Alabama Department of Environmental Management

FINAL

Total Maximum Daily Load (TMDL)
for
Bon Secour Bay

Assessment Unit ID # AL03160205-0300-200 (2008 ID)
Assessment Unit ID # AL03160205-0300-201 (2010 ID)

Pathogens (Enterococci)

Alabama Department of Environmental Management
Water Quality Branch
Water Division
September 2010

Figure 1-1. Site Map of the Original Impaired Portion of Bon Secour Bay

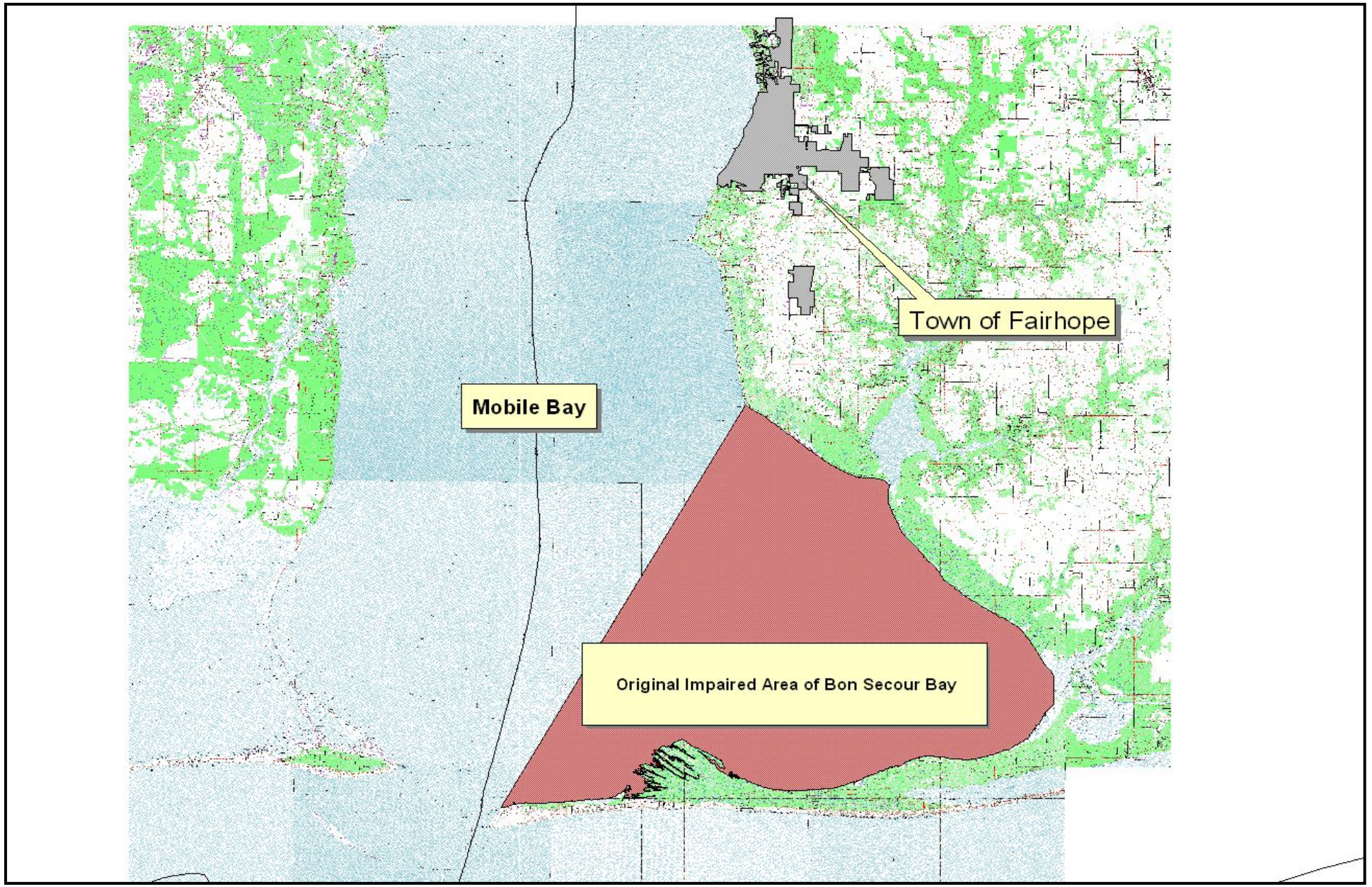

Figure 1-2. Site Map of the Revised Impaired Portion of Bon Secour Bay

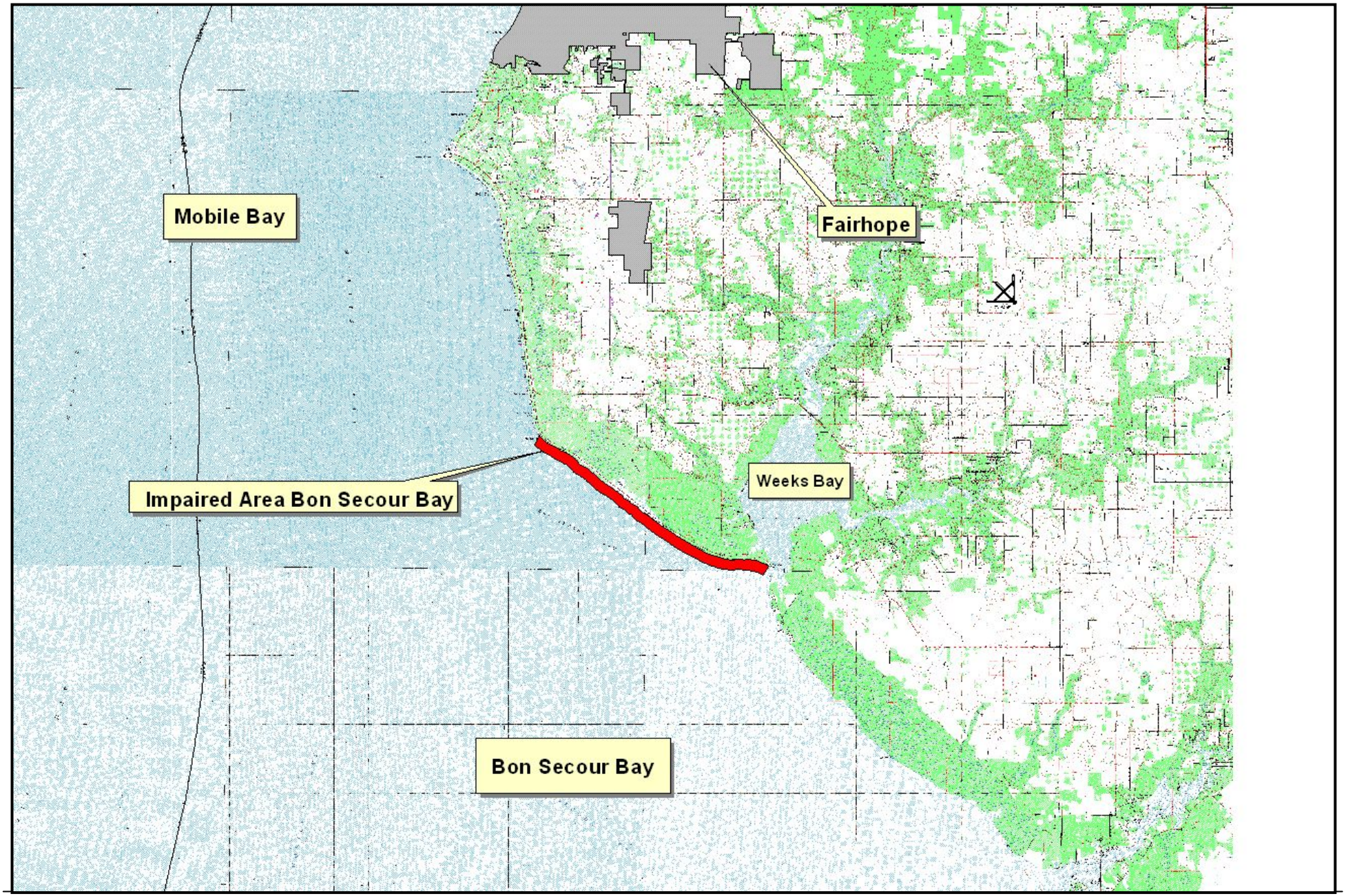

Figure 1-3. Landsat Photo of Mobile and Bon Secour Bays

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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) requires 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 maximum amount of pollutant a waterbody can assimilate while meeting all applicable 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).

Bon Secour Bay is actually a sub-estuary of Mobile Bay. It constitutes the southeast portion of Mobile Bay and is east of a line connecting Mullet Point with the tip of Fort Morgan. Weeks Bay, Bon Secour River, and the intracoastal waterway flow into it on its eastern edge. Figure 1-1 is a site map of Bon Secour Bay. Figure 1-2 is a Landsat photo of Mobile and Bon Secour Bays. In Figure 1-2, Bon Secour Bay constitutes the southeastern portion of Mobile Bay.

Bon Secour Bay has three use classifications – Shellfish Harvesting (SH), Fish & Wildlife (F&W), and Swimming and Other Whole Body Water-Contact Sports (S). Bon Secour Bay was first placed on the §303(d) List in 1998 as a result of shellfish harvesting closures between March 1994 and December 1997. During that time frame, it was closed 17.5% of the time. The Seafood Branch of the Alabama Department of Public Health (ADPH) is responsible for decision-making with respect to harvesting status (i.e., when a shellfish bed is open or closed for oyster harvesting). The criterion employed by the Seafood Branch for harvesting status is stage elevation of the Mobile River at the Bucks water intake located in northern Mobile County. Oyster beds are closed when river stage reaches 8 feet.

Since the original listing of the impaired portion of the bay, five programs have acquired an extensive set of pathogen data. The only data indicating impairment is Beach Monitoring data acquired by ADEM for human health issues with respect to whole body contact (i.e., swimming). All of the monitoring data indicating impairment is located near the shores of the bay (near-shore data), whereas the rest of the data is located in deeper waters (far-shore data). Hence, the near-shore data suggests pathogen impairment whereas the far-shore data does not. In recognition of this difference, the Department will divide the current, impaired portion of the bay into two sub-portions: an impaired, near-shore portion and an unimpaired, far-shore portion. The current TMDL will apply only to the near-shore portion of the bay. A separate delisting analysis and report will be performed in the future for the far-shore portion. The current assessment unit (AL03160205-0300-200) will be replaced with two new assessment units. The unit for the impaired, near-shore portion will be AL03160205-0300-201 and that for the far-shore area will be AL03160205-0300-202. Shown in Table 1-1 below is a summary of this breakdown. As can be seen from the table, the impaired portion of the bay extends

1,000 feet from shore. It is believed that 1,000 feet is a sufficient distance to account for near-shore pathogen impacts.

Table 1-1: Assessment Unit Revisions to Bon Secour Bay*

Assessment Unit ID	Waterbody Name	Type	River Basin	County	Uses	Causes	Sources	Date of Data	Size	Downstream / Upstream Locations	Year Listed	Draft TMDL Date	
AL03160205-0300-200	Bon Secour Bay	E	Mobile	Baldwin	Shellfish Harvesting Swimming Fish & Wildlife	Pathogens	Urban runoff/storm sewers On-site wastewater systems	1994-97	103.84 sq. miles	Segment classified for shellfish harvesting	1998	2010	Old Segment
AL03160205-0300-201	Bon Secour Bay	E	Mobile	Baldwin	Shellfish Harvesting Swimming Fish & Wildlife	Pathogens	Urban runoff/storm sewers On-site wastewater systems	1994-97	0.88 sq. miles	out to 1000 feet offshore from Fish River Point to Mullet Point	1998	2010	Impaired (near-shore) Segment
AL03160205-0300-202	Bon Secour Bay	E	Mobile	Baldwin	Shellfish Harvesting Swimming Fish & Wildlife	Pathogens	Urban runoff/storm sewers On-site wastewater systems	1994-97	102.96 sq. miles	All except out to 1000 feet offshore from Fish River Point to Mullet Point	1998	2010	Unimpaired (far-shore) Segment

*Please note that the word "segment" in Table 1-1 is synonymous with "area" and "portion" in the preceding narrative.

Table 1-2 is a summary of existing and allowable enterococci concentrations required to meet the applicable water quality enterococci single sample criterion for Bon Secour Bay. Table 1-3 lists the TMDL (maximum allowable) pathogen concentrations under critical conditions for the bay.

Table 1-2. Enterococci Conditions and Required Reductions

Source	Existing Conditions (col/100 mLs)	Allowable Conditions (col/100 mLs)	Margin of Safety (MOS) (col/100 mLs)	Percent Reduction (%)
Nonpoint Source	1260	94	10	93
Point Source	0	0	0	0
Total	1260	94	10	93

Table 1-3. Enterococci TMDL for Impaired Portion of Bon Secour Bay

TMDL = WLA + LA + MOS					
TMDL	**Margin of Safety (MOS)**	**Waste Load Allocation (WLA)[a]**			**Load Allocation (LA)**
		WWTPs[b]	**MS4s[c]**	**Leaking Collection Systems[d]**	
(col/100ml)	**(col/100ml)**	**(col/day)**	**(% reduction)**	**(col/day)**	**(col/100ml)**
104	10	NA	NA	0	94

a. There are no CAFOs in the subject watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. NA = not applicable, no WWTPs currently located in the Bon Secour Bay watershed. 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 pathogen loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for pathogens.

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 it is committed towards targeting the load reductions to improve water quality in the Bon Secour Bay 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 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 Bon Secour Bay as impaired for pathogens. Bon Secour Bay has an area of 103.84 square miles. The §303(d) listing was originally reported on Alabama's 1998 List of impaired waters based on oyster harvesting status data acquired from the Seafood Branch of the ADPH. Additional data has been acquired since then under five different programs.

2.2 Problem Definition

Waterbody Impaired:	Bon Secour Bay
Impaired Area:	0.88 square miles
Contributing Drainage Area:	2.37 square miles
Water Quality Standard Violation:	Enterococci (Pathogens)
Water Use Classification:	Shellfish Harvesting (SH), Fish and Wildlife (F&W), and Swimming and Other Whole Body Water-Contact Sports (S)

Usage Related to Classification:
Bon Secour Bay has three use classifications: SH, F&W, and S. Usage of waters for the SH classification is described in ADEM Admin. Code R. 335-6-10-.09 (4) (a), (b), (c), and (d) as follows:

(a) Best usage of waters: propagation and harvesting of shellfish for sale or use as a food product.
(b) Conditions related to best usage: waters will meet the sanitary and bacteriological standards included in the National Shellfish Sanitation Program Model Ordinance, 1999, Chapter IV, published by the Food and Drug Administration, U.S. Department of Health and Human Services and the requirements of the State Department of Public Health. The waters will also be of a quality suitable for the propagation of fish and other aquatic life, including 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.

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

(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.

Usage of waters for the S classification is described in ADEM Admin. Code R. 335-6-10-.09 (3) (a), (b), (c), and (d) as follows:

*(a) Best usage of waters: swimming and other whole body watercontact 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.*

Pathogen Criteria:

Pathogen criteria of waters for the SH classification are described in ADEM Admin. Code R. 335-6-10-.09 (4) 7.(i) and (ii) as follows:

(i) Not to exceed the limits specified in the National Shellfish Sanitation Program Model Ordinance, 1999, Chapter IV, published by the Food and Drug Administration, U. S. Department of Health and Human Services.
(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 235 colonies/100 ml in any sample in non-coastal waters. In coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 colonies/100 ml nor exceed a maximum of 104 colonies/100 ml in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric mean bacterial organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters. 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 watercontact sports.

Pathogen criteria of waters for the F&W classification are described in ADEM Admin. Code R. 335-6-10-.09 (5) 7.(i) and (ii) as follows:

(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 watercontact sports.

Pathogen criteria of waters for the S classification are described in ADEM Admin. Code R. 335-6-10-.09 (3) 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 E. coli organism density does not exceed 126 colonies/100 ml nor exceed a maximum of 235 colonies/100 ml in any sample in non-coastal waters. In coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 colonies/100 ml nor exceed a maximum of 104 colonies/100 ml in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric mean bacterial organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters.
(iii) The policy of nondegradation of high quality waters shall be stringently applied to bacterial quality of recreational waters.

∗ ***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.*

Criteria Exceeded:

Criteria for different use classifications are not always the same. In the event that a waterbody has multiple use classifications, the most stringent of the criteria will apply, thereby insuring that criteria are maintained for each use classification. An assessment of the pathogen criteria for Bon Secour Bay results in the following applicable criteria:

Year-Round:

The geometric mean for enterococcus may not exceed 35 cols/100 mLs;
The single sample maximum for enterococcus may not exceed 104 cols/100 mLs.

There were numerous exceedances of the criteria at the Mary Ann Nelson Beach Monitoring station. The one selected for load reductions was the one that resulted in the highest percentage reduction to the watershed. That value was a single sample measurement taken on 6/14/04. Value of the measurement was 1260 cols/100 mLs.

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

The single sample Enterococci allowable concentration of 94 colonies/100 ml will be used for TMDL development. This concentration was derived by using the single sample criterion of 104 colonies/100 ml and a 10% (10 colonies/100 ml) explicit margin of safety. This allowable concentration is considered protective of water quality standards and should not allow any of the applicable criteria to be exceeded year-round.

3.2 Source Assessment

3.2.1 Point Sources in the Bon Secour Bay Watershed

Continuous Point Sources
There are no known continuous point sources in Bon Secour Bay. 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
Bon Secour Bay does not lie within a Municipal Separate Stormwater Sewer System (MS4) area; therefore a WLA for an MS4 system will not be applicable.

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.

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 Bon Secour Bay Watershed

Nonpoint sources in this watershed appear to be limited to septic systems and possibly SSOs. The following are examples of how different landuses can contribute to Enterococci bacterial loading:

- Agricultural land can be a source of Enterococci 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 Enterococci bacteria.

- Forested areas can be a source of Enterococci bacteria 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.

- Developed land can be a source of Enterococci bacteria due to storm water runoff, illicit discharges of wastewater, runoff from improper disposal of waste materials, failing septic tanks, leaking sewer infrastructure, and domestic animals. An illicit discharge refers to non-permitted facilities or individuals discharging wastewater through storm drains and/or directly to the waterbody.

- Septic systems can contribute to pathogen loadings when failing or not operating properly.

3.3 Land Use Assessment

Landuse for the Bon Secour area was determined using ArcView 3.3 in conjunction with landuse datasets derived from the 2001 National Land Cover Dataset (NLCD). Figure 3-1 displays landuse areas and Table 3-1 displays landuse percentages both for individual uses as well as aggregate uses.

Figure 3-1. Landuse Map for the Contributing Watershed to Bon Secour Bay

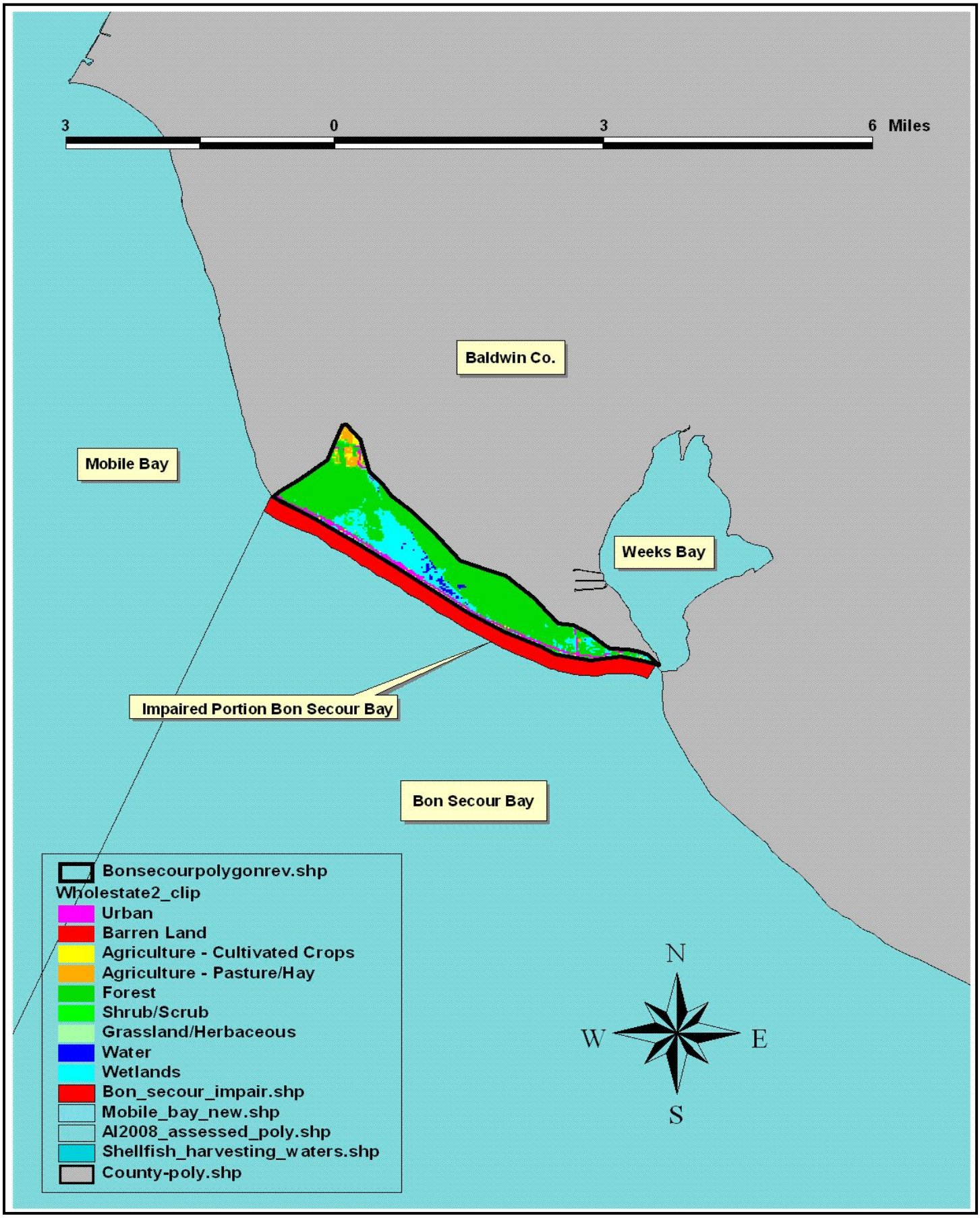

Table 3-1. Landuse for the Contributing Watershed to Bon Secour Bay

Landuse	Area (sq m)	Area (sq mi)	Area (acres)	Percentage
Open Water	189000	0.07	46.7	3.1%
Developed, Open Space	312300	0.12	77.2	5.1%
Developed, Low Intensity	94500	0.04	23.4	1.5%
Deciduous Forest	18000	0.01	4.4	0.3%
Evergreen Forest	3798900	1.47	938.7	62.0%
Mixed Forest	128700	0.05	31.8	2.1%
Shrub/Scrub	103500	0.04	25.6	1.7%
Grassland/Herbaceous	1800	0.00	0.4	0.0%
Pasture/Hay	159300	0.06	39.4	2.6%
Cultivated Crops	140400	0.05	34.7	2.3%
Woody Wetlands	939600	0.36	232.2	15.3%
Emergent Herbaceous Wetlands	240300	0.09	59.4	3.9%
Total	**6126300**	**2.37**	**1513.8**	**100.0%**
Aggregate Landuse	**Area (sq m)**	**Area (sq mi)**	**Area (acres)**	**Percentage**
Agriculture	299700	0.12	74.1	4.9%
Forest	3945600	1.52	975.0	64.4%
Developed	406800	0.16	100.5	6.6%
Other	1474200	0.57	364.3	24.1%
Total	**6126300**	**2.37**	**1513.8**	**100.0%**

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 this watershed are from SSOs and failing septic tanks. Individual loads and reductions will not be calculated for the range of nonpoint sources, but rather, the loadings and reductions will be calculated as a single total load and reduction.

3.5 Data Availability and Analysis

As indicated earlier in the Executive Summary, there have been five different programs under which pathogen data has been acquired since the original listing of the bay. Four of them are administered by the Department while one is performed by the Seafood Branch of the ADPH. Data acquired from the Seafood Branch is simply referred to in this document as Seafood Branch data. The raw data is listed in Appendix B and a map of the Seafood Branch stations is shown in Figure 3-5. There are nine stations – 82, 83, 92, 104B, 106, 104A, 112A, 114, and 107B. Data goes back to 2004 to remain consistent with the 6-year rule explained in our sampling and listing methodology.

The four ADEM programs are Beach Monitoring, 303(d), a special bay study performed in 2003 and 2004, and ambient (trend) monitoring. The Beach monitoring program has been in effect for approximately 10 years with the purpose of protecting human health for whole body contact within coastal waters (i.e., swimming). The data is collected by ADEM and the Baldwin County Health Department. Results of the data go to the Baldwin County Health Department for assessment employing ADEM's water quality criteria for pathogens in the coastal area. If values exceed the criteria, then the health department issues a swimming advisory until subsequent data indicates there is no longer a problem. There is one Beach Monitoring station in the impaired portion of the bay. It is

named Mary Ann Nelson Beach and is located slightly northwest of the mouth of Weeks Bay. A map of the station is shown in Figure 3-5.

ADEM's second relevant monitoring program is 303(d). The purpose here is to acquire additional data since the time of the listing data. The additional data will either support the original listing decision or it will suggest that the waterbody should be delisted. There are three 303(d) stations: BSBB-2, 3 and 4. They are shown in Figure 3-2.

The Department's third program under which data was collected was a special bay study performed in 2003 and 2004. The purpose of this study was to collect two comprehensive sets of data that could be employed to calibrate and verify a dynamic model for Mobile Bay (including Bon Secour Bay). There was one station under this study: MB-3aBS. The "BS" suffix refers to the fact that this was a special bay study. A map of the bay study station is shown in Figure 3-3.

The Department's fourth program was the ambient monitoring program, sometimes called trend monitoring. The purpose of this program is to determine trends in water quality at targeted locations around the State. There is one trend station in Bon Secour Bay, identified as station MB-3a. A map of this station can be found in figure 3-6.

Table 3-2 gives location descriptions for all the sampling stations and the program with which they are associated.

Of the data collected from the five monitoring programs, the only one which shows exceedances for pathogen concentrations is the Beach Monitoring program. Data for all the other programs indicates no impairment. An inspection of station locations reveals that the stations with exceedances are near-shore while those with no exceedances are located in deeper waters. This suggests that the pathogens causing impairment are localized while the majority of the listed portion of the bay is supporting its designated use with respect to pathogens. Hence, the majority of the original listed portion of Bon Secour Bay be delisted in the future, while the near-shore portion will have a pathogen TMDL developed (i.e., the current TMDL).

There were numerous exceedances of both single sample and geomean criteria at the Mary Ann Nelson Beach Monitoring location. The data was evaluated against both geomean and single sample criteria year-round. As stated earlier, the year-round geomean and single sample criteria are 35 and 104 cols/100 mLs, respectively. The exceedance event which results in the largest pathogen reduction occurred on June 14, 2004. This was a single sample event with a measured value of 1,260 cols/100 mLs.

Figure 3-2. Map of ADEM 303(d) Sampling Stations in Bon Secour Bay

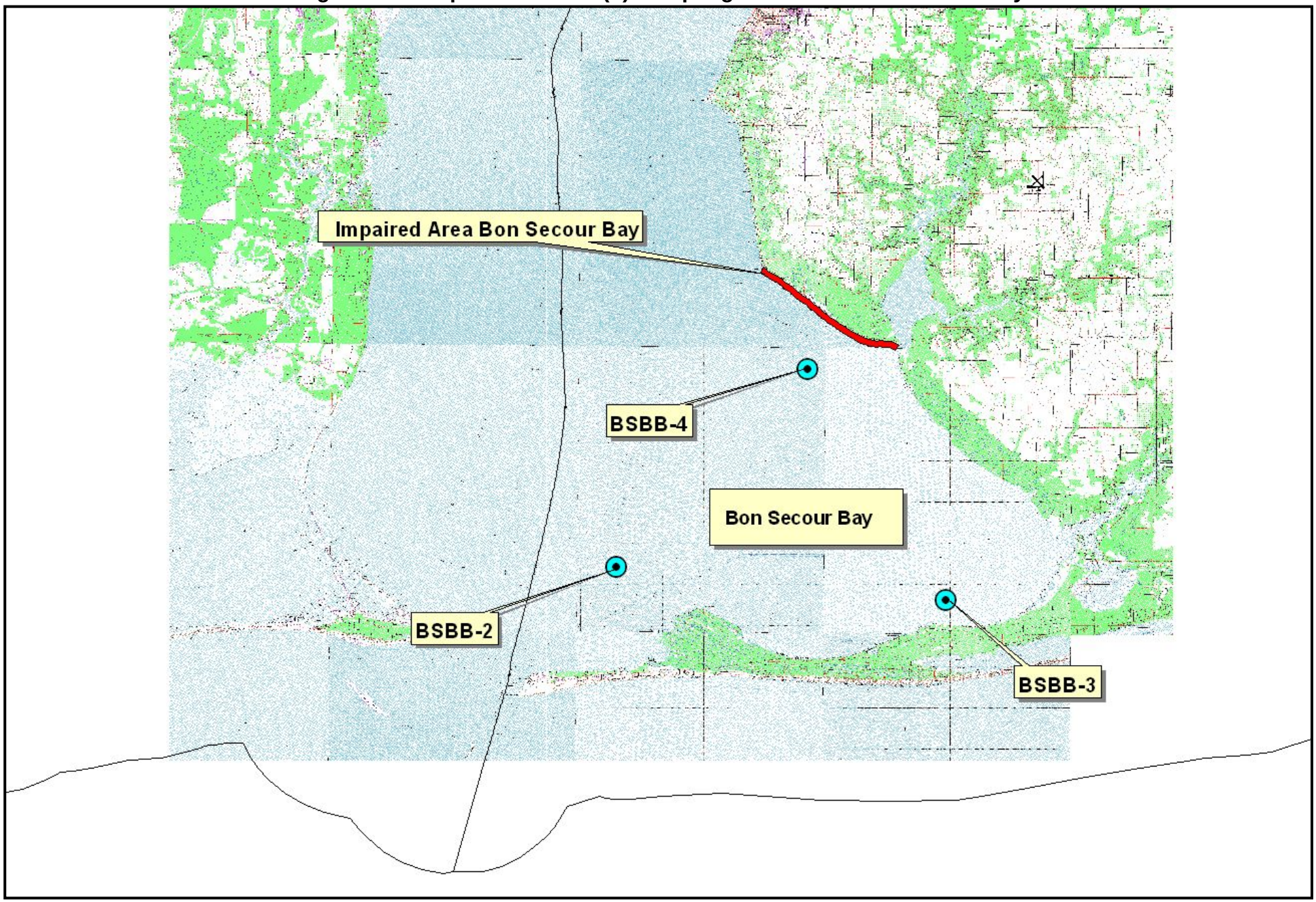

Figure 3-3. Map of ADEM 2004 Bay Study Stations in Bon Secour Bay

Figure 3-4. Map of ADEM Beach Monitoring Stations in Bon Secour Bay

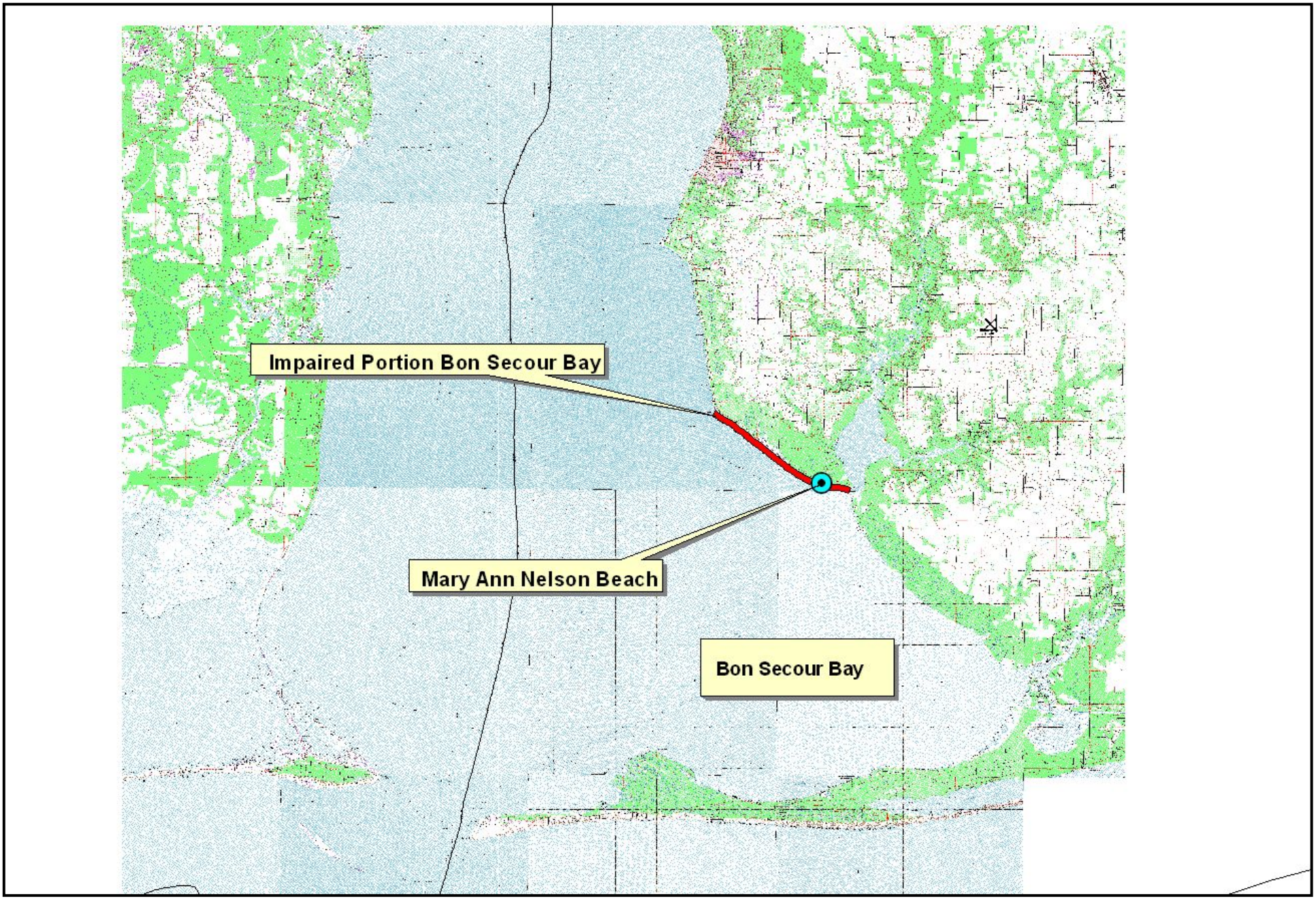

Figure 3-5. Map of Seafood Branch Stations in Bon Secour Bay

Figure 3-6. Map of Trend Station in Bon Secour Bay

Table 3-2. Bon Secour Bay Sampling Station Location Descriptions

Station ID	Program	Location Description	Latitude	Longitude
BSBB-2	303(d)	SW corner of Bon Secour Bay	30.27809	-87.97983
BSBB-3	303(d)	SE Corner of Bon Secour Bay	30.26502	-87.81334
BSBB-4	303(d)	Northern part of Bon Secour Bay	30.36555	-87.88386
MB-3aBS	Bay Study	SE Portion of Bon Secour Bay in the Intracoastal Waterway	30.28453	-87.85255
Mary Ann Nelson Beach	Beach Monitoring	Northern Beach of Bon Secour Bay Slightly West of the Mouth of Weeks Bay	30.37873	-87.85284
82	Seafood Branch	NE Corner of Bon Secour Bay near Mouth of Weeks Bay	30.37100000	-87.83800000
83	Seafood Branch	NE Portion of Bon Secour Bay near Weeks Bay	30.36450000	-87.85666667
92	Seafood Branch	East Portion of Bon Secour Bay Slightly NW of Bon Secour River	30.30433333	-87.78850000
104B	Seafood Branch	East Corner of Bon Secour Bay near Bon Secour River	30.28783333	-87.77466667
106	Seafood Branch	East Corner of Bon Secour Bay near Bon Secour River	30.28250000	-87.77150000
104A	Seafood Branch	East Portion of Bon Secour Bay Slightly SW of Bon Secour River	30.26183333	-87.79616667
112A	Seafood Branch	Southern Portion of Bon Secour Bay	30.24833333	-87.85800000
114	Seafood Branch	SW Portion of Bon Secour Bay near Little Point Clear	30.26033333	-87.93700000
107B	Seafood Branch	SW Tip of Bon Secour Bay neat Ft Morgan	30.23750000	-88.00950000
MB-3a	Trend	Same as MB-3aBS	30.28453	-87.85255

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

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.

Both an explicit and implicit MOS was incorporated into this TMDL. The MOS accounts for the uncertainty associated with the limited availability of Enterococci data used in this analysis. An explicit MOS was applied to the TMDL by reducing the Enterococci single sample mean criterion concentration by ten percent and calculating a mass loading target with measured flow data. The single sample mean criterion was reduced by ten percent to achieve a target concentration of 94 colonies/100 mL. An implicit MOS was incorporated in the TMDL by basing the existing condition on the highest measured Enterococci 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). As discussed earlier, the MOS is both implicit and 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). In this instance, flow was not a consideration due to the tidal influence, small watershed size, and very localized exceedances. Therefore, a percent reduction was based solely on the highest exceedance value measured in terms of concentration.

4.2 Reduction and TMDL Calculations

A percent reduction approach was utilized to calculate the pathogen TMDL for Bon Secour Bay. The following equation was used to calculate the appropriate load reduction:

$$= \frac{(\text{Highest Exceedance} - \text{Single Sample Criterion w/ MOS})}{\text{Highest Exceedance}} \times 100\%$$

The single sample criterion was used because it yielded the greatest reduction among the available data. Allowable concentrations were calculated for the single sample criterion of 104 colonies/100ml. The TMDL was based on a single sample violation that produced percent reductions of Enterococci necessary to achieve applicable water quality criteria. Since the exceedance was a localized value indicative of near-shore impacts only, the contributing watershed was limited to that which impacted the sampling location at Mary Ann Nelson Beach. The contributing watershed is shown in Figure 3-1 and is less than 0.1 square mile, much less than the watershed area for the bay.

Percent Reduction Calculation:

$$\frac{(1260\ \text{col/100 ml} - 94\ \text{col/100 ml})}{1260\ \text{col/100 ml}} \times 100\% = 93\%$$

The difference in the pathogen concentrations between the existing conditions (violation event) and the allowable conditions converted to a percent reduction represents the total load reduction needed to achieve the Enterococci water quality criterion. The TMDL was calculated as the total daily Enterococci concentration to Bon Secour Bay as evaluated at the Mary Ann Nelson Beach station. Table 4-1 shows the pathogen reductions required for the selected exceedance event that occurred on June 14, 2004.

Table 4-1. Enterococci Conditions and Required Reductions

Source	Existing Conditions (col/100 mLs)	Allowable Conditions (col/100 mLs)	Margin of Safety (MOS) (col/100 mLs)	Percent Reduction (%)
Nonpoint Source	1260	94	10	93
Point Source	0	0	0	0
Total	1260	94	10	93

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

Table 4-2. Enterococci TMDL for Near-Shore, Impaired Portion of Bon Secour Bay

TMDL = WLA + LA + MOS					
TMDL	**Margin of Safety (MOS)**	**Waste Load Allocation (WLA)[a]**			**Load Allocation (LA)**
		WWTPs[b]	**MS4s[c]**	**Leaking Collection Systems[d]**	
(col/100ml)	**(col/100ml)**	**(col/day)**	**(% reduction)**	**(col/day)**	**(col/100ml)**
104	10	NA	NA	0	94

a. There are no CAFOs in the subject watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. NA = not applicable, no WWTPs currently located in the Bon Secour Bay watershed. 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 pathogen loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for pathogens.

4.3 TMDL Summary

As indicated earlier, the available data suggests that the bulk of the original listed portion of Bon Secour Bay is unimpaired. This can be considered the portion of the bay not subject to localized, near-shore effects. Therefore, the far-shore portion of the bay will be delisted in the future. The near-shore portion of the bay obviously has impairment due to pathogens. These impacts are most likely a result of SSOs and failing septic systems. The near-shore portion of the bay is addressed in this TMDL.

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 Bon Secour Bay 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, 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
Alabama / Coosa / Tallapoosa	2010
Escatawpa / Upper Tombigbee / Lower Tombigbee / Mobile	2011
Black Warrior / Cahaba	2012
Chattahoochee / Chipola / Escatawpa / Perdido-Escambia	2013
Tennessee	2014

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 A

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.

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

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

Alabama Department of Environmental Management, 1998 - 2008 §303(d) List. ADEM.

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

Comprehensive Sanitary Survey of Alabama's Area I and III Shellfish Growing Waters in Mobile & Baldwin Counties. 2007. Alabama Department of Public Health – Seafood Branch.

Appendix B

Water Quality Data

Table B-1: Bon Secour Bay ADEM 303(d) Data

Station ID	Visit Date	Enterococcus Col 100ml	Ent Col dc	Rev Entero Col 100ml	Fecal Col 100ml	Fecal Col dc	Rev Fecal Col 100ml
BSBB-2	6/8/2009	2	L	1	2	L	1
BSBB-2	6/16/2009	2	L	1	2	L	1
BSBB-2	6/18/2009	2	LH		2	LH	
BSBB-2	6/22/2009	2	L	1	2	L	1
BSBB-2	6/24/2009	2	L	1	2	L	1
BSBB-2	8/3/2009	2	L	1	2	L	1
BSBB-2	8/10/2009	2	L	1	2	L	1
BSBB-2	8/12/2009	2	L	1	2	L	1
BSBB-2	8/19/2009	2	L	1	2	L	1
BSBB-2	8/20/2009	2	L	1	2	L	1
		Entero criteria:					
			SS<=104 cols/100 mLs				
			Geomean<=35 cols/100 mLs				
		Count=	9			# Geomeans=	1
		SS Exceedances=	0			# Geomean Exceedances=	0
		Percent SS Exceedances=	0			Percent Geomean Exceedances=	0
		Fecal Count=	9				
		Geomean=	1.0				
		Median=	1				
		# Samples>43=	0				
		% Samples>43=	0				

Table B-1: Bon Secour Bay ADEM 303(d) Data (Cont.)

Station ID	Visit Date	Enterococcus Col 100ml	Ent Col dc	Rev Entero Col 100ml	Fecal Col 100ml	Fecal Col dc	Rev Fecal Col 100ml
BSBB-3	6/8/2009	2	L	1	2	L	1
BSBB-3	6/16/2009	2	L	1	2	L	1
BSBB-3	6/18/2009	2	LH		2	LH	
BSBB-3	6/22/2009	2	L	1	2	L	1
BSBB-3	6/24/2009	2	L	1	2	L	1
BSBB-3	8/3/2009	2	L	1	2	J	2
BSBB-3	8/10/2009	2	L	1	2	J	2
BSBB-3	8/12/2009	2	L	1	2	J	2
BSBB-3	8/19/2009	2	L	1	4	J	2
BSBB-3	8/20/2009	2	L	1	2	L	1

Entero criteria:	
	SS<=104 cols/100 mLs
	Geomean<=35 cols/100 mLs

Count=	9	# Geomeans=	1
SS Exceedances=	0	# Geomean Exceedances=	0
Percent SS Exceedances=	0	Percent Geomean Exceedances=	0

Fecal Count=	9
Geomean=	1.4
Median=	1.0
# Samples>43=	0
% Samples>43=	0

Table B-1: Bon Secour Bay ADEM 303(d) Data (Cont.)

Station ID	Visit Date	Enterococcus Col 100ml	Ent Col dc	Rev Entero Col 100ml	Fecal Col 100ml	Fecal Col dc	Rev Fecal Col 100ml
BSBB-4	6/8/2009	2	L	1	2	L	1
BSBB-4	6/16/2009	2	L	1	2	L	1
BSBB-4	6/18/2009	2	LH		2	LH	
BSBB-4	6/22/2009	2	L	1	2	L	1
BSBB-4	6/24/2009	2	L	1	2	L	1
BSBB-4	8/3/2009	2	L	1	2	L	1
BSBB-4	8/10/2009	2	L	1	2	L	1
BSBB-4	8/12/2009	2	L	1	2	L	1
BSBB-4	8/19/2009	2	L	1	2	L	1
BSBB-4	8/20/2009	2	L	1	2	L	1
		Entero criteria:					
			SS<=104 cols/100 mLs				
			Geomean<=35 cols/100 mLs				
	Count=		9		# Geomeans=		1
	SS Exceedances=		0		# Geomean Exceedances=		0
	Percent SS Exceedances=		0		Percent Geomean Exceedances=		0
		Fecal Count=	9				
		Geomean=	1.0				
		Median=	1.0				
		# Samples>43=	0				
		% Samples>43=	0				

Table B-2: Bon Secour Bay 2004 Bay Study Data

Station_ID	Date	Time (24hr)	Duplicate Sample	Comments	Enterococci (cols/100 mLs)	Rev Enterococci (cols/100 mLs)	Fecal Coliform (col/100ml)	Fecal Coliform oor	Coliform (col/100ml)
MB-3aBS	10/12/2004	1225	FALSE	Enterococci: no data NAAIIIIUltimate CBOD: 2.79 mg/l				NAA	
MB-3aBS	10/5/2004	1100	FALSE	Enterococci: < 1 col/100ml	0.5	0.5	1	<MDL	0.5
MB-3aBS	8/18/2004	940	FALSE	Enterococci: <1 col/100ml	0.5	0.5	1	<MDL	0.5
MB-3aBS	7/19/2004	915	FALSE	Enterococci: < 1 col/100ml	0.5	0.5	2	—	2
MB-3aBS	6/22/2004	950	FALSE	Enterococci: 2 col/100ml	2	2	74	—	77
MB-3aBS-DUP	6/22/2004	1010	TRUE	Enterococci: 2 col/100ml	2		80	—	
MB-3aBS	5/25/2004	1015	FALSE	Enterococci: < 2 col/100ml	1	1		—	
MB-3aBS	4/22/2004	1015	FALSE	Enterococci: 4 col/100ml	4	4		—	

Note: Where duplicate samples were obtained, the result was reported as the average of the two values.
The average values are highlighted in yellow.

Table B-3: Bon Secour Bay Beach Monitoring Data

ADEM/ADPH Beach Monitoring Program
Microbiological Analyses
Mary Ann Nelson Beach, Mobile Bay

most recent advisory status: 05/03/10

see advisory key below

Latitude: 30.37873° N
Longitude: 87.85284° W

Date Collected		Enterococcus Count/100 ml	Rev Enterococcus Count/100 ml	Enterococcus Geomean	Comments
05/04/10 resample		60	60		
05/03/10		373	373		
03/08/10 resample		80	80		
03/05/10 resample		440	440		
03/04/10 resample		187	187		
03/03/10		507	507		
02/02/10		no sample collected this month; site closed for construction			
01/04/10		10	10		
12/10/09 resample		40	40		
12/09/09 resample		113	113		
12/08/09 resample		113	113		
12/07/09 resample		580	580	78	
12/04/09 resample		1160	1160	203	
12/03/09 resample		374	374	225	
12/02/09 resample		800	800	269	
12/01/09		140	140	248	
11/02/09		10	10		
10/06/09 resample		32	32		
10/05/09	>	400	400		
09/28/09		20	20		
09/14/09		100	100		
08/31/09		6	6		
08/17/09		44	44		
08/03/09	<	2	1		
07/20/09	<	2	1		
07/06/09		76	76		
06/22/09		6	6		
06/08/09	<	2	1		
05/26/09		46	46		
05/11/09		2	2		
04/28/09		4	4		
03/02/09		8	8		
02/02/09		10	10		
01/06/09		6	6		
12/01/08		30	30		
11/03/08		2	2		
10/06/08		4	4		
09/15/08		2	2		
09/08/08		10	10		
08/27/08 resample	<	7	3.5		
08/26/08		180	180		
08/12/08 resample		14	14		rain
08/11/08		300	300	31	rain
07/30/08 resample		74	74		
07/29/08 resample		1000	1000	76	
07/28/08		680	680	104	
07/14/08	<	2	1		
07/01/08 resample		6	6		
06/30/08		267	267	64	
06/16/08		10	10		
06/03/08		74	74		
05/19/08		8	8		
05/05/08		40	40		
04/24/08 resample		6	6		
04/23/08 resample		110	110		
4/22/08 resample		530	530	41	
04/21/08		300	300	57	
03/03/08		80	80		
02/12/08		56	56		
02/11/08		125	125		
01/07/08	<	1	0.5		
12/03/07		no sample/low tide	no sample/low tide		
11/05/07	<	1	0.5		
10/16/07		41	41		
09/24/07		66	66		
09/10/07		13	13		
08/27/07		15	15		
08/13/07		42	42		

Entero criteria:
SS<=104 cols/100 mLs
Geomean<=35 cols/100 mLs

Count=	132
SS Exceedances=	35
% Exceedances=	26.5
# Geomeans=	16
# Geomean Exceedances=	15
% Geomean Exceedances=	94

SS Max=	1260
Geomean Max=	269

Table B-3: Bon Secour Bay Beach Monitoring Data (Cont.)

07/30/07		6	6		
07/16/07		2	2		
07/02/07		35	35		
06/18/07		5	5		rain
06/05/07		54	54		
05/21/07		93	93		
05/07/07		2	2		
04/09/07		13	13		
03/12/07		4	4		
02/12/07		4	4		
01/10/07 resample		8	8		
01/09/07 resample		283	283		
01/08/07	>	200	200		rain past 24 hrs.
12/12/06		9	9		
11/06/06		4	4		rain
10/19/06		28	28		
09/25/06		26	26		
09/11/06		2	2		
08/28/06	<	1	0.5		
08/14/06		2	2		
07/31/06	<	1	0.5		
07/17/06		3	3		
07/05/06		10	10		
06/19/06		5	5		
06/06/06	<	1	0.5		
05/08/06		10	10		
04/10/06		31	31		
03/27/06		26	26		
02/06/06		16	16		
08/22/05		2	2		
08/01/05		26	26		
07/13/05		4	4		
06/27/05		2	2		
05/13/05		12	12		
05/03/05		12	12		
04/22/05 resample		39	39		
4/21/2005 resample		188	188		
04/20/05 resample		440	440	54	
04/19/05		133	133	63	
03/25/05 resample		35	35	108	
3/24/2005 resample		157	157	115	
03/23/05		130	130		
02/18/05 resample		44	44		
2/17/2005 resample		110	110		
02/15/05		170	170		
01/11/05		no sample/low tide	no sample/low tide		
12/13/04		no sample/low tide	no sample/low tide		
11/05/04 resample		35	35		
11/04/04 resample		148	148		
11/03/04 resample		160	160		
11/02/04		165	165		
10/12/04		22	22		
09/13/04		83	83		
08/31/04		1	1		
08/16/04		7	7		
08/09/04		10	10		
07/26/04		15	15		
07/12/04		11	11		
06/28/04		9	9		
06/16/04 resample		50	50		
06/15/04 resample		320	320		rain
06/14/04		1260	1260	72	heavy rain
06/01/04		60	60		
05/26/04		27	27		
05/10/04		21	21		
04/06/04		70	70		
03/01/04		80	80		
02/02/04		58	58		
01/06/04		no sample/low tide	no sample/low tide		

Table B-3: Bon Secour Bay Beach Monitoring Data (Cont.)

Note: Geometric mean is calculated from no fewer than 5 samples collected at a given station over not more than a 30 day period at intervals not less than 24 hrs.
ADEM coastal whole body water contact standard for fecal coliform = 100col/100ml (geo. mean).
ADPH and EPA whole body water contact guidelines for enterococci = 104 col/100ml (single sample max
All fecal coliform analyses performed by ADEM Mobile Branch Lab using EPA standard method 9222D.
All enterococci analyses performed by ADPH Mobile Laboratory using EPA standard method 1600

nd: no data

Advisory Key

The most recent testing of water from this site revealed enterococci levels within the recommended EPA standards. Water quality is acceptable.

The most recent testing of water from this site revealed Enterococci levels over the EPA recommended threshold. There may be an increased risk of illness associated with swimming at this site. Because elevated bacteria levels are often transient and usually fall quickly, this site is now being retested. The status will be revised to red or green based on the results of the retest.

Repeat testing of this site has again revealed Enterococci levels over the EPA recommended threshold. There may be an increased risk of illness associated with swimming at this site. Because elevated bacteria levels have persisted, a public health advisory will be issued. This site will be retested.

Table B-4: Bon Secour Bay Seafood Branch Data

Area III - Combined Fecal Data			
Station 82			
Date	Fecal Conc. (mpn)		
5/5/2004	2.0		
7/13/2004	1.8		
8/17/2004	1.8		
10/20/2004	33.0	Count=	28
1/26/2005	26.0	Geomean=	6.3
3/23/2005	13.0	Median=	5.7
6/27/2005	6.8	# Samples>43=	1
9/15/2005	33.0	% Samples>43=	3.6
11/14/2005	7.8		
4/25/2006	13.0		
5/17/2006	1.8		
6/20/2006	4.5		
7/26/2006	1.8		
9/20/2006	49.0		
11/14/2006	7.8		
2/7/2007	1.8		
6/12/2007	1.8		
7/17/2007	4.0		
9/26/2007	33.0		
11/14/2007	23.0		
5/6/2008	2.0		
7/8/2008	13.0		
11/24/2008	1.8		
12/9/2008	7.8		
6/9/2009	2.0		
7/22/2009	4.5		
8/11/2009	4.5		
82	22.0		

Table B-4: Bon Secour Bay Seafood Branch Data (Cont.)

Area III - Combined Fecal Data			
Station 83			
Date	Fecal Conc. (mpn)		
5/5/2004	1.8		
7/13/2004	1.8		
8/17/2004	7.8		
10/20/2004	33.0	**Count=**	**27**
1/26/2005	23.0	**Geomean=**	**3.3**
3/23/2005	2.0	**Median=**	**2.0**
6/27/2005	1.8	**# Samples>43=**	**0**
9/15/2005	4.5	**% Samples>43=**	**0.0**
11/14/2005	7.8		
4/25/2006	4.5		
5/17/2006	1.8		
6/20/2006	1.8		
7/26/2006	1.8		
9/20/2006	2.0		
11/14/2006	4.0		
2/7/2007	1.8		
6/12/2007	1.8		
7/17/2007	4.5		
9/26/2007	7.8		
11/14/2007	4.5		
5/6/2008	2.0		
7/8/2008	6.8		
11/24/2008	1.8		
6/9/2009	1.8		
7/22/2009	1.8		
8/11/2009	1.8		
4/16/2010	2.0		

Table B-4: Bon Secour Bay Seafood Branch Data (Cont.)

Area III - Combined Fecal Data			
Station 92			
Date	Fecal Conc. (mpn)		
3/31/2004	1.8		
5/5/2004	1.8		
7/13/2004	1.8		
8/17/2004	2.0	**Count=**	**29**
10/20/2004	13.0	**Geomean=**	**2.4**
1/26/2005	1.8	**Median=**	**1.8**
3/23/2005	1.8	**# Samples>43=**	**0**
6/27/2005	1.8	**% Samples>43=**	**0.0**
9/15/2005	11.0		
11/14/2005	2.0		
4/25/2006	1.8		
5/17/2006	1.8		
6/20/2006	1.8		
7/26/2006	2.0		
9/20/2006	1.8		
11/14/2006	1.8		
2/7/2007	1.8		
6/12/2007	2.0		
7/17/2007	1.8		
9/26/2007	7.8		
11/14/2007	2.0		
5/6/2008	1.8		
7/8/2008	2.0		
11/24/2008	1.8		
12/9/2008	4.5		
6/9/2009	1.8		
7/22/2009	1.8		
8/11/2009	2.0		
4/16/2010	7.8		

Table B-4: Bon Secour Bay Seafood Branch Data (Cont.)

Area III - Combined Fecal Data			
Station 104B			
Date	Fecal Conc. (mpn)		
3/31/2004	7.8		
5/5/2004	1.8		
7/13/2004	1.8		
8/17/2004	1.8	**Count=**	**29**
10/20/2004	1.8	**Geomean=**	**2.2**
1/26/2005	1.8	**Median=**	**1.8**
3/23/2005	2.0	**# Samples>43=**	**0**
6/27/2005	1.8	**% Samples>43=**	**0.0**
9/15/2005	1.8		
11/14/2005	4.0		
4/25/2006	1.8		
5/17/2006	1.8		
6/20/2006	1.8		
7/26/2006	1.8		
9/20/2006	1.8		
11/14/2006	1.8		
2/7/2007	2.0		
6/12/2007	1.8		
7/17/2007	1.8		
9/26/2007	4.5		
11/14/2007	4.5		
5/6/2008	2.0		
7/8/2008	1.8		
11/24/2008	1.8		
12/9/2008	4.5		
6/9/2009	1.8		
7/22/2009	4.5		
8/11/2009	2.0		
4/16/2010	1.8		

Table B-4: Bon Secour Bay Seafood Branch Data (Cont.)

Area III - Combined Fecal Data			
Station 106			
Date	Fecal Conc. (mpn)		
3/31/2004	6.8		
5/5/2004	1.8		
7/13/2004	1.8		
8/17/2004	1.8	**Count=**	**28**
10/20/2004	7.8	**Geomean=**	**2.1**
1/26/2005	1.8	**Median=**	**1.8**
3/23/2005	1.8	**# Samples>43=**	**0**
6/27/2005	1.8	**% Samples>43=**	**0.0**
9/15/2005	1.8		
11/14/2005	2.0		
4/25/2006	2.0		
5/17/2006	2.0		
6/20/2006	1.8		
7/26/2006	1.8		
9/20/2006	1.8		
11/14/2006	1.8		
2/7/2007	1.8		
6/12/2007	2.0		
7/17/2007	1.8		
9/26/2007	2.0		
11/14/2007	1.8		
5/6/2008	1.8		
7/8/2008	4.5		
11/24/2008	1.8		
6/9/2009	2.0		
7/22/2009	1.8		
8/11/2009	1.8		
4/16/2010	1.8		

Table B-4: Bon Secour Bay Seafood Branch Data (Cont.)

Area III - Combined Fecal Data			
Station 104A			
Date	Fecal Conc. (mpn)		
3/31/2004	4.5		
5/5/2004	2.0		
7/13/2004	1.8		
8/17/2004	2.0	**Count=**	**29**
10/20/2004	1.8	**Geomean=**	**2.0**
1/26/2005	2.0	**Median=**	**1.8**
3/23/2005	2.0	**# Samples>43=**	**0**
6/27/2005	1.8	**% Samples>43=**	**0.0**
9/15/2005	1.8		
11/14/2005	1.8		
4/25/2006	1.8		
5/17/2006	1.8		
6/20/2006	1.8		
7/26/2006	1.8		
9/20/2006	2.0		
11/14/2006	1.8		
2/7/2007	1.8		
6/12/2007	1.8		
7/17/2007	1.8		
9/26/2007	7.8		
11/14/2007	2.0		
5/6/2008	2.0		
7/8/2008	2.0		
11/24/2008	1.8		
12/9/2008	1.8		
6/9/2009	1.8		
7/22/2009	1.8		
8/11/2009	1.8		
4/16/2010	2.0		

Table B-4: Bon Secour Bay Seafood Branch Data (Cont.)

Area III - Combined Fecal Data			
Station 112A			
Date	Fecal Conc. (mpn)		
3/31/2004	1.8		
5/5/2004	1.8		
7/13/2004	1.8		
8/17/2004	1.8	**Count=**	**29**
10/20/2004	1.8	**Geomean=**	**1.9**
1/26/2005	1.8	**Median=**	**1.8**
3/23/2005	1.8	**# Samples>43=**	**0**
6/27/2005	1.8	**% Samples>43=**	**0.0**
9/15/2005	1.8		
11/14/2005	1.8		
4/25/2006	1.8		
5/17/2006	1.8		
6/20/2006	1.8		
7/26/2006	1.8		
9/20/2006	1.8		
11/14/2006	1.8		
2/7/2007	1.8		
6/12/2007	1.8		
7/17/2007	1.8		
9/26/2007	2.0		
11/14/2007	1.8		
5/6/2008	1.8		
7/8/2008	4.5		
11/24/2008	2.0		
12/9/2008	1.8		
6/9/2009	2.0		
7/22/2009	1.8		
8/11/2009	1.8		
4/16/2010	1.8		

Table B-4: Bon Secour Bay Seafood Branch Data (Cont.)

Area III - Combined Fecal Data			
Station 114			
Date	Fecal Conc. (mpn)		
3/31/2004	1.8		
5/5/2004	1.8		
7/13/2004	1.8		
8/17/2004	1.8	**Count=**	**29**
10/20/2004	1.8	**Geomean=**	**1.9**
1/26/2005	1.8	**Median=**	**1.8**
3/23/2005	1.8	**# Samples>43=**	**0**
6/27/2005	1.8	**% Samples>43=**	**0.0**
9/15/2005	1.8		
11/14/2005	1.8		
4/25/2006	1.8		
5/17/2006	1.8		
6/20/2006	1.8		
7/26/2006	1.8		
9/20/2006	1.8		
11/14/2006	2.0		
2/7/2007	2.0		
6/12/2007	1.8		
7/17/2007	1.8		
9/26/2007	1.8		
11/14/2007	1.8		
5/6/2008	1.8		
7/8/2008	1.8		
11/24/2008	4.5		
12/9/2008	1.8		
6/9/2009	1.8		
7/22/2009	1.8		
8/11/2009	1.8		
4/16/2010	1.8		

Table B-4: Bon Secour Bay Seafood Branch Data (Cont.)

Area III - Combined Fecal Data			
Station 107B			
Date	Fecal Conc. (mpn)		
3/31/2004	1.8		
5/5/2004	1.8		
7/13/2004	1.8		
8/17/2004	1.8	**Count=**	**29**
10/20/2004	1.8	**Geomean=**	**2.0**
1/26/2005	1.8	**Median=**	**1.8**
3/23/2005	1.8	**# Samples>43=**	**0**
6/27/2005	1.8	**% Samples>43=**	**0.0**
9/15/2005	1.8		
11/14/2005	1.8		
4/25/2006	1.8		
5/17/2006	1.8		
6/20/2006	1.8		
7/26/2006	1.8		
9/20/2006	1.8		
11/14/2006	1.8		
2/7/2007	2.0		
6/12/2007	1.8		
7/17/2007	1.8		
9/26/2007	1.8		
11/14/2007	7.8		
5/6/2008	1.8		
7/8/2008	2.0		
11/24/2008	1.8		
12/9/2008	1.8		
6/9/2009	1.8		
7/22/2009	1.8		
8/11/2009	1.8		
4/16/2010	13.0		

Table B-5: Bon Secour Bay Trend Data

Station_ID	Date	Time (24hr)	Duplicate Sample	Duplicate Time (24hrs)	Comments	Enterococcus (col/100ml)	Entero oor	Rev Entero (col/100ml)	Entero Geomean (cols/100 mLs)
MB-3a	3/11/2005	1050	FALSE			1	L	0.5	
MB-3a	4/5/2005	1000	FALSE			12		12	
MB-3a	6/21/2005	915	FALSE			2	L	1	
MB-3a	7/19/2005	915	FALSE	916		2	L	1	
MB-3a	7/19/2005	916	TRUE			2	L		
MB-3a	8/8/2005	910	FALSE			2	L	1	
MB-3a	9/14/2005	1030	FALSE			2	L	1	
MB-3a	10/26/2005	1000	FALSE			2	L	1	
MB-3a	11/3/2005	1025	FALSE			2	L	1	
MB-3a	12/8/2005	1010	FALSE			2	L	1	
MB-3a	1/19/2006	1020	FALSE			2	L	1	
MB-3a	2/23/2006	1220	FALSE			2	L	1	
MB-3a	3/21/2006	940	FALSE			2	L	1	
MB-3a	4/5/2006	1140	FALSE			2	L	1	
MB-3a	5/17/2006	1050	FALSE	1055		2	L	1	
MB-3a	5/17/2006	1055	TRUE			2	L		
MB-3a	6/20/2006	1030	FALSE			2	L	1	
MB-3a	7/5/2006	930	FALSE			2	L	1	
MB-3a	8/23/2006	1010	FALSE			2	L	1	
MB-3a	9/20/2006	1005	FALSE			2	L	1	
MB-3a	10/10/2006	955	FALSE			2	L	1	
MB-3a	11/27/2006	1100	FALSE			2	L	1	
MB-3a	12/14/2006	1105	FALSE			2	L	1	
MB3a	3/20/2007	940	FALSE		Enterococcus = 2 (L)			1	
MB3a	4/24/2007	1050	FALSE		Enterococcus = 2 (L)			1	
MB3a	6/6/2007	1210	FALSE		Enterococcus = 2 col/dl (L)			1	
MB3a	6/21/2007	1145	FALSE		Enterococcus= 2col/dl (L)			1	
MB3a	7/25/2007	1045	FALSE		Enterococcus = 2 col/dl (L)			1	
MB3a	8/14/2007	1020	FALSE		Enterococcus= 2 col/dl (L)			1	
MB3a	9/5/2007	1130	FALSE		Enterococcus = 2 col/dl (L)			1	
MB-3A	3/12/2008					2	L	1	
MB-3A	4/23/2008					2	L	1	
MB-3A	5/8/2008					2	L	1	
MB-3A	6/30/2008					2	L	1	
MB-3A	7/22/2008					2	L	1	
MB-3A	8/27/2008					2	L	1	
MB-3A	9/16/2008					2	L	1	
MB-3A	10/29/2008					2	L	1	
MB-3A	11/12/2008					2	L	1	
MB-3A	12/29/2008					2	L	1	
MB-3A	1/12/2009					2	L	1	
MB-3A	2/5/2009					2	L	1	
MB-3A	3/12/2009					2	L	1	
MB-3A	4/16/2009					2	L	1	
MB-3A	5/26/2009					2	L	1	
MB-3A	6/8/2009					2	L	1	
MB-3A	6/16/2009					2	L	1	
MB-3A	6/17/2009					2	L	1	
MB-3A	6/18/2009					2	LH		
MB-3A	6/22/2009					2	L	1	
MB-3A	6/24/2009					2	L	1	

Table B-5: Bon Secour Bay Trend Data (Cont.)

MB-3A	7/14/2009					2	L	1	
MB-3A	8/3/2009					2	L	1	1
MB-3A	8/10/2009					2	L	1	
MB-3A	8/12/2009					2	L	1	
MB-3A	8/18/2009					2	L	1	
MB-3A	8/19/2009					2	L	1	
MB-3A	8/20/2009					2	L	1	
MB-3A	9/23/2009					2	L	1	

Note 1: L=less than the MDL (method detection limit). H=out of holding time.
Note 2: Where duplicate samples were obtained, the result was reported as the average of the two values. Cells for duplicate averages are highlighted in yellow.
Note 3: Cells highlighted in green represent geomean data.
Note 4: Summer entails the months of June through September.
Note 5: SS=single sample.

			Entero criteria:						
				SS<=104 cols/100 mLs					
				Geomean<=35 cols/100 mLs					
			Count=	56			# Geomeans=	2	
		SS Exceedances=		0			# Geomean Exceedances=	0	
		Percent SS Exceedances=		0			Percent Geomean Exceedances=	0	

Table B-5: Bon Secour Bay Trend Data (Cont.)

Station_ID	Date	Time (24hr)	Duplicate Sample	Duplicate Time (24hrs)	Fecal Coliform (col/100ml)	Fecal Coliform oor	Rev Fecal (col/100ml)
MB-3a	3/11/2005	1050	FALSE		2		2
MB-3a	4/5/2005	1000	FALSE		22		22
MB-3a	6/21/2005	915	FALSE		2	L	1
MB-3a	7/19/2005	915	FALSE	916	2	L	1
MB-3a	7/19/2005	916	TRUE		2	L	
MB-3a	8/8/2005	910	FALSE		2	L	1
MB-3a	9/14/2005	1030	FALSE		2	L	1
MB-3a	10/26/2005	1000	FALSE		2	L	1
MB-3a	11/3/2005	1025	FALSE		2	L	1
MB-3a	12/8/2005	1010	FALSE		2	L	1
MB-3a	1/19/2006	1020	FALSE		2	L	1
MB-3a	2/23/2006	1220	FALSE		2	L	1
MB-3a	3/21/2006	940	FALSE		2	L	1
MB-3a	4/5/2006	1140	FALSE		2	L	1
MB-3a	5/17/2006	1050	FALSE	1055	2	L	1
MB-3a	5/17/2006	1055	TRUE		2	L	
MB-3a	6/20/2006	1030	FALSE		2	L	1
MB-3a	7/5/2006	930	FALSE		2	L	1
MB-3a	8/23/2006	1010	FALSE		2	L	1
MB-3a	9/20/2006	1005	FALSE		2	L	1
MB-3a	10/10/2006	1020	FALSE				
MB-3a	10/10/2006	955	FALSE		2	L	1
MB-3a	11/27/2006	1100	FALSE		2	L	1
MB-3a	12/14/2006	1105	FALSE		2	L	1
MB-3a	1/9/2007	1045	FALSE		10		10
MB3a	3/20/2007	940	FALSE		2		2
MB3a	4/24/2007	1050	FALSE		2	L	1
MB3a	6/6/2007	1210	FALSE		2	L	1
MB3a	6/21/2007	1145	FALSE		2	L	1
MB3a	7/25/2007	1045	FALSE		2	L	1
MB3a	8/14/2007	1020	FALSE		2	L	1
MB3a	9/5/2007	1130	FALSE		2	L	1
MB-3A	3/12/2008				2	L	1
MB-3A	4/23/2008						
MB-3A	5/8/2008				2	L	1
MB-3A	6/30/2008				2	L	1
MB-3A	7/22/2008				2	L	1
MB-3A	8/27/2008				2	L	1
MB-3A	9/16/2008				2	L	1
MB-3A	10/29/2008				2	L	1
MB-3A	11/12/2008				2	J	2
MB-3A	12/29/2008				2	L	1
MB-3A	1/12/2009				2	J	2
MB-3A	2/5/2009				2	L	1
MB-3A	3/12/2009				2	L	1
MB-3A	4/16/2009				2	J	2
MB-3A	5/26/2009				2	L	1
MB-3A	6/8/2009				2	L	1
MB-3A	6/16/2009				2	L	1
MB-3A	6/17/2009				2	L	1
MB-3A	6/18/2009				2	LH	
MB-3A	6/22/2009				2	L	1
MB-3A	6/24/2009				2	L	1

Table B-5: Bon Secour Bay Trend Data (Cont.)

MB-3A	7/14/2009				2	L	1
MB-3A	8/3/2009				2	L	1
MB-3A	8/10/2009				2	L	1
MB-3A	8/12/2009				2	L	1
MB-3A	8/18/2009				2	L	1
MB-3A	8/19/2009				2	L	1
MB-3A	8/20/2009				2	L	1
MB-3A	9/23/2009				2	J	2
Note 1: L=less than the MDL (method detection limit). H=out of holding time.							
Note 2: Where duplicate samples were obtained, the result was reported as the average of the two values. Cells for duplicate averages are highlighted in yellow.							
		Count=	**58**				
		Geomean=	**1.2**				
		Median=	**1**				
		# Samples>43=	**0**				
		% Samples>43=	**0**				