices in the watershed. This monitoring will occur in each basin according the schedule shown in Table 7.

Table 7: 303(d) Follow Up Monitoring Schedule

River Basin Group	Year to be Monitored
Black Warrior/Cahaba	2012
Chattahoochee / Chipola / Choctawhatchee / Perdido-Escambia	2013
Tennessee	2014
Alabama / Coosa / Tallapoosa	2015
Escatawpa / Mobile / Lower Tombigbee / Upper Tombigbee	2016

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 will be prepared and published in the four major daily newspapers in Montgomery, Huntsville, Birmingham, and Mobile, as well as submitted to persons who have requested to be on ADEM's postal and electronic mailing distributions. In addition, the public notice and subject TMDL will be made available on ADEM's Website: www.adem.state.al.us. The public can also request paper or electronic copies of the TMDL by contacting Mr. Chris Johnson at 334-271-7827 or cljohnson@adem.state.al.us. 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 Appendix A: References

ADEM Administrative Code, 2010. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2010. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's §303(d) Monitoring Program. 2002, 2006 & 2010. ADEM.

Alabama Department of Environmental Management (ADEM), Alabama's Water Quality Assessment and Listing Methodology, January 2010.

Alabama Department of Environmental Management, 2006 §303(d) List and Fact Sheet. ADEM.

Alabama Department of Environmental Management (ADEM) Laboratory QA Manual, Chapter 5, Table 5-2: ADEM Laboratory Qualifier Codes and, June 13, 2005.

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 Appendix B: ADEM and GSA Water Quality Data

Table 8: GSA Water Quality Data 1996-1998

Station	Date	Fecal Coli., #/100 ml	Geometric Mean, #/100 ml
3-C	04/04/96	280	
3-C	04/11/96	160	
3-C	04/16/96	2,300	
3-C	04/24/96	600	
3-C	05/02/96	280	444
3-C	05/08/96	1,260	600
3-C	05/16/96	260	661
3-C	05/22/96	215	412
3-C	05/29/96	1,240	476
3-C	06/13/96	381	
3-C	06/20/96	1,040	
3-C	06/27/96	1,440	
3-C	07/02/96	690	
3-C	07/10/96	440	704
3-C	07/17/96	380	704
3-C	07/25/96	2,200	818
3-C	08/01/96	1,380	811
3-C	08/08/96	2,100	1013
3-C	08/14/96	1,140	1225
3-C	08/22/96	2,900	1840
3-C	08/29/96	1,820	1771
3-C	04/08/97	630	
3-C	04/14/97	97	
3-C	04/22/97	360	
3-C	04/30/97	410	
3-C	05/07/97	100	246
3-C	05/13/97	183	192
3-C	05/22/97	143	208
3-C	05/29/97	4,100	338
3-C	06/04/97	210	296
3-C	06/11/97	2,800	575
3-C	06/18/97	1,600	888
3-C	06/25/97	730	1230

Station	Date	Fecal Coli., #/100 ml	Geometric Mean, #/100 ml
3-C	07/02/97	610	840
3-C	07/10/97	910	1127
3-C	07/17/97	890	896
3-C	07/22/97	4300	1092
3-C	07/30/97	890	1136
3-C	08/06/97	1,320	1325
3-C	08/13/97	710	1261
3-C	08/20/97	1900	1468
3-C	08/28/97	610	993
3-C	04/21/98	550	
3-C	04/29/98	350	
3-C	05/06/98	720	
3-C	05/13/98	610	
3-C	05/21/98	110	392
3-C	05/27/98	200	321
3-C	06/03/98	270	304
3-C	06/08/98	53	181
3-C	06/23/98	270	
3-C	06/29/98	140	
3-C	07/08/98	260	
3-C	07/14/98	4000	
3-C	07/22/98	940	517
3-C	07/28/98	220	496
3-C	08/04/98	183	524
3-C	08/11/98	610	621
3-C	08/19/98	810	451
3-C	08/26/98	370	374
3-C	08/31/98	440	430

Individual Sample	Geometric Mean
Number of Measurements: 61 Number >2000 colonies/100 ml.: 8 Percent >2000 colonies/100 ml.: 13.1%	Number of Measurements: 41 Number >200 colonies/100 ml.: 39 Percent >200 colonies/100 ml.: 95.1%

Table 9: 2011 E. coli Data for Station 3-C

Station ID	Visit Date	E Coli (col/100ml)	Geomean (col/100ml)	Flow (cfs)	Season
3-C	3/24/2011	178.5		0.0523	Winter
3-C	4/14/2011	275.5		0.021	Winter
3-C	5/2/2011	98.7			Summer
3-C	6/13/2011	115.3			Summer
3-C	6/30/2011	152.9		0.0111	Summer
3-C	7/11/2011	214.2			Summer
3-C	7/18/2011	224.7			Summer
3-C	7/25/2011	77.1			Summer
3-C	7/28/2011	193.5	161.5	0.0482	Summer
3-C	8/18/2011	56.3			Summer
3-C	8/24/2011	86			Summer
3-C	8/25/2011	88.4	91.4		Summer
3-C	9/8/2011	58.8			Summer
3-C	9/15/2011	145.5	81.1		Summer
3-C	10/5/2011	98.7			Summer

Designated Use

	OAW	PWS		S	SH	F&W		LWF	A&I
		Summer	Winter			Summer	Winter		
Geometric Mean, cfu/100 ml	126	126	548	126	126	126	548	548	700
Single Sample Max, cfu/100 ml	235	487	2507	235	235	487	2507	2507	3200

7.3 Appendix C: UT3-C Watershed Photos

Station 3-C looking upstream. CPR & Ruth Young. 4/14/11.

Station 3-C looking downstream. CPR & Ruth Young. 4/14/11.

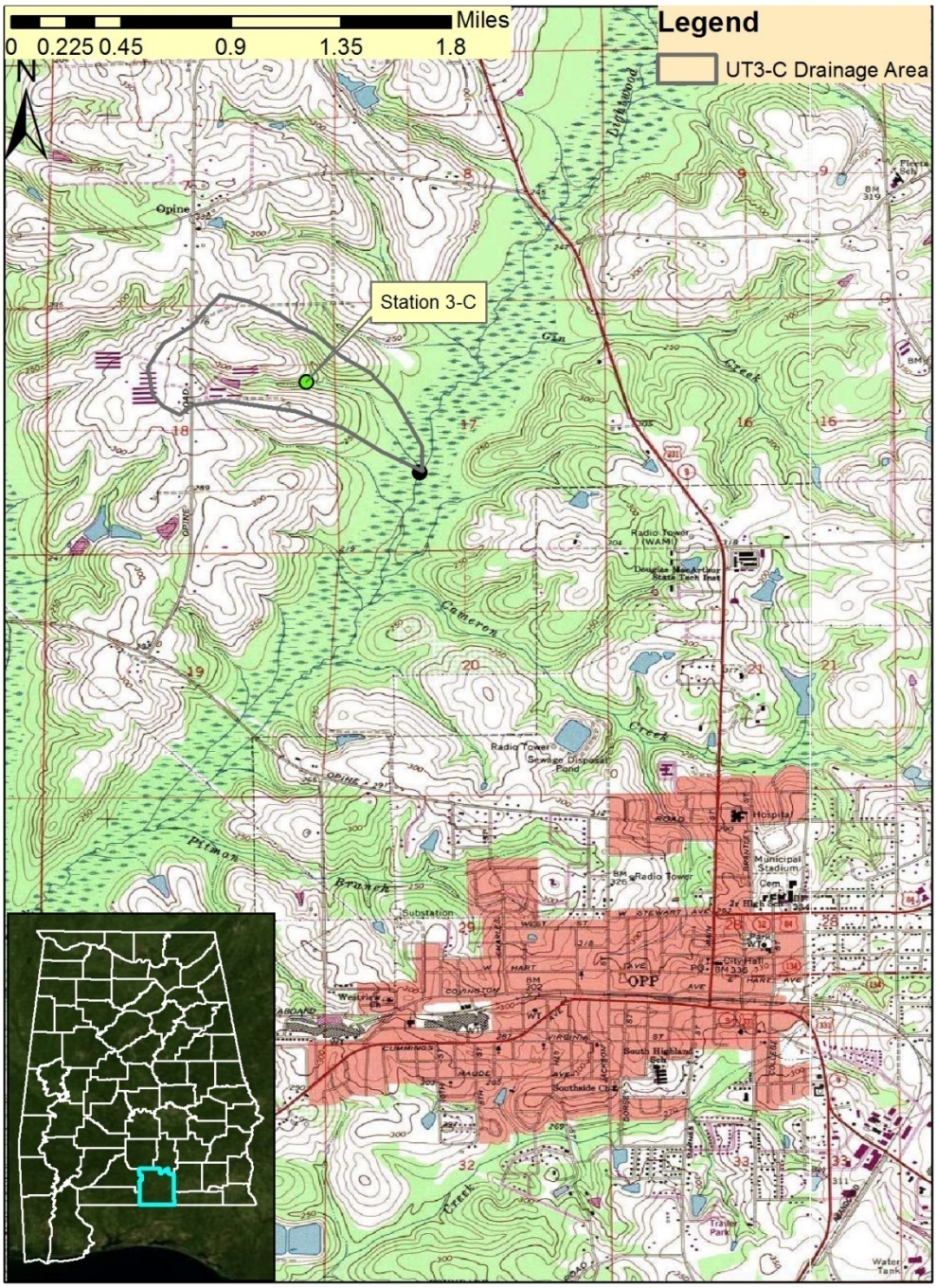

Figure 4: Topographic Map