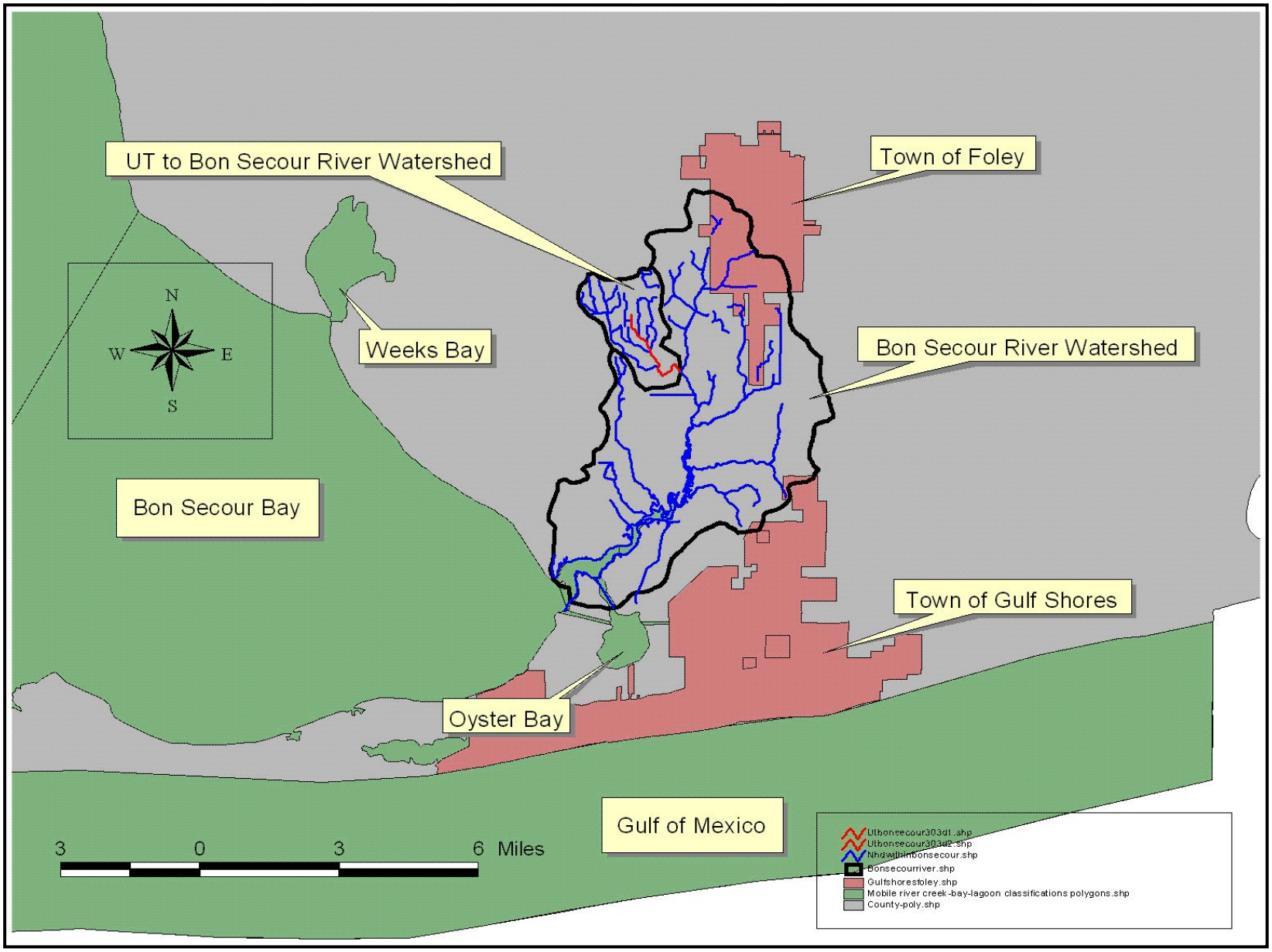
FINAL

Total Maximum Daily Load (TMDL)
for
Unnamed Tributary to Bon Secour River
Assessment Unit ID # AL03160205-0310-702
Pathogens (fecal coliform)

Alabama Department of Environmental Management
Water Quality Branch
Water Division
September 2009

Figure I. Site Map of UT to Bon Secour River within the Bon Secour River Watershed



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1.0 Executive Summary

Section §303(d) of the Clean Water Act (CWA) and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop total maximum daily loads (TMDLs) for waterbodies that are not meeting designated uses under technology-based pollution controls. A TMDL is the maximum amount of pollutant a waterbody can assimilate while meeting water quality standards for the pollutant of concern. All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES) regulated discharges, a load allocation (LA) for all nonpoint sources, and an explicit and/or implicit margin of safety (MOS).

The unnamed tributary (UT) to Bon Secour River is a part of the Bon Secour River watershed in southwest Baldwin County. It lies southwest of the Town of Foley and northwest of Gulf Shores. It's located in the northwest corner of the Bon Secour River watershed. Its source begins at Craft Farms Road and it flows in a southeasterly direction until merging with Bon Secour River just east of county road 65 and north of county road 12. It has a length of 1.64 miles and total drainage area of 3.36 square miles. It has a use classification of Fish & Wildlife (F&W).

The UT to Bon Secour River was first placed on the State's §303(d) list for pathogens in 1998 as a result of fecal coliform data collected by the Alabama Department of Environmental Management (ADEM) in 1995. The data was collected as part of ADEM's effort to characterize the Bon Secour River watershed for landuse, water quality, and geology. The result of this effort was a report issued in 1996 entitled "*A Survey of the Bon Secour River Watershed*." Subsequent data collected by ADEM in 2006 and 2007 has confirmed the impairment.

A mass balance approach was employed for calculating the pathogen Total Maximum Daily Load (TMDL) for the UT. The mass balance approach typically uses the highest exceedance concentration from the available data for the watershed and utilizes the conservation of mass principle. Loads can be calculated by multiplying fecal coliform concentrations times respective instream flows times a conversion factor. The highest pathogen loading to the UT to Bon Secour River was calculated using a single sample exceedance concentration from station UTBB1 on 10/22/07 times the flow for the sampling event times a conversion factor. Employing the same flow from 10/22/07 along with the allowable pathogen concentration results in the allowable load. The allowable concentration is equal to the water quality criterion minus a 10% margin of safety (MOS). The single sample fecal coliform water quality criterion for F&W waterbodies is 2000 colonies/100 mL. Incorporating a 10% MOS results in an allowable pathogen concentration of 1800 colonies/100 mL. Shown in Table 1-1 below are the pathogen loadings associated with the exceedance concentration and allowable concentration at station UTBB1.

Table 1-1. 2007 Coliform Loads and Required Reductions

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	Reduction %
NPS load	1.85E+10	1.19E+10	6.61E+09	36%
Point Source	0	0	0	0%

Shown in Table 1.2 below are the required TMDL pathogen loadings under critical conditions for UTBB1.

Table 1-2. Fecal Coliform TMDL for the UT to Bon Secour River Watershed

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)
1.32E+10	1.32E+09	NA	NA	0	1.19E+10	36%

a. There are no CAFOs in the UT to Bon Secour River watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLAs for WWTPs are expressed as a daily maximum; NA = not applicable, no point sources. Future WWTPs must meet the applicable instream water quality criteria for pathogens 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 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in fecal coliform loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for fecal coliform.

Compliance with the terms and conditions of 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 with a commitment to targeting the necessary load reductions to improve water quality in the UT to Bon Secour River watershed. As additional data and/or information becomes 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 (CWA) as amended by the Water Quality Act of 1987 and EPA's Water Quality Planning and Management Regulations [(Title 40 of the Code of Federal Regulations (CFR), Part 130)] require states to identify waterbodies which are not meeting water quality standards applicable to their designated use classifications. The identified waters are prioritized based on severity of pollution with respect to designated use classifications. Total maximum daily loads (TMDLs) for all pollutants causing violation of applicable water quality standards are established for each identified water. Such loads are established at levels necessary to implement the applicable water quality standards with seasonal variations and margins of safety. The TMDL process establishes the allowable loading of pollutants, or other quantifiable parameters 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 from both point and non-point sources and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Alabama has identified the UT to Bon Secour River as being impaired by pathogens (fecal coliform). The §303(d) listing was originally reported on Alabama's 1998 List of Impaired Waters. The sources of the impairment are listed as urban runoff/storm sewers and pasture grazing.

2.2 Problem Definition

Waterbody Impaired:	UT to Bon Secour River from its mouth to its source
Waterbody Length:	1.64 miles
Waterbody Drainage Area:	3.36 square miles
Water Quality Standard Violation:	Fecal Coliform (single sample)
Pollutant of Concern:	Pathogens (fecal coliform)
Water Use Classification:	Fish and Wildlife

Usage Related to Classification:
All of the UT to Threemile Creek is classified as Fish and Wildlife. 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.

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:

7. Bacteria:

(i) In non-coastal waters, bacteria of the fecal coliform group shall not exceed a geometric mean of 1,000 colonies/100 mL; nor exceed a maximum of 2,000 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 fecal coliform organism density does not exceed 200 colonies/100 mL 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.

Criteria Exceeded:
Water quality data collected by ADEM in 1995 was employed for listing the UT to Bon Secour River on Alabama's 1998 §303(d) list. At the time of the listing, waters in which less than or equal to 10% of the samples collected over a five year period exceeded the single-sample maximum of 2000 colonies/100 mL were considered to comply with Alabama's water quality standard for fecal coliform bacteria. Geometric mean samples comprised of at least 5 samples collected over a thirty day period that were reported less than or equal to 200 colonies/100 mL (June-September) or 1000 colonies/100 mL (October-May) were considered to comply with Alabama's water quality standard for fecal coliform bacteria. Waters in which greater than 10% of the samples exceeded the single-sample maximum criterion of 2000 colonies/100 mL or any geometric mean sample that exceeded the geometric mean criterion of 200 colonies/100 mL (June-September) or 1000 colonies/100 mL (October-May) were considered impaired and subsequently listed for pathogens (fecal coliform) on Alabama's §303(d) list.

ADEM collected data on the UT to Bon Secour River in 1995. The geometric mean of the data was a value of 11,732 col/100 mL. This data can be found in Appendix 7.2, Table 7-1.

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

For the purpose of this TMDL, a single sample fecal coliform target of 1800 colonies/100 mL will be used. This target was derived by using a 10% explicit margin of safety from the single sample criterion of 2000 colonies/100 mL. This target should allow the UT to support its applicable F&W bacteria criteria.

3.2 Source Assessment

3.2.1 Point Sources in the UT to Bon Secour River Watershed

Continuous Point Sources

There are no continuous NPDES discharges located in the UT to Bon Secour River watershed. However, any future NPDES regulated discharges that are considered by the Department to be a pathogen source will be required to meet the instream water quality criteria for pathogens at the point of discharge.

Non-Continuous Point Sources

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 a review of ADEM's NPDES enforcement database, it was determined that no SSOs have occurred in the UT to Bon Secour watershed since 2003.

Future NPDES regulated stormwater discharges will be required to demonstrate consistency with the assumptions and requirements of this TMDL.

Nonpoint Sources in the UT to Bon Secour River Watershed

Nonpoint sources of fecal coliform bacteria do not have a defined discharge point, but rather, occur over the entire length of a stream or waterbody. On the land surface, fecal coliform bacteria can accumulate over time in the soil and then are washed off during rain events. As the runoff transports the sediment over the land surface, more fecal coliform bacteria are collected and carried to the stream or waterbody. Therefore, there is some net loading of fecal coliform bacteria into the stream is dictated by the watershed hydrology.

Agricultural land can be a source of fecal coliform 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 fecal coliform bacteria to waterbodies. To account for the potential influence from animals with direct access to stream reaches in the watershed, fecal coliform loads can be calculated as a direct source into the stream.

Fecal coliform bacteria can also originate from forested areas due to the presence of wild animals such as deer, raccoons, turkeys, waterfowl, etc. Wildlife 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.

Fecal coliform loading from urban areas is potentially attributable to multiple sources including storm water runoff, illicit discharges of wastewater, runoff from improper disposal of waste materials, failing septic tanks, sewer overflows due to I&I (infiltration and inflow) and domestic animals. Septic systems are common in unincorporated portions of a watershed and may be direct or indirect sources of bacterial pollution via ground and surface waters. Onsite septic systems have the potential to deliver fecal coliform bacteria to surface waters due to system failure and malfunction.

3.3 Land Use Assessment

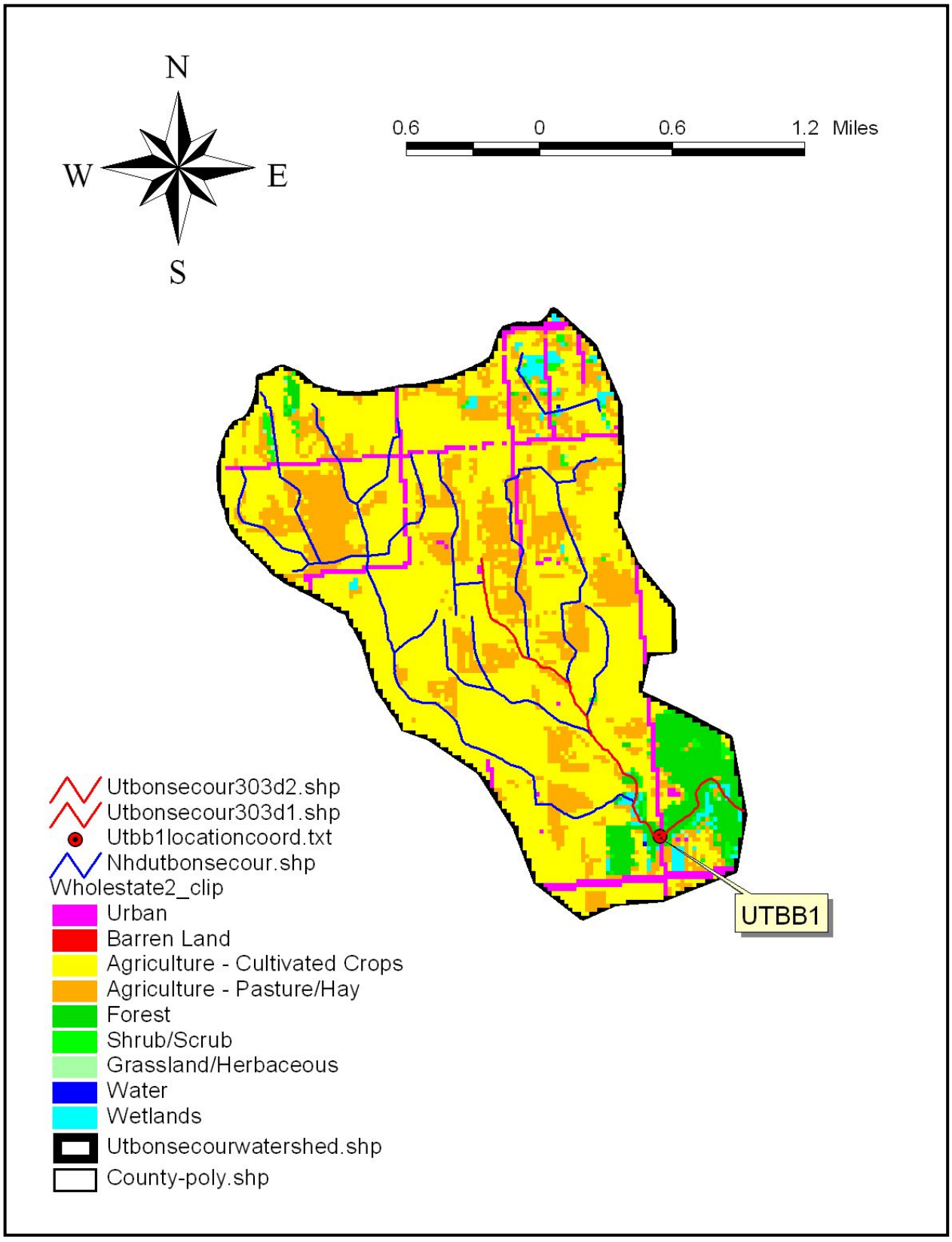
The UT to Bon Secour River watershed is a part of the larger Bon Secour River watershed. The 12-digit hydrologic unit code (HUC) for Bon Secour River is 031602050310. Shown in Table 3-1 are land uses in the UT to Bon Secour River watershed and their respective percentages. Land use for the UT to Bon Secour River watershed was determined using ArcView with land use information derived from the 2001 National Land Cover Dataset (NLCD). Figure 3-2 is a map of land use within the UT to Bon Secour River watershed.

As can be seen from the land use table, the predominant uses of land in the UT to Bon Secour River watershed in 2001 were pasture and crops. That has changed over the last several years due to development. The primary land uses within the watershed today are sod farms, pasture and low intensity commercial development.

Table 3-1. Land Use in the UT to Bon Secour River Watershed

Landuse in the UT to Bon Secour River Watershed		
Landuse	**Area (sq mi)**	**Percentage**
Open Water	0.001	0.02%
Developed, Open Space	0.130	3.86%
Developed, Low Intensity	0.031	0.93%
Developed, Medium Intensity	0.007	0.21%
Deciduous Forest	0.028	0.84%
Evergreen Forest	0.124	3.68%
Mixed Forest	0.041	1.23%
Shrub/Scrub	0.047	1.40%
Grassland/Herbaceous	0.003	0.09%
Pasture/Hay	0.745	22.17%
Cultivated Crops	2.146	63.86%
Woody Wetlands	0.023	0.69%
Emergent Herbaceous Wetlands	0.034	1.01%
Total	**3.360**	**100.00%**
Aggregate Landuse		
Landuse	**Area (mi^2)**	**Percentage**
Open Water	0.001	0.0%
Developed	0.168	5.0%
Forest	0.193	5.8%
Shrub/Scrub	0.047	1.4%
Grassland	0.003	0.1%
Pasture	0.745	22.2%
Crops	2.146	63.9%
Wetlands	0.057	1.7%
Total	**3.360**	**100.0%**

Figure 3-2. Land Use Map of the UT to Bon Secour River Watershed



3.4 Linkage Between Numeric Targets and Sources

As mentioned earlier, the UT to Bon Secour River watershed currently has three primary land uses – sod farms, pasture and low intensity commercial development. The most likely sources of pathogen loadings from these type land uses are agricultural and storm sewer runoff. Fecal coliform loads from forests and wetlands tend to be low due to their filtering capabilities and are considered as natural or background conditions with respect to pollutant sources.

It is not considered practical to calculate individual components for nonpoint source loadings. Hence, there will not be individual loads or reductions calculated for different 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

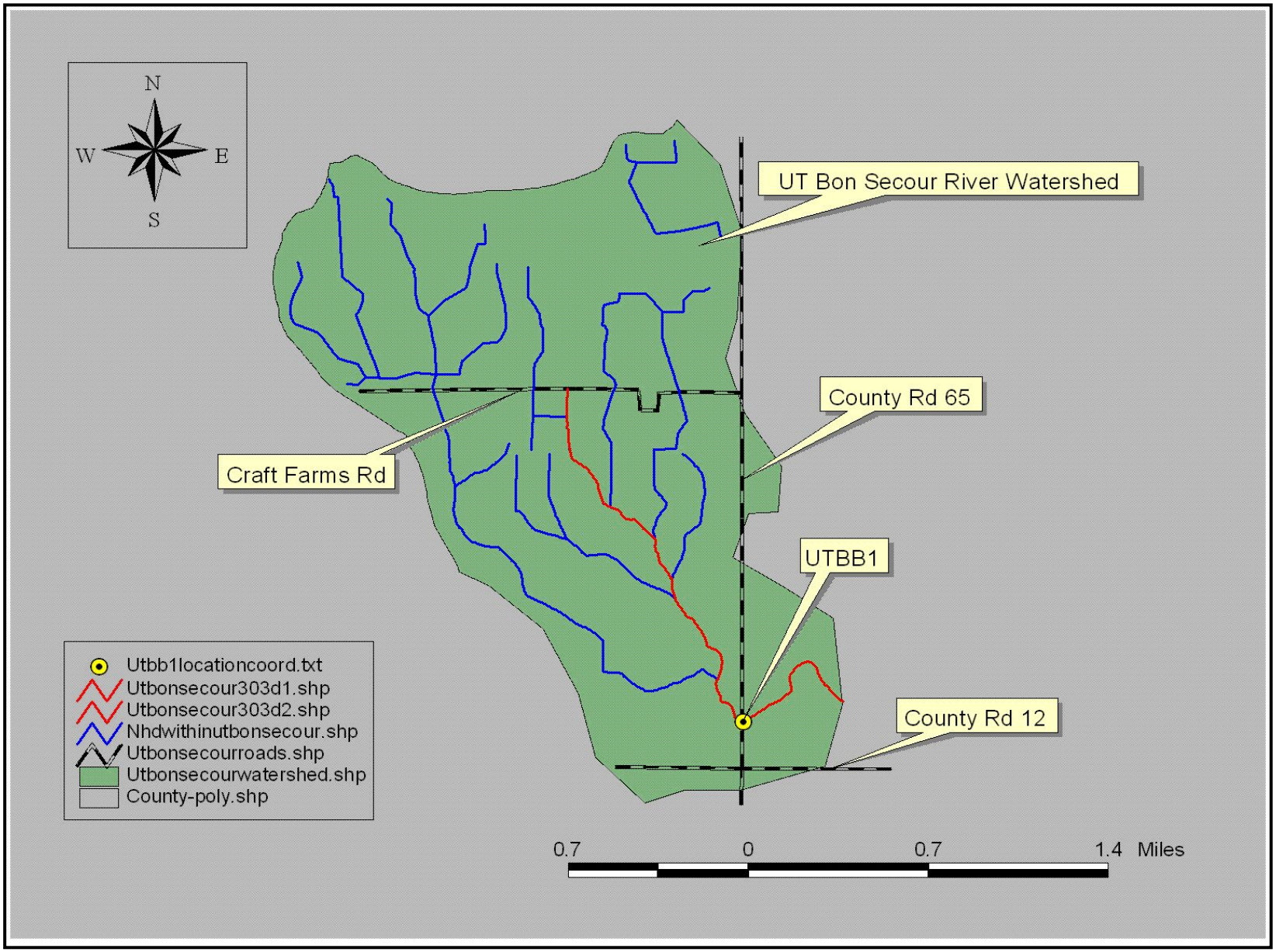
As indicated earlier in the document, data collected by ADEM in 1995 resulted in placement of the UT to Bon Secour River on the State's 1998 §303(d) list. A summary of ADEM listing data can be found in Appendix 7.2, Table 7-1. It should be noted that UTBB1 was denoted as station UTNW in the 1995 ADEM survey. Since that time, additional data has been collected by ADEM in 2006 and 2007 to assess use support. ADEM §303(d) data can be found in Appendix 7.2, Table 7-2. Of eight samples collected by ADEM from 3/21/06 to 10/22/07, there was one exceedance for an exceedance rate of 12.5%.

Shown below in Table 3-2 is a location description for the only sampling station in the watershed – UTBB1. Shown in Figure 3-3 is a map of the station location in the watershed.

Table 3-2. ADEM Sampling Station in the UT to Bon Secour River Watershed

Station	Agency	Description	Latitude	Longitude
UTBB1	ADEM	UT to Bon Secour River at Baldwin Co. Rd. 65	30.3582	-87.717

Figure 3-3. Map of UT to Bon Secour River Sampling Station



3.6 Critical Conditions

Critical conditions typically occur during the summer months. This can be explained by the nature of storm events in the summer versus the winter. 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. Also, the summer fecal coliform criterion is more stringent than the winter criterion.

For some of the sampling events at UTBB1, flows were large enough to be measured. That was not the case for the 10/22/07 exceedance event. For that reason, surrogate flows were estimated using data from the USGS permanent record station on Fish River near Silverhill (gage #02378500). Average daily discharge data for 2007 was downloaded from the USGS website for the Silverhill gage. Surrogate flows were then calculated for UTBB1 employing a ratio of drainage areas between the Silverhill gage and the UTBB1 station. The maximum single sample concentration of 2800 colonies/100 mL with an average flow of 0.27 cfs at UTBB1 will be employed to estimate the TMDL pathogen loadings to the UT to the Bon Secour River watershed.

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 summer single sample criterion was reduced by ten percent to achieve the target concentration of 1800 colonies/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 (colonies/day), in accordance with 40 CFR 130.2(i).

4.2 Load Calculations

A mass balance approach was used to calculate the fecal coliform TMDL for the UT to Bon Secour River. The mass balance approach utilizes the conservation of mass principle. Total existing mass loads were calculated by multiplying the fecal coliform concentration times the corresponding stream flow. Existing loads were calculated for the highest single sample exceedance event. In the same manner, allowable loads were calculated for the single sample criterion of 2000 col/100ml.

Existing Conditions

The first loading calculated was an estimate of the pathogen loading to the watershed during the 10/22/07 single sample exceedance event. It was done by multiplying the single sample exceedance concentration of 2800 colonies/100 mL times the flow for the sampling event times a conversion factor. This concentration was based on the measurement at UTBB1 on 10/22/07 and can be found in Table 7-2. The surrogate-calculated stream flow was 0.27 cfs. The product of these two values and a conversion factor gives the total mass loading of fecal coliform to UTBB1 under maximum exceedance conditions.

$$\frac{0.27\,\text{ft}^3}{\text{s}} \times \frac{2800\,\text{colonies}}{100\,\text{mL}} \times \frac{24465755 \quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.85 \times 10^{10}\,\text{colonies}}{\text{day}}$$

Allowable Conditions

The second load represents the allowable value to the watershed under the same hydraulic conditions as the first. This is done by taking the product of the flow for the exceedance event

times the conversion factor times the allowable single sample fecal concentration of 1800 colonies/100 mL. The allowable fecal coliform loading is:

$$\frac{0.27\,\text{ft}^3}{\text{s}} \times \frac{1800\ \text{colonies}}{100\,\text{mL}} \times \frac{24465755\quad 100\,\text{mL}*\text{s}}{\text{ft}^3*\text{day}} = \frac{1.19\times10^{10}\ \text{colonies}}{\text{day}}$$

The explicit margin of safety of 200 colonies/100 mL equals a daily loading of:

$$\frac{0.27\,\text{ft}^3}{\text{s}} \times \frac{200\ \text{colonies}}{100\,\text{mL}} \times \frac{24465755\quad 100\,\text{mL}*\text{s}}{\text{ft}^3*\text{day}} = \frac{1.32\times10^{9}\ \text{colonies}}{\text{day}}$$

The difference in the pathogen loading between the existing conditions (violation event) and the allowable conditions converted to a percentage represents the total load reduction needed to achieve the fecal coliform water quality criterion. The TMDL was calculated as the total daily fecal coliform load to the UT to Bon Secour River as evaluated at station UTBB1. Table 4-1 shows the results of existing conditions and percent reductions employing the single sample criterion.

Table 4-1. 2007 Coliform Loads and Required Reductions

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	Reduction %
NPS load	1.85E+10	1.19E+10	6.61E+09	36%
Point Source	NA	NA	NA	NA

The TMDL, WLA, LA and MOS values necessary to achieve the applicable fecal coliform criteria are provided in Table 4-2 below.

Table 4-2. Fecal Coliform TMDL for the UT to Bon Secour River Watershed

TMDL	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation(LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(colonies/day)	(colonies/day)	(colonies/day)	(% reduction)	(colonies/day)	(colonies/day)	(% reduction)
1.32E+10	1.32E+09	NA	NA	0	1.19E+10	36%

a. There are no CAFOs in the UT to Bon Secour River watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLAs for WWTPs are expressed as a daily maximum; NA = not applicable, no point sources. Future WWTPs must meet the applicable instream water quality criteria for pathogens 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 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in fecal coliform loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for fecal coliform.

4.3 TMDL Summary

The UT to Bon Secour River was placed on Alabama's §303(d) list in 1998 based on data collected by ADEM in 1995. In 2006 and 2007, ADEM collected additional water quality data which confirmed the pathogen impairment and provided the basis for TMDL development.

A mass balance approach was used to calculate the fecal coliform TMDL for Toulmins Spring Branch. Based on the TMDL analysis, it was determined that a 36% reduction in fecal coliform loading was necessary to achieve compliance with applicable water quality standards.

Compliance with the terms and conditions of 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 with a commitment to targeting the necessary load reductions to improve water quality in the UT to Bon Secour River watershed. As additional data and/or information becomes available, it may be 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, the ADEM 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
Tennessee	2009
Alabama / Coosa / Tallapoosa	2010
Escatawpa / Mobile / Lower Tombigbee / Upper Tombigbee	2011
Black Warrior / Cahaba	2012
Chattahoochee / Chipola / Choctawhatchee / Perdido-Escambia	2013

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 distributions. 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 7.1

References

ADEM Administrative Code, 2007. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2007. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

A Survey of the Bon Secour River Watershed. Coastal Program. July 1996. ADEM.

Alabama's §303(d) Monitoring Program. 2006 and 2007. ADEM.

Alabama Department of Environmental Management (ADEM), Alabama's Water Quality Assessment and Listing Methodology, December 2005.

Alabama's §303(d) Lists. 1998-2008 §303(d) Lists. ADEM.

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

Appendix 7.2

Water Quality Data

Table 7-1. Listing Data Collected by ADEM in 1995

LOCATION		WATER TEMP. (DEG C)	pH (S.U.)	D.O. (mg/L)	SPECIFIC CONDUCTIVITY ($_{\mu}$mhos/cm)	TURBIDITY (NTUs)	NITRATE NITROGEN (mg/L)	AMMONIA NITROGEN (mg/L)	TOTAL KJELDAHL NITROGEN (mg/L)	PHOSPHATE (mg/L)	[3] FECAL COLIFORM (mg/L)
STATION BS01	AVERAGE	21	6.1	6.6	79	55	1.861	0.060	0.48	0.142	473
	MAXIMUM	25	6.5	7.5	101	135	3.350	0.229	1.60	0.384	12,400
	MINIMUM	17	5.7	5.5	49	2.2	0.021	<0.01	<0.01	0.036	5
STATION UTNW	AVERAGE	21	5.9	3.8	110	63	2.514	0.155	0.93	0.189	11,732
	MAXIMUM	24	6.5	8.0	135	171	3.970	0.254	1.60	0.642	32,500
	MINIMUM	18	5.5	0.9	80	12.4	0.769	0.105	0.1	0.051	2,000
[1] STATION UTF	AVERAGE					32	0.067	0.029	1.66	0.054	1,574
	MAXIMUM					58	0.137	0.077	3.60	0.133	6,000
	MINIMUM					18.4	0.013	<0.01	0.68	0.003	500
STATION NEBS	AVERAGE	20	6.4	7.7	51	35	0.947	0.039	0.50	0.044	586
	MAXIMUM	26	8.7	9.3	68	78	1.810	0.073	1.60	0.212	5,600
	MINIMUM	14	5.2	6.6	40	4.1	0.032	<0.01	0.09	0.003	156
[2] STATION SC	AVERAGE	16	6.5	7.4	74	58	1.709	0.316	1.03	0.231	4,414
	MAXIMUM	18	7.4	9.8	86	92	3.780	1.945	2.90	0.606	15,000
	MINIMUM	14	6.0	5.3	66	11.5	0.209	<0.01	0.13	0.022	1,440
[2] STATION SHC	AVERAGE	18	6.0	6.9	112	22	1.530	0.046	0.60	0.092	4,687
	MAXIMUM	20	6.4	8.1	225	59	2.230	0.162	1.50	0.405	20,250
	MINIMUM	14	5.8	5.2	58	6.4	0.472	<0.01	0.13	0.013	1,260
STATION BB01	AVERAGE	21	6.1	5.9	73	9.3	1.210	0.017	0.51	0.033	90
	MAXIMUM	26	6.8	7.7	93	16.8	2.415	0.067	0.83	0.075	272
	MINIMUM	10	5.6	4.4	49	1.8	0.006	<0.01	0.09	0.003	32
STATION BB02	AVERAGE	24	6.4	7.5	13,018	2.2	0.541	0.060	0.90	0.046	0
	MAXIMUM	27	7.1	9.5	17,900	2.3	1.240	0.163	1.60	0.084	0
	MINIMUM	19	6.0	3.2	4,670	2	0.243	<0.01	0.22	0.01	0
STATION BS02	AVERAGE	22	7.4	9.0	15,150	14.6	0.403	0.03	0.86	0.091	15
	MAXIMUM	33	8.3	11.4	24,280	36	2.150	0.14	2.20	0.306	88
	MINIMUM	13	6.1	5.6	1,510	2.7	<0.005	<0.01	0.15	0.017	0

1: DUE TO ITS INTERMITTANT FLOW CHARACTERISTICS, STATION UTF WAS SAMPLED ONLY FOLLOWING STORM EVENTS. PREVAILING CONDITIONS PREVENTED MEASUREMENT OF TEMP., DO, pH & COND.

2: STATIONS SC & SHC WERE NOT FLOWING JULY-SEPTEMBER. DATA REPRESENTS SAMPLES COLLECTED DURING TIMES OF FLOW, JANUARY-JUNE

3: AVERAGE VALUES GIVEN FOR FECAL COLIFORM REPRESENT THE GEOMETRIC MEAN GM $X_N = (X_1 * X_2 .. X_N)^{1/N}$

Table 7-2. Pathogen Data Collected by ADEM at Station UTBB1 in 2006 and 2007

Station_ID	Date	Time (24hr)	Fecal Coliform (col/100ml)	Fecal Coliform oor	Stream Flow (cfs)	Surrogate Flow (cfs)	Measured Stream Flow as Percentage of Surrogate Flow	Avg Percent*	Revised Surrogate Flow (cfs)
UTBB-1	3/21/2006	940	28	E		5.18			0.27
UTBB-1	4/27/2006	905	1400		0.4	10.29	3.89%	5.27%	0.54
UTBB-1	5/16/2006	950	230			4.35			0.23
UTBB-1	8/24/2006	1300	2000		0.4	4.48	8.93%		0.24
UTBB-1	9/13/2006	1045	2	L	0.3	9.97	3.01%		0.53
UTBB-1	10/18/2006	1130	450		0.3	26.6	1.13%		1.40
UTBB-1	5/31/2007	1045	1800			2.78			0.15
UTBB-1	10/22/2007	1110	2800			5.11			0.27
		Count	**8**						
		No. Exceedances	**1**						
		% Exceedances	**12.5%**						
		***Excluding 10/18/06 data**							