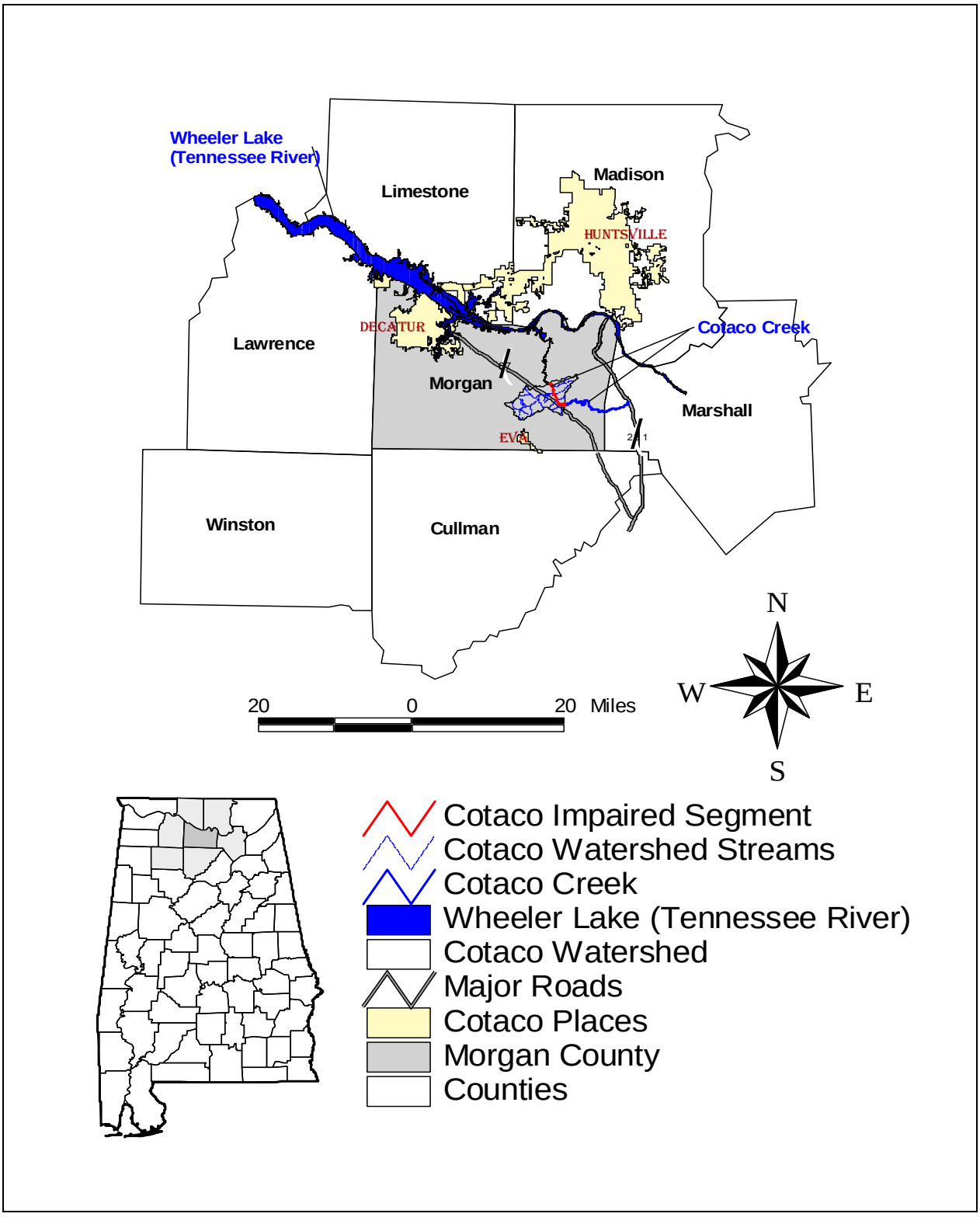
FINAL

Total Maximum Daily Load (TMDL)
For
Cotaco Creek
Assessment Unit ID # AL06030002-0603-102
Pathogens (fecal coliform)

Alabama Department of Environmental Management
Water Quality Branch
Water Division
September 2008

Figure 1-1. Listed Portion of Cotaco Creek in the Tennessee River Basin



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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 wasteload allocations for point sources (WLAs), load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS).

Cotaco Creek is on the §303(d) list for pathogens (fecal coliform) from Guyer Branch to West Fork Cotaco Creek. Cotaco Creek forms in southeast Morgan county, in the Tennessee River Basin. Cotaco Creek flows into Wheeler Lake on the Tennessee River. The total length of Cotaco Creek is 33.58 miles, of which 5.38 miles are on the §303(d) list. The total drainage area of Cotaco Creek is 243 square miles, of which 27 square miles drain to the impaired segment. Cotaco Creek has a use classification of Swimming (S) and Fish & Wildlife (F&W).

Data collected in 1997 by the Tennessee Valley Authority (TVA) indicated Cotaco Creek was impaired for pathogens (fecal coliform). The data was collected from station 264702 and can be found in Appendix B, Table 7.1.

In 2003, a §303(d) sampling study was performed by ADEM on Cotaco Creek for additional water quality assessment. ADEM collected 30 samples from Cotaco Creek in 2003. According to the data collected in 2003, Cotaco Creek was not meeting the pathogen criterion applicable to its use classification of Swimming and Fish and Wildlife. Therefore, a TMDL will be developed for pathogens on the listed reach.

A mass balance approach was used for calculating the pathogen TMDL for Cotaco Creek. The mass balance approach utilizes the conservation of mass principle. Loads are calculated by multiplying the fecal coliform concentrations times respective instream flows. The current (impaired) pathogen loading for this TMDL was calculated using a geometric mean exceedance concentration times the average flow of the five samples. The target loading, defined as the geometric mean criterion including a margin of safety, was calculated using the same average flow value times the fecal coliform geometric mean target of 180 col/100 mL (200 col/100 mL – 10% Margin of Safety). Reductions to meet the target loading were then calculated by subtracting the target loading from the current loading.

Table 1.1 is a summary of estimated current loads and target loads required to meet the applicable water quality pathogen geometric mean criterion for Cotaco Creek. Table 1.2 lists the TMDL (maximum allowable) pathogen loadings under critical conditions (summer months) for Cotaco Creek.

Table 1-1. Current and Target Fecal Coliform Loads and Required Reductions

Source	Current Load (col/day)	Target Load (col/day)	Required Reduction (col/day)	Reduction %
NPS load	2.89E+12	5.47E+11	2.34E+12	81%
Point Source	0.00E+00	0.00E+00	0.00E+00	0%

Table 1-2. Fecal Coliform TMDL for Cotaco Creek

TMDL = WLA + LA + MOS			
TMDL	**WLA**	**LA**	**MOS**
(col/day)	(col/day)	(col/day)	(col/day)
6.08E+11	0.00E+00	5.47E+11	6.08E+10

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 instream 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 5.38 miles of Cotaco Creek as impaired for pathogens. The §303(d) listing was originally reported on Alabama's 1998 List of Impaired Waters based on TVA data collected in 1997.

2.2 Problem Definition

Waterbody Impaired:	Cotaco Creek from Guyer Branch to West Fork Cotaco Creek
Impaired Reach Length:	5.38 miles
Impaired Drainage Area:	27 square miles
Water Quality Standard Violation:	Fecal Coliform
Pollutant of Concern:	Pathogens (fecal coliform)
Water Use Classification:	Swimming/Fish and Wildlife

Usage related to classification:
The impaired stream segment, Cotaco Creek, is classified as Swimming/Fish and Wildlife. Usage of waters in the classification Swimming 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 places 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.*
>
> ** **NOTE**: In assigning this classification to waters intended for swimming and water-contact sports, the Commission will take into consideration the relative proximity of discharges of wastes and will recognize the potential hazards involved in locating swimming areas close to waste discharges. The Commission will not assign this classification to waters, the bacterial quality of which is dependent upon adequate disinfection of waste and where the interruption of such treatment would render the water unsafe for bathing.*

Fecal Coliform Criteria:
Criteria for acceptable bacteria levels for the Swimming use classification are described in ADEM Admin. Code R. 335-6-10-09(3)(c)6(i),(ii), and (iii) as follows:

> *(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 fecal coliform organism density does not exceed 200 col/100 ml in non-coastal waters. In coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 col/100 ml nor exceed a maximum of 104 col/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.

Usage of waters in the classification Fish and Wildlife 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.

Fecal Coliform Criteria:
Criteria for acceptable bacteria levels for the Fish and Wildlife use classification are described in ADEM Admin. Code R. 335-6-10-09(5)(e)7(i) and (ii) as follows:

(i) In non-coastal waters, bacteria of the fecal coliform group shall not exceed a geometric mean of 1,000 col/100 mL; nor exceed a maximum of 2,000 col/100 mL in any sample. In coastal waters, bacteria of the enterococci group shall not exceed a maximum of 275 col/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 fecal coliform organism density does not exceed 200 col/100 mL in non-coastal waters. In coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 col/100 mL nor exceed a maximum of 158 col/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.

Criteria Exceeded:
Water quality data collected by the Tennessee Valley Authority (TVA) in 1997 was used by ADEM for listing Cotaco Creek on Alabama's 1998 §303(d) list. At the time of the listing, waters that had less than or equal to 10% of the samples, collected over a five year period, exceed the single-sample maximum of 2000 col/100 mL (F&W criteria) or a geometric mean of 200 col/100 mL (S and summer F&W criteria) in at least five samples collected in a thirty day period are considered to comply with Alabama's water quality criteria for fecal coliform bacteria. Waters in which greater than 10% of the samples exceed the single-sample maximum of 2000 col/100 mL (F&W criteria) or a geometric mean of 200 col/100 mL (S and summer F&W criteria) in at least five samples collected in a thirty day period are considered impaired and listed for pathogens (fecal coliform) on Alabama's §303(d) list.

The TVA data used for the listing of Cotaco Creek consisted of 6 samples taken at station 264702. Two of these samples were unable to be processed due to interference and another is a duplicate. The basis for listing was a result of the single sample exceedance of 4,100 col/100 mL. This data can be viewed in Appendix B, Table 7.1.

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

For the purpose of this TMDL a geometric mean fecal coliform target of 180 col/100 mL will be used. This target was derived by using a 10% explicit margin of safety from the geometric mean of 200 col/100 mL criterion. This target is considered protective of water quality standards and should not allow the geometric mean of 200 col/100 mL (S and summer F&W criteria) or the single sample maximum of 2000 col/100 mL (F&W criteria) to be exceeded.

3.2 Source Assessment

Point Sources in the Cotaco Creek Watershed

There are no point sources in the Cotaco Creek watershed which would cause or contribute to the fecal coliform loading. Therefore, the WLA portion of the TMDL will be zero. Any new discharges to this stream must meet a monthly average discharge limit of 200 col/100 mL for fecal coliform.

Nonpoint Sources in the Cotaco Creek Watershed

Due to the absence of point sources, nonpoint sources are believed to be the primary source of fecal coliform bacteria in the Cotaco Creek watershed. Land use in this watershed is rural, consisting of 33.51% agriculture (pasture/hay and row crops) and 55.37% forested. The following are examples of how different land uses can contribute to fecal coliform bacterial loading:

- Agricultural land can be a source of fecal coliform bacteria due to runoff from pastures, animal operations, improper land application of animal wastes, and animals with access to streams. These mechanisms can significantly contribute to the loading of fecal coliform bacteria.

    - During a site visit on 5/29/2007 by ADEM personnel, the Cotaco Creek watershed was observed to have many active cattle operations.

- Fecal coliform bacteria can originate from forested areas due to the presence of wild animals such as deer, raccoons, turkeys, beavers, waterfowl, etc. Control of these sources is usually limited and may be impractical in most cases. As a result, forested areas are not specifically targeted in this TMDL.

- Leaking or failing septic systems can be another source of fecal coliform bacteria.

3.3 Land Use Assessment

Land use for the Cotaco Creek watershed was determined using ArcView with land use datasets derived from the 2001 National Land Cover Dataset (NLCD). Figure 3-1 and Table 3-1 display the land use areas for the Cotaco Creek watershed.

The Cotaco Creek watershed is clearly dominated by two land use categories. Approximately 34% of the land use is agricultural and approximately 55% of the land use is forested. Overall, approximately 89% of the watershed is used for agricultural or silvicultural purposes with only around 11% of the land use as residential, commercial, wetlands, or other uses. If not managed properly, agriculture and silviculture can have significant nonpoint source impacts.

Figure 3-1. Land Use Map for the Cotaco Creek Watershed

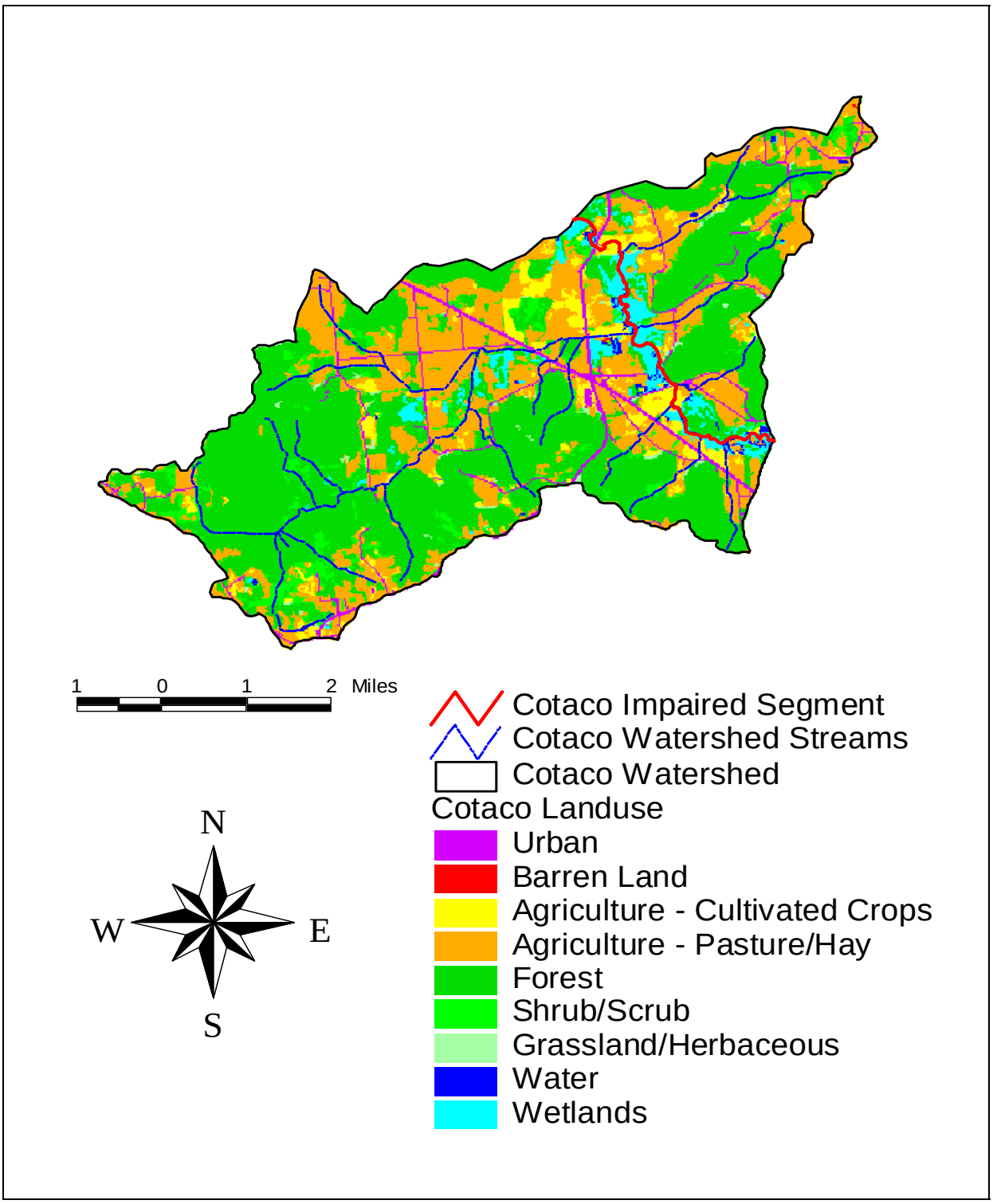

Table 3-1. Land Use Areas for the Cotaco Creek Watershed

Land Use	Acres	Sq. Miles	Percentages
Open Water	1,101	0.2	0.64
Developed, Open Space	6,414	1.0	3.71
Developed, Low Intensity	580	0.1	0.34
Developed, Medium Intensity	245	0.0	0.14
Developed, High Intensity	33	0.0	0.02
Barren Land (Rock/Sand/Clay)	42	0.0	0.02
Deciduous Forest	75,886	11.9	43.85
Evergreen Forest	6,251	1.0	3.61
Mixed Forest	6,892	1.1	3.98
Shrub/Scrub	9,447	1.5	5.46
Grassland/Herbaceous	1,394	0.2	0.81
Pasture/Hay	49,337	7.7	28.51
Cultivated Crops	8,649	1.4	5.00
Woody Wetlands	6,787	1.1	3.92
Total	**173,059**	**27.0**	**100.00**

Grouped Landuses	Acres	Sq. Miles	Percentages
Agriculture	57,986	9.1	33.51
Forest	95,817	15.0	55.37
Developed	7,272	1.1	4.20
Other	11,985	1.9	6.93
Total	**173,059**	**27.0**	**100.00**

3.4 Linkage Between Numeric Targets and Sources

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 Cotaco Creek 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 different nonpoint sources such as forest, agriculture, and septic systems. The loadings and reductions will only be calculated as a single total nonpoint source load and reduction.

3.5 Data Availability and Analysis

TVA collected monthly water quality data for Cotaco Creek at Station 264702 at Cotaco Florette Road during June through October in 1997. Of the 6 samples taken, two of these samples were unable to be processed due to interference and another is a duplicate. Of the 4 samples that provided a colony count (including one duplicate sample), the October measurement of 4,100 col/100 mL was the sample that resulted in Cotaco Creek being placed on the 1998 §303(d) list

based upon the F&W fecal coliform single sample criterion. This data can be viewed in Appendix B, Table 7.1.

ADEM collected water quality data on Cotaco Creek in 2003 as part of Alabama's §303(d) Monitoring Program at Station CTCM-26 at Cotaco Florette Road, Station CTCM-37 at Fowler Road, and Station CTCM-38 at Crawford Bottom Road. Station CTCM-38 is located just upstream of the 303(d) listed stretch of Cotaco Creek. Therefore, the data will only be used for understanding the upstream watershed conditions and not calculations in this TMDL. Figure 3-2 and Table 3-3 display locations and list descriptions for the TVA and ADEM stations. Of the fecal coliform samples collected at these stations, only one sample, at CTCM-37, violated the single sample F&W maximum criterion of 2000 col/100 mL. Of the samples that qualified for a geometric mean calculation in 2003, five months exceeded the criterion of 200 col/100 mL. The necessary flow data to calculate the TMDL could not be gathered in 2003 due to large pools or no flow. To estimate the flow data, a drainage area ratio calculation with Big Nance Creek was employed. Big Nance Creek was utilized because of flow data gathered by a real-time USGS gauge and its watershed location, characteristics, and landuse being similar to Cotaco Creek.

Figure 3-2. Map of ADEM and TVA Sampling Stations on Cotaco Creek

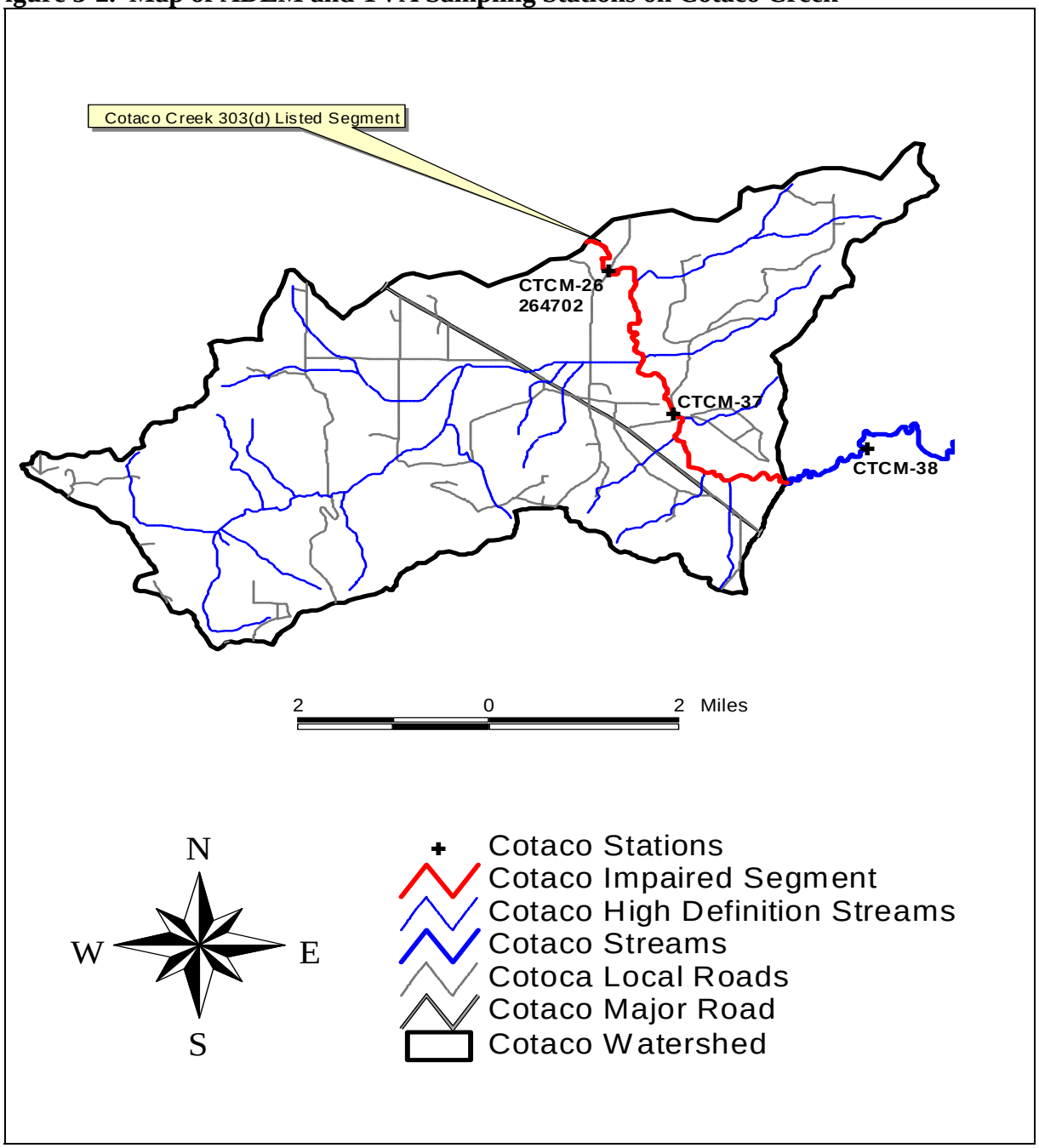

Table 3-2. Cotaco Creek Sampling Station Descriptions

Years	Station ID	Data Source	Station Location	Latitude	Longitude
1997, 2003	264702 CTCM-26	TVA ADEM	NE of Lynntown, at CR 73 (Cotaco Florette Rd)	34.43967	86.70060
2003	CTCM-37	ADEM	at CR 505 (Fowler Rd)	34.41410	86.68880
2003	CTCM-38	ADEM	Crawford Bottom Rd. (Crawford Bridge)	34.40780	86.65330

3.6 Critical Conditions

Summer months 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 fecal coliform bacteria into streams, resulting in spikes of fecal coliform bacteria counts. In winter, frequent low intensity rain events are more typical and do not allow for the build-up of fecal coliform bacteria on the land surface, resulting in a more uniform loading rate.

The data collected by ADEM in 2003 in the Cotaco Creek watershed follows this trend. The one single sample exceedance value of 3,400 col/100ml appears to be the result of an extreme rain event. The other fecal coliform concentrations have a relative uniform loading.

3.7 Margin of Safety

There are two methods for incorporating a Margin of Safety (MOS) in the 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.

An explicit MOS was incorporated in this TMDL. The explicit MOS includes the uncertainty of the fecal coliform data used in this analysis and the uncertainty of selecting an appropriate critical condition from the existing fecal coliform loads. A margin of safety was applied to the TMDL by reducing the criterion concentration by ten percent and calculating a mass loading target with measured flow data. The geometric mean criterion was reduced by ten percent to achieve the target concentration of 180 col/100 mL.

4.0 TMDL Development

4.1 Definition of a TMDL

A total maximum daily load (TMDL) is the sum of individual wasteload 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:

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

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 (col/day), in accordance with 40 CFR 130.2(i).

4.2 Load Calculations

A mass balance approach was used to calculate the pathogen TMDL for Cotaco Creek. The mass balance approach utilizes the conservation of mass principle. Total mass loads can be calculated by multiplying the fecal coliform concentration times the stream flow.

Three loads were calculated in this analysis to determine the current conditions, target conditions, and the TMDL. The first calculation represents the current load to the watershed. This was calculated by multiplying the geometric mean sample exceedance concentration of 950 col/100 mL times the estimated average flow for all five of the fecal coliform measurements of 124.2 cfs times the conversion factor. This exceedance value was chosen because it yielded the greatest reduction and is therefore the most protective of the streams use classification. The most conservative and chosen reduction percentage was 81%. Loadings and reductions were calculated using the other exceedance values and resulted in reductions of 47.1% (max = 3,400 col/100mL), 68.3% (geomean = 568 col/100mL), 48.9% (geomean = 352 col/100mL), and 29.7% (geomean = 256 col/100mL).

The second calculation represents the target loading to the watershed. This was calculated by multiplying the same flow of 124.2 cfs times the target geometric mean fecal concentration of 180 col/100 mL times the conversion factor times. The difference between the current load and the target load, converted to a percent reduction, represents the loading reduction necessary to achieve the fecal coliform water quality target under those specific flow conditions. Calculations for these two loads can be found in Table 4.1.

The third load calculation is the TMDL under critical conditions. The TMDL is the total amount of pollutant that can be assimilated by the receiving water body per day while achieving water quality standards under critical conditions. Critical conditions will be represented by the average flow of the five days that the geometric mean criterion was exceeded. The TMDL was calculated by multiplying the critical flow of 124.2 cfs times the maximum allowable fecal concentration of 200 col/100 mL times the conversion factor. This loading value represents the maximum fecal load that can be discharged from the watershed without causing a violation of the applicable geometric mean water quality criterion of 200 col/100 mL. Calculations for the TMDL are shown in Table 4.1 of the following page.

Table 4-1. Current vs. Allowable Pathogen Loadings for Cotaco Creek

Load Reduction and TMDL Calculations for Cotaco Creek

Average Flow estimated at CTCM-37 for Geometric Mean Samples:	124.2	cfs	
Geometric Mean Fecal coliform concentration measured:	950	col/100 mL	
Allowable fecal coliform geomean concentration minus MOS:	180	col/100mL	= 200 - 10%
Margin of safety for the geomean criteria	20	col/100mL	= 10% of criteria

Load Calculations:

Load = Fecal Coliform Conc * Measured Flow * Conversion Factor
Load = Colonies of Fecal Coliform/day — Measured Flow = cfs
Fecal Coliform Conc = col/100 mL — Conversion Factor = 24465755 (ml-s/ft3-day)

Current Load:

Nonpoint source load (LA)	2.89E+12	col/day	
Point source load (WLA)	0.00E+00	col/day	There are no point sources in this watershed
Current load =	2.89E+12	col/day	

Target Load:

Nonpoint source load (LA)	5.47E+11	col/day	
Point source load (WLA)	0.00E+00	col/day	There are no point sources in this watershed
Allowable load =	5.47E+11	col/day	

Margin of Safety:

MOS load =	6.08E+10	col/day

Source	Current Load (col/day)	Target Load (col/day)	Required Reduction (col/day)	Reduction %	Final Load (col/day)
LA	2.89E+12	5.47E+11	2.34E+12	81%	5.47E+11
WLA	0.00E+00	0.00E+00	0.00E+00	0%	0.00E+00
Total	2.89E+12	5.47E+11	2.34E+12	81%	5.47E+11

Total Maximum Daily Load (TMDL): TMDL = WLA + LA + MOS

TMDL	WLA	LA	MOS
6.08E+11	0.00E+00	5.47E+11	6.08E+10

Percent Reduction to Achieve the Fecal Coliform Standard:

Total reduction: 81% = (current load - allowable load) / current load

The following assumptions are made for calculating the allowable load.
The water quality criterion for fecal coliform for geometric means is 200 col/100 ml.
To account for an explicit Margin of Safety (MOS) a target concentration of 180 col/100 ml was used to calculate the allowable load compared to the geometric criterion which is 200 col/ 100 ml.

4.3 TMDL Summary

Pathogen impairment in Cotaco Creek was documented as indicated from the 1997 TVA study and the 303(d) follow up monitoring performed in 2003 by ADEM. Therefore, the TMDL is specifying an 81% reduction to non point sources, targeted primarily to the agricultural uses in the watershed.

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.

Table 5-1. 303(d) Follow Up Monitoring Schedule

River Basin Group	Year to be Monitored
Chattahoochee / Chipola / Choctawhatchee / Perdido-Escambia	2008
Tennessee	2009
Alabama / Coosa / Tallapoosa	2010
Escatawpa / Mobile / Lower Tombigbee / Upper Tombigbee	2011
Black Warrior / Cahaba	2012

6.0 Public Participation

As part of the public participation process, this TMDL was placed on public notice and made available for review and comment. The public notice was 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 distribution lists. In addition, the public notice and subject TMDL was 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 was 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 became part of the administrative record. ADEM considered all comments received by the public prior to finalization of this TMDL and subsequent submission to EPA Region 4 for final review and approval.

Appendix A
References

ADEM Administrative Code, 2005. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2004. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's 303(d) Monitoring Program. 2003. ADEM.

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Tennessee River Basin Non-Point Source Project. 1997. Tennessee Valley Authority (TVA)

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

Water Quality Report to Congress, For Calendar Years 1990-1991. Alabama Department of Environmental Management, Montgomery, Alabama, June 1996. ADEM, 1992.

Appendix B
Water Quality Data

Table 7-1. TVA Pathogen Data Collected on Cotaco Creek

Station ID	Date	Time (24hr)	Flow (cfs)	Fecal Coliform (col/100ml)
264702	06/25/97	14:00	749.0	INT
264702	07/16/97	11:00	56.0	200
264702	08/20/97	10:15	28.5	INT
264702	09/17/97	9:00	0.0	680
264702	10/22/97	8:00	121.0	4100
264702	10/22/97	8:01*		3700

*Duplicate

Table 7-2. ADEM Pathogen Data Collected on Cotaco Creek

Station ID	Date	Time (24 hr)	Flow (cfs)	Fecal Coliform (col/100ml)	Estimated Flow (cfs)
CTCM-26	6/3/2003	10:25 AM	N/A	400	135.63
CTCM-26	6/9/2003	9:45 AM	N/A	>620	216.26
CTCM-26	6/16/2003	9:50 AM	N/A	710	146.07
CTCM-26	6/19/2003	9:03 AM	N/A	1520	195.39
CTCM-26	6/25/2003	10:00 AM	N/A	220	30.35
			Geomean:	**568**	144.74
CTCM-26	8/14/2003	11:13 AM	N/A	200	559.61
CTCM-26	8/18/2003	10:00 AM	N/A	270	89.16
CTCM-26	8/20/2003	11:06 AM	N/A	310	65.45
CTCM-26	8/25/2003	11:35 AM	N/A	>620	37.94
CTCM-26	8/26/2003	11:45 AM	N/A	520	36.04
			Geomean:	**352**	157.64
CTCM-37	6/3/2003	11:00 AM	N/A	3400	116.42
CTCM-37	6/9/2003	10:00 AM	N/A	>620	185.63
CTCM-37	6/16/2003	10:10 AM	N/A	280	125.38
CTCM-37	6/19/2003	9:20 AM	N/A	1580	167.72
CTCM-37	6/25/2003	10:08 AM	N/A	830	26.05
			Geomean:	**950**	124.24
CTCM-37	8/14/2003	10:57 AM	N/A	250	480.35
CTCM-37	8/18/2003	10:15 AM	N/A	250	76.53
CTCM-37	8/20/2003	11:00 AM	N/A	1440	56.18
CTCM-37	8/25/2003	11:05 AM	N/A	92	32.57
CTCM-37	8/26/2003	11:30 AM	N/A	132	30.94
			Geomean:	**256**	135.31

(cont.) Table 7-2. ADEM Pathogen Data Collected on Cotaco Creek

Station ID	Date	Time (24 hr)	Flow (cfs)	Fecal Coliform (col/100ml)
CTCM-38	6/3/2003	11:30 AM	N/A	330
CTCM-38	6/9/2003	10:10 AM	N/A	>620
CTCM-38	6/16/2003	10:20 AM	N/A	280
CTCM-38	6/19/2003	9:25 AM	N/A	1980
CTCM-38	6/25/2003	10:30 AM	N/A	380
			Geomean:	**533**
CTCM-38	8/14/2003	10:37 AM	N/A	125
CTCM-38	8/18/2003	10:30 AM	N/A	148
CTCM-38	8/20/2003	10:47 AM	N/A	58
CTCM-38	8/25/2003	10:50 AM	N/A	52
CTCM-38	8/26/2003	11:15 AM	N/A	41
			Geomean:	**74**

*Station CTCM-38 located just upstream of impaired stretch

Table 7-3. Flow Data-Big Nance Creek USGS Gauge 03586500

Big Nance Creek	Flow (cfs)
6/1/2003	107
6/2/2003	99
6/3/2003	143
6/4/2003	212
6/5/2003	126
6/6/2003	93
6/7/2003	228
6/8/2003	873
6/9/2003	228
6/10/2003	118
6/11/2003	112
6/12/2003	316
6/13/2003	170
6/14/2003	99
6/15/2003	84
6/16/2003	154
6/17/2003	81
6/18/2003	244
6/19/2003	206
6/20/2003	117
6/21/2003	78
6/22/2003	58
6/23/2003	46
6/24/2003	37
6/25/2003	32
6/26/2003	29
6/27/2003	151
6/28/2003	453
6/29/2003	107
6/30/2003	109
8/1/2003	47

Big Nance Creek	Flow (cfs)
8/2/2003	45
8/3/2003	40
8/4/2003	42
8/5/2003	78
8/6/2003	571
8/7/2003	1140
8/8/2003	303
8/9/2003	131
8/10/2003	88
8/11/2003	71
8/12/2003	63
8/13/2003	949
8/14/2003	590
8/15/2003	242
8/16/2003	164
8/17/2003	113
8/18/2003	94
8/19/2003	83
8/20/2003	69
8/21/2003	58
8/22/2003	51
8/23/2003	46
8/24/2003	45
8/25/2003	40
8/26/2003	38
8/27/2003	37
8/28/2003	62
8/29/2003	76
8/30/2003	46
8/31/2003	37