



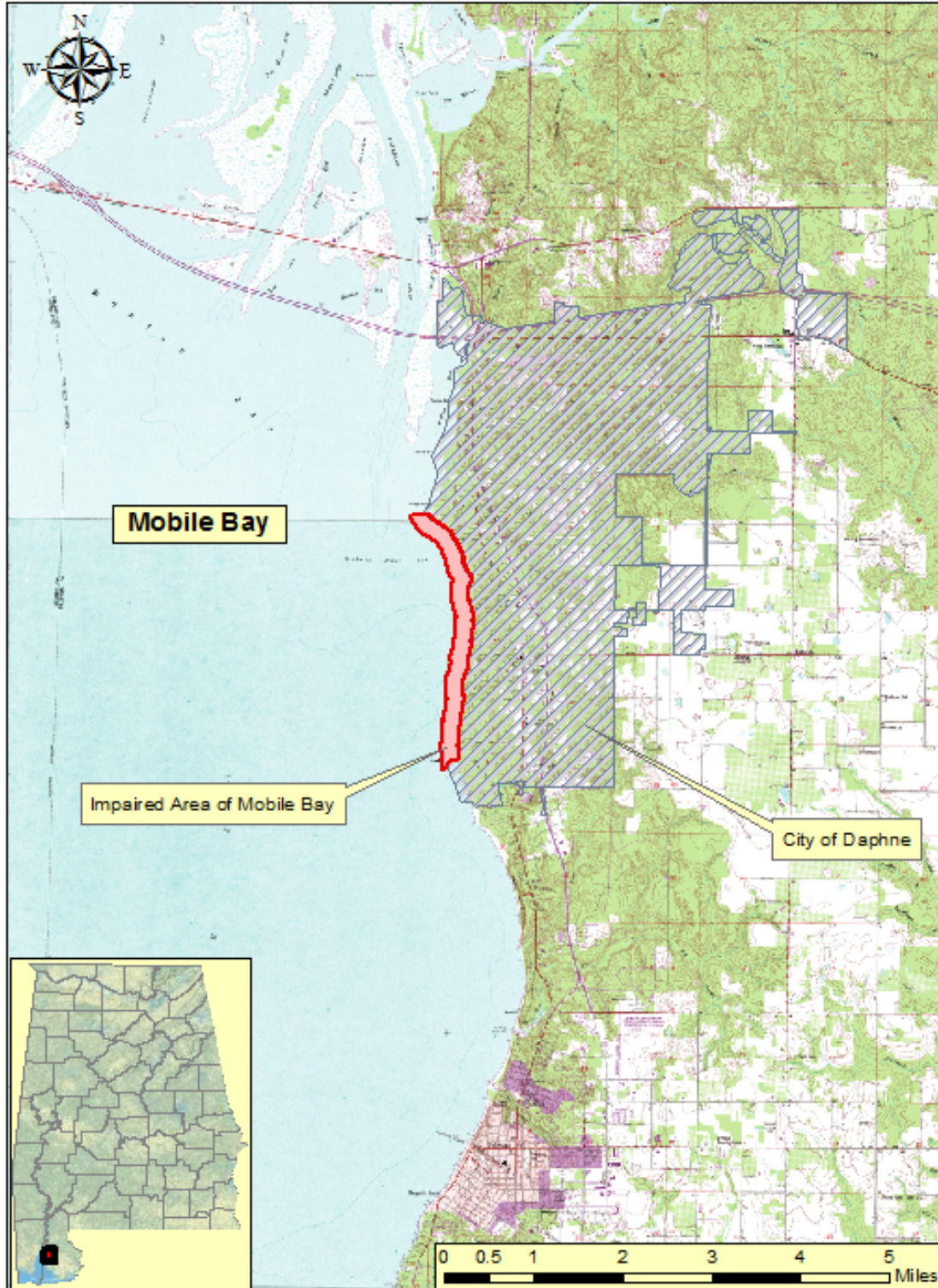
**Final**  
**Total Maximum Daily Load (TMDL)**  
**For**  
**Mobile Bay**

**Assessment Unit ID # AL03160205-0300-501**

**Pathogens (Enterococci)**

Alabama Department of Environmental Management  
Water Quality Branch  
Water Division  
August 2015

**Figure 1-1 Site Map of Impaired Portion of Mobile Bay**



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## 1.0 Executive Summary

Section §303(d) of the Clean Water Act and EPA’s Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated uses and to determine the Total Maximum Daily Load (TMDL) for pollutants causing the use impairment. A TMDL is the maximum amount of pollutant a waterbody can assimilate while meeting all applicable water quality standards for the pollutant of concern. All TMDLs include the sum of individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS).

Mobile Bay has a drainage area of just over 44,000 square miles spreading over four states. In terms of area, it is the sixth largest river system in the United States. In addition, Mobile Bay is the second largest estuary in the US. It has a mean annual flow of around 65,000 cfs at its mouth, which empties into the Gulf of Mexico. It has an average depth of 10 feet. North to south, the bay is approximately 32 miles long. At its widest point from east to west, it is 23 miles long. It is bordered on the north by the Mobile River delta area. The primary freshwater inflow comes from the Mobile River, with additional inflows from the Tensaw, Spanish, Apalachee, and Blakely Rivers. It is bordered on the west, east, and south by the Mississippi Sound, Perdido Bay, and the Gulf of Mexico, respectively. The bay is subject to a diurnal tide with a range of approximately 1.5 to 2 feet.

The northeast portion of Mobile Bay was originally placed on Alabama’s 2010 §303(d) list of impaired waters for pathogen impairment based on Alabama Department of Environmental Management (ADEM) Beach Monitoring Program data collected in 2008 and 2009. The sources of the impairment, as listed on Alabama’s §303(d) list, are urban runoff and storm sewers. This area of Mobile Bay has designated use classifications of *Swimming and Other Whole-Body Water Contact Sports (S)* and *Fish and Wildlife (F&W)*. Unlike the majority of Mobile Bay, shellfish harvesting is prohibited in this area; therefore, these waters are not subject to Alabama Department of Public Health (ADPH) closures which have contributed to the listing of other segments in previous cycles.

The original listing had the entire northeast Mobile Bay listed, but after review of available data, it was evident that the majority of the northeast Mobile Bay is meeting applicable water quality standards with respect to pathogens (Enterococci). However, beach monitoring continues to show exceedances of Alabama’s pathogen criteria. As a result, the original assessment unit ID (AL03160205-0300-500) was split into two separate units. Assessment unit ID AL03160205-0300-501 (1000-ft-wide zone along shoreline of Mobile Bay) is the subject of this TMDL. A delisting report for Assessment Unit ID AL03160205-0300-502 (remaining portion of northeast Mobile Bay) was approved in March 2014. A summary of the assessment unit IDs is shown below in Table 1-1.

**Table 1-1. Assessment Unit IDs for Northeast Mobile Bay**

Assessment Unit ID	Listing Action	Description
AL03160205-0300-501	TMDL	1000-ft-wide zone along shoreline
AL03160205-0300-502	Delisted in 2014	Remaining portion of northeast Mobile Bay

A percent reduction approach was utilized to calculate the pathogen TMDL for northeast Mobile Bay. Typically, TMDLs are expressed on a mass loading basis (e.g., pounds per day). In this instance, flow was not a consideration due to 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. It was determined that the highest percent reduction was calculated for a single sample violation of 1,230 colonies/100 mL measured on June 11, 2012, at the beach monitoring station MAY\_DAY. This violation resulted in a 92% reduction.

The existing pathogen loading used for this TMDL was based on the highest single sample exceedance at the beach monitoring station MAY\_DAY with a reported concentration of 1,230 colonies/100 mL. The allowable loading, defined by the single sample criterion including a margin of safety, was calculated by subtracting 10% from the single sample criterion. The allowable loading was determined to be 94 colonies/100 mL (104 colonies/100 mL – 10% Margin of Safety). The reduction required to meet the allowable loading was then calculated by subtracting the allowable loading from the existing loading and then dividing that by the existing loading. The highest single sample violation calls for a reduction of 92%.

Table 1-2 is a summary of the existing load, allowable load, and percent reduction for the single sample criterion vs. the geometric mean criterion for northeast Mobile Bay (Assessment Unit ID AL03160205-0300-501). Table 1-3 provides details of the TMDL along with the corresponding reductions for northeast Mobile Bay which are protective of enterococci water quality standards year round.

**Table 1-2. Enterococci Concentrations and Required Reduction for AL03160205-0300-501 at Station MAY\_DAY**

Source	Existing Concentration (col/100 mL)	Allowable Concentration (col/100 mL)	Required Reduction (col/100 mL)	% Reduction
<b>Nonpoint Source - Single Sample</b>	1230	94	1136	92%
<b>Nonpoint Source - Geometric Mean</b>	59.40	32	27.40	46%
<b>Point Source</b>	0	0	0	0%

**Table 1-3. Enterococci TMDL for Impaired Portion of Northeast Mobile Bay**

TMDL <sup>e</sup>	Margin of Safety (MOS)	Waste Load Allocation (WLA) <sup>a</sup>			Load Allocation (LA)	
		WWTPs <sup>b</sup>	MS4s <sup>c</sup>	Leaking Collection Systems <sup>d</sup>		
(col/100 mL)	(col/100 mL)	(col/100 mL)	(% reduction)	(col/day)	(col/100 mL)	(% reduction)
104	10	0	92%	0	94	92%

- a. There are no CAFOs in the subject watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
- b. Both existing and future WWTPs must meet applicable instream water quality criteria for pathogens at the point of discharge.
- c. Future MS4 areas would also be required to demonstrate consistency with the assumptions and requirements of this TMDL.
- d. The objective for leaking collections 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.
- e. TMDL was established using the *Swimming* use classification single sample criterion of 104 colonies/100 mL.

## 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 the 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). A TMDL is the sum of individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS).

The State of Alabama has identified a 1.08 square mile portion of Mobile Bay as impaired for pathogens. This portion of Mobile Bay was originally placed on Alabama’s 2010 §303(d) List of Impaired Waterbodies for pathogens (Enterococci) based on Beach Monitoring Program data collected in 2008-2009 at station MAY\_DAY near the City of Daphne, AL. The original listing had the whole portion of northeast Mobile Bay listed, but after review of the data, it was apparent that most of the northeast Mobile Bay is meeting water quality standards with respect to pathogens. Therefore, the original listing of the entire northeast Mobile Bay was divided into two separate units (1000-ft-wide zone along shoreline and remaining portion of northeast Mobile Bay). This TMDL will cover the 1000-ft-wide zone along the shoreline. A delisting report for the remaining portion of northeast Mobile Bay was written and approved in March 2014.

## 2.2 Problem Definition

<u>Waterbody Impaired:</u>	Portion of northeast Mobile Bay from Ragged Point to the mouth of Yancey Branch extending out to 1,000 feet offshore
<u>Impaired Area:</u>	1.08 square miles
<u>Contributing Drainage Area:</u>	1.62 square miles
<u>Water quality Standard Violation:</u>	Pathogens (Single Sample Max & Geometric Mean; Enterococci)
<u>Pollutant of Concern:</u>	Pathogens (Enterococci)
<u>Water Use Classification:</u>	Swimming (S) and Fish & Wildlife (F&W)
<u>Usage Related to Classification:</u>	

The impaired portion of northeast Mobile Bay has two use classifications: *S* and *F&W*. Usage of waters for the *S* classification is described in ADEM Admin. Code R. 335-6-10-.09 (3)(a) and (b) as follows:

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

**\*Note:** *In assigning this classification to waters intended for swimming and water-contact sports, the Commission will take into consideration the relative proximity of discharges of wastes and will recognize the potential hazards involved in locating swimming areas close to waste discharges. The Commission will not assign this classification to waters, the bacterial quality of which is dependent upon adequate disinfection of waste and where the interruption of such treatment would render the water unsafe for bathing.*



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.*

Pathogen Criteria:

Pathogen criteria of waters for *S* classification are described in ADEM Admin. Code R. 335-6-10-.09 (3) (c) 6. (i), (ii), and (iii) as follows:

6. *Bacteria:*

- (i). *Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these wastes\*, are not acceptable for swimming or other whole body water-contact sports.*
- (ii). *In all other areas, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean *E. coli* organism density does not exceed 126 colonies/100 mL nor exceed a maximum of 235 colonies/100 mL in any sample in non-coastal waters. In coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 colonies/100 mL nor exceed a maximum of 104 colonies/100 mL in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric mean bacterial organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters.*

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

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

*7. Bacteria:*

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

(ii) *For incidental water contact and recreation during June through September, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean E. coli organism density does not exceed 126 colonies/100 mL nor exceed a maximum of 487 colonies/100 mL in any sample in non-coastal waters. In coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 colonies/100 mL nor exceed a maximum of 158 colonies/100 mL in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric bacterial coliform organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters. Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these wastes, are not acceptable for swimming or other whole body water contact sports.*

A summary of Alabama's bacteria criteria for *S* and *F&W* use classifications is shown in Table 2-1 below.

**Table 2-1. Alabama's Bacteria Criteria**

Use Classification	Non-Coastal Waters	Coastal Waters
<b>Swimming and Other Whole-Body Water Contact (S)</b>	<i>E. Coli (colonies/100 ml)</i> <ul style="list-style-type: none"> <li>• Geometric Mean <math>\leq 126</math></li> <li>• Single Sample Max <math>\leq 235</math></li> </ul>	<i>Enterococci (colonies/100 ml)</i> <ul style="list-style-type: none"> <li>• Geometric Mean <math>\leq 35</math></li> <li>• Single Sample Max <math>\leq 104</math></li> </ul>
<b>Fish &amp; Wildlife (F&amp;W)</b>	<i>E. Coli (colonies/100 ml)</i> June – September: <ul style="list-style-type: none"> <li>• Geometric Mean <math>\leq 126</math></li> <li>• Single Sample Max <math>\leq 487</math></li> </ul> October - May: <ul style="list-style-type: none"> <li>• Geometric Mean <math>\leq 548</math></li> <li>• Single Sample Max <math>\leq 2507</math></li> </ul>	<i>Enterococci (colonies/100 ml)</i> June – September: <ul style="list-style-type: none"> <li>• Geometric Mean <math>\leq 35</math></li> <li>• Single Sample Max <math>\leq 158</math></li> </ul> October - May: <ul style="list-style-type: none"> <li>• Single Sample Max <math>\leq 275</math></li> </ul>

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 ensuring that criteria are maintained for each use classification. An assessment of the pathogen criteria for the impaired portion of northeast Mobile Bay results in the following applicable criteria:

Annual (January – December):

- The geometric mean for Enterococci may not exceed 35 colonies/100 mL;
- The single sample maximum for Enterococci may not exceed 104 colonies/100 mL.

There were numerous exceedances of the applicable pathogen criteria at the beach monitoring station. The exceedance value selected for load reductions was the one that resulted in the highest percentage reduction to the watershed. That value was a single sample Enterococci measurement taken on 6/11/2012 at the May Day Park beach station that had a reported concentration of 1230 colonies/100 mL.

### **3.0 Technical Basis for TMDL Development**

#### **3.1 Water Quality Target Identification**

A 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 to be protective of water quality standards and should not allow any of the applicable criteria to be exceeded.

## **3.2 Source Assessment**

### **3.2.1 Point Sources in northeast Mobile Bay Watershed**

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

#### **3.2.1.1 Continuous Point Sources**

There is one continuous point source near the impaired portion of the bay. Daphne Water Reclamation Facility (AL0027561) discharges to the Blakely River and is located approximately 2 miles upstream of the impaired portion of northeast Mobile Bay. It is believed that this facility does not have an impact on the impairment of northeast Mobile Bay. A map referencing the location of the facility is shown in Figure 3-1. 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.

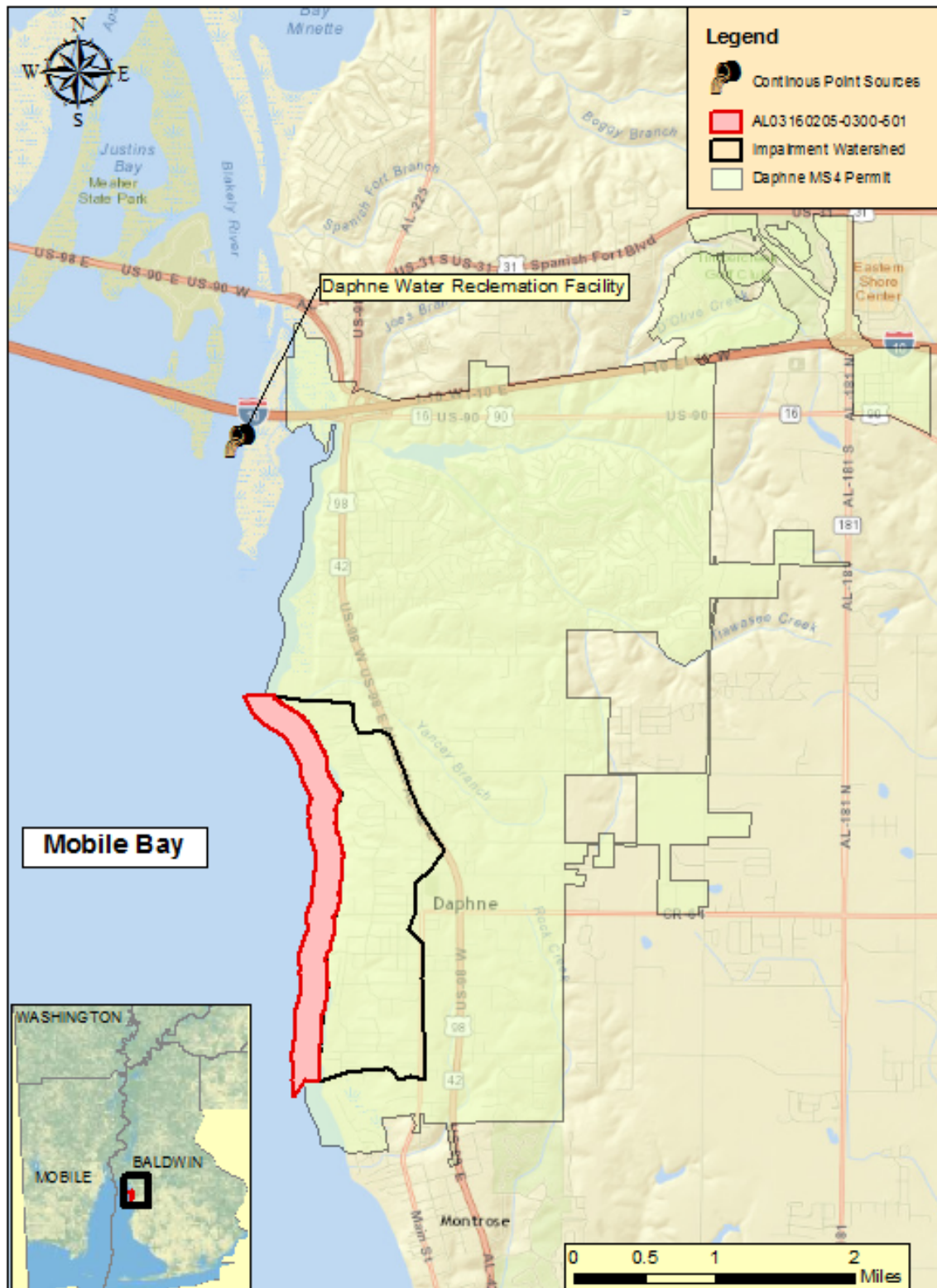
#### **3.2.1.2 Non-Continuous Point Sources**

The entire watershed of the impaired portion of northeast Mobile Bay lies within the City of Daphne's Phase II Municipal Separate Stormwater Sewer System (MS4) area. The City of Daphne currently has its own Phase II MS4 permit (ALR040039). Since the Phase II MS4 area drains to the pathogen impaired portion of northeast Mobile Bay, it will be considered as a point source and allocated as an MS4 WLA in the TMDL. Figure 3-1 shows the City of Daphne's Phase II MS4 permit area.

Sanitary sewer overflows (SSOs) have a 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 files, it was determined that numerous SSOs have occurred in the Daphne area, with some ending up in the bay. These overflows typically occur from manholes. SSO data for Daphne can be found in the appendices of this report in Table 7-2.

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

**Figure 3-1. Point Sources in Northeast Mobile Bay**



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### **3.2.2 Nonpoint Sources in the northeast Mobile Bay Watershed**

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

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

Enterococci bacteria can also originate from forested areas due to the presence of wild animals such as deer, raccoons, turkeys, beavers, and waterfowl. 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.

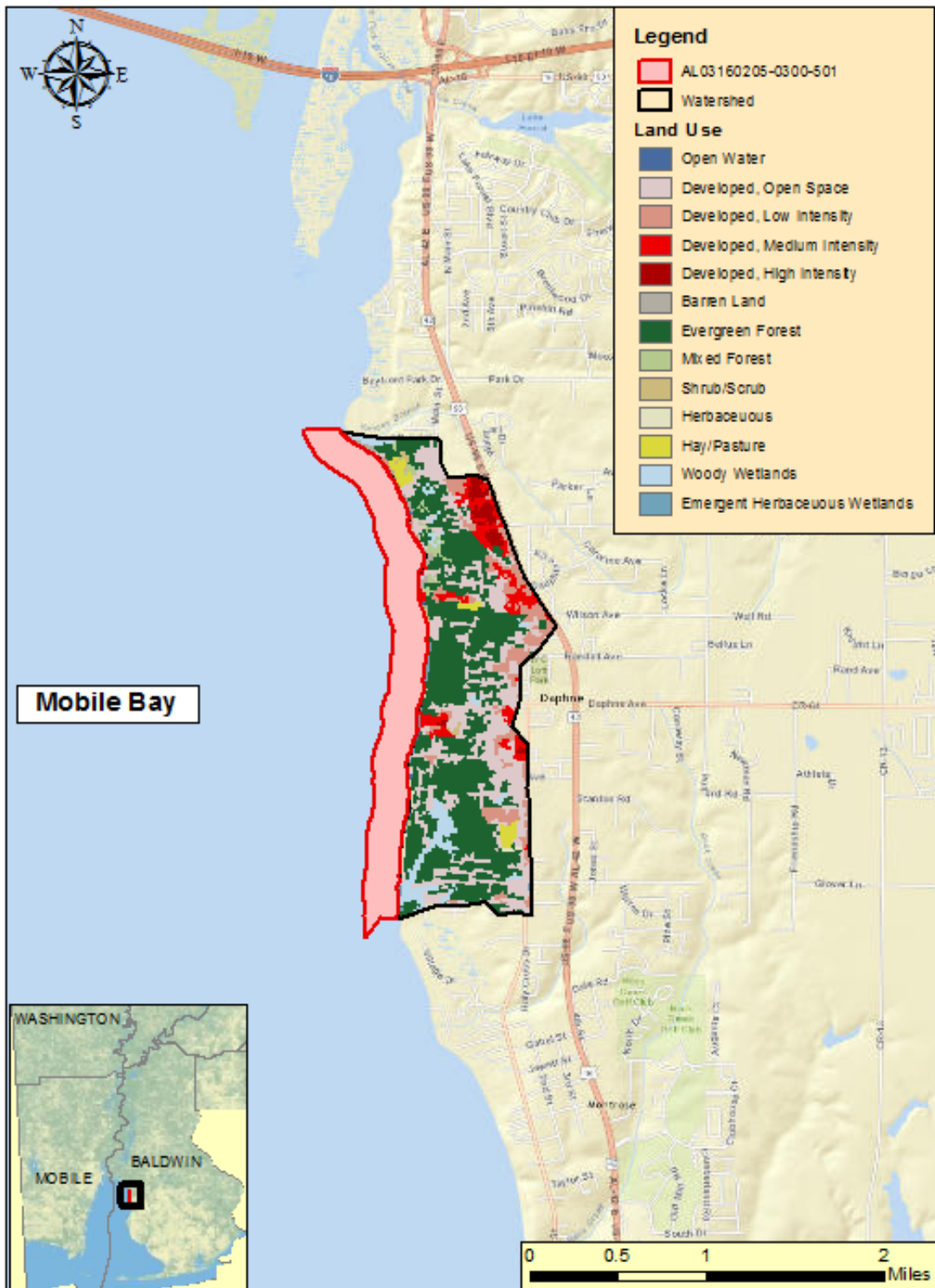
Enterococci loading from urban areas is potentially attributable to multiple sources including storm water runoff, illicit discharges of wastewater, runoff from improper disposal of waste materials, failing septic tanks, sewer overflows due to I & I (infiltration and inflow), and domestic animals. Septic systems are common in unincorporated areas of the watershed and may be direct or indirect sources of bacterial pollution via ground and surface waters. Onsite septic systems have the potential to deliver Enterococci bacteria to surface waters due to system failure and malfunction. The City of Daphne most likely has a limited number of older homes still with septic systems.

### **3.3 *Land Use Assessment***

Land use for the watershed was determined using ArcMap with land use datasets derived from the 2011 National Land Cover Dataset (NLCD). Figure 3-2 displays the land use areas for the watershed of the impaired portion of northeast Mobile Bay. Table 3-1 depicts the primary land uses in the watershed of the impaired portion of northeast Mobile Bay. Figure 3-3 shows the grouped land uses for the watershed.

The majority of the watershed is forests/natural at 53% and developed land at 45%. The remaining land use is approximately 2% agricultural lands and less than 1% open water. Developed land includes both commercial and residential land uses and is all within the City of Daphne.

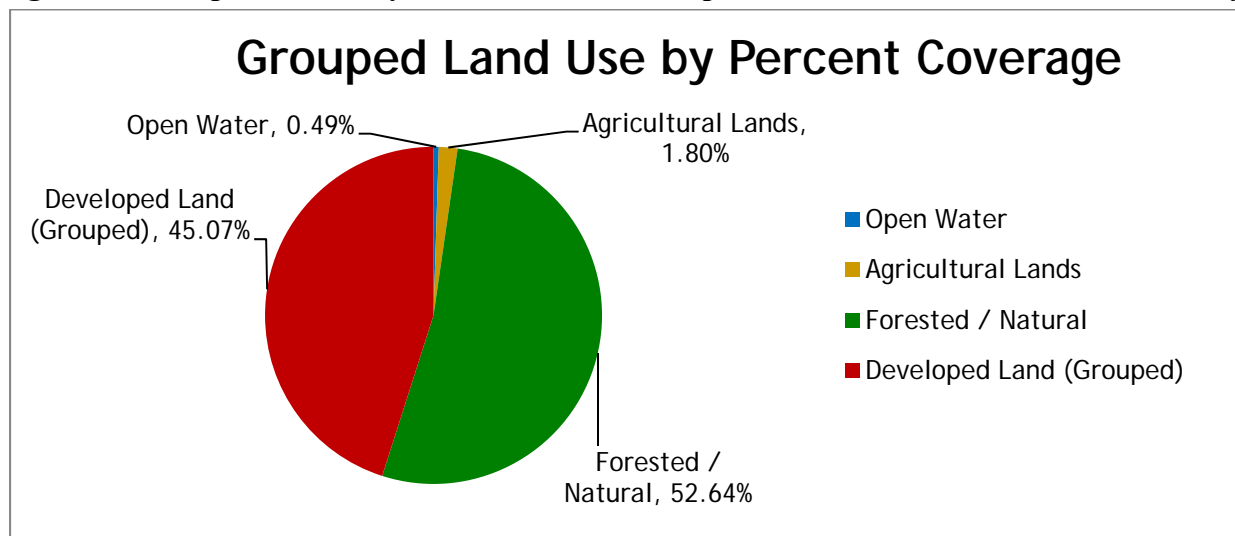
Figure 3-2. Land Use Map for Impaired Portion of Northeast Mobile Bay



**Table 3-1. Land Use Areas for the Impaired Portion of Northeast Mobile Bay**

Class Description	Mi <sup>2</sup>	Acres	Percent
Open Water	0.01	5.12	0.49%
Developed, Open Space	0.44	278.88	26.88%
Developed, Low Intensity	0.15	94.30	9.09%
Developed, Medium Intensity	0.10	64.05	6.17%
Developed, High Intensity	0.03	21.57	2.08%
Barren Land	0.01	8.90	0.86%
Deciduous Forest	0.00	0.00	0.00%
Evergreen Forest	0.71	455.02	43.85%
Mixed Forest	0.02	13.79	1.33%
Shrub/Scrub	0.01	5.34	0.51%
Herbaceous	0.01	7.34	0.71%
Hay/Pasture	0.03	18.68	1.80%
Cultivated Crops	0.00	0.00	0.00%
Woody Wetlands	0.09	55.38	5.34%
Emergent Herbaceous Wetlands	0.01	9.34	0.90%
<b>TOTALS →</b>	<b>1.62</b>	<b>1037.69</b>	<b>100.00%</b>
Class Description	Mi <sup>2</sup>	Acres	Percent
Open Water	0.01	5.12	0.49%
Agricultural Lands	0.03	18.68	1.80%
Forested / Natural	0.85	546.20	52.64%
Developed Land (Grouped)	0.73	467.70	45.07%
<b>TOTALS →</b>	<b>1.62</b>	<b>1037.69</b>	<b>100.00%</b>

**Figure 3-3. Graph of Primary Land Uses for the Impaired Portion of Northeast Mobile Bay**





### ***3.4 Linkage Between Numeric Targets and Sources***

The impaired portion of the northeast Mobile Bay watershed has two main land uses, namely forested/natural and developed land. Pollutant loadings from forested areas tend to be low due to their filtering capabilities and will be considered as background conditions. The most likely sources of pathogen loading in this watershed are from urban runoff, 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***

The beach monitoring program has been in effect for approximately 15 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 Alabama Department of Public Health (ADPH). Samples are usually collected twice per week, once per week, or once every other week during the swimming season (June through September) and once per month during the cooler months. Results of the data are assessed employing ADEM's water quality criteria for pathogens in the coastal area. If values exceed the criteria, then ADPH 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 northeast Mobile Bay, located along the beach of Daphne. The station is at Daphne May Day Park (Station: MAY\_DAY). A map showing the station location is shown in Figure 3-4.

Of the data collected at the station MAY\_DAY, there were numerous exceedances of both single sample and geometric mean criteria. The data was evaluated against both geometric mean and single sample criteria for the Swimming and Fish and Wildlife use classifications. As stated earlier, the more stringent criteria of the two use classifications will apply; therefore, the single sample criterion of 104 colonies/100 mL (year round) and the geometric mean criterion of 35 colonies/100mL (year round) will apply.

The exceedance event which results in the largest pathogen reduction at Daphne May Day Park occurred on June 11, 2012. This was a single sample event with a measured Enterococci value of 1,230 colonies/100 mL. A table with all of the exceedances can be found in the Appendices of this report.

**Table 3-2. ADEM Beach Monitoring Station on Northeast Mobile Bay**

<b>Station</b>	<b>Beach</b>	<b>Waterbody</b>	<b>Latitude</b>	<b>Longitude</b>
MAY_DAY	May Day Beach	Mobile Bay	30.59923°	-87.91407°

**Figure 3-4. Map of ADEM Beach Monitoring Stations on Northeast Mobile Bay**



### ***3.6 Critical Conditions***

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

### ***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 were 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. The single sample mean criterion of 104 colonies/100 mL 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 (WLAs) for point sources, 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 following equation:

$$\mathbf{TMDL = \Sigma WLAs + \Sigma LAs + MOS}$$

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). 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 northeast Mobile Bay. The following equation was used to calculate the appropriate load reduction:

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

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/100 mL. 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, the contributing watershed was limited to the near-shore area of the bay.

### 4.2.1 Percent Reduction Calculation:

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 percent reduction calculation is shown below.

$$\frac{(1230 \text{ col}/100 \text{ mL} - 94 \text{ col}/100 \text{ mL})}{1230 \text{ col}/100 \text{ mL}} \times 100\% = 92\% \text{ Reduction}$$

The TMDL was calculated as the total daily Enterococci concentration to northeast Mobile Bay as evaluated at the May Day Park station. Table 4-1 shows a summary of the existing loads, allowable loads, and percent reduction for both the single sample and geometric mean criterion for the impaired portion of northeast Mobile Bay. Table 4-2 provides the details of the TMDL along with the corresponding reductions for northeast Mobile Bay which are protective of Enterococci water quality standards year round.

**Table 4-1. Enterococci Concentrations and Required Reductions for AL03160205-0300-501 at Station MAY\_DAY**

Source	Existing Concentration (col/100 mL)	Allowable Concentration (col/100 mL)	Required Reduction (col/100 mL)	% Reduction
Nonpoint Source - Single Sample	1230	94	1136	92%
Nonpoint Source - Geometric Mean	59.40	32	27.40	46%
Point Source	0	0	0	0%

**Table 4-2. Enterococci TMDL for Impaired Portion of Northeast Mobile Bay**

TMDL <sup>e</sup>	Margin of Safety (MOS)	Waste Load Allocation (WLA) <sup>a</sup>			Load Allocation (LA)	
		WWTPs <sup>b</sup>	MS4s <sup>c</sup>	Leaking Collection Systems <sup>d</sup>		
(col/100 mL)	(col/100 mL)	(col/100 mL)	(% reduction)	(col/day)	(col/100 mL)	(% reduction)
104	10	0	92%	0	94	92%

- a. There are no CAFOs in the subject watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
- b. Both existing and future WWTPs must meet applicable instream water quality criteria for pathogens at the point of discharge.
- c. Future MS4 areas would also be required to demonstrate consistency with the assumptions and requirements of this TMDL.
- d. The objective for leaking collections 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.
- e. TMDL was established using the *Swimming* use classification single sample criterion of 104 colonies/100 mL.

### 4.3 TMDL Summary

As indicated earlier, the northeast portion of Mobile Bay was originally placed on Alabama’s 2010 §303(d) list of impaired waters for pathogen impairment based on Alabama Department of Environmental Management (ADEM) Beach Monitoring Program data collected in 2008 and 2009. After review of available data, it is evident that the majority of the northeast Mobile Bay is meeting applicable water quality standards with respect to pathogens (Enterococci). However, beach monitoring continues to show exceedances of Alabama’s pathogen criteria. As a result, the original assessment unit ID (AL03160205-0300-500) was split into two separate units. A delisting report for Assessment Unit ID AL03160205-0300-502 (remaining portion of northeast Mobile Bay) was approved in March 2014. Assessment unit ID AL03160205-0300-501 (1000-ft-wide zone along shoreline of Mobile Bay) is not currently meeting water quality standards with respect to pathogens and is the subject of this TMDL. These pathogen impacts are a result of urban runoff and SSOs. It was determined that a 92% reduction of Enterococci loadings from the watershed is needed for this portion of northeast Mobile Bay to meet water quality standards.

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

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria, and we are committed to targeting the load reductions to improve water quality in the northeast Mobile 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 statewide approach to water quality management. Each year, ADEM's water quality resources are divided among multiple priorities statewide including §303(d) listed waterbodies, waterbodies with active TMDLs, and other waterbodies as determined by the Department. Monitoring will help further characterize water quality conditions resulting from the implementation of best management practices and load reductions in the watershed.

## ***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 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](http://www.adem.state.al.us). The public could also request paper or electronic copies of the TMDL by contacting Ms. Kimberly Minton at 334-271-7826 or [kminton@adem.state.al.us](mailto:kminton@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 have become part of the administrative record. ADEM has 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.

## ***7.0 Appendices***

### ***7.1 References***

ADEM Administrative Code, 2014. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2014. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's §303(d) Beach Monitoring Program. 2009, 2010, 2011, 2012, 2013, & 2014. ADEM.

Alabama Department of Environmental Management (ADEM), Alabama's Water Quality Assessment and Listing Methodology, January 2014.

Alabama's §303(d) List and Fact Sheet. 2010 & 2012. ADEM.

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

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

## 7.2 Water Quality Data

**Table 7-1. Beach Monitoring Data at May Day Park (MAY\_DAY)**

ADEM/ADPH Beach Monitoring Program			
Microbiological Analyses			
May Day Park, Daphne, Mobile Bay			
Latitude:30.59923 ° N		<b>most recent advisory status:</b> 11/03/14	
Longitude:87.91407 ° W		see advisory key below	
Date Collected	Enterococcus Count/100 ml *	Enterococcus Geo. Mean	Comments
11/03/14	2		
10/07/14 resample	4	12.76	
10/06/14	220		
09/22/14	4	8.93	
09/15/14	24	10.26	
09/08/14	4	8.93	
09/02/14	74	8.93	
08/25/14	2	6.73	
08/18/14	8	9.12	
08/11/14	12	10.84	
08/04/14	4	12.00	
07/28/14	18	12.00	
07/21/14			no sample collected 07/21/2014; site closed
07/14/14	16	9.29	
07/07/14	18	10.92	
06/30/14	4	17.18	
06/23/14	10	24.03	
06/16/14	6	27.81	
06/09/14	28	39.59	
06/04/14 resample	14	42.43	
06/03/14	273	37.94	
05/27/14	30		
05/19/14	24		
05/12/14	50		
05/05/14	8		
04/21/14	28		
03/10/14	2		
02/04/14 resample	4		
02/03/14	200		
01/13/14	58		
12/02/13	16		
11/04/13	4		
10/15/13	4		
09/23/13	4	7.35	



Date Collected	Enterococcus Count/100 ml *	Enterococcus Geo. Mean	Comments
09/16/13	2	14.02	
09/09/13	16	15.74	
09/03/13	< 2	16.60	
08/26/13	22	30.83	
08/20/13 resample	28	29.23	
08/19/13	193	29.48	
08/12/13	4	23.02	
08/05/13	22	41.91	
07/29/13	82	38.29	
07/22/13	16	59.40	
07/15/13	56	42.00	
07/08/13	80	39.65	
07/01/13	14	21.78	
06/25/13 resample	80	18.96	
06/24/13	547	13.23	
06/17/13	2	5.19	
06/04/13	4	9.42	
05/28/13	7	10.22	
05/20/13	13	14.18	
05/13/13	6		
05/06/13	34		
04/29/13	6		
04/23/13	36		
03/04/13	24		
02/04/13	6		
01/07/13	98		
12/03/12	90		
11/05/12	< 2		
10/03/12 resample	20	22.98	
10/02/12 resample	233	23.51	
10/01/12	687	21.17	
09/24/12	6	10.55	
09/17/12	4	16.26	
09/10/12	2	16.26	
09/05/12 resample	22	27.45	
09/04/12	124	25.35	
08/20/12	52	6.68	
08/13/12	4	5.63	
08/06/12	16	6.10	
07/30/12	2	4.02	
07/23/12	2	5.94	
07/16/12	22	9.76	
07/09/12	6	29.54	
07/02/12	< 2	34.56	
06/25/12	14	34.56	




Date Collected	Enterococcus Count/100 ml *	Enterococcus Geo. Mean	Comments
06/18/12	24	34.56	
06/13/12 resample	30	36.73	
06/12/12 resample	132	23.39	
06/11/12	1230	16.55	
06/05/12	18	8.07	
05/29/12	< 2	6.48	
05/22/12	14	6.48	
05/14/12	2		
05/07/12	34		
04/30/12	6		
04/24/12	< 2		
03/05/12	62		
02/07/12	36		
01/09/12	2		
12/05/11	20		
11/15/11	20		
10/17/11	< 2		
09/28/11	2	3.57	
09/19/11	6	5.76	
09/12/11	4	7.95	
09/07/11	6	18.02	
08/29/11	2	20.22	
08/22/11	22	30.60	
08/15/11	30	40.80	
08/09/11 resample	12	34.87	
08/08/11	360	41.66	
08/01/11	12	21.05	
07/25/11	24	24.10	
07/19/11	56	15.93	
07/18/11	90	12.39	
07/11/11	10	8.77	
07/05/11	6	9.63	
06/27/11	27	7.73	
06/20/11	< 2	11.19	
06/13/11	16	17.27	
06/07/11	16	16.46	
05/31/11	2	15.22	
05/24/11 resample	8	22.84	
05/23/11	240		
05/16/11	27		
05/09/11	12		
05/02/11	10		
04/18/11	18		
03/02/11 resample	14		
03/01/11	133		

Date Collected	Enterococcus Count/100 ml *	Enterococcus Geo. Mean	Comments
02/07/11	38		
01/18/11	16		
12/07/10	4		
11/04/10 resample	40		
11/03/10	> 400		
site closed for construction of new boat ramp and parking area			
02/03/10	48		
01/05/10	78		
12/07/09 resample	< 7		
12/04/09 resample	560		
12/03/09 resample	520		
12/02/09	440		
11/03/09	12		
10/07/09 resample	12	17.75	
10/06/09	144	18.95	
09/30/09	6	11.16	
09/23/09	2	9.29	
09/17/09 resample	50	16.57	rain
09/16/09	134	13.79	
09/10/09	4	8.22	
09/02/09	6	8.22	
08/26/09	< 2	9.87	
08/20/09 resample	4	16.26	
08/19/09	267	21.52	
08/12/09	6	12.26	
08/05/09	4	12.98	
07/29/09	18	11.30	
07/22/09	40	7.28	
07/15/09	16	5.72	
07/08/09	8	3.78	
07/01/09	< 2	4.54	
06/24/09	< 2	5.99	
06/17/09	12	9.49	
06/10/09	< 2	7.61	
06/04/09	20	27.06	
05/28/09	8	22.78	
05/20/09	20	22.78	
05/13/09	4	23.28	
05/08/09 resample	14	33.11	
5/7/09 resample	193		
05/06/09	307		
04/30/09	6		
04/22/09	8		

Date Collected	Enterococcus Count/100 ml *	Enterococcus Geo. Mean	Comments
03/03/09	4		
02/03/09	2		
01/06/09	14		
12/02/08			no sample low tide
11/04/08	14		
10/07/08	32		
09/24/08	26	15.63	
09/17/08	8	12.24	
09/10/08	12	25.29	
09/05/08 resample	20	28.64	
09/04/08	146	34.76	
08/28/08	< 2	31.04	
08/20/08	6	34.84	
08/14/08 resample	20	32.57	
08/13/08	787	35.90	rain
08/06/08	64	13.54	
07/30/08	74	10.73	
07/23/08	4	5.21	
07/16/08	4	4.54	
07/09/08	6	6.13	
07/02/08	20	10.84	
06/25/08	< 2	11.91	
06/18/08	2	26.57	
06/11/08	18	38.33	
06/05/08	104	34.75	
05/29/08	32	17.99	
05/22/08 resample	20	16.02	
05/21/08	147	15.33	
05/14/08	18		
05/07/08	10		
05/01/08	2		
04/23/08	16		
03/03/08	14		
02/12/08	6		
01/10/08 resample	20		
01/09/08 resample	133		
01/08/08	120		

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.  
\* On 5/15/00 the method used for Enterococci analyses was changed from EPA standard method 9230B to EPA method 1600.

### Advisory Key

	The most recent testing of water from this site revealed Enterococci levels below the EPA recommended threshold. 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.

### 7.3 Sanitary Sewer Overflow (SSO) Data

**Table 7-2. Daphne SSO Data**

Overflow Date	Discharge Volume	Discharge Length	Discharge Location	Discharge Destination	Overflow Time
4/5/2008	less than 10,000 gallons	3 hrs	I-10 lift station at I-10 and Hwy 98	Joe's Branch Creek	10:00:00 AM
6/5/2008	200 gallons	30 min	110 Lakefront Dr, Daphne -manhole	Lake forest Lake	4:00:00 PM
6/5/2008	<1,000 gallons	30 minutes	Lake Front Drive	Lake Forest Lake	
11/12/2008	>500 gallons	approx 1 hr	manhole behind 138 Buena Vista Dr, Daphne	Tiawasee Creek	10:00:00 AM
12/10/2008	<200 gallons	20 minutes	Main St & Hwy 90 lift station	D' Olive creek	12:00:00 PM
2/2/2009	800 gallons	1 day	North of I-10 at end of Wilson Ave in Spanish Fort	UT to D' Olive Creek	10:00:00 AM
4/26/2009	900 gallons		82 Caisson Trace, Spanish Fort	Spanish Fort Branch	10:00:00 AM
6/3/2009	4,000 gallons	1 hr 50 min	I-10 Lift Station, Spanish Fort	Joe's Branch	7:00:00 PM
4/9/2010	4500 gallons	5 hrs	Wooded area	UT to Tiawasee	8:00:00 PM
6/7/2010	1800 gallons	30 mins.	Yancy Branch Lift Station, West side of US98	Yancy Branch	5:00:00 PM
3/6/2011	200 gallons	2.5 hrs.	129 Creekside Drive, Daphne	UT to Tiawasee Creek	9:00:00 AM
5/30/2011	2,600 gallons	8 hours	Gordon Circle in Lake Forest	Storm drain and UT Lake Forest Lake	2:00:00 AM
6/12/2011	500 gallons	30 mins.	Timber creek LS	Ground absorbed	10:15:00 AM
5/3/2012	2,000 gallons	30 mins.	Yancy WWTP Highway 98	Yancy Branch	9:00:00 PM
6/10/2012	500 gallons	30 minute	Charmerbiain Trace Subdivision	Storm drain	3:30:00 PM
6/10/2012	2000 gallons	25 minute	Yancy Branch LS Hwy 98	storm drain	10:00:00 AM
7/17/2012	2,800 gallons		I-10 L S Bass Pro Blvd	ground absorbed	10:45:00 PM
8/29/2012	400 gallons	400 mins.	Yancy Branch Lift Station Hwy. 98	Yancy Branch Creek	7:30:00 PM
5/20/2013	500 gallons		10 b Street	drainage ditch	8:36:00 AM
7/11/2013	850 gallons		20000 Bass Pro Drive	Trib to Joes Branch	12:33:00 PM
8/8/2013	2,900 gallons		Timber Creek West LS	Unnamed Tributary to Joes Branch	
11/4/2013	1400 gallons	2 hr	Timber Creek lift station		10:00:00 AM
11/13/2013	500 gallons	3 hrs	115 Kentwood Drive Daphne, AL	UT to D' Olive Creek	10:30:00 AM
1/26/2014	300 gallons	3 hrs	160 Buena Vista Dr.	UT to Tiawasee Creek	12:15:00 PM
2/4/2014	1000 gallons	24 hr 45 min	16 Bugle Retreat	UT to Bay Minette Creek	2:45:00 PM
2/27/2014	500 gallons	2 hrs	216 Montclair Loop Daphne, AL	UT to Tiawasee Creek	4:00:00 PM
3/10/2014	600 gallons	4 hrs	224 Montclair Loop Daphne, AL	UT to Tiawasee Creek	9:55:00 AM

Overflow Date	Discharge Volume	Discharge Length	Discharge Location	Discharge Destination	Overflow Time
4/15/2014	400 gallons	0 hrs	Yancy Branch, Windscape Lift Station	Blakely River	7:34:00 AM
4/15/2014	600 gallons	1 hrs	233 Bayview Drive Daphne, AL	Blakely River	9:43:00 AM
4/30/2014	7000 gallons	1 hrs	6321 Jordan Road Daphne AL	Blakely River	6:15:00 AM
4/30/2014			Yancy Branch Lift Station		6:25:00 AM
4/30/2014	20500 gallons	3 hrs	Manhole behind I-10 Lift Station	Blakely River	7:15:00 AM
4/30/2014	1350 gallons	1 hrs	Dog pound Lift Station Daphne, AL	Blakely River	8:20:00 AM
4/30/2014	2200 gallons	3 hrs	YMCA Lift Station Daphne, AL	Blakely River	8:30:00 AM
4/30/2014	2000 gallons	1 hrs	233 Bayview Drive Daphne, AL	Blakely River	8:40:00 AM
5/16/2014	975 gallons	4 hrs	160 Buena Vista Drive Daphne, AL	Blakely River	5:30:00 PM
7/10/2014	500 gallons	1 hrs	Behind 11 Signal Hill Road Spanish Fort. AL	Blakely River UT	10:00:00 AM
7/25/2014			Crestview Circle		12:12:00 PM
7/28/2014	2500 gallons	6 hrs	160 Buena Vista Drive Daphne, AL 36526	UT to Tiawasee Creek	12:12:00 PM
8/15/2014	3500 gallons	2 hrs	129 Creekside Dr Daphne, AL	Blakely River	3:00:00 PM
8/29/2014	120 gallons	1 hrs	Behind 73 General Canby Blvd.	Blakely River UT	12:27:00 PM
10/8/2014	300 gallons	0 hrs	Behind 104 Crestview Daphne, AL	Blakely River UT	9:00:00 AM

## 7.4 Northeast Mobile Bay Photos

**Photo 1. May Day Park Public Access**



**Photo 2. May Day Park Beach**





**Photo 3. May Day Park Boardwalk Along Boat Ramp**



**Photo 4. May Day Park Boat Ramp and Public Pier**

