

Total Maximum Daily Load Document

E-105, Caw Caw Swamp Watershed
(Hydrologic Unit Codes 030502030305, 030502030306)
Fecal Coliform Bacteria,
Indicator for Pathogens



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Abstract

§303(d) of the Clean Water Act (CWA) and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop total maximum daily loads (TMDLs) for water bodies that are not meeting designated uses under technology-based pollution controls. A TMDL is maximum amount of pollutant a waterbody can assimilate while meeting water quality standards for the pollutant of concern. All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES)-permitted discharges, a load allocation (LA) for all nonpoint sources, and an explicit and/or implicit margin of safety (MOS) for the pollutant of concern. A fecal coliform TMDL was developed for station # E-105 within the Caw Caw Swamp watershed located in Calhoun and Orangeburg Counties, SC. This station in Orangeburg County, SC is listed as impaired on the State's 2008 §303(d) list due to excessive fecal coliform numbers documented during the 2002 - 2006 assessment period. Seventeen percent of the samples collected between 2001-2006 at the impaired monitoring station exceeded the water quality standards.

This watershed is predominantly forest and agricultural lands. There are currently no active NPDES permitted sanitary waste dischargers within the watershed. Probable causes of fecal contamination include agricultural runoff, failing septic systems, leaking sewers, sanitary sewer overflows, and urban runoff. The load-duration curve methodology was used to calculate existing and TMDL loads for each impaired segment. Existing pollutant loadings and proposed TMDL reductions for critical hydrologic conditions are presented in Table Ab-1. Critical hydrologic conditions were defined as either moist, mid-range, or dry depending on which condition demonstrated the highest load reductions necessary to meet water quality standards. In order to achieve the target load (slightly below water quality standards) for Caw Caw Swamp, reductions in the existing loads of up to 35 % will be necessary at this station. Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. For SCDOT, compliance with terms and conditions of its NPDES MS4 permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP). Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and are eligible for CWA §319 grants.

The Department recognizes that **adaptive management/implementation** of this TMDL (i.e. WLA and LA) might be needed to achieve the water quality standard and we are committed towards targeting the load reductions to improve water quality in the Caw Caw Swamp watershed. As additional data and/or information becomes available, it may become necessary to revise and/or modify the TMDL target accordingly.

Table Ab-1. Total Maximum Daily Loads for the Caw Caw Swamp Watershed. Loads are expressed as colony forming units (cfu) per day.

Station	Existing Load (cfu/day)	TMDL (cfu/day)	Margin of Safety (MOS) (cfu/ day)	Wasteload Allocation (WLA)		Load Allocation (LA)	
				Continuous Sources ¹ (cfu/day)	Non-continuous Sources ^{2,4} (% Reduction)	Load Allocation (cfu/day)	% Reduction to Meet LA ³
E-105	1.17E+11	8.06E+10	4.03E+09	NA	35 %	7.66E+10	35%

Table Notes:

1. WLAs are expressed as a daily maximum; NA = not applicable, no point sources. Existing and future continuous discharges are required to meet the prescribed loading for the pollutant of concern. Loadings are developed based upon permitted flow and assuming an allowable permitted maximum concentration of 400cfu/100ml.
2. Percent reduction applies to all NPDES-permitted stormwater discharges, including current and future MS4, construction and industrial discharges covered under permits numbered SCS & SCR. Stormwater discharges are expressed as a percentage reduction due to the uncertain nature of stormwater discharge volumes and recurrence intervals. Stormwater discharges are required to meet percentage reduction or the existing instream standard for pollutant of concern in accordance with their NPDES permit.
3. Percent reduction applies to existing instream load; Where Percentage Reduction = (Existing Load-Load Allocation) / Existing Load.
4. By implementing the best management practices that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 Permit to address fecal coliform, the SCDOT will comply with this TMDL and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 permit.

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1.0 INTRODUCTION

1.1 Background

Fecal coliform bacteria (FC) are widely used as an indicator of pathogens in surface waters and wastewater. The presence of FCs in surface waters may signify a presence of pathogens, which in turn leads to a greater risk of health for individuals participating in recreational activities within the water body (USEPA, 2001). Acute gastrointestinal illnesses affect millions of people in the United States and cause billions of dollars of costs each year (Gaffield et al. 2003). Of these illnesses many are caused by contaminated drinking water. Untreated stormwater runoff has been associated with a number of disease outbreaks, most notably an outbreak in Milwaukee that caused many deaths in 1993.

Though occurring at low levels from natural sources, the concentration of fecal coliform bacteria can be elevated in water bodies as the result of pollution. Sources of fecal coliform bacteria are usually diffuse or nonpoint in nature and originate from stormwater runoff, failing septic systems, agricultural runoff, leaking sewers among other sources. Occasionally, the source of the pollutant is a point source. Section 303(d) of the Clean Water Act (CWA) and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop TMDLs for water bodies that are not meeting designated uses under technology-based pollution controls. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and in stream water quality conditions so that states can establish water quality-based controls to reduce pollution and restore and maintain the quality of water resources (USEPA 1991).

The State of South Carolina has placed one monitoring station in the Caw Caw Swamp watershed on South Carolina's Section 2008 §303(d) list for impairment due to fecal coliform bacteria. This station is identified in Table 1 and Figure 1.

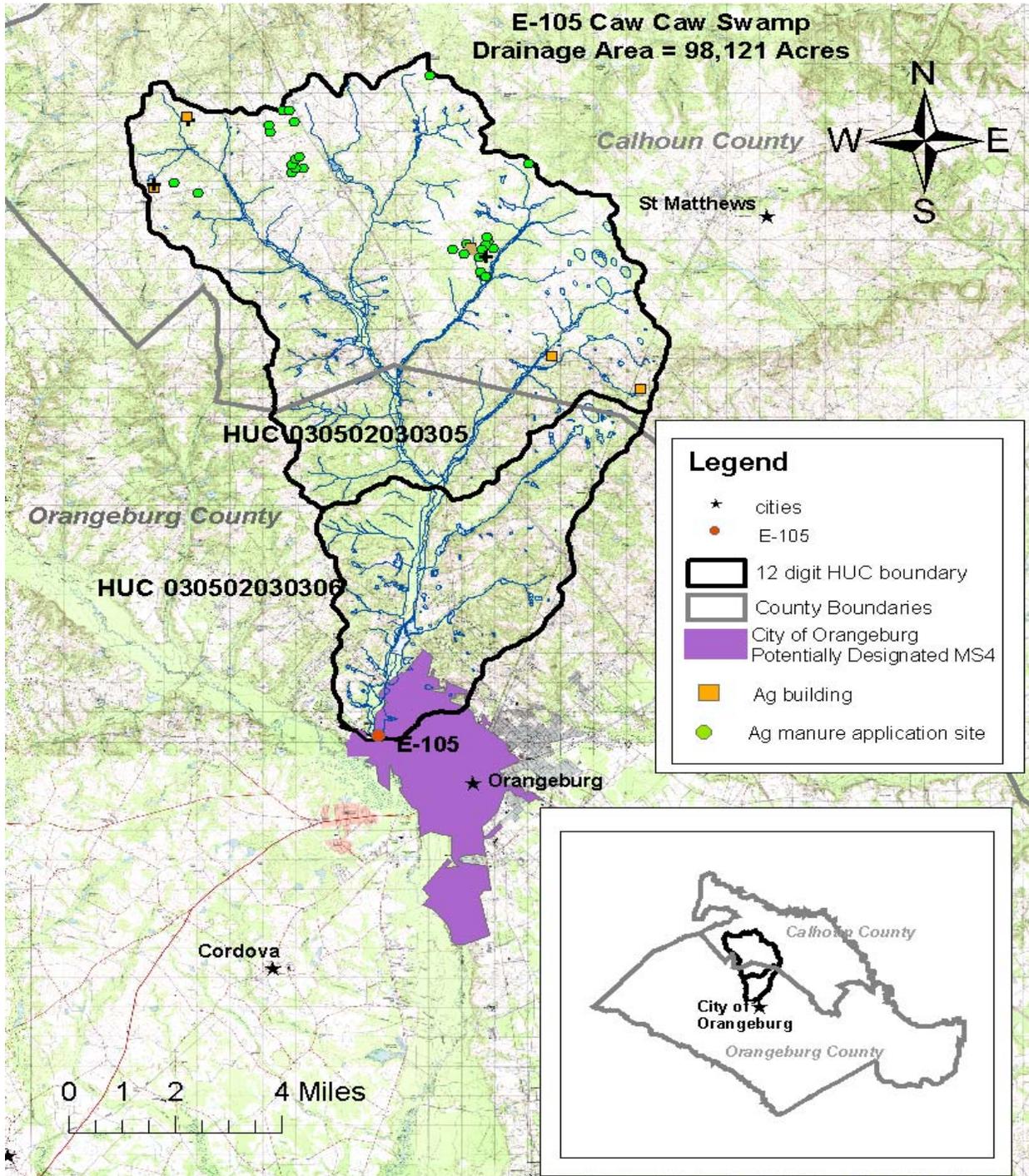
Table 1. Caw Caw Swamp Watershed Fecal Coliform Impaired Waters.

Waterbody	Station Number	Description
Caw Caw Swamp	E-105	Caw Caw Swamp at S-38-1032

1.2 Watershed Description

The headwaters of Caw Caw Swamp are located near the town of St. Matthews in Calhoun County. Caw Caw Swamp flows in a southerly direction eventually flowing into the North Fork Edisto River near the city of Orangeburg in Orangeburg County. It is located within the Edisto River Basin (see Figure 1). The Caw Caw Swamp watershed (HUCs 030502030305, 030502030306) drains approximately 98,121 acres, or 80.4 square miles.

**Figure 1. Location of Impaired DHEC Monitoring Station E-105 Watershed
 Calhoun and Orangeburg Counties
 12 Digit Hydrologic Unit Codes 030502030305, 030502030306
 Edisto Basin**

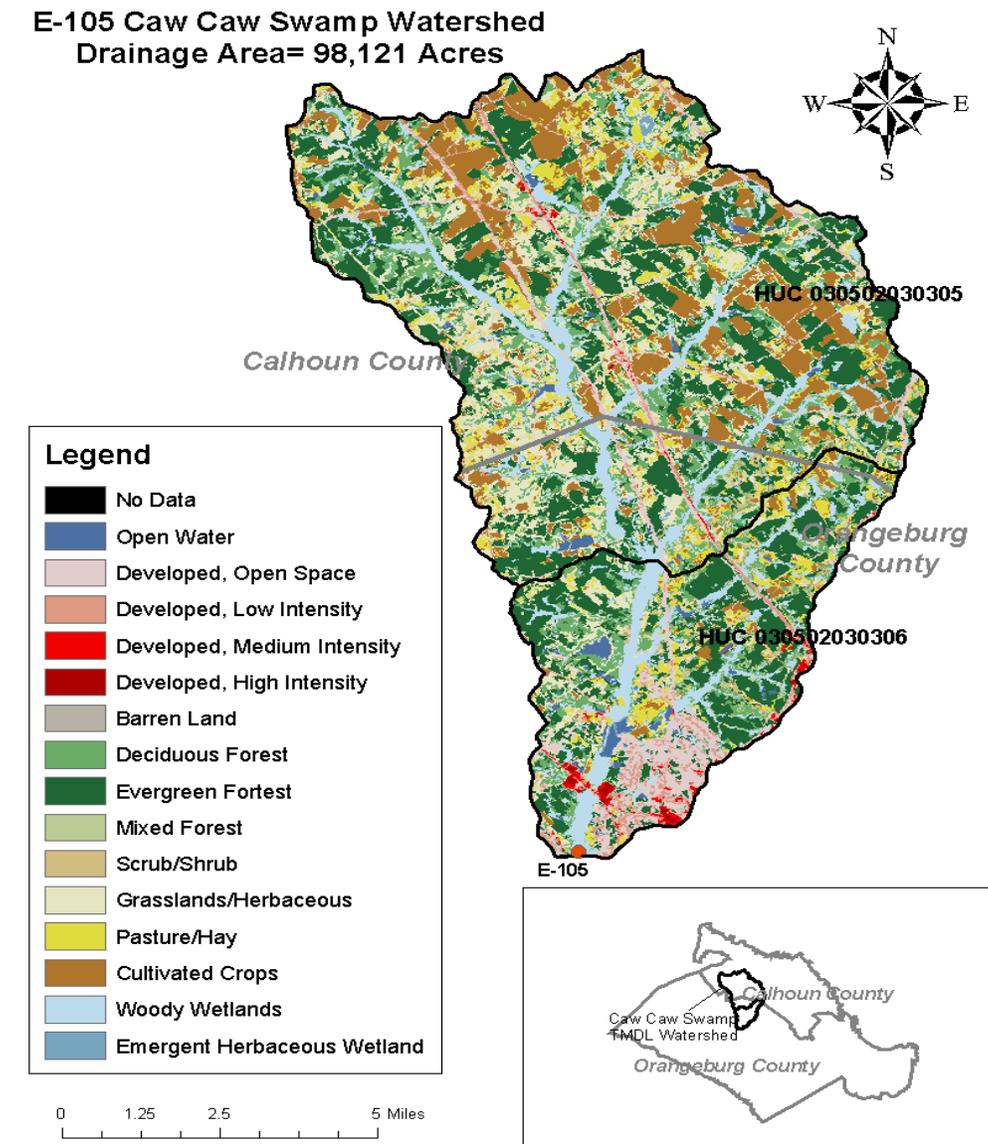


Land use within the watershed is predominately forest (38%) and other non-cultivated vegetated lands (18 %) representing 56 % of the drainage area (NLCD 2001). Developed lands (residential, commercial, industrial or open urban space) comprise approximately 10 % of the watershed and are mostly located near the bottom of the watershed (Table 2; Figure 2).

Table 2. Caw Caw Swamp Watershed Land Use (derived from NLCD 2001).

Land Use (NLCD 2001)	Total Watershed (acres)	Square Miles	%
Developed (residential, commercial, industrial)	5184	8.1	10.05
Forest or otherwise vegetated (non-cultivated)	28,992	45.3	56.41
Wetlands/ Open Water	6464	10.1	12.57
Pasture/crop	10,816	16.9	20.96
Total	98,121	80.4	100

Figure 2. Land Use Within Caw Caw Swamp Watershed



1.3 Water Quality Standard

The impaired stream segment of Caw Caw Swamp basin is designated as Class Freshwater. Waters of this class are described as:

“Freshwaters (FW) are freshwaters suitable for primary and secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the requirements of the Department. Suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora. Suitable also for industrial and agricultural uses.” (R.61-68)

South Carolina’s Water Quality Standard (WQS) for fecal coliform in freshwater is:

“Not to exceed a geometric mean of 200/100 mL, based on five consecutive samples during any 30 day period; nor shall more than 10% of the total samples during any 30 day period exceed 400/100 mL.” (R.61-68).

Primary contact recreation is not limited to large streams and lakes. Even streams that are too small to swim in will allow small children the opportunity to play and immerse their hands and faces. The current water quality standard protects all surface waters for primary use recreation.

2.0 WATER QUALITY ASSESSMENT

The South Carolina Department of Health and Environmental Control (SCDHEC) conducts monitoring at one location within the Caw Caw Swamp watershed (SCDHEC 2004). Monitoring is conducted at station E-105 which was monitored for the course of 5 years (2001-2006).

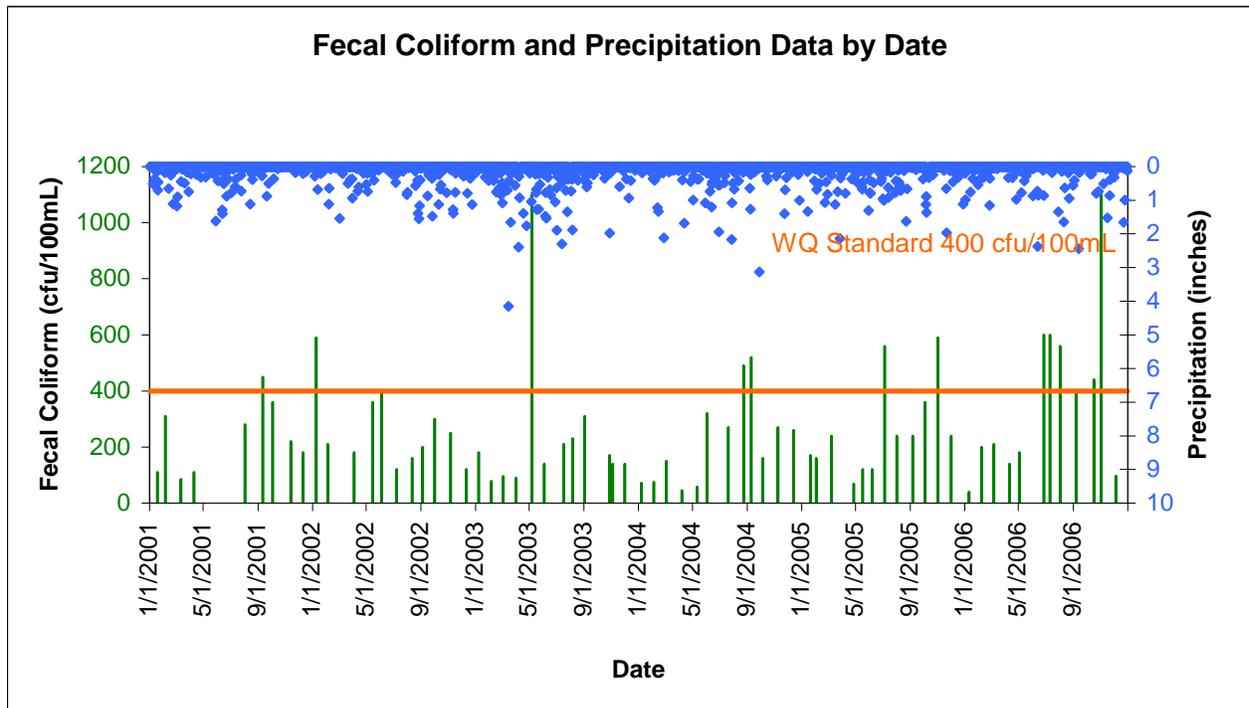
Waters in which no more than 10% of the samples collected over a five year period are greater than 400 fecal coliform counts or cfu/100 ml are considered to comply with the South Carolina WQS for fecal coliform bacteria. Waters with more than 10% of samples greater than 400 cfu/100 ml are considered impaired for fecal coliform bacteria and placed on South Carolina’s §303(d) list¹. Caw Caw Swamp (E-105) is considered impaired due to fecal coliform WQS exceedences. Table 3 provides a summary of number of samples collected, number of exceedences and exceedence percentage. Figure 3 illustrates precipitation and fecal coliform by date. There is a negligible correlation between rain, fecal coliform, and flow. A detailed list of all samples by date with their respective water quality data is presented in Appendix B at the end of this document.

Table 3. Fecal Coliform WQS Exceedence Summary for Impaired Station E-105 (2001-2006)

Station	Waterbody	Number of Samples	Number Samples >400/100mL	% Samples Exceed WQS
E-105	Caw Caw Swamp	69	12	17 %

¹ The frequency of sampling was fewer than five samples within a 30 day period, therefore the water quality assessment was based on the 10% standard (400/100 mL).

Figure 3. Precipitation and Fecal Coliform Data by Date



3.0 SOURCE ASSESSMENT AND LOAD ALLOCATION

Fecal coliform bacteria are used by the State of South Carolina as the indicator for pathogens in surface waters. Pathogens, which are usually difficult to detect, cause disease and make full body contact recreation in lakes and streams a risk to public health. Indicators such as fecal coliform bacteria, enterococci, or *E. coli* are easier to measure, have similar sources as pathogens, and persist in surface waters for a similar or longer length of time. These bacteria are not in themselves disease causing, but indicate the potential presence of organisms that may result in sickness.

There are many sources of pathogen pollution in surface waters. In general these sources may be classified as point and nonpoint sources. With the implementation of technology-based controls, pollution from continuous point sources, such as factories and wastewater treatment facilities, has been greatly reduced. These point sources are required by the (CWA) to obtain a NPDES permit. In South Carolina NPDES permits require that dischargers of sanitary wastewater must meet the state standard for fecal coliform at the point of discharge. Municipal and private sanitary wastewater treatment facilities may occasionally be sources of pathogen or fecal coliform bacteria pollution. However, if these facilities are discharging wastewater that meets their permit limits, they are not causing impairment. If any of these facilities is not meeting its permit limits, enforcement actions/mechanisms are required.

Other non-continuous point sources required to obtain NPDES permits that may be a source of pathogens include Municipal Separate Storm Sewer Systems (MS4s) and stormwater discharges

from industrial or construction sites. MS4s may require NPDES discharge permits under the NPDES Stormwater regulations. These sources are also required to comply with the state standard for the pollutant(s) of concern. If discharges from regulated MS4 entities and from construction and industrial sites meet the percentage reduction or the water quality standard as prescribed in Section 5 of this TMDL document and required in their permit(s), they should not be causing or contributing to an instream FC bacteria impairment.

3.1 Point Sources

Point sources are defined as pollutant loads discharged at a specific location from pipes, outfalls, and conveyance channels from either municipal wastewater treatment plants, industrial waste treatment facilities, or regulated stormwater discharges. Point sources can also include pollutant loads contributed by tributaries to the main receiving water stream or river. Point sources can be further broken down into continuous and non-continuous.

3.1.1 Continuous Point Sources

Currently there are no permitted domestic discharges in the Caw Caw Swamp Watershed. Future NPDES discharges in the referenced watershed are required to implement the WLA and demonstrate consistency with assumptions and requirements of the TMDL.

3.1.2 Non-Continuous Point Sources

Non-continuous point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permits numbered SCS and SCR and regulated under SC Water Pollution Control Permits Regulation 122.26(b)(14)&(15). All regulated MS4 entities have the potential to contribute FC pollutant loadings in the delineated drainage area used in the development of this TMDL.

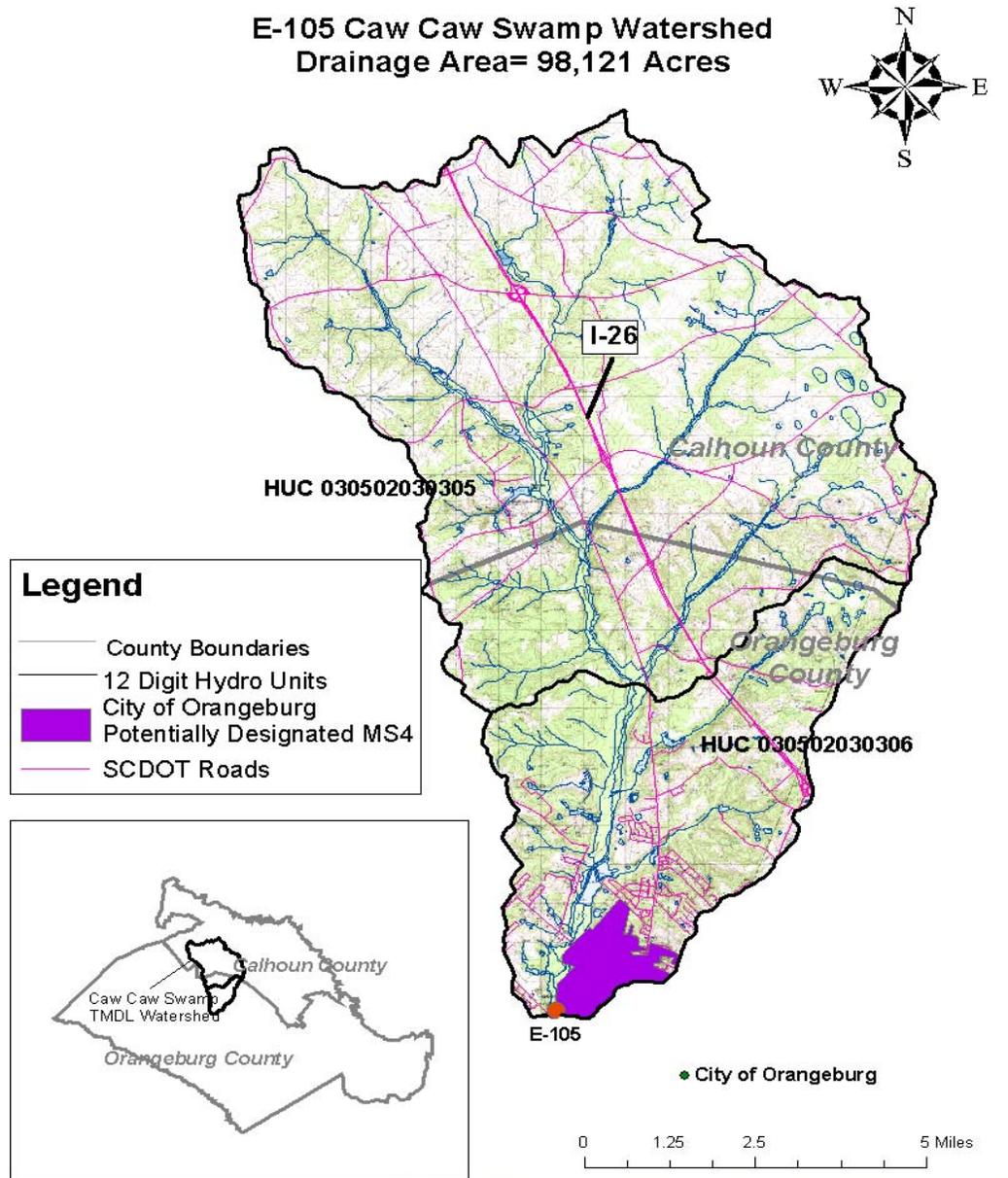
The South Carolina Department of Transportation (SCDOT) is currently the only designated Municipal Separate Storm Sewer System (MS4) within the watershed. The SCDOT operates under NPDES MS4 SCS040001 and owns and operates roads in the watershed (Figure 4). However, the Department recognizes that SCDOT is not a traditional MS4 in that it does not possess statutory taxing or has enforcement powers. SCDOT does not regulate land use or zoning, issue building or development permits.

The City of Orangeburg is currently a potentially designated Municipal Separate Storm Sewer Systems (MS4) community under NPDES Phase II Stormwater rules. Similar to regulated MS4s, potentially designated MS4 entities (as listed in 64 FR, P. 688837) or other unregulated MS4 communities located in the Caw Caw Swamp watershed may have the potential to contribute FC bacteria in stormwater runoff. If future MS4 permits are applicable to this watershed, then those discharges will be subject to the assumptions and requirements of the WLA portion of this TMDL. However, there may be industrial or construction activities going on at any time that could produce stormwater runoff.

Industrial facilities that have the potential to cause or contribute to a violation of a water quality standard are covered by the NPDES Storm Water Industrial General Permit (SCR000000). Construction activities are usually covered by the NPDES Storm Water Construction General Permit from DHEC (SCR100000). Where construction activities have the potential to affect

water quality of a water body with a TMDL, the Storm Water Pollution Prevention Plan (SWPPP) for the site must address any pollutants of concern and adhere to any wasteload allocations in the TMDL.

Figure 4. SCDOT Owned and Maintained Roads in the Caw Caw Swamp Watershed



3.2 Nonpoint Sources

Nonpoint source pollution is defined as pollution that is not released through pipes but rather originates from multiple sources over a relatively large area. Nonpoint sources can be divided into source activities related either to land or water use including failing septic tanks, improper animal-keeping practices, agriculture, forestry practices, wildlife and urban and rural runoff. Nonpoint source pollution is likely the major contributing factor to negatively impact water quality in this watershed. The Department recognizes that there may be wildlife, agricultural activities, grazing animals, septic tanks and/or other nonpoint source contributors located within unregulated areas (outside the permitted area) of the Caw Caw Swamp watershed. Nonpoint sources located in unregulated areas are subject to the LA and not the WLA component of the TMDL.

3.2.1 Wildlife

Wildlife (mammals and birds) can be a significant contributor of fecal coliform bacteria. Wildlife in this area typically includes deer, squirrels, raccoons, and other mammals as well as a variety of birds. Wildlife wastes are carried into nearby streams by runoff following rainfall or deposited directly in streams. A windshield survey showed that beavers are active in Caw Caw Swamp (picture 2, appendix C). According to a study conducted by SCDNR in 2008, there are an estimated 15-30 deer per square mile within Orangeburg County (SCDNR 2008).

3.2.2 Agricultural Activities

Agricultural activities that involve livestock or animal wastes are potential sources of fecal coliform contamination of surface waters. Fecal matter can enter the waterway via runoff from the land or by direct deposition into the stream. Agricultural activities may represent a significant source in the Caw Caw Swamp watershed.

3.2.2.1 Agricultural Animal Facilities

Owners/operators of most commercial animal growing operations are required by SC Regulation 61-43, Standards for the Permitting of Agricultural Animal Facilities, to obtain permits for the handling, storage, treatment (if necessary) and disposal of the manure, litter and dead animals generated at their facilities (SCDHEC 2002). The requirements of R. 61-43 are designed to protect water quality; therefore, we have a reasonable assurance that facilities operating in compliance with this regulation should not contribute to downstream water quality impairments. SC currently does not have any confined animal feeding operations (CAFOs) under NPDES coverage; however, the State does have permitted animal feeding operations (AFOs) covered under R. 61-43. These permitted operations are not allowed to discharge to waters of the State and are covered under 'no discharge' (ND) permits. Discharges from these operations to waters of the State are illegal and are subject to enforcement actions by SCDHEC.

There are currently four active animal feeding operations (AFOs) in the Caw Caw Swamp watershed (Table 4). These facilities consist of two poultry operations and two swine operations. These facilities are routinely inspected for compliance. Permitted agricultural facilities that operate in compliance with their permit are not considered to be sources of impairment (ND

permits). Although there are only four permitted AFOs in this watershed, there are twenty-three associated sprayfields.

Table 4. Permitted Active Animal Feeding Operations within the Caw Caw Swamp Watershed.

Downstream Impaired	AFO Permit	Facility	Type of Livestock	Number Animals	Total Permitted Acres
E-105	ND0010049	Hair Swine	Swine	100	NA
E-105	ND0063185	Robinson (David) Hog Farm	Swine	1260	239
E-105	ND0085553	McCarson Farms	Poultry	124000	NA
E-105	ND0085693	Maydo Farms	Poultry	120000	NA

3.2.2.2 Grazing Livestock

Livestock, especially cattle, are frequently major contributors of fecal coliform bacteria to streams. Cattle on average produce some 1 E+11 cfu/day per animal of fecal coliform bacteria (ASAE 1998). Grazing cattle and other livestock may contaminate streams with fecal coliform bacteria indirectly by runoff from pastures or directly by defecating into streams and ponds. The grazing of unconfined livestock (in pastures) is not regulated by SC DHEC. The United States Department of Agriculture’s National Agricultural Statistics Service reported 2,546 and 16,375 cattle in Calhoun and Orangeburg Counties respectively in 2002 (USDA 2008). Pasture and crop land use within the Caw Caw Swamp watershed is estimated to be 10,816 acres, which was derived from NLCD 2001. A windshield survey demonstrated that there are a number of cows and horses in the Caw Caw Swamp watershed. Direct loading by cattle or other livestock to surface waters within the Caw Caw Swamp watershed is likely to be a significant source of fecal coliform.

3.2.3 Leaking Sanitary Sewers and Illicit Discharges

Leaking sewer pipes and illicit sewer connections represent a direct threat to public health since they result in discharge of partially treated or untreated human wastes to the surrounding environment. Quantifying these sources is extremely speculative without direct monitoring of the source because the magnitude is directly proportional to the volume and its proximity to the surface water. Typical values of fecal coliform in untreated domestic wastewater range from 10⁴ to 10⁶ MPN/100mL (Metcalf and Eddy 1991).

Illicit sewer connections into storm drains result in direct discharges of sewage via the storm drainage system outfalls. Monitoring of storm drain outfalls during dry weather is needed to document the presence or absence of sewage in the drainage systems.

It was noted during a source assessment that there is a lift station located on the banks directly beside Caw Caw Swamp impaired station E-105 (see picture, Appendix C). The purpose of a sewage lift station is to raise wastewater up to a level that will allow it to gravity feed into the

sewer line. If not properly maintained, there could be a release of raw sewage into Caw Caw Swamp. At the time of TMDL development, it is unknown if this occurred.

3.2.4 *Failing Septic Systems*

Studies demonstrate that wastewater located four feet below properly functioning septic systems contain on average less than one fecal coliform bacteria organism per 100 mL (Ayres Associates 1993). Failed or non-conforming septic systems, however, can be a major contributor of fecal coliform to Caw Caw Swamp and tributaries. Wastes from failing septic systems enter surface waters either as direct overland flow or via groundwater. Although loading to streams from failing septic systems is likely to be a continual source, wet weather events can increase the rate of transport of pollutants from failing septic systems because of the wash-off effect from runoff and the increased rate of groundwater recharge.

Based on the 2000 U.S. population census, there are an estimated 5,540 septic systems within Calhoun County and an estimated 25,593 septic systems within Orangeburg County. Of the 6,388 households within Calhoun County, an estimated 848 people rely on a community sewer system. Of the 37,237 households within Orangeburg County, an estimated 11,644 people rely on a community sewer system. Within the Caw Caw Swamp watershed in these two counties it is estimated that there are 4,975 people living in 2,044 households (2,111 people living in 880 households in the Calhoun County portion of the watershed and 2,864 people living in 1,164 households in the Orangeburg County portion of the watershed). Of these, a small part of the Orangeburg County portion of the watershed near the City of Orangeburg is serviced by a community sewer system. This is comprised of 2,248 people living in 993 households. Of the remaining population in the Orangeburg County portion of the watershed, 616 people living in 171 households are on septic. There are no households serviced by a community sewer system in the Calhoun County portion of this watershed. Given that information and assuming one septic tank per household, it is estimated that there are 1051 septic tanks within the entire Caw Caw Swamp watershed

3.2.5 *Urban Runoff*

The City of Orangeburg is a potentially designated MS4 located in this watershed. Similar to regulated MS4s, potentially designated MS4 entities (as listed in FR 64, 235, P. 688837) or other unregulated MS4s communities located in the Caw Caw Swamp Watershed may have the potential to contribute fecal coliform bacteria in stormwater runoff. Dogs, cats, and other domesticated pets are the primary source of fecal coliform deposited on the urban landscape. There are also 'urban' wildlife, squirrels, raccoons, pigeons, and other birds, all of which contribute to the fecal coliform load. A windshield survey demonstrated that many households have dogs and/or cats, many of which are free roaming.

Roads, facilities and/or properties owned and/or operated by the South Carolina Department of Transportation (SCDOT) is/are currently covered under NPDES MS4 SCS040001, hence covered under the WLA (waste load allocation) portion of this TMDL. There may be other non-regulated roads (county roads) within the watershed that could contribute to FC loading within

the Caw Caw Swamp watershed. Runoff from properties including but not limited to ditches, culverts and right of ways may have the potential to contribute or convey fecal coliform loading.

4.0 LOAD-DURATION CURVE METHOD

The load-duration curve method was developed as a means of incorporating natural variability, uncertainty, and risk assessment into TMDL development (Bonta and Cleland 2003). The analysis is based on the range of hydrologic conditions for which there are appropriate water quality data. The load-duration curve method uses the cumulative frequency distribution of stream flow and pollutant concentration data to estimate existing and TMDL loads for a water body. Development of the load-duration curve is described in this chapter.

The load-duration curve method depends on an adequate period of record for flow data. Gauge 02174250, Cow Castle Creek, was used. This gauge began recording daily flows in 1970 and provides the flow data required to establish flow duration curves at each of the impaired stations.

Flow data for a ten year period (1996-2006) were used to establish flow duration curves. The records for this period were complete (i.e., no missing dates) for the Cow Castle Creek gauge. The flow records were used to estimate flow at the impaired monitoring station (E-105).

Drainage areas of each sampling station were delineated using USGS topographic maps and ArcMap software. The cumulative area drained was calculated and used to estimate flow based on the ratio of the monitoring station drainage area to the downstream USGS gauge. For example, the USGS Cow Castle Creek gauge records flow from 23.4 square miles (sq mi). The cumulative drainage area at monitoring station E-105 (Caw Caw Swamp) is approximately 80.3 sq mi, or 343 % of the area drained at the Cow Castle Creek gauge. Mean daily flow for the E-105 monitoring location was assumed to be 343 % of the daily flow at the Cow Castle Creek gauge.

Flow duration curves were developed by ranking flows from highest to lowest and calculating the probability of occurrence (presented as a percentage or duration interval), where zero corresponds to the highest flow. The duration interval can be used to determine the percentage of time a given flow is achieved or exceeded, based on the period of record. Flow duration curves were divided into five hydrologic condition categories (High Flows, Moist Conditions, Mid-Range, Dry Conditions and Low Flows). Categorizing flow conditions can assist in determining which hydrologic conditions result in the greatest number of exceedences. A high number of exceedences under dry conditions might indicate a point source or illicit connection issue, whereas moist conditions may indicate nonpoint sources. Data within the High Flow and Low Flow categories are generally not used in the development of a TMDL due to their infrequency.

A target load-duration curve was created by calculating the allowable load using daily flow, the fecal coliform WQS concentration and a unit conversion factor. The water quality target was set at 380 cfu/100ml for the instantaneous criterion, which is five percent lower than the water quality criteria of 400 cfu/100ml. A five percent explicit Margin of Safety (MOS) was reserved

from the water quality criteria in developing target load-duration curves. The load-duration curve for station E-105 is presented in Figure 5.

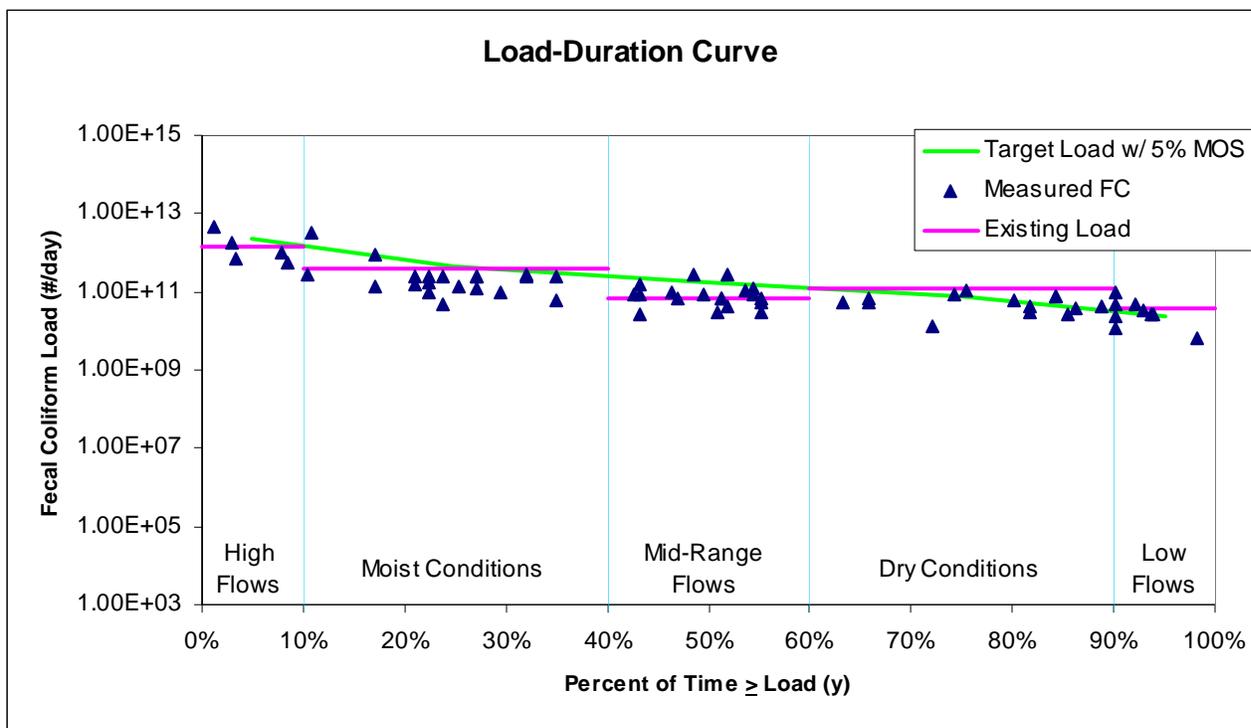
For the load duration curve, the independent variable (X-Axis) represents the percentage of estimated flows greater than value x. The dependent variable (Y-Axis) represent the fecal coliform loading at each estimated flow expressed in terms of colony forming units per day (cfu/day). In each defined flow interval, existing and target loadings were calculated by the following equations:

$$\text{Existing Load} = \text{Mid-Point Flow in Each Hydrologic Category} \times 90^{\text{th}} \text{ Percentile Fecal Coliform Concentration} \times 10000$$

$$\text{Target Load} = \text{Mid-Point Flow in Each Hydrologic Category} \times 380 \text{ (WQ criterion minus a 5\% MOS)} \times 10000$$

$$\text{Percent Reduction} = (\text{Existing Load} - \text{Target Load}) / \text{Existing Load}$$

Figure 5. Load Duration Curve for Caw Caw Swamp Station E-105



Instantaneous loads for the impaired station were calculated. Measured fecal coliform concentrations from 2001- 2006 were multiplied by measured (or estimated flow based on drainage area) flow on the day of sampling and a unit conversion factor. These data were plotted on the load-duration graph based on the flow duration interval for the day of sampling. Samples above the target line are violations of the WQS while samples below the line are in compliance

(Figure 5). Only the instantaneous water quality criterion was targeted because there is insufficient data to evaluate against the 30-day geometric mean.

An existing load was determined for each hydrologic category for the TMDL calculations. The 90th percentile of measured fecal coliform concentration within each hydrologic category was multiplied by the flow at each category midpoint (i.e., flow at the 25% duration interval for the Moist Conditions, 50% interval for Mid-Range, and 75% for Dry Condition). Existing loads are plotted on the load-duration curves presented in Figure 5. These values were compared to the target load (which includes an explicit 5% MOS) at each hydrologic category midpoint to determine the percent load reduction necessary to achieve compliance with the WQS. This TMDL assumes that if the highest percent reduction is achieved then the WQS will be attained under all flow conditions.

5.0 DEVELOPMENT OF TOTAL MAXIMUM DAILY LOAD

A total maximum daily load (TMDL) for a given pollutant and water body is comprised of the sum of individual wasteload allocations (WLAs) for point sources, and load allocations (LAs) for both nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving water body. Conceptually, this definition is represented by the equation:

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

The TMDL is the total amount of pollutant that can be assimilated by the receiving water body while still achieving compliance with WQS. In TMDL development, allowable loadings from all pollutant sources that cumulatively amount to no more than the TMDL must be established and thereby provide the basis to establish water quality-based controls.

For most pollutants, TMDLs are expressed as a mass load (e.g., kilograms per day). For bacteria, however, TMDLs are expressed in terms of number (#), colony forming units (cfu), organism counts (or resulting concentration), or MPN (Most Probable Number), in accordance with 40 CFR 130.2(l).

5.1 Critical Conditions

This TMDL is based on the flow recurrence interval between 10% and 90% and excludes extreme high and low flow conditions; flows that are characterized as ‘Low’ or ‘High’ in Figure 4 and Appendix A were not included in the analysis. The critical condition for each monitoring station is identified as the flow condition requiring the largest percent reduction, within the 10-90% duration intervals. Critical conditions for the Caw Caw Swamp watershed pathogen impaired segment are listed in Table 5. These data indicate that for station E-105, dry weather conditions results in larger bacteria loads and is therefore the critical condition.

5.2 Existing Load

An existing load was determined for each hydrologic category for the TMDL calculations as described in Section 4.0 of this TMDL. The existing load under the critical condition, described in Section 5.1 above was used in the TMDL calculations. Loadings from all sources are included in this value: wildlife, cattle-in-streams, urban run-off as well as failing septic systems. The existing load for station E-105 in the Caw Caw Swamp watershed is provided in Appendix A.

Table 5. Percent Reduction Necessary to Achieve Target Load by Hydrologic Category.

Station	Waterbody	Moist Conditions	Mid-Range Flow	Dry Conditions
E-105	Caw Caw Swamp	NRN	NRN	35 %

Highlighted cells indicate critical condition.

NRN = no reduction needed. Existing load below target load.

5.3 Wasteload Allocation

The wasteload allocation (WLA) is the portion of the TMDL allocated to NPDES-permitted point sources (USEPA 1991). Note that all illicit dischargers, including SSOs, are illegal and not covered under the WLA of this TMDL.

5.3.1 Continuous Point Sources

There are currently no NPDES-permitted domestic dischargers in the Caw Caw Swamp watershed. Future continuous discharges are required to meet the prescribed loading for the pollutant of concern based on permitted flow and assuming an allowable permitted maximum concentration of 400cfu/100mL.

5.3.2 Non-Continuous Point Sources

Non-continuous point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permits numbered SCS & SCR and regulated under SC Water Pollution Control Permits Regulation 122.26(b)(14) & (15). Illicit discharges, including SSOs, are not covered under any NPDES permit and are subject to enforcement mechanisms. All areas defined as “Urbanized Area” by the US Census are required under the NPDES Stormwater Regulations to obtain a permit for the discharge of stormwater. Other non-urbanized areas may be required under the NPDES Phase II Stormwater Regulations to obtain a permit for the discharge of stormwater.

Waste load allocations for stormwater discharges are expressed as a percentage reduction instead of a numeric loading due to the uncertain nature of stormwater discharge volumes and recurrence intervals. Stormwater discharges are required to meet the percentage reduction or the existing instream standard for the pollutant of concern. The percent reduction is based on the maximum percent reduction (critical condition) within any hydrologic category necessary to achieve target conditions. Table 6 presents the reduction needed in the impaired segment. The reduction percentages in this TMDL also apply to the fecal coliform waste load attributable to those areas of the watershed which are covered or will be covered under NPDES MS4 permits. Compliance

by an entity with responsibility for the MS4, with the terms of its individual MS4 permit may fulfill any obligations it has towards implementing this TMDL.

As appropriate information is made available to further define the pollutant contributions for the permitted MS4, an effort can be made to revise these TMDLs. This effort will be initiated as resources permit and if deemed appropriate by the Department. For the Department to revise these TMDLs the following information should be provided, but not limited to:

1. An inventory of service boundaries of the MS4 covered in the MS4 permit, provided as ARCGIS compatible shape files.
2. An inventory of all existing and planned stormwater discharge points, conveyances, and drainage areas for the discharge points, provided as ARCGIS compatible shape files. If drainage areas are not known, any information that would help estimate the drainage areas should be provided. The percentage of impervious surface within the MS4 area should also be provided.
3. Appropriate and relevant data should be provided to calculate individual pollutant contributions for the MS4 permitted entities. At a minimum, this information should include precipitation, water quality, and flow data for stormwater discharge points.

Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. However, the Department recognizes that SCDOT is not a traditional MS4 in that it does not possess statutory taxing or enforcement powers. SCDOT does not regulate land use or zoning, issue building or development permits.

Table 6. Percent Reduction Necessary to Achieve Target Load.

Station	Waterbody	% Reduction
E-105	Caw Caw Swamp	35 %

5.4 Load Allocation

The Load Allocation applies to the nonpoint sources of fecal coliform bacteria and is expressed both as a load and as a percent reduction. The load allocation is calculated as the difference between the target load under the critical condition and the point source WLA. The load allocation for each station is listed in Table Ab-1 Table and 7. The City of Orangeburg is a potentially designated MS4 located in this watershed and is currently subject to the LA component of this TMDL. There may also be other unregulated MS4s located in the watershed that are subject to the LA component of this TMDL. At such time that the referenced entities, or other future unregulated entities become regulated NPDES MS4 entities and subject to applicable provisions of SC Regulation 61-68 D, they will be required to meet load reductions prescribed in the WLA component of the TMDL. This also applies to future discharges associated with industrial and construction activities that will be subject to SC R. 122.26(b)(14) & (15) (SCDHEC 2003).

5.5 Seasonal Variability

Federal regulations require that TMDLs take into account the seasonal variability in watershed loading. The variability in this TMDL is accounted for by using a 10-year hydrological data set and 1-year water quality sampling data set, which includes data collected from all seasons.

5.6 Margin of Safety

The margin of safety (MOS) may be explicit and/or implicit. The explicit margin of safety is 5% of the TMDL or 20 counts/100mL of the instantaneous criterion of 400 cfu/100 mL (380 cfu/100mL). Target loads are therefore 95% of the assimilative capacity (TMDL) of the waterbody. The MOS is expressed as the value calculated from the critical condition defined in Section 5.1 and is the difference between the TMDL and the sum of the WLA and LA. The calculated values of the MOS for each station are given in Table 7.

5.7 TMDL

For most pollutants, TMDLs are expressed as a mass load (e.g., kilograms per day). For bacteria, however, TMDLs are expressed in terms of cfu or organism counts (or resulting concentration), in accordance with 40 CFR 130.2(l). Only the instantaneous water quality criterion was targeted because there is insufficient data to evaluate against the 30-day geometric mean. The target load is defined as the load (from point and nonpoint sources) minus the MOS that a stream segment can receive while meeting the WQS. The TMDL value is the median target load within the critical condition (i.e., the middle value within the hydrologic category that requires the greatest load reduction) plus WLA and MOS. Values for each component of the TMDL for the impaired segments of the Caw Caw Swamp watershed are provided in Table 7.

While TMDL development was primarily based on instantaneous water quality criterion, terms and conditions of NPDES permits for continuous discharges require facilities to demonstrate compliance with both geometric mean and instantaneous water quality criteria for fecal coliform bacteria in treated effluent. NPDES permits for continuous dischargers require data collection sufficient to monitor for compliance of both criteria at the point of outfall.

Table 7 indicates the percentage reduction or water quality standard for impaired station E-105. Note that all future NPDES-permitted stormwater discharges will also be required to meet the prescribed percentage reductions, or the water quality standard. It should be noted that in order to meet the WQS for FC bacteria, prescribed load reductions must be targeted from all sources, including NPDES permitted and nonpoint sources.

Based on the available information at this time, the portion of the watershed that drains directly to a regulated MS4 and that which drains through the unregulated MS4 has not been clearly defined within the MS4 jurisdictional area. Loading from both types of sources (regulated and unregulated) typically occurs in response to rainfall events, and discharge volumes as well as recurrence intervals are largely unknown. Therefore, the regulated MS4 is assigned the same percent reduction as the non-regulated sources in the watershed. Compliance with the MS4 permit in regards to this TMDL document is determined at the point of discharge to waters of the state. The regulated MS4 entity is only responsible for implementing the TMDL WLA in

accordance with their MS4 permit requirements and is not responsible for reducing loads prescribed as LA in this TMDL document.

Table 7. TMDL Components for the Fecal Coliform Impaired Segments in the Caw Caw Swamp Watershed. Loads are expressed as colony forming units (cfu) per day.

Station	Existing Load (cfu/day)	TMDL (cfu/day)	Margin of Safety (MOS) (cfu/day)	Wasteload Allocation (WLA)		Load Allocation (LA)	
				Continuous Sources ¹ (cfu/day)	Non-continuous Sources ^{2,4} (% Reduction)	LA (cfu/day)	% Reduction to Meet LA ³
E-105	1.17E+11	8.06E+10	4.03E+09	NA	35 %	7.66E+10	35%

Table Notes:

1. WLAs are expressed as daily maximum; NA = not applicable, no point sources. Existing and future continuous discharges are required to meet the prescribed loading for the pollutant of concern. Loadings were developed based upon permitted flow and assuming an allowable permitted maximum concentration of 400cfu/100ml.
2. Percent reduction applies to all NPDES-permitted stormwater discharges, including current and future MS4, construction and industrial discharges covered under permits numbered SCS & SCR. Stormwater discharges are expressed as a percentage reduction due to the uncertain nature of stormwater discharge volumes and recurrence intervals. Stormwater discharges are required to meet percentage reduction or the existing instream standard or the pollutant of concern in accordance with their NPDES permit.
3. Percent reduction applies to existing instream load; Where Percentage Reduction = (Existing Load-Load Allocation) / Existing Load
4. By implementing the best management practices that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 Permit to address fecal coliform, the SCDOT will comply with this TMDL and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 permit.

6.0 IMPLEMENTATION

The implementation of both point (WLA) and non-point (LA) source components of the TMDL are necessary in order to bring about the required reductions in FC bacteria loading to Caw Caw Swamp and its tributaries in order to meet water quality standards. Using existing authorities and mechanisms, an implementation plan providing information on how point and non point sources of pollution are being abated or may be abated in order to meet water quality standards is provided. Sections 6.1.1-6.1.7 presented below correspond with sections 3.1.1-3.2.5 of the source assessment presented in the TMDL document. As the implementation strategy progresses, DHEC may continue to monitor the effectiveness of implementation measures and evaluate water quality where deemed appropriate.

Point sources are discernible, confined, and discrete conveyances of pollutants to a water body including but not limited to pipes, outfalls, channels, tunnels, conduits, man-made ditches, etc. The Clean Water Act's primary point source control program is the National Pollutant Discharge Elimination System (NPDES). Point sources can be broken down into continuous and non-continuous point sources. Some examples of a continuous point source are wastewater treatment facilities (WWTF) and industrial facilities. Non-continuous point sources are related to

stormwater and include municipal separate storm sewer systems (MS4), construction activities, etc. Current and future NPDES discharges in the referenced watershed are required to comply with the load reductions prescribed in the wasteload allocation (WLA).

Nonpoint source pollution originates from multiple sources over a relatively large area. It is diffuse in nature and indistinct from other sources of pollution. It is generally caused by the pickup and transport of pollutants from rainfall moving over and through the ground. Nonpoint sources of pollution may include, but are not limited to: wildlife, agricultural activities, illicit discharges, failing septic systems, and urban runoff. Nonpoint sources located in unregulated portions of the watershed are subject to the load allocation (LA) and not the WLA of the TMDL document.

South Carolina has several tools available for implementing the non-point source component of this TMDL. The *Implementation Plan for Achieving Total Maximum Daily Load Reductions From Nonpoint Sources for the State of South Carolina* (SCDHEC 1998) document is one example. Another key component for interested parties to control pollution and prevent water quality degradation in the watershed would be the establishment and administration of a program of Best Management Practices (BMPs). Best management practices may be defined as a practice or a combination of practices that have been determined to be the most effective, practical means used in the prevention and/or reduction of pollution.

Interested parties (local stakeholder groups, universities, local governments, etc.) may be eligible to apply for CWA §319 grants to install BMPs that will implement the LA portion of this TMDL and reduce nonpoint source FC loading to Caw Caw Swamp and its tributaries. Congress amended the Clean Water Act (CWA) in 1987 to establish the Section 319 Nonpoint Source Management Program. Under Section 319, States receive grant money to support a wide variety of activities including the restoration of impaired waters. TMDL implementation projects are given highest priority for 319 funding. CWA §319 grants are not available for implementation of the WLA component of this TMDL nor within the MS4 jurisdictional boundary. Additional resources are provided in Section 7.0 of this TMDL document.

SCDHEC will also work with the existing agencies in the area to provide nonpoint source education in the Caw Caw Swamp watershed. Local sources of nonpoint source education and assistance include the Natural Resource Conservation Service (NRCS), the Clemson University Cooperative Extension Service, and the South Carolina Department of Natural Resources.

The Department recognizes that **adaptive management/implementation** of this TMDL might be needed to achieve the water quality standard and we are committed towards targeting the load reductions to improve water quality in the Caw Caw Swamp Watershed. As additional data and/or information becomes available, it may become necessary to revise and/or modify the TMDL target accordingly.

6.1 Implementation Strategies

The strategies presented in this document for implementation of the referenced TMDL are not inclusive and are to be used only as guidance. The strategies are informational suggestions which

may or may not lead to the required load reductions being met for the referenced watershed while demonstrating consistency with the assumptions and requirements of the TMDL. Application of certain strategies provided within may be voluntary and they are not a substitute for actual NPDES permit conditions.

Point Sources

6.1.1 Continuous Point Sources

Continuous point source WLA reductions will be implemented through NPDES permits. Existing and future continuous discharges are required to meet the prescribed loading for the pollutant of concern and demonstrate consistency with the assumptions and requirements of the TMDL. Loadings are developed based upon permitted flow and assume an allowable permitted maximum concentration of 400cfu/100ml.

6.1.2 Non-Continuous Point Sources

An iterative BMP approach as defined in the general storm water NPDES MS4 permit is expected to provide significant implementation of the WLA. Permit requirements for implementing WLAs in approved TMDLs will vary across waterbodies, discharges, and pollutant(s) of concern. The allocations within a TMDL can take many different forms – narrative, numeric, specific BMPs – and may be complimented by other special requirements such as monitoring.

The level of monitoring necessary, deployment of structural and non-structural BMPs, evaluation of BMP performance, and optimization or revisions to the existing pollutant reduction goals of the SWMP or any other plan is TMDL and watershed specific. Hence, it is expected that NPDES permit holders evaluate their existing SWMP or other plans in a manner that would effectively address implementation of this TMDL with an acceptable schedule and activities for their permit compliance. The Department staff (permit writers, TMDL project managers, and compliance staff) is willing to assist in developing or updating the referenced plan as deemed necessary. Please see Appendix E which provides additional information as it relates to evaluating the effectiveness of an MS4 Permit as it related to compliance with approved TMDLs. Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. For SCDOT, compliance with terms and conditions of its NPDES MS4 permit is effective implementation of the WLA to the MEP.

The Department acknowledges that progress with the assumptions and requirements of the TMDL by MS4s is expected to take one or more permit iteration. Achieving the WLA reduction for the TMDL may constitute MS4 compliance with its SWMP, provided the MEP definition is met, even where the numeric percent reduction may not be achieved in the interim.

Regulated MS4 entities are required to develop a SWMP that includes the following: public education, public involvement, illicit discharge detection & elimination, construction site runoff control, post construction runoff control, and pollution prevention/good housekeeping. These

measures are not exhaustive and may include additional criterion depending on the type of NPDES MS4 permit that applies. These examples are recognized as acceptable stormwater practices and may be applied to unregulated MS4 entities or other interested parties in the development of a stormwater management plan.

An informed and knowledgeable community is crucial to the success of a stormwater management plan (USEPA, 2005). MS4 entities may implement a public education program to distribute educational materials to the community, or conduct equivalent outreach activities about the impacts of stormwater discharges on local waterbodies and the steps that can be taken to reduce stormwater pollution. Some appropriate BMPs may be brochures, educational programs, storm drain stenciling, stormwater hotlines, tributary signage, and alternative information sources such as web sites and bumper stickers (USEPA, 2005).

The public can provide valuable input and assistance to a MS4 program and they may have the potential to play an active role in both development and implementation of the stormwater program where deemed appropriate. There are a variety of practices that can involve public participation such as public meetings/citizens panels, volunteer water quality monitoring, volunteer educators, community clean-ups, citizen watch groups, and “Adopt a Storm Drain” programs which encourage individuals or groups to keep storm drains free of debris and monitor what is entering local waterways through storm drains (USEPA, 2005).

Illicit discharge detection and elimination efforts are also necessary. Discharges from MS4s often include wastes and wastewater from non-stormwater sources. These discharges enter the system through either direct connections or indirect connections. The result is untreated discharges that contribute high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving waterbodies (USEPA, 2005). Pollutant levels from these illicit discharges have been shown in EPA studies to be high enough to significantly degrade receiving water quality and threaten aquatic, wildlife, and human health. MS4 entities may have a storm sewer system map which shows the location of all outfalls and to which waters of the US they discharge to. If not already in place, an ordinance prohibiting non-stormwater discharges into MS4 with appropriate enforcement procedures may also be developed. Entities may also have a plan for detecting and addressing non-stormwater discharges. The plan may include locating problem areas through infrared photography, finding the sources through dye testing, removal/correction of illicit connections, and documenting the actions taken to illustrate that progress is being made to eliminate illicit connections and discharges.

A program might also be developed to reduce pollutants in stormwater runoff to their MS4 from construction activities. An ordinance or other regulatory mechanism may exist requiring the implementation of proper erosion and sediment controls on applicable construction sites. Site plans should be reviewed for projects that consider potential water quality impacts. It is recommended that site inspections should be conducted and control measures enforced where applicable. A procedure might also exist for considering information submitted by the public (USEPA, 2005). For information on specific BMPs please refer to the SCDHEC Stormwater Management BMP Handbook online at:

http://www.scdhec.com/environment/ocrm/pubs/docs/SW/BMP_Handbook/Erosion_prevention.pdf

Post-construction stormwater management in areas undergoing new development or redevelopment is recommended because runoff from these areas has been shown to significantly affect receiving waterbodies. Many studies indicate that prior planning and design for the minimization of pollutants in post-construction stormwater discharges is the most cost-effective approach to stormwater quality management (USEPA, 2005). Strategies might be developed to include a combination of structural and/or non-structural BMPs. An ordinance or other regulatory mechanism may also exist requiring the implementation of post-construction runoff controls and ensuring their long term-operation and maintenance. Examples of non-structural BMPs are planning procedures and site-based BMPs (minimization of imperviousness and maximization of open space). Structural BMPs may include but are not limited to stormwater retention/detention BMPs, infiltration BMPs (dry wells, porous pavement, etc.), and vegetative BMPs (grassy swales, filter strips, rain gardens, artificial wetlands, etc.).

Pollution prevention/good housekeeping is also a key element of stormwater management programs. Generally this requires the MS4 entity to examine and alter their actions to ensure reductions in pollution are occurring. This could also result in a reduction of costs for the MS4 entity. It is recommended that a plan be developed to prevent or reduce pollutant runoff from municipal operations into the storm sewer system and it is encouraged to include employee training on how to incorporate pollution prevention/good housekeeping techniques. To minimize duplication of effort and conserve resources, the MS4 operator can use training materials that are available from EPA or relevant organizations (USEPA, 2005).

MS4 communities are encouraged to utilize partnerships when developing and implementing a stormwater management program. Watershed associations, educational entities, and state, county, and city governments are all examples of possible partners with resources that can be shared. For additional information on partnerships contact the SCDHEC Watershed Manager for the waterbody of concern online at: <http://www.scdhec.gov/environment/water/shed/contact.htm> For additional information on stormwater discharges associated with MS4 entities please see the USEPA NPDES website online at http://cfpub.epa.gov/npdes/home.cfm?program_id=6 for information pertaining to the National Menu of BMPs, Urban BMP Performance Tool, Outreach Documents, etc.

The Department acknowledges that progress with the assumptions and requirements of the TMDL by MS4s is expected to take one or more permit iteration. Achieving the WLA reduction for the TMDL may constitute MS4 compliance with its SWMP, provided the MEP definition is met, even where the numeric percent reduction may not be achieved in the interim.

Nonpoint Sources

6.1.3 Wildlife

Suggested forms of implementation for wildlife will vary widely due to geographic location and species. During a source assessment it was noted that beaver dams were present upstream from the impaired site. Beaver problems should be brought to the attention of the South Carolina Department of Natural Resources. Deterrents could be used to keep waterfowl away from lawns

in close proximity to surface waters. These include non-toxic sprays, decoys, kites, noisemakers, scarecrows, and plastic owls. Homeowners should be educated on the impacts of feeding wildlife or planting food plots in close proximity to surface waters. Please check local and federal laws before applying deterrents or harassing wildlife. Additional information may be obtained from the “Managing Pet and Wildlife Waste to Prevent Contamination of Drinking Water” bulletin provided by USEPA (2001).

6.1.4 Agricultural Activities

The majority of the Caw Caw Swamp watershed is agricultural, therefore focus of implementation through improving BMPs may be able to reduce pollutant loading significantly. Suggested forms of implementation for agricultural activities will vary based on the activity of concern.

Agricultural BMPs can be vegetative, structural or management oriented. When selecting BMPs, it is important to keep in mind that nonpoint source pollution occurs when a pollutant becomes available, is detached and then transported to nearby receiving waters. Therefore, for BMPs to be effective the transport mechanism of the pollutant, fecal coliform, needs to be identified.

There are five animal feeding operations (AFO) located in the Caw Caw Swamp watershed. The following are BMP suggestions for these farms.

Installing fencing along the streams within the watershed and providing an alternative water source where livestock are present would eliminate direct contact with the streams. If fencing is not feasible, it has been shown that installing water troughs within a pasture area reduced the amount of time livestock spent drinking directly from streams by 92% (ASABE 1997). An indirect result of this was a 77% reduction in stream bank erosion by providing an alternative to accessing the stream directly for water supply. It was also noted during a windshield survey that several cow pastures had numerous amounts of manure. A manure storage facility would not only help water quality by minimizing the amount of FC that could be flushed into the creek after a rain, but it would also allow farmers to purchase little to no fertilizer and save money. The manure could be applied to crops when they will readily use it.

For row crop farms in the referenced watershed, many common practices exist to reduce FC contributions. Unstabilized soil directly adjacent to surface waters can contribute to FC loading during periods of runoff after rain events. Agricultural field borders and filter strips (vegetative buffers) can provide erosion control around the border of planted crop fields. These borders can provide food for wildlife, may possibly be harvested (grass and legume), and also provide an area where farmers can turn around their equipment (SCDNR 1997). A study conducted in 1998 by the American Society of Agricultural and Biological Engineers (ASABE) has shown that a vegetative buffer measuring 6.1 meters in width can reduce fecal runoff concentrations from $2.0E+7$ to an immeasurable amount once filtered through the buffer. A buffer of this width was also shown to reduce phosphorous and nitrogen concentrations by 75%.

The agricultural BMPs listed above are a sample of the many accepted practices that are currently available. Many other techniques such as conservation tillage, responsible pest

management, and precision agriculture also exist and may contribute to an improvement in overall water quality in the watershed. Education should be provided to local farmers on these methods as well as acceptable manure spreading and holding (stacking sheds) practices.

For additional information on accepted agricultural BMPs you can obtain a copy of the “Farming for Clean Water in South Carolina” handbook by contacting Clemson University Cooperative Extension Service at (864) 656-1550. In addition, Clemson Extension Service offers a ‘Farm-A-Syst’ package to farmers. Farm-A-Syst allows the farmer to evaluate practices on their property and determine the nonpoint source impact they may be having. It recommends best management practices (BMPs) to correct nonpoint source problems on the farm. You can access Farm-A-Syst by going onto the Clemson Extension Service website:

<http://www.clemson.edu/waterquality/FARM.HTM>

NRCS provides financial and technical assistance to help South Carolina landowners address natural resource concerns, promote environmental quality, and protect wildlife habitat on property they own or control. The cost-share funds are available through the Environmental Quality Incentives Program (EQIP). EQIP helps farmers improve production while protecting environmental quality by addressing such concerns as soil erosion and productivity, grazing management, water quality, animal waste, and forestry concerns. EQIP also assists eligible small-scale farmers who have historically not participated in or ranked high enough to be funded in previous sign ups. Please visit www.sc.nrcs.usda.gov/programs/ for more information, including eligibility requirements.

Also available through NRCS, the Grassland Reserve Program (GRP) is a voluntary program offering landowners the opportunity to protect, restore and enhance grasslands on their property. NRCS and the Farm Service Agency (FSA) coordinate implementation of the GRP, which helps landowners restore and protect grassland, rangeland, pastureland, shrubland and certain other lands and provides assistance for rehabilitating grasslands. The program will conserve vulnerable grasslands from conversion to cropland or other uses and conserve valuable grasslands by helping maintain viable grazing operations. A grazing management plan is required for participants. NRCS has further information on their website for the GRP as well as additional programs such as the Conservation Reserve Program, Conservation Security Program, Farm and Ranch Lands Protection Program, etc. You can visit the NRCS website by going to: www.sc.nrcs.usda.gov/programs/

6.1.5 Leaking Sanitary Sewers and Illicit Discharges

Leaking sanitary sewers and illicit discharges, although illegal and subject to enforcement, may be occurring in the watershed at any time. It should be recognized that these activities may occur in unregulated portions of the watershed. Due to the high concentration of pollutant loading that is generally associated with these discharges, their detection may provide a substantial improvement in overall water quality in the Caw Caw Swamp watershed. Detection methods may include, but are not limited to: dye testing, air pressure testing, static pressure testing, and infrared photography.

As noted in section 3, there is a lift station located on the banks of Caw Caw Swamp right at impaired station E-105. Managing the network of sewage lift stations that pump to the treatment

plant is crucial to maintaining water quality. One way to ensure that the lift station is well protected is to put in a control device that can be monitored to ensure there is no FC bacteria loading into Caw Caw Swamp.

SCDHEC recognizes illicit discharge detection and elimination activities are conducted by MS4 entities as pursuant to compliance with existing MS4 permits. Note that these activities are designed to detect and eliminate illicit discharges that may contain FC bacteria. It is the intent of SCDHEC to work with the MS4 entities to recognize FC load reductions as they are achieved. SCDHEC acknowledges that these efforts to reduce illicit discharges and SSOs are ongoing and some reduction may already be accountable (i.e. load reductions occurring during TMDL development process). Thus, the implementation process is an iterative and adaptive process. Regular communication between all implementation stakeholders will result in successful remediation of controllable sources over time. As recreational uses are restored, SCDHEC will recognize efforts of implementers where their efforts can be directly linked to restoration.

6.1.6 Failing Septic Systems

A septic system, also known as an onsite wastewater system, is defined as failing when it is not treating or disposing of sewage in an effective manner. The most common reason for failure is improper maintenance by homeowners. Untreated sewage water contains disease-causing bacteria and viruses, and well as unhealthy amounts of nitrate and other chemicals. Failed septic systems can allow untreated sewage to seep into wells, groundwater, and surface water bodies, where people get their drinking water and recreate. Pumping a septic tank is probably the single most important thing that can be done to protect the system. If the buildup of solids in the tanks becomes too high and solids move to the drainfield, this could clog and strain the system to the point where a new drainfield will be needed.

The Office of Coastal Resource Management (OCRM) has created a toolkit for homeowners and local governments which includes tips for maintaining their systems. These septic system Do's and Don't's are as follows:

Septic System Do's and Don'ts from SCDHEC Office of Coastal Resource Management:

Do's:

- Conserve water to reduce the amount of wastewater that must be treated and disposed of by your system. Doing laundry over several days will put less stress on your system.
- Repair any leaking faucets or toilets. To detect toilet leaks, add several drops of food dye to the toilet tank and see if dye ends up in the bowl.
- Divert down spouts and other surface water away from your drainfield. Excessive water keeps the soil from adequately cleansing the wastewater.
- Have your septic tank inspected yearly and pumped regularly by a licensed septic tank contractor.

Don'ts:

- Don't drive over your drainfield or compact the soil in any way.
- Don't dig in your drainfield or build anything over it, and don't cover it with a hard surface such as concrete or asphalt.
- Don't plant anything over or near the drainfield except grass. Roots from nearby trees and shrubs may clog and damage the drain lines.
- Don't use your toilet as a trash can or poison your system and the groundwater by pouring harmful chemicals and cleansers down the drain. Harsh chemicals can kill the bacteria that help purify your wastewater.

For additional information on how septic systems work and how to properly plan a septic system, please visit the DHEC Environmental Health Onsite Wastewater page at the following link: http://www.scdhec.gov/health/envhlth/onsite_wastewater/septic_tank.htm

6.1.7 Urban Runoff

Urban runoff is surface runoff of rainwater created by urbanization outside of regulated areas which may pick up and carry pollutants to receiving waters. Pavement, compacted areas, roofs, reduced tree canopy and open space increase runoff volumes that rapidly flow into receiving waters. This increase in volume and velocity of runoff often causes stream bank erosion, channel incision and sediment deposition in stream channels. In addition, runoff from these developed areas can increase stream temperatures that along with the increase in flow rate and pollutant loads negatively affect water quality and aquatic life (USEPA 2005). This runoff can pick up FC bacteria along the way. Many strategies currently exist to reduce FC loading from urban runoff and the USEPA nonpoint source pollution website provides extensive resources on this subject which can be accessed online at: <http://www.epa.gov/nps/urban.html>.

Some examples of urban nonpoint source bmps are street sweeping, stormwater wetlands, pet waste receptacles (equipped with waste bags), and educational signs which can be installed adjacent to receiving waters in the watershed such as parks, common areas, apartment complexes, trails, etc. Low impact development (LID) may also be effective. LID is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product. There are many practices that have been used to adhere to these principles such as bioretention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements (USEPA, 2009).

Some additional urban BMPs that can be adopted in public parks are doggy doileys and pooch patches. Doggy doileys are disposal units, which act like septic systems for pet wastes, and are installed in the ground where decomposition can occur (USEPA, 2001). This requires the pet owner to place the waste into the disposal units.

Although the Caw Caw Swamp watershed is rural in nature, many of the urban runoff practices discussed in this section can be applied to individual households in the watershed. Education should be provided to individual homeowners in the referenced watershed on the contributions to

FC loading from pet waste. Education to homeowners in the watershed on the fate of substances poured into storm drain inlets should also be provided. For additional information on urban runoff please see the SCDHEC Nonpoint Source Runoff Pollution homepage at <http://www.scdhec.gov/environment/water/npspage.htm>.

Clemson Extension's Home-A-Syst handbook can also help homeowners reduce sources of NPS pollution on their property. This document guides homeowners through a self-assessment of their property and can be accessed online at: <http://www.clemson.edu/waterquality/HOMASYS.HTM>

7.0 RESOURCES FOR POLLUTION MANAGEMENT

This section provides a listing of available resources to aid in the mitigation and control of pollutants. There are examples from across the nation, most of which are easily accessible on the world wide web.

7.1 General for Urban and Suburban Stormwater Mitigation

- National Management Measures to Control Nonpoint Source Pollution from Urban Areas – Draft. 2002. EPA842-B-02-003. Available at: <http://www.epa.gov/owow/nps/urbanmm/index.html>
- Stormwater Management Volume Two: Stormwater Technical Manual. Massachusetts Department of Environmental Management. 1997. Available at: <http://www.mass.gov/dep/brp/stormwtr/stormpub.htm>
- Fact Sheets for the six minimum control measures for storm sewers regulated under Phase I or Phase II. Available at: http://cfpub1.epa.gov/npdes/stormwater/swfinal.cfm?program_id=6
- A Current Assessment of Urban Best Management Practices. 1992. Metropolitan Washington Council of Governments. Washington, DC
- Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs. 1987. Metropolitan Washington Council of Governments. Washington, DC
- 2004 Stormwater Quality Manual. Connecticut Department of Environmental Protection 2004. Available at: <http://dep.state.ct.us/wtr/stormwater/strmwtrman.htm>
- Stormwater Treatment BMP New Technology Report. California Department of Transportation. 2004. SW-04-069-.04.02 Available at: http://www.dot.ca.gov/hq/env/stormwater/special/newsetup/pdfs/new_technology/CTSW-RT-04-069.pdf
- Moonlight Beach Urban Runoff Treatment facility: Using Ultraviolet Disinfection to Reduce Bacteria Counts. Rasmus, J. and K. Weldon. 2003. StormWater, May/June 2003. Available at http://www.forester.net/sw_0305_moonlight.html
- Operation, Maintenance, and Management of Stormwater Management Systems. Livingston, Shaver, Skupien, and Horner. August 1997. Watershed Management Institute. Call: (850) 926-5310.
- Model Ordinances to Protect Local Resources – Stormwater Control Operation and Maintenance. USEPA Webpage: <http://www.epa.gov/owow/nps/ordinance/stormwater.htm>

- Stormwater O & M Fact Sheet Preventive Maintenance. USEPA 1999. 832-F-99-004. Available at: <http://www.epa.gov/owm/mtb/prevmain.pdf>
- The MassHighway Stormwater Handbook. Massachusetts Highway Department. 2004. Available at: <http://166.90.180.162/mhd/downloads/projDev/swbook.pdf>
- University of New Hampshire Stormwater Center: Dedicated to the protection of water resources through effective stormwater management. Available at: <http://www.unh.edu/erg/cstev/index.htm#>
- EPA's Stormwater website: <http://www.epa.gov/region1/topics/water/stormwater.html>

7.2 Illicit Discharges

- Illicit Discharge Detection and Elimination Manual - A Handbook for Municipalities. 2003. New England Interstate Water Pollution Control Commission. Available at: http://www.neiwpcc.org/PDF_Docs/iddmanual.pdf
- Model Ordinances to Protect Local Resources – Illicit Discharges. USEPA webpage: <http://www.epa.gov/owow/nps/ordinance/discharges.htm>

7.3 Pet Waste

- National Management Measure to Control Non Point Source Pollution from Urban Areas – Draft. USEPA 2002. EPA 842-B-02-2003. Available from: <http://www.epa.gov/owow/nps/urbanmm/index.html>
- Septic Systems for Dogs? Nonpoint Source News-Notes 63. Pet Waste: Dealing with a Real Problem in Suburbia. Kemper, J. 2000. New Jersey Department of Environmental Protection. Available from: http://www.state.nj.us/dep/watershedmgt/pet_waste_fredk.htm
- Stormwater Manager's Resource Center. Schueler, T., Center for Watershed Protection, Inc. <http://www.stormwatercenter.net>
- Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. U.S. EPA, Office of Water 1993. Washington, DC.
- National Menu of Best Management Practices for Stormwater Phase II. USEPA. 2002. Available at: <http://www.epa.gov/npdes/menuofbmps/menu.htm>
- Welcome to NVRC'S Four Mile Run Program. NVRC 2001. Available at: <http://www.novaregion.org/fourmilerun.htm>
- Boston's ordinance on dog waste. City of Boston Municipal Codes, Chapter XVI. 16-1.10A Dog Fouling. Available at: http://www.amlegal.com/boston_ma/

- Pet Waste and Water Quality. Hill, J.A., and D. Johnson. 1994. University of Wisconsin Extension Service. <http://cecommerce.uwex.edu/pdfs/GWQ006.PDF>
- Long Island Sound Study. Pet Waste Poster. EPA. Available at: <http://www.longislandsoundstudy.net/pubs/misc/pet.html>
- Source Water Protection Practices Bulletin: Managing Pet and Wildlife Waste to Prevent Contamination of Drinking Water. USEPA. 2001. EPA 916-F-01-027. Available at: <http://www.epa.gov/safewater/protect/pdfs/petwaste.pdf>

7.4 Wildlife

- An example of a bylaw prohibiting the feeding of wildlife: Prohibiting Feeding of Wildlife. Town of Bourne Bylaws Section 3.4.3. Available at: http://www.townofbourne.com/Town%20Offices/Bylaws/chapter_3.htm
- Integrated Management of Urban Canadian Geese. M Underhill. 1999. Conference Proceedings, Waterfowl Information Network.
- Urban Canadian Geese in Missouri. Missouri Conservationist Online. Available at: <http://www.conservation.state.mo.us/conmag/2004/02/20.htm>

7.5 Septic Systems

- National Management Measures to Control Nonpoint Source Pollution from Urban Areas – Draft. Chapter 6. New and Existing Onsite Wastewater Treatment Systems. USEPA 2002. EPA842-B-02-003. Available at: <http://www.epa.gov/owow/nps/urbanmm/index.html>
- Septic Systems. USEPA Webpage: <http://cfpub.epa.gov/owm/septic/home.cfm>

7.6 Field Application of Manure

- Conservation Standard Practice-Irrigation Water Management. Number 449. United States Department of Agriculture (USDA) Natural Resources Conservation Service. 2003. Available at: <http://www.nrcs.usda.gov/technical/Standards/nhcp.html>
- Conservation Standard Practice-Filter Strip. Number 393. USDA Natural Resources Conservation Service (NRCS). 2003. Available at: <http://www.nrcs.usda.gov/technical/Standards/nhcp.html>
- Buffer Strips: Common Sense Conservation. USDA Natural Resource Conservation Service. No Date. Website. Available at: <http://www.nrcs.usda.gov/feature/buffers/>

- Conservation Standard Practice-Riparian Forest Buffer. Number 391. USDA Natural Resource Conservation Service. 2003. Available at: <http://www.nrcs.usda.gov/technical/Standards/nhcp.html>

7.7 Grazing Management

- Conservation Standard Practice-Stream Crossing. Number 578. USDA Natural Resource Conservation Service. 2003. Available at: <http://www.nrcs.usda.gov/technical/Standards/nhcp.html>

Guidance Specifying Management Measures for Nonpoint Source Pollution in Coastal Waters. Chapter 2. Management Measures for Agricultural Sources. Grazing Management. USEPA. Available at: <http://www.epa.gov/owow/nps/MMGI/Chapter2/ch2-2e.html>

7.8 Animal Feeding Operations and Barnyards

- National Management Measures to Control Nonpoint Source Pollution from Agriculture. USEPA 2003. Report: EPA 841-B-03-004. Available at: <http://www.epa.gov/owow/nps/agmm/index.html>
- Livestock Manure Storage. Software designed to assess the threat to ground and surface water from manure storage facilities. USEPA. Available at: <http://www.epa.gov/seahome/manure.html>
- National Engineering Handbook Part 651. Agricultural Waste Management Field Handbook. NRCS. Available At: <http://www.wcc.nrcs.usda.gov/awm/awmfh.html>
- Animal Waste Management. NRCS website: <http://www.wcc.nrcs.usda.gov/awm/>
- Animal Waste Management Software. A tool for estimating waste production and storage requirements. Available at: <http://www.wcc.nrcs.usda.gov/awm/awm.html>
- Manure Management Planner. Software for creating manure management plans. Available at: <http://www.agry.purdue.edu/mmp/>
- Animal Feeding Operations Virtual Information Center. USEPA website: <http://cfpub.epa.gov/npdes/afo/virtualcenter.cfm>

7.9 Federal Agriculture Resources: Program Overviews, Technical Assistance, and Funding

- USDA-NRCS assists landowners with planning for the conservation of soil, water, and natural resources. Local, state, and federal agencies and policymakers also rely on NRCS expertise. Cost shares and financial incentives are available in some cases. Most work is done with local partners. The NRCS is the largest funding source for agricultural improvements. To find out about potential funding, see: <http://www.ma.nrcs.usda.gov/programs/>. To pursue obtaining funding, contact a local NRCS coordinator. Contact information is available at: http://www.ma.nrcs.usda.gov/contact/employee_directory.html
- NRCS provides a wealth of information and BMP fact sheets tailored to agricultural and conservation practices through the NRCS Electronic Field Office Technical Guide at: http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=SC

The 2002 USDA Farm Bill (<http://www.nrcs.usda.gov/programs/farmbill/2002/>) provides a variety of programs related to conservation. Information can be found at:

<http://www.nrcs.usda.gov/programs/farmbill/2002/products.html>. The following programs can be linked to from the USDA Farm Bill website:

Conservation Security Program (CSP): <http://www.nrcs.usda.gov/programs/csp/>

Conservation Reserve Program (CRP): <http://www.nrcs.usda.gov/programs/crp/>

Wetlands Reserve Program (WRP): <http://www.nrcs.usda.gov/programs/wrp/>

Environmental Quality Incentives Program (EQIP):

<http://www.nrcs.usda.gov/programs/eqip/>

Grassland Reserve Program (GRP): <http://www.nrcs.usda.gov/programs/GRP/>

Conservation of Private Grazing Land Program (CPGL):

<http://www.nrcs.usda.gov/programs/cpgl/>

Wildlife Habitat Incentives Program (WHIP): <http://www.nrcs.usda.gov/programs/whip/>

Farm and Ranch Land Protection Program (FRPP):

<http://www.nrcs.usda.gov/programs/frpp/>

- Resource Conservation and Development Program (RC&D): <http://www.nrcs.usda.gov/programs/rcd/>

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Wetlands Reserve Program (WRP): <http://www.nrcs.usda.gov/programs/wrp/>

Environmental Quality Incentives Program (EQIP):

<http://www.nrcs.usda.gov/programs/eqip/>

Grassland Reserve Program (GRP): <http://www.nrcs.usda.gov/programs/GRP/>

Conservation of Private Grazing Land Program (CPGL):

<http://www.nrcs.usda.gov/programs/cpgl/>

Wildlife Habitat Incentives Program (WHIP): <http://www.nrcs.usda.gov/programs/whip/>

Farm and Ranch Land Protection Program (FRPP):

<http://www.nrcs.usda.gov/programs/frpp/>

Resource Conservation and Development Program (RC&D):

<http://www.nrcs.usda.gov/programs/rcd/>

- CORE4 Conservation Practices. The common sense approach to natural resource conservation. USDA-NRCS (1999). This manual is intended to help USDA-NRCS personnel and other conservation and nonpoint source management professionals implement effective programs using four core conservation practices: conservation tillage, nutrient management, pest management, and conservation buffers, available at: <http://www.nrcs.usda.gov/technical/ECS/agronomy/core4.pdf>
- County soil survey maps are available from NRCS at: <http://soils.usda.gov>
- Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. U.S. EPA, Office of Water (1993). Developed for use by State Coastal Nonpoint Pollution Control Programs, Chapter 2 of this document covers erosion control, animal feeding operation management, grazing practices, and management of nutrients, pesticides, and irrigation water, available at: <http://www.epa.gov/owow/nps/MMGI/Chapter2/index.html>.
- Farm-A-Syst is a partnership between government agencies and private business that enables landowners to prevent pollution on farms, ranches, and in homes using confidential environmental assessments, available at: <http://www.uwex.edu/farmasyst/>
- State Environmental Laws Affecting South Carolina Agriculture: A comprehensive assessment of regulatory issues related to South Carolina agriculture has been compiled by the National Association of State Departments, available at: <http://www.nasdaq.org/nasdaq/nasdaq/Foundation/state/states.htm>
- Waterborne Pathogens in Agricultural Wastewater. Rosen, B.H., 2000. USDA, NRCS, Watershed Science Institute. Available at: ftp://ftp-fc.sc.egov.usda.gov/WSI/pdffiles/Pathogens_in_Agricultural_Watersheds.pdf
- Stormwater Program (Phase II); Municipal Sewer Systems and Construction Sites, 64 Federal Register 235 (8 December 1999), pp. 68837.
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- United States Environmental Protection Agency (USEPA). 1991. Guidance for Water Quality-Based Decisions: The TMDL Process. Office of Water, EPA 440/4-91-001.

United States Environmental Protection Agency (USEPA). 2001. Protocol for Developing Pathogen TMDLs. First Edition. Office of Water, EPA 841-R-00-002.

US Geological Survey. 2007. Water-Resources Real-time Data South Carolina Water Year. United States Geological Survey. Available at <http://waterdata.usgs.gov/nw>

Appendix A- Data Tables

90th Percentile Fecal Coliform Concentrations (#/100 mL)						
Hydro Categ Range	High Flow 0-10	Moist Cond. 10-40	Mid Range 40-60	Dry Flow 60-90	Low Flow 90-100	Samples
E-105	236	335	134	581	650	69

Mid Point Hydrologic Category Flow (cfs)					
Hydro Categ (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
E-105	233.35	48.04	19.56	8.24	2.44

Existing Load (#/day)					
Hydro Categ (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
E-105	1.35E+12	3.94E+11	6.40E+10	1.17E+11	3.87E+10

Target Load (#/day)					
Hydro Categ (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
E-105	2.17E+12	4.47E+11	1.82E+11	7.66E+10	2.27E+10

Load Reduction Necessary (#/day)					
Hydro Categ (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
E-105	N/A	N/A	N/A	4.04E+10	N/A

% Load Reduction Necessary					
Hydro Categ (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
E-105	N/A	N/A	N/A	35	N/A

**Appendix B- Fecal Coliform Water Quality Data Summary for Impaired Station E-105
By Date**

DATE	1/18/01	2/5/01	3/12/01	4/10/01	8/2/01	9/11/01	10/3/01	11/13/01	12/10/01
FC (cfu/day)	110	310	85	110	280	450	360	220	180

DATE	1/9/02	2/4/02	3/4/02	4/4/02	5/15/02	6/4/02	7/8/02	8/12/02	9/4/02	10/1/02	11/6/02	12/11/02
FC (cfu/day)	590	210	0	180	360	400	120	160	200	300	250	120

DATE	1/8/03	2/5/03	3/4/03	4/1/03	5/7/03	6/4/03	7/17/03	8/6/03	9/2/03	10/28/03	11/4/03	12/1/03
FC (cfu/day)	180	78	95	90	1100	140	210	230	310	170	140	140

DATE	1/7/04	2/4/04	3/3/04	4/7/04	5/11/04	6/2/04	7/20/04	8/23/04	9/9/04	10/5/04	11/8/04	12/13/04
FC (cfu/day)	72	75	150	45	58	320	270	490	520	160	270	260

DATE	1/20/05	2/2/05	3/8/05	4/27/05	5/17/05	6/7/05	7/5/05	8/1/05	9/6/05	10/4/05	11/1/05	12/1/05
FC (cfu/day)	170	160	240	68	120	120	560	240	240	360	590	240

DATE	1/10/06	2/7/06	3/7/06	4/11/06	5/3/06	6/27/06	7/10/06	8/2/06	9/7/06	10/17/06	11/2/06	12/5/06
FC (cfu/day)	40	200	210	140	180	600	600	560	400	440	1100	97

**Appendix C
Watershed Photos**



Sewer located along the banks of impaired station E-105



Lift Station located at the banks of impaired station E-105



Bridge crossing over impaired station E-105



Beaver dam located upstream from impaired station E-105



Forested area upstream of impaired station E-105 (upper watershed)



Upstream of impaired station E-105, Calhoun County (upper watershed)

Appendix D.

Evaluating the Progress of MS4 Programs: Meeting the Goals of TMDLs and Attaining Water Quality Standards

Bureau of Water

August 2008

Described below are potential approaches that may be used by MS4 permit holders. These are recommendations and examples only, as SCDHEC-BOW recognizes that other approaches may be utilized or employed to meet compliance goals.

1. Calculate pollutant load reduction for each best management practice (BMP) deployed:
 - Retrofitting stormwater outlets
 - Creation of green space
 - LID activities (e.g., creation of porous pavements)
 - Creations of riparian buffers
 - Stream bank restoration
 - Scoop the poop program (how many pounds of poop were scooped/collected)
 - Street sweeping program (amount of materials collected etc.)
 - Construction & post-construction site runoff controls
2. Description & documentation of programs directed towards reducing pollutant loading
 - Document tangible efforts made to reduce impacts to urban runoff
 - Track type and number of structural BMPs installed
 - Parking lot maintenance program for pollutant load reduction
 - Identification and elimination of illicit discharges
 - Zoning changes and ordinances designed to reduce pollutant loading
 - Modeling of activities & programs for reducing pollutant reductions
3. Description & documentation of social indicators, outreach, and education programs
 - Number/Type of training & education activities conducted and survey results
 - Activities conducted to increase awareness and knowledge – residents, business owners. What changes have been made based on these efforts? Any measured behavior or knowledge changes?
 - Participation in stream and/or lake clean-up events or activities
 - Number of environmental action pledges
4. Water quality monitoring: A direct and effective way to evaluate the effectiveness of stormwater management plan activities.
 - Use of data collected from existing monitoring activities (e.g., SCDHEC data for ambient monitoring program available through STORET; water supply intake testing; voluntary watershed group's monitoring, etc)

- Establish a monitoring program for permitted outfalls and/or waterbodies within MS4 areas as deemed necessary– use a certified lab
- Monitoring should focus on water quality parameters and locations that would both link pollutant sources and BMPs being implemented

5. Links:

- Evaluating the Effectiveness of Municipal Stormwater Programs. September 2007. EPA 833-F-07-010
- The BMP database - <http://www.bmpdatabase.org/BMPPerformance.htm> (this link is specifically to the BMP performance page, and lot more)
- EPA’s STORET data warehouse - http://www.epa.gov/storet/dw_home.html
- EPARegion 5: STEPL – Spreadsheet tool for estimating pollutant loads <http://it.tetrattech-ffx.com/stepl/>
- Measurable goals guidance for Phase II Small MS4 - <http://cfpub.epa.gov/npdes/stormwater/measurablegoals/index.cfm>
- Environmental indicators for sotrmwater program- <http://cfpub.epa.gov/npdes/stormwater/measurablegoals/part5.cfm>
- National menu of stormwater best management practices (BMPs) - <http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm>
- SCDHEC – BOW: 319 grant program has attempted to calculate the load reductions for the following BMPs:
 - Septic tank repair or replacement
 - Removing livestock from streams (cattle, horses, mules)
 - Livestock fencing
 - Waste Storage Facilities (aka stacking sheds)
 - Strip cropping
 - Prescribed grazing
 - Critical Area Planting
 - Runoff Management System
 - Waste Management System
 - Solids Separation Basin
 - Riparian Buffers

Appendix E. Responsiveness Summary

Responsiveness Summary Caw Caw Swamp TMDL Document

Comments were received from the following:

South Carolina Department of Transportation

Comments from South Carolina Department of Transportation

Comment 1:

“It is important that the SCDHEC develop TMDLs that are implementable, defensible, reasonable, and which achieve the goal of the waterbody meeting the state standard for its appropriate use designation. It is also important that the SCDHEC understands the role and responsibility of the SCDOT in carrying out its mission to provide transportation for the citizens of South Carolina and its limited ability to affect activities not covered under its regulatory authority. The issues related to this TMDL and all others are watershed-based. Only SCDHEC has the authority to develop basin-wide plans to address the regulated and non-regulated contributors to the impairments that lead to the development of this TMDL in the first place.”

Response 1:

The Department understands the role and responsibilities of SCDOT. It is part of the Department’s goals to develop reasonable, implementable, and scientifically defensible TMDLs which help waterbodies achieve water quality standards. It is further acknowledged that SCDHEC has the authority to develop watershed and basin-wide plans to address regulated and unregulated processes contributing to water quality impairments and the Caw Caw Swamp TMDL is an example of such a plan.

Comment 2:

“TMDLs must consider **all** potential sources of fecal coliform, not just permitted MS4s. These existing sources of pollutants, or other causes of impaired water quality, must be quantified as part of the TMDL process. In this TMDL, DHEC has identified these sources but has not quantified them for use in water quality models. Without this quantification step, there is no basis for determining the effect of the assigned waste load allocation. In the case of this TMDL, if the SCDOT reduced its FC contribution by 100% (because its FC contribution is minimal and it accounts for less than 5% of the watershed area), the stream would still be impaired for FC. However, since the SCDOT is the only identified permitted entity, it possibly could be held in violation of its NPDES permit and subject to sanctions by SCDHEC and the USEPA as well as third party actions. Therefore, all existing point and nonpoint sources that may impact a receiving waterbody must be identified, their contribution quantified, and assigned an appropriate load or waste load allocation.

A TMDL in and of itself carries no regulatory authority over any entity which it names as a contributor of a pollutant. Therefore, no regulatory authority is needed for DHEC to name any entity as a contributor, if they are in fact one. The regulatory authority of a TMDL comes only by way of an NPDES permit held by named entity. Simply because DHEC may not issue an NPDES permit to a flock of geese, a herd of cattle or collectively all leaking sanitary sewers, does not mean that such groups should be excluded from consideration and quantification of the overall water quality in TMDL area.”

Response 2:

Reductions from all sources, including point (WLA) and nonpoint (LA) sources, are required to meet the overall percentage reductions of the referenced TMDL and achieve the water quality standard for the pollutant of concern. Therefore, SCDOT is not the sole source responsible for reducing FC loading to the referenced watershed. At the present time however, SCDOT is currently the only regulated entity in the watershed subject to the WLA portion of the TMDL. Should future permits become applicable to this watershed, those discharges will be subject to the assumptions and requirements of the WLA portion of the referenced TMDL.

Wildlife, agricultural runoff, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff (including potentially designated) are nonpoint sources of pollution and as such are covered under the load allocation portion of the TMDL document. The percent reduction, including the load allocation portion of the TMDL, is provided in Table Ab-1, Table 7, and is further discussed in detail in section 5.4 of this TMDL document. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

It should be noted that unauthorized discharges to Waters of the State, including leaky septic tanks and leaking sewer lines, are illegal and subject to compliance and enforcement mechanisms. Sections 3.2.3 and 3.2.4 (p. 16-17) of the referenced TMDL document discuss leaking sanitary sewers, illicit discharges, and failing septic systems. Maintenance of septic tanks is the responsibility of individual owners. Maintenance of sewer lines is the responsibility of the collection system owner. NPDES permitted stormwater entities (regulated MS4s) must have an illicit discharge detection program in place to help identify illegal discharges, such as those referenced above, in order to ensure that they are eliminated.

Comment 3:

“DHEC should recognize that fecal coliform is not a pollutant of concern for SCDOT and thus SCDOT should not be required under the TMDL to reduce its “contribution.” Other than in locations where SCDOT owned rest areas and maintenance facilities exist, no original source of fecal coliform bacteria (e.g. warm blooded animals) is under the regulatory authority of SCDOT and thus SCDOT is legally unable to make any quantifiable reduction in FC levels in any waterbody. In previously drafted TMDL documents, DHEC has indicated a concern that SCDOT may contribute FC through “conveyance” in locations where a SCDOT roadway lies adjacent to animal feeding operations or land application sites, or in the case of wildlife contributions. These are direct sources of FC bacteria which are outside of the control of SCDOT. Each of these sources should be addressed separately as indicated in Comment 2 above.”

Response 3:

By definition of MS4 as prescribed in R.61-9 section 122.26(b), “Municipal separate storm sewer” means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains)”. SCDOT is a phase I MS4 which may have the potential to **contribute** or **convey** fecal coliform loading to waters of the State. It is the responsibility of the MS4 operator (SCDOT) to ensure that contributions to or the conveyance of FC bacteria loading does not occur within its regulated jurisdictional MS4 area to the Maximum Extent Practicable.

AFOs are inspected by SCDHEC for permit compliance. Permitted agricultural facilities that operate in compliance with their permit are not considered to be sources of impairment. Discharges from these operations to waters of the State are illegal and are subject to compliance and enforcement actions by SCDHEC and are therefore not provided a percentage reduction.

TMDL Excerpt 4 (p. 2):

“All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES)-permitted discharges”

Comment 4:

“Upon consideration of the text of the TMDL, this is an incorrect statement. Permitted dischargers should be included in TMDLs only they are determined to be significant sources.”

Response 4:

The statement in the TMDL is: “All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES)-permitted discharges, a load allocation (LA) for all nonpoint sources, and an explicit and/or implicit margin of safety (MOS).” The statement has been changed to: “All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES)-permitted discharges, a load allocation (LA) for all nonpoint sources, and an explicit and/or implicit margin of safety (MOS) **for the pollutant of concern.**”

Permitted dischargers are included in TMDLs when they are determined to be potential sources of the pollutant of concern.

TMDL Excerpt 5 (p. 2):

“A fecal coliform TMDL was developed for station #E-105 within the Caw Caw Swamp watershed located in Calhoun and Orangeburg Counties, SC.”

Comment 5:

“The Caw Caw Swamp watershed drains 98,121 acres or 80.4 square miles. To base a TMDL for this entire watershed on samples taken from one (1) station is scientifically inadequate and is not an accurate reflection of current water quality conditions.”

Response 5:

At the time of TMDL development, the most current data was used. Data were collected at one site. The site is impaired for FC bacteria. A TMDL must be developed for the pollutant of concern.

The delineated watershed for impaired station E-105 includes waters from Calhoun County that drain into the impaired station in Orangeburg County as outlined in Figure 1, page 8. Any and all potential sources of pollutant are identified in the entire delineated watershed.

TMDL Excerpt 6 (p.2):

“Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL.”

Comment 6:

“Any reduction in FC from SCDOT would have no measurable impact on the overall FC levels since SCDOT roads produce essentially no FC. Therefore, reduction from SCDOT would not effectively implement the WLA. Any FC that may be contributed to the watershed through conveyance over SCDOT roadways should be attributed to its direct source as indicated in Comment 2.”

Response 6:

The statement on p. 2 of the referenced TMDL document reads as follows:

“Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial, and MS4) may effectively implement **the WLA** and demonstrate consistency with the assumptions and requirements of the TMDL.”

To leave out the portion of the statement, “the WLA”, will take the referenced statement out of context. Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits might only effectively implement the WLA portion of the TMDL. The percent reductions from both the LA and WLA components of the TMDL will need to be met to meet the requirements of the TMDL. The Department believes that roads, facilities or properties owned and/or operated by SCDOT in this TMDL drainage area have the potential to be a source or conveyance of FC bacteria.

TMDL Excerpt 7 (p. 7):

“1.1 Background “Of these illnesses many are caused by contaminated drinking water.”

Comment 7:

“This statement is not applicable to this TMDL document. The water quality standard for this TMDL does not cover drinking water which is more rigorous.”

Response 7:

It should also be noted that Caw Caw Swamp is designated as Class Freshwater. Waters of this class are described as:

“Freshwaters (FW) are freshwaters suitable for primary and secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the requirements of the Department.” (R. 61-68)

Designated as Class Freshwater, drinking water supply **is** a supported use for the waters of Caw Caw Swamp after conventional treatment.

TMDL Excerpt 8 (p. 7):

“Untreated stormwater runoff has been associated with a number of disease outbreaks, most notably an outbreak in Milwaukee that caused many deaths in 1993.”

Comment 8:

“The article from which this statement is inaccurately paraphrased is entitled *Cost of illness in the 1993 Waterborne Cryptosporidium outbreak*. In previously drafted TMDLs, DHEC cited the article written by Corso et al.. The references in this paragraph and in the bibliography (Section 8.0) of the subject TMDL have been removed, but the statement remains in the text of the TMDL. The statement is a blatant misrepresentation of the referenced article. Although a disease outbreak due to the protozoa *Cryptosporidium* did occur in Milwaukee in 1993, Corso does not mention either wastewater or stormwater anywhere in the paper; Corso instead states the cause of this outbreak was “an ineffective filtration process” in one of the municipal drinking water plants. The source of the *Cryptosporidium* was never officially identified, but the suspected sources were cattle wastes, slaughterhouse wastes, and sewage.”

Response 8:

The reference for the above mentioned article was never inserted into the bibliography and was never in the text. The Department will insert a reference into the bibliography for the above mentioned article.

The suspected sources of fecal coliform bacteria as noted by SCDOT are “cattle wastes, slaughterhouse wastes, and sewage”. These sources qualify as **wastewater** and **untreated stormwater** runoff and have been associated with a number of disease outbreaks, including the above mentioned outbreak in Milwaukee affecting an estimated 403,000 people in 1993.

As defined by the Department in the SC Pollution Control Act Section 48-1-10, sewage is:
“water-carried human or animal wastes from residences, buildings, industrial establishments or other places, together with such ground water infiltration and surface water as may be present and the admixture with sewage of industrial wastes or other wastes shall also be considered sewage.”

Since surface waters are commonly used as drinking water after filtration and generally contain untreated stormwater runoff and wastewater prior to treatment, they were in fact suspected sources in the *Cryptosporidium* outbreak in Milwaukee, 1993.

TMDL Excerpt 9 (p. 8):

Figure 1

Comment 9:

“A number of agricultural manure application sites are shown in this figure, many in close proximity to a stream. These sites are not mentioned in the text of the document nor named as likely contributors. This practice most likely results in a large contribution of FC. Each of these sources should be quantified as indicated in Comment 2.

Furthermore, the Figure clearly indicates that the single impaired monitoring station in the watershed is situated squarely in the City of Orangeburg which is listed as a “Potentially Designated MS4.” This title

is arbitrary and has no recognizable significance. DHEC should acknowledge the City of Orangeburg as a point source contributor of FC to the watershed and quantify their contribution as indicated in Comment 2.”

Response 9:

All of these sites are mentioned in the text of the document in Table 4 on page 16 as well as on Page 15 (section 3.2.2.1.):

“Owners/operators of most commercial animal growing operations are required by SC Regulation 61-43, Standards for the Permitting of Agricultural Animal Facilities, to obtain permits for the handling, storage, treatment (if necessary) and disposal of the manure, litter and dead animals generated at their facilities (SCDHEC 2002).”

“There are currently four active animal feeding operations (AFOs) in the Caw Caw Swamp watershed (Table 4). These facilities consist of two poultry operations and two swine operations. These facilities are routinely inspected for compliance. Permitted agricultural facilities that operate in compliance with their permit are not considered to be sources of impairment (ND permits).”

According to NPDES MS4 Phase II rules, the City of Orangeburg is considered to be a potentially designated MS4 (as listed in FR 64, 235, P. 688837), which by definition means it falls under the Load Allocation portion of this TMDL

TMDL Excerpt 10 (p. 13):

“Point sources are defined as pollutant loads discharged at a specific location from pipes, outfalls, and conveyance channels from either municipal wastewater treatment plants, industrial waste treatment facilities, or regulated stormwater discharges.”

Comment 10:

“DHEC acknowledges that sources other than SCDOT are point sources of FC but then fails to quantify them and specifically include them in the WLA portion of the TMDL.”

Response 10:

All currently permitted NPDES point sources of pollutant of concern are required to meet the WLA component of the TMDL. Currently SCDOT is the only regulated entity included under the WLA component of the TMDL.

TMDL Excerpt 11 (p. 13):

“The City of Orangeburg is currently a potentially designated Municipal Separate Storm Sewer Systems (MS4) community under the NPDES Phase II Stormwater rules.”

Comment 11:

“For the purposes of this and all TMDLs, the term “potentially designated MS4” is meaningless. Regardless of its DHEC designation, the City of Orangeburg is a contributor of FC and its contribution should be quantified as indicated in Comment 2.”

Response 11:

According to NPDES MS4 Phase II rules, the City of Orangeburg is considered to be a potentially designated MS4 which by definition means are provided a LA (load allocation) portion of the TMDL. The TMDL (section 3.2.5, page 17) explicitly states:

“The City of Orangeburg is a potentially designated MS4 located in this watershed. Similar to regulated MS4s, potentially designated MS4 entities (as listed in FR 64, 235, P. 688837) or other unregulated MS4s communities located in the Caw Caw Swamp Watershed may have the potential to contribute fecal coliform bacteria in stormwater runoff.”

Also stated on page 21, section 5.3.2: “Non-continuous point sources include all NPDES-permitted stormwater discharges, including current **and future MS4s**, construction and industrial discharges covered under permits numbered SCS & SCR and regulated under SC Water Pollution Control Permits Regulation 122.26(b)(14) & (15).”

The TMDL provides both numerical LA and % reduction for all nonpoint sources including urban runoff from the City of Orangeburg.

TMDL Excerpt 12 (p. 13):

“Due to the presence of SCDOT roads in the Caw Caw Swamp watershed, SCDOT is considered to be a contributing source of FC bacteria in the delineated drainage area used in the development of this TMDL document.”

Comment 12:

“The presence of SCDOT roads in the watershed does not constitute a contribution FC to the watershed. SCDOT roads produce essentially no FC. Therefore, reduction from SCDOT would not effectively implement the WLA. Any FC that may be contributed to the watershed through conveyance over SCDOT roadways should be attributed to its direct source as indicated in Comment 2. Therefore, SCDOT is not a contributing source of FC to the watershed.”

Response 12:

By definition of MS4 as prescribed in R.61-9 section 122.26(b), “Municipal separate storm sewer” means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains)”. SCDOT is a phase I MS4 which may have the potential to **contribute** or **convey** fecal coliform loading to waters of the State.

It is stated in the Caw Caw Swamp TMDL document that compliance with terms and conditions of existing and future NPDES sanitary and stormwater permit (including all construction, industrial and MS4) may effectively implement the WLA. However, reductions from all sources, including point (WLA) and nonpoint (LA) sources, are required to meet the overall percentage reductions of the referenced TMDL and achieve the water quality standard for the pollutant of concern.

By definition, nonpoint source pollution is diffuse in nature and indistinct from other sources of pollution. All portions of unregulated sources of nonpoint source pollution that may be contributed to the watershed through conveyance over SCDOT roadways cannot be attributed to their direct source. It is the responsibility of the MS4 operator (SCDOT) to ensure that contributions to or the conveyance of FC bacteria loading does not occur within its regulated jurisdictional MS4 area.

TMDL Excerpt 13 (p. 15):

“Nonpoint source pollution is likely the major contributing factor to negatively impact water quality in this watershed. The Department recognizes that there may be wildlife, agricultural activities, grazing animals, septic tanks and/or other nonpoint source contributors located within unregulated areas (outside the permitted area) of the Caw Caw Swamp watershed. Nonpoint sources located in unregulated areas are subject to the LA and not the WLA component of the TMDL.”

Comment 13:

“All nonpoint sources should be quantified as indicated in Comment 2.”

Response 13:

Wildlife, agricultural runoff, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff are nonpoint sources of pollution and as such are covered under the load allocation portion of the TMDL document. Percent reductions, including the load allocation portion of the TMDL, are provided in Table Ab-1, Table 7, and are further discussed in detail in section 5.4 of this TMDL document. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

TMDL Excerpt 14 (p.15):

“The requirements of R. 61-43 are designed to protect water quality; therefore, we have a reasonable assurance that facilities operating in compliance with this regulation should not contribute to downstream water quality impairments. . . . There are currently four active animal feeding operations (AFOs) in the Caw Caw Swamp watershed (Table 4). . . . Although there are only four permitted AFOs in this watershed, there are twenty-three associated sprayfields.”

Comment 14:

“DHEC’s assurance that these AFOs are in compliance comes from self reported monitoring results which DHEC rarely checks. There is no monitoring of runoff from areas where the waste is land applied (the most typical disposal methodology). To assume that the AFOs are not a significant part of the FC contribution is to ignore the problem. It is unreasonable to assume that since there are rules about the operation of these facilities, that there are no problems. Each of these facilities should be considered specific nonpoint sources of FC and quantified as indicated in Comment 2.”

Response 14:

These permitted operations are not allowed to discharge to waters of the State and are covered under ‘no discharge’ (ND) permits. Discharges from these operations to waters of the State are illegal and are subject to enforcement actions by SCDHEC.

TMDL Excerpt 15 (p.16):

“The grazing of unconfined livestock (in pastures) is not regulated by SC DHEC. . . . Direct loading by cattle or other livestock to surface waters within the Caw Caw Swamp watershed is likely to be a significant source of fecal coliform.”

Comment 15:

“It may be a fact that DHEC does not regulate cows in fields, but it is of no consequence in a non-regulatory document such as a TMDL. Also, the second sentence in the quote contradicts the intention of the first. By stating that direct loading from cattle into surface waters occurs, DHEC has just granted itself regulatory authority over said cattle. By contributing a pollutant to waters of the State, cattle and other wildlife are clearly under DHEC’s plenary authority (SC Code §49-1-90). Regardless of the regulatory authority DHEC may or may not have over a potential source of a pollutant, it should be quantified as indicated in Comment 2 and included in the TMDL.”

Response 15:

Grazing cattle and other livestock may contaminate streams with fecal coliform bacteria indirectly by runoff from pastures or directly by defecating into streams and ponds.

Section 6 of this document has numerous suggestions to owners on how to prevent this. As mentioned on page 29, section 6.1.4.:

“Installing fencing along the streams within the watershed and providing an alternative water source where livestock are present would eliminate direct contact with the streams. If fencing is not feasible, it has been shown that installing water troughs within a pasture area reduced the amount of time livestock spent drinking directly from streams by 92% (ASABE 1997). An indirect result of this was a 77% reduction in stream bank erosion by providing an alternative to accessing the stream directly for water supply. It was also noted during a windshield survey that several cow pastures had numerous amounts of manure. A manure storage facility would not only help water quality by minimizing the amount of FC that could be flushed into the creek after a rain, but it would also allow farmers to purchase little to no fertilizer and save money. The manure could be applied to crops when they will readily use it.”

TMDL Excerpt 16 (p.16):

“It was noted during a source assessment that there is a lift station located on the banks directly beside Caw Caw Swamp impaired station E-105. . . . If not properly maintained, there could be a release of raw sewage into Caw Caw Swamp. At the time of TMDL development, it is unknown if this occurred.”

Comment 16:

“The presence of a lift station in such close proximity to the single monitoring station should be a clear warning signal, resulting in further investigation of its operational and maintenance history. This single lift station could easily be the sole cause of FC impairment at the nearby station. Why did DHEC not investigate this possibility further?”

Response 16:

It is the responsibility of the system operator to ensure that releases do not occur. Unfortunately releases to surface waters are not always reported. Discharges to waters of the state are illegal and subject to compliance and enforcement mechanisms.

TMDL Excerpt 17 (p.17):

“it is estimated that there are 1051 septic tanks within the entire Caw Caw Swamp watershed.”

Comment 17:

“Many studies show that septic tank discharge is a major source of FC in a stream. The TMDL gives no indication of efforts made prior to developing the TMDL to estimate the impact of failing septic systems to FC loadings. DHEC is charged with permitting and ensuring compliance of septic systems. Unauthorized discharges to waters of the State, including failing septic systems, are illegal and subject to compliance and enforcement mechanisms. Therefore, quantifying these sources as indicated in Comment 2 should be a significant compliance and enforcement mechanism under the regulatory authority of DHEC.”

Response 17:

Maintenance of septic tanks is the responsibility of the individual onsite wastewater system owners. The most common reason for failure is improper maintenance by homeowners. Pumping a septic tank is probably the single most important thing that can be done to protect the system.

TMDL Excerpt 18 (p.17):

“The City of Orangeburg are potentially designated MS4s located in this watershed.”

Comment 18:

“The sentence makes no sense grammatically.

The City of Orangeburg should be specifically included in the WLA. The monitoring station is in the City. It’s possible that the entire impairment at the station is caused by sources in the City and that the upper portions of the Watershed are not impaired at all.

For the purposes of this and all TMDLs, the term “potentially designated MS4” is meaningless. Regardless of its DHEC designation, the City of Orangeburg is a point source contributor of FC and its contribution should be quantified as indicated in Comment 2.”

Response 18:

The text has been revised to the following: “The City of Orangeburg is a potentially designated MS4 located in this watershed.”

According to NPDES MS4 Phase II rules, the City of Orangeburg is considered to be a potentially designated MS4 which by definition means are provided a LA (load allocation) portion of the TMDL. The TMDL (section 3.2.5, page 17) explicitly states:

“The City of Orangeburg is a potentially designated MS4 located in this watershed. Similar to regulated MS4s, potentially designated MS4 entities (as listed in FR 64, 235, P. 688837) or other unregulated MS4s communities located in the Caw Caw Swamp Watershed may have the potential to contribute fecal coliform bacteria in stormwater runoff.”

The TMDL provides both numerical LA and % reduction for all nonpoint sources including urban runoff from the City of Orangeburg.

TMDL Excerpt 19 (p. 17):

“Roads, facilities and/or properties owned and/or operated by the South Carolina Department of Transportation (SCDOT) is/are currently covered under NPDES MS4 SCS040001, hence covered under the WLA (waste load allocation) portion of the TMDL.”

Comment 19:

“The logic of the sentence is flawed. The fact that SCDOT has a NPDES MS4 permit does not necessarily make them a contributor of FC in the watershed. Furthermore, the fact that SCDOT owns land and facilities in the watershed does not necessarily make them a contributor of FC.

The presence of SCDOT roads in the watershed does not constitute a contribution FC to the watershed. SCDOT roads produce essentially no FC. Therefore, reduction from SCDOT would not effectively implement the WLA. Any FC that may be contributed to the watershed through conveyance over SCDOT roadways should be attributed to its direct source as indicated in Comment 2. Therefore, SCDOT is not a contributing source of FC in the watershed.”

Response 19:

A reduction of 35% at E-105 from all sources, including point (WLA) and nonpoint (LA) sources, is required to meet the overall percentage reductions of the referenced TMDL and achieve the water quality standard for the pollutant of concern. Therefore, SCDOT is not the sole source responsible for reducing FC loading to the referenced watershed. At the present time however, SCDOT is currently the only regulated entity in the watershed subject to the WLA portion of the TMDL. Should future permits become applicable to this watershed, those discharges will be subject to the assumptions and requirements of the WLA portion of the referenced TMDL.

TMDL Excerpt 20 (p. 19):

“Instantaneous loads for each of the impaired stations were calculated.”

Comment 20:

“This statement further indicates a lack of attention to detail in DHEC’s issuance of TMDLs. There is only one monitoring station in the watershed. The statement implies that there is more than one station.”

Response 20:

The text has been changed to the following: “Instantaneous loads for the impaired station were calculated.”

TMDL Excerpt 21 (p.21):

“The wasteload allocation (WLA) is the portion of the TMDL allocated to NPDES-permitted point sources (USA EPA 1991).”

Comment 21:

“This statement is a half truth. The EPA guidance document referenced by DHEC does not specify that the WLA is to be allocated only to NPDES-permitted point sources. It defines WLA as “the portion of a

receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution." All point sources of a pollutant must be included in the WLA, regardless of whether they are regulated by an NPDES permit. This would include the City of Orangeburg."

Response 21:

According to an EPA memo dated November 22, 2002: "NPDES-regulated storm water discharges must be addressed by the wasteload allocation component of a TMDL. See C.F.R. section 130.2(h)." and "NPDES-regulated storm water discharges may not be addressed by the load allocation (LA) component of a TMDL. See 40 C.F.R. section 130.2(g) &(h)."

TMDL Excerpt 22 (p. 21):

"Non-continuous point sources include all NPDES-permitted stormwater discharges, **including current and future MS4s**"

Comment 22:

This would include the City of Orangeburg.

Response 22:

The City of Orangeburg is a potentially designated MS4 as identified in section 3.2.5. (Urban Runoff) of the TMDL document on page 17: "The City of Orangeburg is a potentially designated MS4 located in this watershed. Similar to regulated MS4s, potentially designated MS4 entities (as listed in FR 64, 235, P. 688837) or other unregulated MS4s communities located in the Caw Caw Swamp Watershed may have the potential to contribute fecal coliform bacteria in stormwater runoff. "

Urban runoff refers to non-continuous pollutant sources such as stormwater from the City of Orangeburg.

TMDL Excerpt 23 (p.24):

Table 8 : Regulated MS4 Entity Responsible for Meeting the Percentage Reduction or WQ standard.

Comment 23:

"SCDOT is the only named entity responsible for meeting the percentage reduction or WQ standard even though other non-regulated entities or entities regulated under non MS4 permits are contributing. Because SCDOT is not a significant source of FC it should not be included as a source in this TMDL."

Response 23:

A reduction of 35% at E-105 from all sources, including point (WLA) and nonpoint (LA) sources, is required to meet the overall percentage reductions of the referenced TMDL and achieve the water quality standard for the pollutant of concern. Therefore, SCDOT is not the sole source responsible for reducing FC loading to the referenced watershed. At the present time however, SCDOT is currently the only regulated entity in the watershed subject to the WLA portion of the TMDL. Should future permits become applicable to this watershed, those discharges will be subject to the assumptions and requirements of the WLA portion of the referenced TMDL.

Wildlife, agricultural runoff, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff are nonpoint sources of pollution and as such are covered under the load allocation portion of the TMDL document. Percent reductions, including the load allocation portion of

the TMDL, are provided in Table Ab-1, Table 7, and are further discussed in detail in section 5.4 of this TMDL document. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

TMDL Excerpt 24 (p. 41):

Appendix A – Data Tables 90th Percentile Fecal Coliform Concentration (#/100 mL)

Comment 24:

- This should read (#/100mL) (number per 100mL)
- # should be given as CFU
- The table reports 69 samples but only 68 are given in Appendix B.

Response 24:

The text has been changed to reflect #/100 mL.

After review it was noted that the sample result for 12/1/05 was not listed in Appendix B. It has been changed to now reflect 69 samples.

TMDL Excerpt 25 (p.41):

1.1.1 Appendix A – Data Tables

Comment 25:

“Commenter was unable to independently reproduce TMDL calculations given in Appendix A.”

Response 25:

DHEC staff reviewed the data and calculations and came up with the same numbers as mentioned in the document.

Amendments to the Caw Caw Swamp TMDL Document

Amendment Location 1:

Abstract

Amendment:

The following paragraph has been revised:

“This watershed is predominantly forest and agricultural lands. There are currently no active NPDES permitted sanitary waste dischargers within the watershed. Probable

sources of fecal contamination include wildlife, agricultural runoff, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff. The load-duration curve methodology was used to calculate existing and TMDL loads for each impaired segment. Existing pollutant loadings and proposed TMDL reductions for critical hydrologic conditions are presented in Table Ab-1. Critical hydrologic conditions were defined as either moist, mid-range, or dry depending on which condition demonstrated the highest load reductions necessary to meet water quality standards. In order to achieve the target load (slightly below water quality standards) for Caw Caw Swamp, reductions in the existing loads of up to 35% will be necessary at some stations. Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. **For SCDOT, compliance with terms and conditions of its NPDES MS4 permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP).** Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and are eligible for CWA §319 grants.”

Amendment Location 2:

Table Ab-1 and Table 7 Footnote

Amendment:

Table notes 2 and 4

Table Notes:

1. WLAs are expressed as a daily maximum; NA = not applicable, no point sources. Existing and future continuous discharges are required to meet the prescribed loading for the pollutant of concern. Loadings were developed based upon permitted flow and assuming an allowable permitted maximum concentration of 400cfu/100ml.
2. Percent reduction applies to all NPDES-permitted stormwater discharges, including current and future MS4, construction and industrial discharges covered under permits numbered SCS & SCR. Stormwater discharges are expressed as a percentage reduction due to the uncertain nature of stormwater discharge volumes and recurrence intervals. Stormwater discharges are required to meet percentage reduction or the existing instream standard for pollutant of concern **in accordance with their NPDES Permit.**
3. Percent reduction applies to existing instream load; Where Percentage Reduction = (Existing Load-Load Allocation) / Existing Load
By implementing the best management practices that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 Permit to address fecal coliform, the SCDOT will comply with this TMDL and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 permit.
4. **By implementing the best management practices that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 Permit to address fecal coliform, the SCDOT will comply with this TMDL and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 permit.**

Amendment Location 3:

Section 3.1.2, page 13

Amendment:

Section 3.1.2. has been revised to read as follows:

Non-continuous point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permits numbered SCS and SCR and regulated under SC Water Pollution Control Permits Regulation 122.26(b)(14)&(15). **All regulated MS4 entities have the potential to contribute FC pollutant loadings in the delineated drainage area used in the development of this TMDL.**

The South Carolina Department of Transportation (SCDOT) is currently the only designated Municipal Separate Storm Sewer System (MS4) within the watershed. The SCDOT operates under NPDES MS4 SCS040001 and owns and operates roads in the watershed (Figure 4). However, the Department recognizes that SCDOT is not a traditional MS4 in that it does not possess statutory taxing or has enforcement powers. SCDOT does not regulate land use or zoning, issue building or development permits.

The City of Orangeburg is currently a potentially designated Municipal Separate Storm Sewer System (MS4) under NPDES Phase II Stormwater rules. Similar to regulated MS4s, potentially designated MS4 entities (as listed in 64 FR, P. 688837) or other unregulated MS4 communities located in the Ninety Six Creek watershed may have the potential to contribute FC bacteria in stormwater runoff. If future MS4 permits are applicable to this watershed, then those discharges will be subject to the assumptions and requirements of the WLA portion of this TMDL. However, there may be industrial or construction activities going on at any time that could produce stormwater runoff.

Industrial facilities that have the potential to cause or contribute to a violation of a water quality standard are covered by the NPDES Storm Water Industrial General Permit (SCR000000). Construction activities are usually covered by the NPDES Storm Water Construction General Permit from DHEC (SCR100000). Where construction activities have the potential to affect water quality of a water body with a TMDL, the Storm Water Pollution Prevention Plan (SWPPP) for the site must address any pollutants of concern and adhere to any wasteload allocations in the TMDL.

Amendment Location 4:

Section 3.2.5, Page 17

Amendment:

The first paragraph of section 5.3.2 has been revised to read as follows:

Non-continuous point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permits numbered

SCS & SCR and regulated under SC Water Pollution Control Permits Regulation 122.26(b)(14) & (15). Illicit discharges, including SSOs, are not covered under any NPDES permit and are subject to enforcement mechanisms. All areas defined as “Urbanized Area” by the US Census are required under the NPDES Stormwater Regulations to obtain a permit for the discharge of stormwater. Other non-urbanized areas may be required under the NPDES Phase II Stormwater Regulations to obtain a permit for the discharge of stormwater.

Amendment Location 5:

Section 5.3.2, Page 22

Amendment:

Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. **However, the Department recognizes that SCDOT is not a traditional MS4 in that it does not possess statutory taxing or enforcement powers. SCDOT does not regulate land use or zoning, issue building or development permits.**

Amendment Location 6:

Section 6.1.2, Page 26

Amendment:

The following paragraph in the implementation section of the Caw Caw Swamp TMDL document has been revised to read as follows:

Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. **For SCDOT, compliance with terms and conditions of its NPDES MS4 permit is effective implementation of the WLA to the MEP.**

Responsiveness Summary Caw Caw Swamp TMDL Document

Comments were received from the following:

South Carolina Department of Transportation

Comments from South Carolina Department of Transportation

Comment 1:

“It is important that the SCDHEC develop TMDLs that are implementable, defensible, reasonable, and which achieve the goal of the waterbody meeting the state standard for its appropriate use designation. It is also important that the SCDHEC understands the role and responsibility of the SCDOT in carrying out its mission to provide transportation for the citizens of South Carolina and its limited ability to affect activities not covered under its regulatory authority. The issues related to this TMDL and all others are watershed-based. Only SCDHEC has the authority to develop basin-wide plans to address the regulated and non-regulated contributors to the impairments that lead to the development of this TMDL in the first place.”

Response 1:

The Department understands the role and responsibilities of SCDOT. It is part of the Department’s goals to develop reasonable, implementable, and scientifically defensible TMDLs which help waterbodies achieve water quality standards. It is further acknowledged that SCDHEC has the authority to develop watershed and basin-wide plans to address regulated and unregulated processes contributing to water quality impairments and the Caw Caw Swamp TMDL is an example of such a plan.

Comment 2:

“TMDLs must consider **all** potential sources of fecal coliform, not just permitted MS4s. These existing sources of pollutants, or other causes of impaired water quality, must be quantified as part of the TMDL process. In this TMDL, DHEC has identified these sources but has not quantified them for use in water quality models. Without this quantification step, there is no basis for determining the effect of the assigned waste load allocation. In the case of this TMDL, if the SCDOT reduced its FC contribution by 100% (because its FC contribution is minimal and it accounts for less than 5% of the watershed area), the stream would still be impaired for FC. However, since the SCDOT is the only identified permitted entity, it possibly could be held in violation of its NPDES permit and subject to sanctions by SCDHEC and the USEPA as well as third party actions. Therefore, all existing point and nonpoint sources that may impact a receiving waterbody must be identified, their contribution quantified, and assigned an appropriate load or waste load allocation.

A TMDL in and of itself carries no regulatory authority over any entity which it names as a contributor of a pollutant. Therefore, no regulatory authority is needed for DHEC to name any entity as a contributor, if they are in fact one. The regulatory authority of a TMDL comes only by way of an NPDES permit held by named entity. Simply because DHEC may not issue an NPDES permit to a flock of geese, a herd of cattle or collectively all leaking sanitary sewers, does not mean that such groups should be excluded from consideration and quantification of the overall water quality in TMDL area.”

Response 2:

Reductions from all sources, including point (WLA) and nonpoint (LA) sources, are required to meet the overall percentage reductions of the referenced TMDL and achieve the water quality standard for the pollutant of concern. Therefore, SCDOT is not the sole source responsible for reducing FC loading to the referenced watershed. At the present time however, SCDOT is currently the only regulated entity in the watershed subject to the WLA portion of the TMDL. Should future permits become applicable to this watershed, those discharges will be subject to the assumptions and requirements of the WLA portion of the referenced TMDL.

Wildlife, agricultural runoff, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff (including potentially designated) are nonpoint sources of pollution and as such are covered under the load allocation portion of the TMDL document. The percent reduction, including the load allocation portion of the TMDL, is provided in Table Ab-1, Table 7, and is further discussed in detail in section 5.4 of this TMDL document. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

It should be noted that unauthorized discharges to Waters of the State, including leaky septic tanks and leaking sewer lines, are illegal and subject to compliance and enforcement mechanisms. Sections 3.2.3 and 3.2.4 (p. 16-17) of the referenced TMDL document discuss leaking sanitary sewers, illicit discharges, and failing septic systems. Maintenance of septic tanks is the responsibility of individual owners. Maintenance of sewer lines is the responsibility of the collection system owner. NPDES permitted stormwater entities (regulated MS4s) must have an illicit discharge detection program in place to help identify illegal discharges, such as those referenced above, in order to ensure that they are eliminated.

Comment 3:

“DHEC should recognize that fecal coliform is not a pollutant of concern for SCDOT and thus SCDOT should not be required under the TMDL to reduce its “contribution.” Other than in locations where SCDOT owned rest areas and maintenance facilities exist, no original source of fecal coliform bacteria (e.g. warm blooded animals) is under the regulatory authority of SCDOT and thus SCDOT is legally unable to make any quantifiable reduction in FC levels in any waterbody. In previously drafted TMDL documents, DHEC has indicated a concern that SCDOT may contribute FC through “conveyance” in locations where a SCDOT roadway lies adjacent to animal feeding operations or land application sites, or in the case of wildlife contributions. These are direct sources of FC bacteria which are outside of the control of SCDOT. Each of these sources should be addressed separately as indicated in Comment 2 above.”

Response 3:

By definition of MS4 as prescribed in R.61-9 section 122.26(b), “Municipal separate storm sewer” means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains)”. SCDOT is a phase I MS4 which may have the potential to **contribute** or **convey** fecal coliform loading to waters of the State. It is the responsibility of the MS4 operator (SCDOT) to ensure that contributions to or the conveyance of FC bacteria loading does not occur within its regulated jurisdictional MS4 area to the Maximum Extent Practicable.

AFOs are inspected by SCDHEC for permit compliance. Permitted agricultural facilities that operate in compliance with their permit are not considered to be sources of impairment. Discharges from these operations to waters of the State are illegal and are subject to compliance and enforcement actions by SCDHEC and are therefore not provided a percentage reduction.

TMDL Excerpt 4 (p. 2):

“All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES)-permitted discharges”

Comment 4:

“Upon consideration of the text of the TMDL, this is an incorrect statement. Permitted dischargers should be included in TMDLs only they are determined to be significant sources.”

Response 4:

The statement in the TMDL is: “All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES)-permitted discharges, a load allocation (LA) for all nonpoint sources, and an explicit and/or implicit margin of safety (MOS).” The statement has been changed to: “All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES)-permitted discharges, a load allocation (LA) for all nonpoint sources, and an explicit and/or implicit margin of safety (MOS) **for the pollutant of concern.**”

Permitted dischargers are included in TMDLs when they are determined to be potential sources of the pollutant of concern.

TMDL Excerpt 5 (p. 2):

“A fecal coliform TMDL was developed for station #E-105 within the Caw Caw Swamp watershed located in Calhoun and Orangeburg Counties, SC.”

Comment 5:

“The Caw Caw Swamp watershed drains 98,121 acres or 80.4 square miles. To base a TMDL for this entire watershed on samples taken from one (1) station is scientifically inadequate and is not an accurate reflection of current water quality conditions.”

Response 5:

At the time of TMDL development, the most current data was used. Data were collected at one site. The site is impaired for FC bacteria. A TMDL must be developed for the pollutant of concern.

The delineated watershed for impaired station E-105 includes waters from Calhoun County that drain into the impaired station in Orangeburg County as outlined in Figure 1, page 8. Any and all potential sources of pollutant are identified in the entire delineated watershed.

TMDL Excerpt 6 (p.2):

“Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL.”

Comment 6:

“Any reduction in FC from SCDOT would have no measurable impact on the overall FC levels since SCDOT roads produce essentially no FC. Therefore, reduction from SCDOT would not effectively implement the WLA. Any FC that may be contributed to the watershed through conveyance over SCDOT roadways should be attributed to its direct source as indicated in Comment 2.”

Response 6:

The statement on p. 2 of the referenced TMDL document reads as follows:

“Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial, and MS4) may effectively implement **the WLA** and demonstrate consistency with the assumptions and requirements of the TMDL.”

To leave out the portion of the statement, “the WLA”, will take the referenced statement out of context. Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits might only effectively implement the WLA portion of the TMDL. The percent reductions from both the LA and WLA components of the TMDL will need to be met to meet the requirements of the TMDL. The Department believes that roads, facilities or properties owned and/or operated by SCDOT in this TMDL drainage area have the potential to be a source or conveyance of FC bacteria.

TMDL Excerpt 7 (p. 7):

“1.1 Background “Of these illnesses many are caused by contaminated drinking water.”

Comment 7:

“This statement is not applicable to this TMDL document. The water quality standard for this TMDL does not cover drinking water which is more rigorous.”

Response 7:

It should also be noted that Caw Caw Swamp is designated as Class Freshwater. Waters of this class are described as:

“Freshwaters (FW) are freshwaters suitable for primary and secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the requirements of the Department.” (R. 61-68)

Designated as Class Freshwater, drinking water supply is a supported use for the waters of Caw Caw Swamp after conventional treatment.

TMDL Excerpt 8 (p. 7):

“Untreated stormwater runoff has been associated with a number of disease outbreaks, most notably an outbreak in Milwaukee that caused many deaths in 1993.”

Comment 8:

“The article from which this statement is inaccurately paraphrased is entitled *Cost of illness in the 1993 Waterborne Cryptosporidium outbreak*. In previously drafted TMDLs, DHEC cited the article written by Corso et al.. The references in this paragraph and in the bibliography (Section 8.0) of the subject TMDL have been removed, but the statement remains in the text of the TMDL. The statement is a blatant misrepresentation of the referenced article. Although a disease outbreak due to the protozoa *Cryptosporidium* did occur in Milwaukee in 1993, Corso does not mention either wastewater or stormwater anywhere in the paper; Corso instead states the cause of this outbreak was “an ineffective filtration process” in one of the municipal drinking water plants. The source of the *Cryptosporidium* was never officially identified, but the suspected sources were cattle wastes, slaughterhouse wastes, and sewage.”

Response 8:

The reference for the above mentioned article was never inserted into the bibliography and was never in the text. The Department will insert a reference into the bibliography for the above mentioned article.

The suspected sources of fecal coliform bacteria as noted by SCDOT are “cattle wastes, slaughterhouse wastes, and sewage”. These sources qualify as **wastewater** and **untreated stormwater** runoff and have been associated with a number of disease outbreaks, including the above mentioned outbreak in Milwaukee affecting an estimated 403,000 people in 1993.

As defined by the Department in the SC Pollution Control Act Section 48-1-10, sewage is:
“water-carried human or animal wastes from residences, buildings, industrial establishments or other places, together with such ground water infiltration and surface water as may be present and the admixture with sewage of industrial wastes or other wastes shall also be considered sewage.”

Since surface waters are commonly used as drinking water after filtration and generally contain untreated stormwater runoff and wastewater prior to treatment, they were in fact suspected sources in the *Cryptosporidium* outbreak in Milwaukee, 1993.

TMDL Excerpt 9 (p. 8):

Figure 1

Comment 9:

“A number of agricultural manure application sites are shown in this figure, many in close proximity to a stream. These sites are not mentioned in the text of the document nor named as likely contributors. This practice most likely results in a large contribution of FC. Each of these sources should be quantified as indicated in Comment 2.

Furthermore, the Figure clearly indicates that the single impaired monitoring station in the watershed is situated squarely in the City of Orangeburg which is listed as a “Potentially

Designated MS4.” This title is arbitrary and has no recognizable significance. DHEC should acknowledge the City of Orangeburg as a point source contributor of FC to the watershed and quantify their contribution as indicated in Comment 2.”

Response 9:

All of these sites are mentioned in the text of the document in Table 4 on page 16 as well as on Page 15 (section 3.2.2.1.):

“Owners/operators of most commercial animal growing operations are required by SC Regulation 61-43, Standards for the Permitting of Agricultural Animal Facilities, to obtain permits for the handling, storage, treatment (if necessary) and disposal of the manure, litter and dead animals generated at their facilities (SCDHEC 2002).”

“There are currently four active animal feeding operations (AFOs) in the Caw Caw Swamp watershed (Table 4). These facilities consist of two poultry operations and two swine operations. These facilities are routinely inspected for compliance. Permitted agricultural facilities that operate in compliance with their permit are not considered to be sources of impairment (ND permits).”

According to NPDES MS4 Phase II rules, the City of Orangeburg is considered to be a potentially designated MS4 (as listed in FR 64, 235, P. 688837), which by definition means it falls under the Load Allocation portion of this TMDL

TMDL Excerpt 10 (p. 13):

“Point sources are defined as pollutant loads discharged at a specific location from pipes, outfalls, and conveyance channels from either municipal wastewater treatment plants, industrial waste treatment facilities, or regulated stormwater discharges.”

Comment 10:

“DHEC acknowledges that sources other than SCDOT are point sources of FC but then fails to quantify them and specifically include them in the WLA portion of the TMDL.”

Response 10:

All currently permitted NPDES point sources of pollutant of concern are required to meet the WLA component of the TMDL. Currently SCDOT is the only regulated entity included under the WLA component of the TMDL.

TMDL Excerpt 11 (p. 13):

“The City of Orangeburg is currently a potentially designated Municipal Separate Storm Sewer Systems (MS4) community under the NPDES Phase II Stormwater rules.”

Comment 11:

“For the purposes of this and all TMDLs, the term “potentially designated MS4” is meaningless. Regardless of its DHEC designation, the City of Orangeburg is a contributor of FC and its contribution should be quantified as indicated in Comment 2.”

Response 11:

According to NPDES MS4 Phase II rules, the City of Orangeburg is considered to be a potentially designated MS4 which by definition means are provided a LA (load allocation) portion of the TMDL. The TMDL (section 3.2.5, page 17) explicitly states:

“The City of Orangeburg is a potentially designated MS4 located in this watershed. Similar to regulated MS4s, potentially designated MS4 entities (as listed in FR 64, 235, P. 688837) or other unregulated MS4s communities located in the Caw Caw Swamp Watershed may have the potential to contribute fecal coliform bacteria in stormwater runoff.”

Also stated on page 21, section 5.3.2: “Non-continuous point sources include all NPDES-permitted stormwater discharges, including current **and future MS4s**, construction and industrial discharges covered under permits numbered SCS & SCR and regulated under SC Water Pollution Control Permits Regulation 122.26(b)(14) & (15).”

The TMDL provides both numerical LA and % reduction for all nonpoint sources including urban runoff from the City of Orangeburg.

TMDL Excerpt 12 (p. 13):

“Due to the presence of SCDOT roads in the Caw Caw Swamp watershed, SCDOT is considered to be a contributing source of FC bacteria in the delineated drainage area used in the development of this TMDL document.”

Comment 12:

“The presence of SCDOT roads in the watershed does not constitute a contribution FC to the watershed. SCDOT roads produce essentially no FC. Therefore, reduction from SCDOT would not effectively implement the WLA. Any FC that may be contributed to the watershed through conveyance over SCDOT roadways should be attributed to its direct source as indicated in Comment 2. Therefore, SCDOT is not a contributing source of FC to the watershed.”

Response 12:

By definition of MS4 as prescribed in R.61-9 section 122.26(b), “Municipal separate storm sewer” means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains)”. SCDOT is a phase I MS4 which may have the potential to **contribute** or **convey** fecal coliform loading to waters of the State.

It is stated in the Caw Caw Swamp TMDL document that compliance with terms and conditions of existing and future NPDES sanitary and stormwater permit (including all construction, industrial and MS4) may effectively implement the WLA. However, reductions from all sources, including point (WLA) and nonpoint (LA) sources, are required to meet the overall percentage reductions of the referenced TMDL and achieve the water quality standard for the pollutant of concern.

By definition, nonpoint source pollution is diffuse in nature and indistinct from other sources of pollution. All portions of unregulated sources of nonpoint source pollution that may be contributed to the watershed through conveyance over SCDOT roadways cannot be attributed to

their direct source. It is the responsibility of the MS4 operator (SCDOT) to ensure that contributions to or the conveyance of FC bacteria loading does not occur within its regulated jurisdictional MS4 area.

TMDL Excerpt 13 (p. 15):

“Nonpoint source pollution is likely the major contributing factor to negatively impact water quality in this watershed. The Department recognizes that there may be wildlife, agricultural activities, grazing animals, septic tanks and/or other nonpoint source contributors located within unregulated areas (outside the permitted area) of the Caw Caw Swamp watershed. Nonpoint sources located in unregulated areas are subject to the LA and not the WLA component of the TMDL.”

Comment 13:

“All nonpoint sources should be quantified as indicated in Comment 2.”

Response 13:

Wildlife, agricultural runoff, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff are nonpoint sources of pollution and as such are covered under the load allocation portion of the TMDL document. Percent reductions, including the load allocation portion of the TMDL, are provided in Table Ab-1, Table 7, and are further discussed in detail in section 5.4 of this TMDL document. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

TMDL Excerpt 14 (p.15):

“The requirements of R. 61-43 are designed to protect water quality; therefore, we have a reasonable assurance that facilities operating in compliance with this regulation should not contribute to downstream water quality impairments. . . . There are currently four active animal feeding operations (AFOs) in the Caw Caw Swamp watershed (Table 4). . . . Although there are only four permitted AFOs in this watershed, there are twenty-three associated sprayfields.”

Comment 14:

“DHEC’s assurance that these AFOs are in compliance comes from self reported monitoring results which DHEC rarely checks. There is no monitoring of runoff from areas where the waste is land applied (the most typical disposal methodology). To assume that the AFOs are not a significant part of the FC contribution is to ignore the problem. It is unreasonable to assume that since there are rules about the operation of these facilities, that there are no problems. Each of these facilities should be considered specific nonpoint sources of FC and quantified as indicated in Comment 2.”

Response 14:

These permitted operations are not allowed to discharge to waters of the State and are covered under ‘no discharge’ (ND) permits. Discharges from these operations to waters of the State are illegal and are subject to enforcement actions by SCDHEC.

TMDL Excerpt 15 (p.16):

“The grazing of unconfined livestock (in pastures) is not regulated by SC DHEC. . . . Direct loading by cattle or other livestock to surface waters within the Caw Caw Swamp watershed is likely to be a significant source of fecal coliform.”

Comment 15:

“It may be a fact that DHEC does not regulate cows in fields, but it is of no consequence in a non-regulatory document such as a TMDL. Also, the second sentence in the quote contradicts the intention of the first. By stating that direct loading from cattle into surface waters occurs, DHEC has just granted itself regulatory authority over said cattle. By contributing a pollutant to waters of the State, cattle and other wildlife are clearly under DHEC’s plenary authority (SC Code §49-1-90). Regardless of the regulatory authority DHEC may or may not have over a potential source of a pollutant, it should be quantified as indicated in Comment 2 and included in the TMDL.”

Response 15:

Grazing cattle and other livestock may contaminate streams with fecal coliform bacteria indirectly by runoff from pastures or directly by defecating into streams and ponds.

Section 6 of this document has numerous suggestions to owners on how to prevent this. As mentioned on page 29, section 6.1.4.:

“Installing fencing along the streams within the watershed and providing an alternative water source where livestock are present would eliminate direct contact with the streams. If fencing is not feasible, it has been shown that installing water troughs within a pasture area reduced the amount of time livestock spent drinking directly from streams by 92% (ASABE 1997). An indirect result of this was a 77% reduction in stream bank erosion by providing an alternative to accessing the stream directly for water supply. It was also noted during a windshield survey that several cow pastures had numerous amounts of manure. A manure storage facility would not only help water quality by minimizing the amount of FC that could be flushed into the creek after a rain, but it would also allow farmers to purchase little to no fertilizer and save money. The manure could be applied to crops when they will readily use it.”

TMDL Excerpt 16 (p.16):

“It was noted during a source assessment that there is a lift station located on the banks directly beside Caw Caw Swamp impaired station E-105. . . . If not properly maintained, there could be a release of raw sewage into Caw Caw Swamp. At the time of TMDL development, it is unknown if this occurred.”

Comment 16:

“The presence of a lift station in such close proximity to the single monitoring station should be a clear warning signal, resulting in further investigation of its operational and maintenance history. This single lift station could easily be the sole cause of FC impairment at the nearby station. Why did DHEC not investigate this possibility further?”

Response 16:

It is the responsibility of the system operator to ensure that releases do not occur. Unfortunately releases to surface waters are not always reported. Discharges to waters of the state are illegal and subject to compliance and enforcement mechanisms.

TMDL Excerpt 17 (p.17):

“it is estimated that there are 1051 septic tanks within the entire Caw Caw Swamp watershed.”

Comment 17:

“Many studies show that septic tank discharge is a major source of FC in a stream. The TMDL gives no indication of efforts made prior to developing the TMDL to estimate the impact of failing septic systems to FC loadings. DHEC is charged with permitting and ensuring compliance of septic systems. Unauthorized discharges to waters of the State, including failing septic systems, are illegal and subject to compliance and enforcement mechanisms. Therefore, quantifying these sources as indicated in Comment 2 should be a significant compliance and enforcement mechanism under the regulatory authority of DHEC.”

Response 17:

Maintenance of septic tanks is the responsibility of the individual onsite wastewater system owners. The most common reason for failure is improper maintenance by homeowners. Pumping a septic tank is probably the single most important thing that can be done to protect the system.

TMDL Excerpt 18 (p.17):

“The City of Orangeburg are potentially designated MS4s located in this watershed.”

Comment 18:

“The sentence makes no sense grammatically.

The City of Orangeburg should be specifically included in the WLA. The monitoring station is in the City. It’s possible that the entire impairment at the station is caused by sources in the City and that the upper portions of the Watershed are not impaired at all.

For the purposes of this and all TMDLs, the term “potentially designated MS4” is meaningless. Regardless of its DHEC designation, the City of Orangeburg is a point source contributor of FC and its contribution should be quantified as indicated in Comment 2.”

Response 18:

The text has been revised to the following: “The City of Orangeburg is a potentially designated MS4 located in this watershed.”

According to NPDES MS4 Phase II rules, the City of Orangeburg is considered to be a potentially designated MS4 which by definition means are provided a LA (load allocation) portion of the TMDL. The TMDL (section 3.2.5, page 17) explicitly states:

“The City of Orangeburg is a potentially designated MS4 located in this watershed. Similar to regulated MS4s, potentially designated MS4 entities (as listed in FR 64, 235, P. 688837) or other unregulated MS4s communities located in the Caw Caw Swamp Watershed may have the potential to contribute fecal coliform bacteria in stormwater runoff.”

The TMDL provides both numerical LA and % reduction for all nonpoint sources including urban runoff from the City of Orangeburg.

TMDL Excerpt 19 (p. 17):

“Roads, facilities and/or properties owned and/or operated by the South Carolina Department of Transportation (SCDOT) is/are currently covered under NPDES MS4 SCS040001, hence covered under the WLA (waste load allocation) portion of the TMDL.”

Comment 19:

“The logic of the sentence is flawed. The fact that SCDOT has a NPDES MS4 permit does not necessarily make them a contributor of FC in the watershed. Furthermore, the fact that SCDOT owns land and facilities in the watershed does not necessarily make them a contributor of FC.

The presence of SCDOT roads in the watershed does not constitute a contribution FC to the watershed. SCDOT roads produce essentially no FC. Therefore, reduction from SCDOT would not effectively implement the WLA. Any FC that may be contributed to the watershed through conveyance over SCDOT roadways should be attributed to its direct source as indicated in Comment 2. Therefore, SCDOT is not a contributing source of FC in the watershed.”

Response 19:

A reduction of 35% at E-105 from all sources, including point (WLA) and nonpoint (LA) sources, is required to meet the overall percentage reductions of the referenced TMDL and achieve the water quality standard for the pollutant of concern. Therefore, SCDOT is not the sole source responsible for reducing FC loading to the referenced watershed. At the present time however, SCDOT is currently the only regulated entity in the watershed subject to the WLA portion of the TMDL. Should future permits become applicable to this watershed, those discharges will be subject to the assumptions and requirements of the WLA portion of the referenced TMDL.

TMDL Excerpt 20 (p. 19):

“Instantaneous loads for each of the impaired stations were calculated.”

Comment 20:

“This statement further indicates a lack of attention to detail in DHEC’s issuance of TMDLs. There is only one monitoring station in the watershed. The statement implies that there is more than one station.”

Response 20:

The text has been changed to the following: “Instantaneous loads for the impaired station were calculated.”

TMDL Excerpt 21 (p.21):

“The wasteload allocation (WLA) is the portion of the TMDL allocated to NPDES-permitted point sources (USAEPA 1991).”

Comment 21:

“This statement is a half truth. The EPA guidance document referenced by DHEC does not specify that the WLA is to be allocated only to NPDES-permitted point sources. It defines WLA as “the portion of a receiving water’s loading capacity that is allocated to one of its existing or future point sources of pollution.” All point sources of a pollutant must be included in the WLA, regardless of whether they are regulated by an NPDES permit. This would include the City of Orangeburg.”

Response 21:

According to an EPA memo dated November 22, 2002: “NPDES-regulated storm water discharges must be addressed by the wasteload allocation component of a TMDL. See C.F.R. section 130.2(h).” and “NPDES-regulated storm water discharges may not be addressed by the load allocation (LA) component of a TMDL. See 40 C.F.R. section 130.2(g) &(h).”

TMDL Excerpt 22 (p. 21):

“Non-continuous point sources include all NPDES-permitted stormwater discharges, **including current and future MS4s**”

Comment 22:

This would include the City of Orangeburg.

Response 22:

The City of Orangeburg is a potentially designated MS4 as identified in section 3.2.5. (Urban Runoff) of the TMDL document on page 17: “The City of Orangeburg is a potentially designated MS4 located in this watershed. Similar to regulated MS4s, potentially designated MS4 entities (as listed in FR 64, 235, P. 688837) or other unregulated MS4s communities located in the Caw Caw Swamp Watershed may have the potential to contribute fecal coliform bacteria in stormwater runoff. “

Urban runoff refers to non-continuous pollutant sources such as stormwater from the City of Orangeburg.

TMDL Excerpt 23 (p.24):

Table 8 : Regulated MS4 Entity Responsible for Meeting the Percentage Reduction or WQ standard.

Comment 23:

“SCDOT is the only named entity responsible for meeting the percentage reduction or WQ standard even though other non-regulated entities or entities regulated under non MS4 permits are

contributing. Because SCDOT is not a significant source of FC it should not be included as a source in this TMDL.”

Response 23:

A reduction of 35% at E-105 from all sources, including point (WLA) and nonpoint (LA) sources, is required to meet the overall percentage reductions of the referenced TMDL and achieve the water quality standard for the pollutant of concern. Therefore, SCDOT is not the sole source responsible for reducing FC loading to the referenced watershed. At the present time however, SCDOT is currently the only regulated entity in the watershed subject to the WLA portion of the TMDL. Should future permits become applicable to this watershed, those discharges will be subject to the assumptions and requirements of the WLA portion of the referenced TMDL.

Wildlife, agricultural runoff, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff are nonpoint sources of pollution and as such are covered under the load allocation portion of the TMDL document. Percent reductions, including the load allocation portion of the TMDL, are provided in Table Ab-1, Table 7, and are further discussed in detail in section 5.4 of this TMDL document. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

TMDL Excerpt 24 (p. 41):

Appendix A – Data Tables 90th Percentile Fecal Coliform Concentration (#/100 mL)

Comment 24:

- This should read (#/100mL) (number per 100mL)
- # should be given as CFU
- The table reports 69 samples but only 68 are given in Appendix B.

Response 24:

The text has been changed to reflect #/100 mL.

After review it was noted that the sample result for 12/1/05 was not listed in Appendix B. It has been changed to now reflect 69 samples.

TMDL Excerpt 25 (p.41):

1.1.1 Appendix A – Data Tables

Comment 25:

“Commenter was unable to independently reproduce TMDL calculations given in Appendix A.”

Response 25:

DHEC staff reviewed the data and calculations and came up with the same numbers as mentioned in the document.

Amendments to the Caw Caw Swamp TMDL Document

Amendment Location 1:

Abstract

Amendment:

The following paragraph has been revised:

“This watershed is predominantly forest and agricultural lands. There are currently no active NPDES permitted sanitary waste dischargers within the watershed. Probable sources of fecal contamination include wildlife, agricultural runoff, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff. The load-duration curve methodology was used to calculate existing and TMDL loads for each impaired segment. Existing pollutant loadings and proposed TMDL reductions for critical hydrologic conditions are presented in Table Ab-1. Critical hydrologic conditions were defined as either moist, mid-range, or dry depending on which condition demonstrated the highest load reductions necessary to meet water quality standards. In order to achieve the target load (slightly below water quality standards) for Caw Caw Swamp, reductions in the existing loads of up to 35% will be necessary at some stations. Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. **For SCDOT, compliance with terms and conditions of its NPDES MS4 permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP).** Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and are eligible for CWA §319 grants.”

Amendment Location 2:

Table Ab-1 and Table 7 Footnote

Amendment:

Table notes 2 and 4

Table Notes:

1. WLAs are expressed as a daily maximum; NA = not applicable, no point sources. Existing and future continuous discharges are required to meet the prescribed loading

- for the pollutant of concern. Loadings were developed based upon permitted flow and assuming an allowable permitted maximum concentration of 400cfu/100ml.
2. Percent reduction applies to all NPDES-permitted stormwater discharges, including current and future MS4, construction and industrial discharges covered under permits numbered SCS & SCR. Stormwater discharges are expressed as a percentage reduction due to the uncertain nature of stormwater discharge volumes and recurrence intervals. Stormwater discharges are required to meet percentage reduction or the existing instream standard for pollutant of concern **in accordance with their NPDES Permit.**
 3. Percent reduction applies to existing instream load; Where Percentage Reduction = $(\text{Existing Load} - \text{Load Allocation}) / \text{Existing Load}$
By implementing the best management practices that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 Permit to address fecal coliform, the SCDOT will comply with this TMDL and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 permit.
 4. **By implementing the best management practices that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 Permit to address fecal coliform, the SCDOT will comply with this TMDL and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 permit.**

Amendment Location 3:

Section 3.1.2, page 13

Amendment:

Section 3.1.2. has been revised to read as follows:

Non-continuous point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permits numbered SCS and SCR and regulated under SC Water Pollution Control Permits Regulation 122.26(b)(14)&(15). **All regulated MS4 entities have the potential to contribute FC pollutant loadings in the delineated drainage area used in the development of this TMDL.**

The South Carolina Department of Transportation (SCDOT) is currently the only designated Municipal Separate Storm Sewer System (MS4) within the watershed. The SCDOT operates under NPDES MS4 SCS040001 and owns and operates roads in the watershed (Figure 4). However, the Department recognizes that SCDOT is not a traditional MS4 in that it does not possess statutory taxing or has enforcement powers. SCDOT does not regulate land use or zoning, issue building or development permits.

The City of Orangeburg is currently a potentially designated Municipal Separate Storm Sewer System (MS4) under NPDES Phase II Stormwater rules. Similar to regulated MS4s, potentially designated MS4 entities (as listed in 64 FR, P. 688837) or other unregulated MS4 communities located in the Ninety Six Creek watershed may have the potential to contribute FC bacteria in stormwater runoff. If future MS4 permits are applicable to this watershed, then those discharges will

be subject to the assumptions and requirements of the WLA portion of this TMDL. However, there may be industrial or construction activities going on at any time that could produce stormwater runoff.

Industrial facilities that have the potential to cause or contribute to a violation of a water quality standard are covered by the NPDES Storm Water Industrial General Permit (SCR000000). Construction activities are usually covered by the NPDES Storm Water Construction General Permit from DHEC (SCR100000). Where construction activities have the potential to affect water quality of a water body with a TMDL, the Storm Water Pollution Prevention Plan (SWPPP) for the site must address any pollutants of concern and adhere to any wasteload allocations in the TMDL.

Amendment Location 4:

Section 3.2.5, Page 17

Amendment:

The first paragraph of section 5.3.2 has been revised to read as follows:

Non-continuous point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permits numbered SCS & SCR and regulated under SC Water Pollution Control Permits Regulation 122.26(b)(14) & (15). Illicit discharges, including SSOs, are not covered under any NPDES permit and are subject to enforcement mechanisms. All areas defined as “Urbanized **Area**” by the US Census are required under the NPDES Stormwater Regulations to obtain a permit for the discharge of stormwater. Other non-urbanized areas may be required under the NPDES Phase II Stormwater Regulations to obtain a permit for the discharge of stormwater.

Amendment Location 5:

Section 5.3.2, Page 22

Amendment:

Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. **However, the Department recognizes that SCDOT is not a traditional MS4 in that it does not possess statutory taxing or enforcement powers. SCDOT does not regulate land use or zoning, issue building or development permits.**

Amendment Location 6:

Section 6.1.2, Page 26

Amendment:

The following paragraph in the implementation section of the Caw Caw Swamp TMDL document has been revised to read as follows:

Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. **For SCDOT, compliance with terms and conditions of its NPDES MS4 permit is effective implementation of the WLA to the MEP.**