Total Maximum Daily Load Document

Salkehatchie River, Turkey Creek & Wells Branch
(Hydrologic Unit Codes: 03050207-01, & -06,
& Stations CSTL-001B, CSTL-003, CSTL-028,
RS-02472, & CSTL-006)
Fecal Coliform Bacteria, Indicator for Pathogens

Salkehatchie River at US-278 near Barnwell, SC

June 2012

Bureau of Water

DHEC

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Technical Document Number 023J-12

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). Fecal coliform TMDLs have been developed for the Salkehatchie River and two tributaries - Turkey Creek and Wells Branch. These watersheds are located mostly in Barnwell and Bamberg Counties, but extend into Allendale, Colleton, Hampton, and Aiken Counties. The Salkehatchie River at CSTL-028, CSTL-003, and CSTL-006, Turkey Creek at CSTL-001B and Wells Branch (RS-02472) were included on South Carolina's 2010 §303(d) list of impaired waters. The impaired stations are included on the State's 2010 §303(d) list due to excessive fecal coliform numbers documented during the 2004 - 2008 assessment period.

The predominant land uses in the watershed of the upper Salkehatchie River and its tributaries are forest, agricultural (pasture/hay and cultivated crops), and wetlands. The sub-watersheds for Turkey Creek and the Salkehatchie River at CSTL-003 are the only sub-watersheds to have more than 5 % developed land. The City of Barnwell, which is mostly within the Turkey Creek watershed, has a wastewater treatment plant (WWTP) that discharges to the Salkehatchie River. The SC DOT is the only regulated MS4 in these watersheds. The most likely sources of fecal coliform bacteria to Turkey Creek and the Salkehatchie River at CSTL-003 are failing septic systems, urban runoff, leaking sewers, and overflowing sewers. The mostly likely sources to the remaining sub-watersheds are cattle in the streams and failing septic systems. The load-duration curve methodology was used to calculate the existing loads and the TMDL loads for these streams. Existing loads and TMDL loads are presented in Table Ab-1. Wells Branch and the Salkehatchie River at CSTL-003 require higher reductions in the existing load of fecal coliform bacteria than do the Salkehatchie River at CSTL-028 and CSTL-006 or Turkey Creek. For SCDOT, existing and future NPDES MS4 permittees, compliance with terms and conditions of its NPDES permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP) and demonstrates consistency with the assumptions and requirements of the TMDL. For existing and future NPDES construction and Industrial stormwater permittees, compliance with terms and conditions of its permit is effective implementation of the WLA. 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 (SC DHEC) recognizes that **adaptive implementation** of these TMDLs (i.e. WLAs and LAs) might be needed to achieve the water quality standard and we are committed towards targeting the load reductions to improve water quality in the Salkehatchie River Watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL target accordingly.

Table Ab-1. Total Maximum Daily Loads for the Salkehatchie River, Turkey Creek, and Wells Branch.

Station	Existing Load	TMDL	Margin of Safety	Wasteload Allocation (WLA)			Load Allocation (LA)	
				Contin-uous Sources[1]	Non-Continuous Sources[2,5]	Non-Continuous SCDOT Sources[2, 5]	LA	Reduction to Meet LA[5]
	(cfu/day)	(cfu/day)	(cfu/day)	(cfu/day)	(% Reduction)		(cfu/day)	(% Reduction)
CSTL-001B	1.37E+11	8.44E+10	4.22E+09	See note below	42%	42% [4]	8.01E+10	42%
CSTL-028	3.99E+11	3.48E+11	1.74E+10	See note below	17%	0% [3]	3.31E+11	17%
CSTL-003	1.17E+12	4.66E+11	2.33E+10	4.54E+10	66%	66% [4]	3.97E+11	66%
RS-02472	2.71E+11	1.04E+11	5.22E+09	See note below	63%	0% [3]	9.92E+10	63%
CSTL-006	2.88E+12	1.92E+12	9.59E+10	See note below	37%	0% [3]	1.82E+12	37%

Table Notes:

1. WLAs are expressed as a daily maximum. 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 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. As long as the conditions within the SCDOT MS4 area remain the same the Department deems the contributions from SCDOT negligible and no reduction of FC bacteria is necessary. SCDOT must continue to comply with the provisions of its approved NPDES stormwater 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.
5. Percent reduction applies to existing instream load.

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1.0 INTRODUCTION

1.1 Background

Fecal coliform bacteria 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 storm runoff has been associated with a number of disease outbreaks, most notably the outbreak in Milwaukee that caused many deaths and affected an estimated 403,000 people (Corso et al., 2003).

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 source, such as stormwater runoff, failing septic systems, and leaking sewers. Occasionally, the source of the pollutant is a point source. Section §303(d) of the Clean Water Act 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. The TMDL process establishes the allowable loadings 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 Salkehatchie River at CSTL-028, CSTL-003, and CSTL-006, Turkey Creek at CSTL-001B and Wells Branch at RS-02472, have been included on South Carolina’s 2010 §303(d) list of impaired waters due to exceedences of the fecal coliform bacteria standard. The locations of these sites are identified in Figure 1 and Table 1.

1.2 Watershed Description

The upper Salkehatchie River and its tributaries (including Turkey, Toby, Georges, Savannah Creeks and Wells Branch) are black water streams located in the coastal plain of South Carolina (Figure 1). Though more than half of the watershed is within Barnwell County, substantial parts of the watershed are in Bamberg and Allendale Counties. Also very small areas of the watershed extend into Aiken, Hampton and Colleton Counties. Most of the watershed falls in the Southeastern Plains Eco-region; the balance is in the Atlantic Coastal Plain Eco-region. The watershed is further described in the *Watershed Water Quality Assessment: Salkehatchie River Basin* (SCDHEC, 2010)

The upper Salkehatchie River as defined by these TMDLs begins near Williston and flows in a general southeasterly direction (Figure 2). The lower boundary of the river for these TMDLs is at US-601, south of Ehrhardt. Turkey Creek and the headwaters of the Salkehatchie River, which make up the upper third of the watershed, have three impaired sites: CSTL-001B, CSTL-028, and CSTL-003 (Figure 2). These watersheds are the most populated sub-watersheds of the upper Salkehatchie. About half of Williston is located within the drainage for CSTL-028. Most of the

City of Barnwell is located within the Turkey Creek sub-watershed (CSTL-001B), though the city extends into the sub-watersheds for CSTL-028 and CSTL-003.

Lake Edgar Brown, a small impoundment owned by the South Carolina Department of Natural Resources and separated from Turkey Creek by an embankment, supports recreational uses and is not impaired. The lake has approved phosphorus and pH TMDLs. The sub-watershed for the lake is small (346 hectares or 854 acres) and is mostly within the city limits of Barnwell.

The middle third of the upper Salkehatchie watershed is not impaired, with the exception of Wells Branch. This part of the watershed is defined by the water quality monitoring site, CSTL-048, on the Salkehatchie River at US-301/321. Wells Branch is a very rural watershed and with few inhabitants. Much of the land is in pine plantations (personal observation).

The lower third of the watershed, the area downstream of CSTL-048, is also largely rural. The only populated place is the Town of Ehrhardt, which is mostly within the sub-watershed.

Table 1. Salkehatchie River water quality monitoring site descriptions.

Waterbody	Station Number	Description	Cumulative Drainage Area (km^2)
Lake Edgar Brown	CL-064*, RL-06437*	Lake Edgar Brown in forebay and at S-06-488	3.5
Turkey Creek	CSTL-001B	Turkey Creek at Clinton Street, Barnwell	74.0
Salkehatchie River	CSTL-028	Salkehatchie River at SC-64	160.3
Salkehatchie River	CSTL-003	Salkehatchie River at US-278	269.0
Wells Branch	RS-02472	Wells Branch at SC-300	57.1
Salkehatchie River	CSTL-048*	Salkehatchie River at US-301/321	686.3
Salkehatchie River	CSTL-006	Salkehatchie River at US-601	882.7

* Sites are not included on the 2010 303(d) list for FC bacteria. As long as ambient conditions remain the same no reduction is needed at these locations.

The predominant land uses in the watershed are forest, agricultural (pasture/hay, grassland, and row crops), and wetlands (Table 2). Much of the forest land is scrubby oak and pine. The 2001 NLCD data has two classifications – pasture/hay and grassland – which in this area are indistinguishable and are both included under agricultural land use. Developed land uses exceed 5 % of all land uses

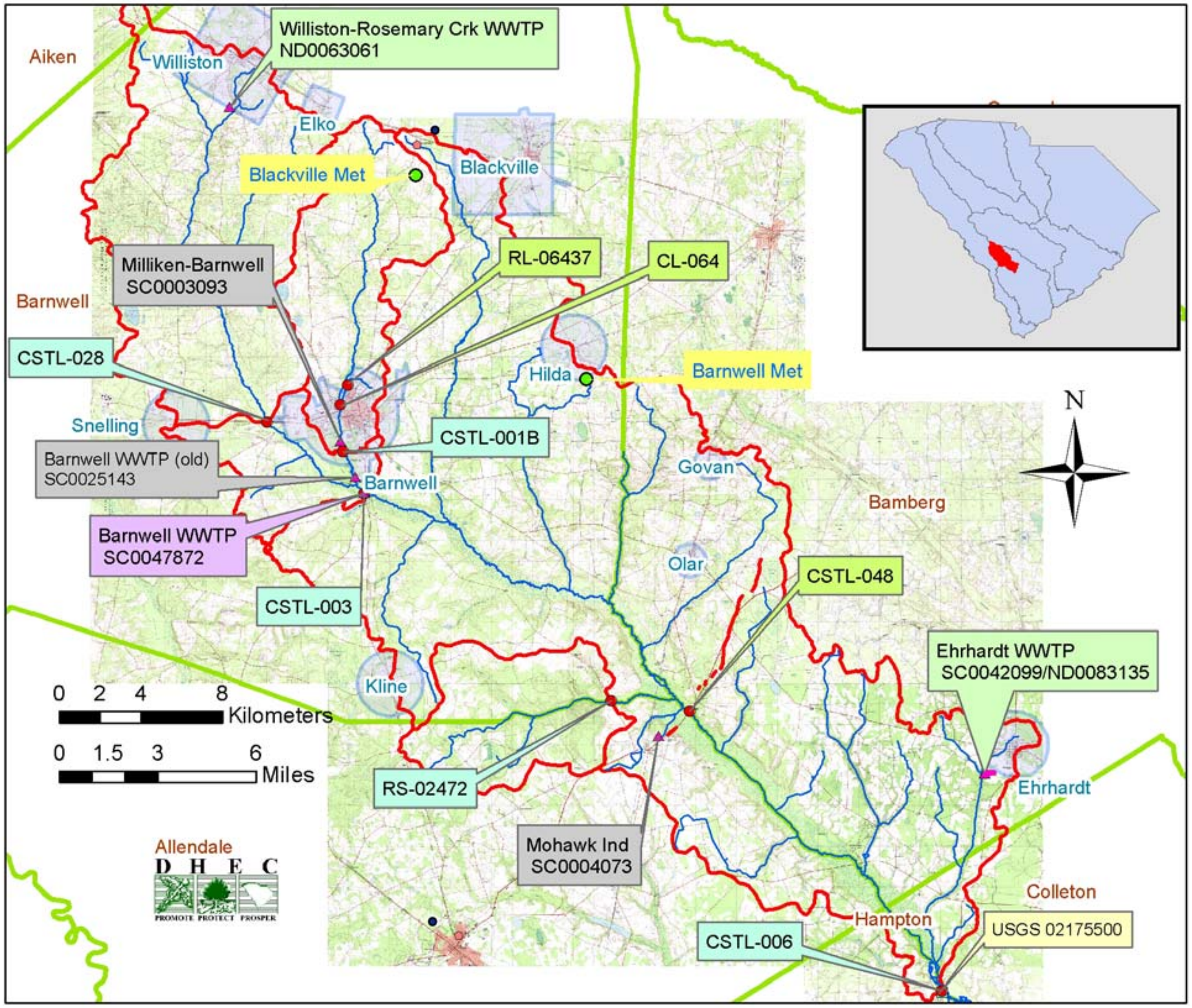

Figure 1. Map of the upper Salkehatchie River watershed.

Table 2. Land uses in the upper Salkehatchie River watershed in 2001.

Landuse Class	**Headwaters to CSTL-001B**		**Headwaters to CSTL-028**		**CSTL-028 and CSTL-001B to CSTL-003***		**Headwaters to RS-02472**		**CSTL-003 to CSTL-006***	
	Area (ha)	Percent	Area (ha)	Percent	Area (ha)	Percent	Area (ha)	Percent	Area (ha)	Percent
Water	10	0.1%	40	0.3%	0	0.0%	9	0.2%	109	0.2%
Developed	**711**	**9.6%**	789	4.9%	**255**	**7.4%**	115	2.0%	2,451	4.4%
Forest	**3,123**	**42.2%**	**7,596**	**47.4%**	**1,195**	**34.5%**	**2,582**	**45.2%**	**20,451**	**36.7%**
Scrub/Shrub	35	0.5%	87	0.5%	13	0.4%	35	0.6%	331	0.6%
Grassland	**960**	**13.0%**	**2,657**	**16.6%**	**546**	**15.8%**	**770**	**13.5%**	**7477**	**13.4%**
Agricultural	**1,649**	**22.3%**	**2,968**	**18.5%**	**814**	**23.5%**	**1,375**	**24.1%**	**13,914**	**25.0%**
Wetland	**907**	**12.3%**	**1,888**	**11.8%**	**643**	**18.5%**	**827**	**14.5%**	**10,925**	**19.6%**
Total	**7,394**	**100%**	**16,026**	**100%**	**3,466**	**100%**	**5,713**	**100%**	**55,624**	**100%**

* Note: Land use data for CSTL-003 and CSTL-006 do not include drainage areas of upstream stations.

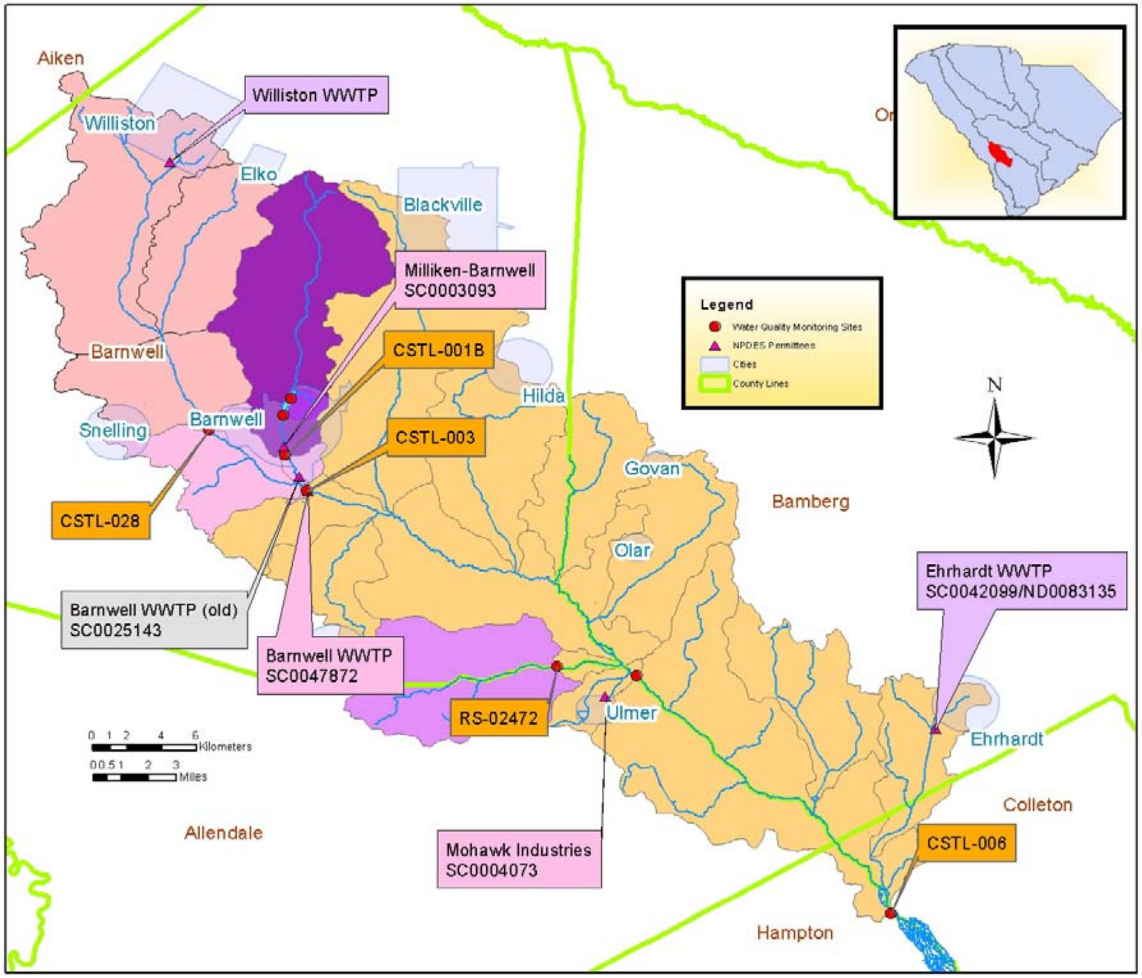

Figure 2. Salkehatchie TMDL watersheds.

in the sub-watersheds for CSTL-001B and CSTL-003, which together include most of the City of Barnwell. The Wells Branch watershed has almost no developed land use. Land use is displayed in a map format in Figure 3.

1.3 Water Quality Standard

The impaired stream segments of the Salkehatchie River, Turkey Creek and Wells Branch are designated as Class Freshwater. Waters of this class are described as follows:

> "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 standard 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).

Insufficient data are available to evaluate the 30-day geometric mean for these TMDLs. These TMDLS are based on the instantaneous component of the standard – 400 cfu/100 ml.

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. Regulation mandates that all perennial streams should be protected for recreational use.

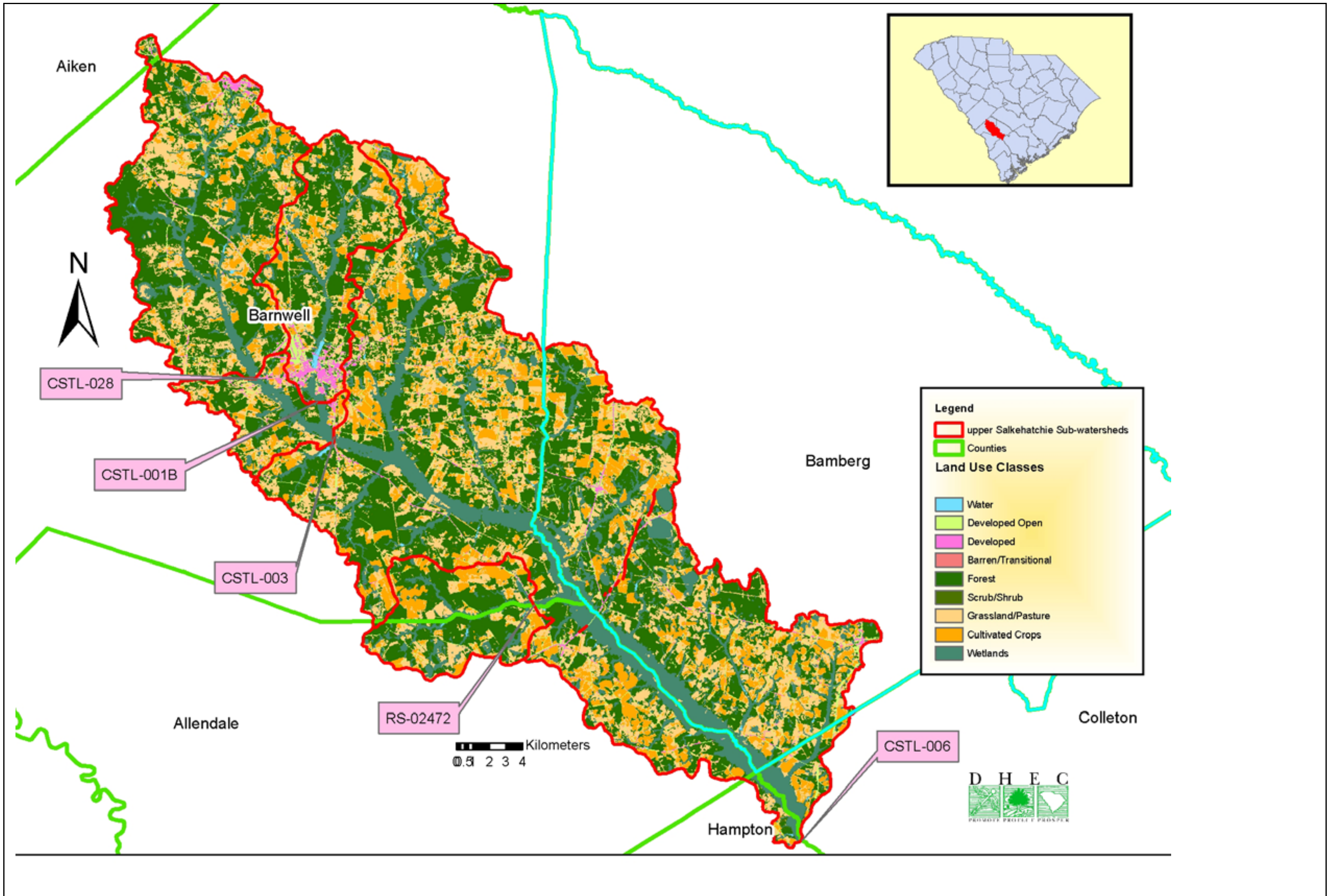

Figure 3. Land uses in the Salkehatchie River watershed in 2001.

2.0 WATER QUALITY ASSESSMENT

The South Carolina Department of Health and Environmental Control (SCDHEC) has monitored water quality at 8 locations within the upper Salkehatchie River watershed (SCDHEC, 2010). The locations of these sites are shown in Figure 1. Four sites are located on the upper Salkehatchie River, one is on Turkey Creek, two on Lake Edgar Brown, and one is on Wells Branch. Lake Edgar Brown has approved phosphorus and pH TMDLs, which can be accessed at http://www.scdhec.gov/environment/water/tmdl/docs/tmdleb.pdf. All of the water quality monitoring sites are described in Table 1. The unimpaired sites are CL-064 and RL-06437 (Lake Edgar Brown) and CSTL-048 on the Salkehatchie River.

Waters in which no more than 10% of the samples collected over the five year assessment 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) list. Five of the eight locations in the upper Salkehatchie River watershed are considered impaired due to fecal coliform water quality standards (WQS) exceedences. Table 3 provides a summary of number of samples collected, number of exceedences and exceedence percentages at impaired locations. The assessment period for the 2010 list is 2004 – 2008. The sample data for these sites is provided in Appendix A Table A-1.

A DHEC swimming advisory sign posted on the boat landing on the Salkehatchie River at US-601 (CSTL-006) is pictured in Figure 4.

Figure 4. Swimming advisory sign on Salkehatchie River at US-601 (CSTL-006).

Table 3. Statistics for fecal coliform data collected in upper Salkehatchie River for impaired locations on the 2010 303(d) list (2004-2008 data were assessed).

Station	Sampled Years	All Samples			2010 Assessment Period
		# of Samples	# of Samples Exceeding Stnd	% of Samples Exceeding Standard	# of Samples Exceeding Stnd [1]
CSTL-028	1999 - 2009	124	16	12.9%	17.6%
CSTL-001B	1999 - 2007, 2009	109	15	13.8%	17.4%
CSTL-003	1999, 2000, 2005, 2009	36	7	19.4%	16.7%
RS-02472	2002	11	5	45.5%	45.5%
CSTL-006	1999-2000, 2005	33	6	18.2%	25.0%

[1] The frequency of sampling was fewer than five samples within a 30-day period, therefore the water quality assessment was based on the single sample maximum standard of 400/100 mL.

Sampling of the five impaired sites has varied considerably over time. Only the Salkehatchie River at CSTL-028 has been sampled in every year. Wells Branch (RS-02472, a random site) was sampled only in 2002. Due to Department budget reductions and subsequent changes to the statewide ambient water quality monitoring strategy, monitoring at each of these impaired sites was discontinued after 2009. One unimpaired location, CSTL-048, will continue to be monitored by the Department every year. For further details on the State of South Carolina Monitoring Strategy, please go to: http://www.scdhec.gov/environment/water/docs/strategy.pdf.

A plot of fecal coliform bacteria concentrations in Turkey Creek at CSTL-001B and precipitation (Figure 5) shows little discernible pattern. Similar plots for the Salkehatchie River and Wells Branch are provided in Appendix A Figures A-1 through A-4. A graph of precipitation vs fecal coliform bacteria for Turkey Creek (Figure 6) shows no meaningful correlation between rainfall and fecal coliform bacteria concentrations. Likewise a graph of turbidity vs fecal coliform bacteria (Figure 7) shows only a weak correlation. The locations of the rain gauges are outside of the Turkey Creek watershed (Figure 1). Prior to 2007 precipitation data was from the rain gauge near Blackville (Blackville Met), after 2006 data was from the rain gauge near Hilda (Barnwell Met). Turbidity, which is measured in the same sample as the fecal coliform bacteria, should be a better indicator of runoff for these sites. However, none of the other sites exhibited a correlation between either precipitation or turbidity and fecal coliform concentrations either. The lack of a strong association between fecal coliform bacteria concentrations and precipitation suggests that there are multiple sources of fecal coliform bacteria in these streams and that both continual sources, such as failing septic systems, leaking sewer lines, or illicit discharges and runoff related sources are important.

All of the fecal coliform data for the impaired sites are provided in Appendix A Table A-1.

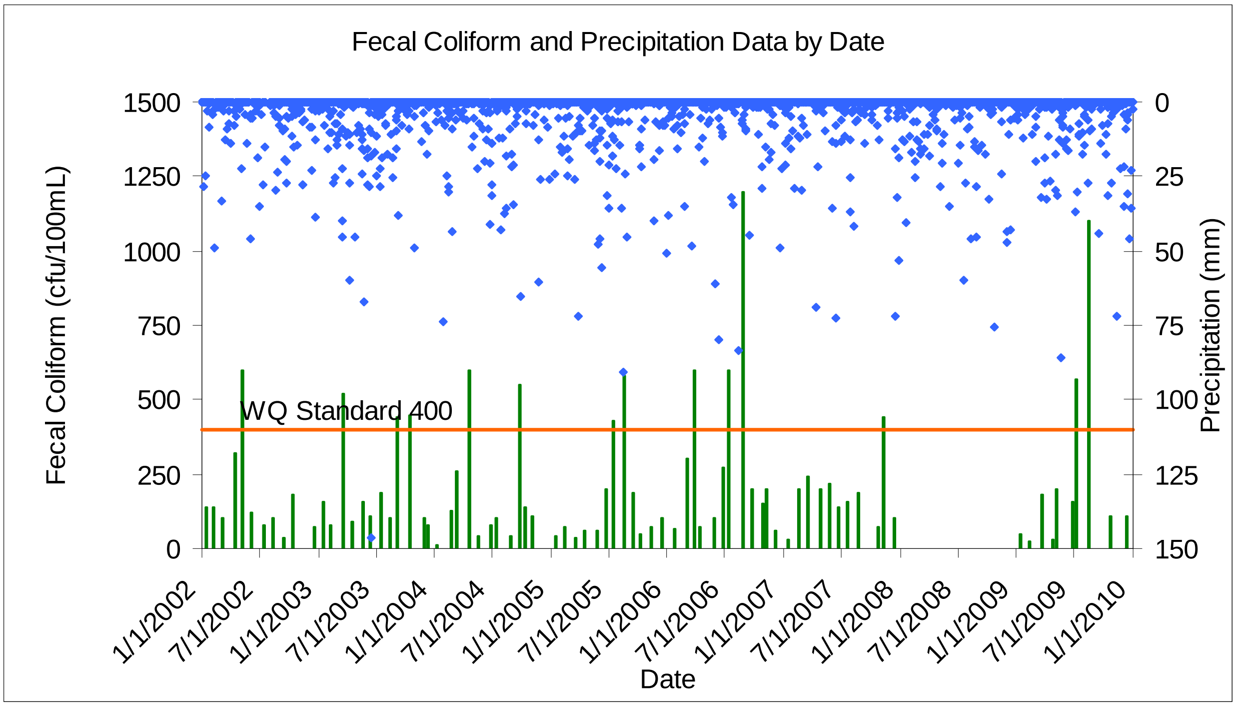

Figure 5. Precipitation-fecal coliform bacteria plot for Turkey Creek at CSTL-001B.

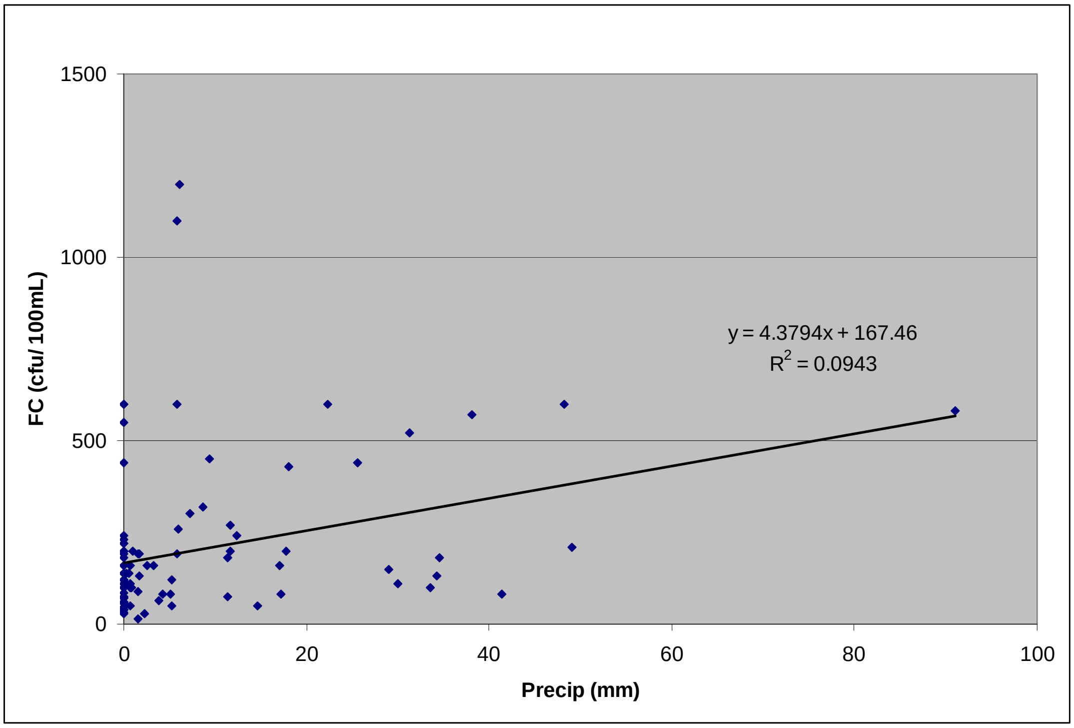

Figure 6. Precipitation vs fecal coliform concentrations in Turkey Creek at CSTL-001B.

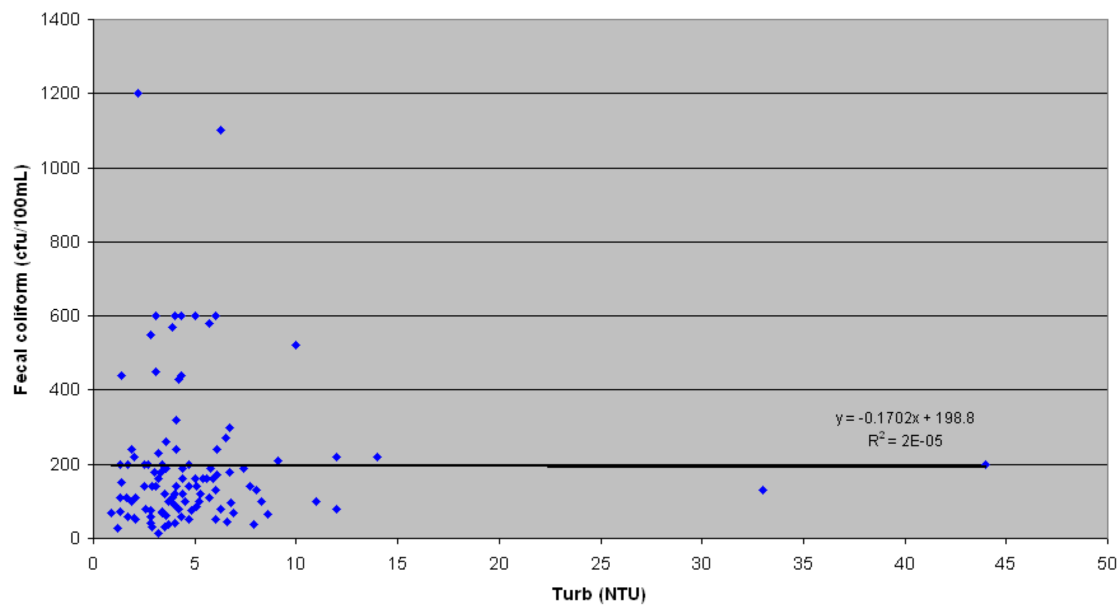

Figure 7. Turbidity vs fecal coliform concentrations in Turkey Creek at CSTL-001B.

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 risky. Indicators such as fecal coliform bacteria, enteroccoci, or E. *Coli* are easier to measure, have similar sources as pathogens, and persist a similar or longer length of time in surface waters. These bacteria are not in themselves usually disease causing, but indicate the potential presence of organisms that may result in illness.

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 point sources, such as factories and wastewater treatment facilities, has been greatly reduced. These point sources are required by the Clean Water Act 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, facilities that are discharging wastewater that meets their permit limits are not causing or contributing to an 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 for industrial or construction activities under the NPDES Stormwater regulations. These sources are also required to comply with the state standard for the pollutant(s) of concern. If MS4s and discharges from construction sites meet the percentage reduction or the water quality standard as prescribed in Section 5 of this TMDL document and required in their MS4 permit(s), they should not be causing or contributing to an downstream FC bacteria impairment.

3.1 Point Sources in the upper Salkehatchie River Watershed

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 three active NPDES domestic wastewater treatment facilities in the upper Salkehatchie River watershed (Figure 1). However, only one has a permit to discharge treated wastewater into surface water. The two that do not discharge to surface water apply the treated wastewater to land. One of these the Town of Ehrhardt previously discharged to Savannah Creek (NPDES SC0042099). The City of Barnwell WWTP previously discharged to Turkey Creek

(NPDES SC0025143). In 2002 the facility was upgraded, the outfall relocated downstream to the Salkehatchie River just upstream of CSTL-003, and a new permit issued (NPDES SC0047872). Milliken and Company (NPDES SC0003093) has discharged industrial wastewater without domestic waste into Turkey Creek upstream of CSTL-001B. This facility is shutting down and has not discharged treated wastewater since early 2010. The permit will be inactivated. Formerly, Mohawk Industries (SC0004073) discharged effluent that included treated domestic wastewater into Gin Branch, a tributary of the Salkehatchie River. This permit is now inactive. Table 4 provides permit information, loads, and number of permit exceedences for these facilities. Neither Barnwell facility reported a permit violation between 2000 and 2010.

The Barnwell WWTP has reported no violations of either its monthly or daily fecal coliform limits (Appendix B Table B-1). However, there have been a number of Sanitary Sewer Overflows (SSOs) reported for Barnwell (Appendix B Table B-3). Several of these were reported to have reached surface waters and two involved nearly 48,000 gallons of wastewater.

Current and future continuous NPDES discharges in the referenced watershed are required to comply with the load reductions prescribed in the WLA and demonstrate consistency with the assumptions and requirements of these TMDLs.

Table 4. NPDES permitted dischargers in the upper Salkehatchie River watershed.

Facility Owner	NPDES Permit #	Design Flow (mgd)	Receiving Body	Permit Expiration Date	Fecal Coliform	Permitted Load (cfu/day)[1]	# of Permit Violations 2002-10 (Monthly means / Daily Max.)
Barnwell, City of (Old)	SC0025143	1.8	Turkey Creek	Inactive	Yes	NA	0 (0)
Barnwell, City of (New)	SC0047872	3	Salkehatchie River	9/30/2013	Yes	4.54E+10	0 (0)
Milliken Barnwell Plant	SC0003093	1.3	Turkey Creek	11/30/2008	No	NA	NA
Mohawk Industries	SC0004073	1.257	Gin Branch	Inactive	Yes	NA	2 (3)
Ehrhardt, Town of	SC0042099	0.06	Savannah Creek	Inactive	Yes	NA	1 (5)

[1] - Loads are calculated from daily maximum limit of 400 cfu/ 100mL

3.1.2 Non-Continuous Point Sources

Non-continuous point sources include all NPDES-permitted stormwater dischargers, 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). These sources are also required to comply with the state standard for the pollutant(s) of concern.

The South Carolina Department of Transportation (SCDOT) is currently the only designated Municipal Separate Storm Sewer System (MS4) within the upper Salkehatchie watershed. Roads, facilities or properties owned and/or operated by SCDOT are currently covered under NPDES MS4 SCS040001. Runoff from properties including but not limited to ditches, culverts, right of ways, maintenance buildings, rest areas, facilities with improperly-maintained onsite septic systems, etc. may have the potential to contribute pollutant loadings to waters of the State. However, DHEC recognizes that SCDOT is not a traditional MS4 in that it does not possess statutory taxing authority nor has enforcement powers. SCDOT does not regulate land use or zoning, issue building or construction permits.

An extensive network of SCDOT roads exists in part of the upper Salkehatchie watershed (Figure 8). The northern part of the Salkehatchie River watershed contains the City of Barnwell. The lower part of the watershed, that is the area draining to CSTL-006, and the Wells Branch watershed are largely un-developed and contain relatively few roads. Only the watersheds for CSTL-001B and CSTL-003 have developed land uses that exceed 5 % of the total of all land uses.

If future MS4 permits are applicable to this watershed, then those discharges will also become subject to the assumptions and requirements of the WLA portion of this TMDL. However, there maybe 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. Note that there may be other stormwater discharges not covered under permits numbered SCS and SCR that occur in the referenced watershed. These activities are not subject to the WLA portion of the TMDL.

Sanitary Sewer Overflows (SSOs) and leaking sewers are common sources of fecal coliform bacteria in urban areas. Typical FC concentrations in wastewater from SSOs have been reported to be 10^5 to 10^7 MPN/100mL (Novotny et al., 1989). Twenty SSOs have been reported for Barnwell

County for the collection systems of Williston and Barnwell and an industrial facility between 2000 and October 2011 (Appendix B Table B-3). No other SSOs were reported for the watershed. All of these SSOs appear to be within the upper Salkehatchie watershed and most involved the City of Barnwell's collection system. Two of the spills in Barnwell were estimated to have involved nearly 48,000 gallons of untreated wastewater. One of these spills was reported to have reached surface waters, the other not. Because of limited information it is difficult to relate spills to instream water quality. Small SSOs may go unreported; therefore, the actual numbers of releases that occurred in the Salkehatchie River watershed and reached waters of the State are not known. Because of the proximity of sewers to streams in the City of Barnwell, the sewage collection system may be a contributor to the impairment of Turkey Creek and the Salkehatchie River at CSTL-003. Leaking sewers and Sanitary Sewer Overflows (SSO) are illicit discharges and do not receive allocations. SCDHEC responds to illicit discharges through compliance and enforcement mechanisms under the NPDES program.

The Department acknowledges that progress with the assumptions and requirements of the TMDL by MS4s is expected to take one or more permit iteration. Progress towards 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.

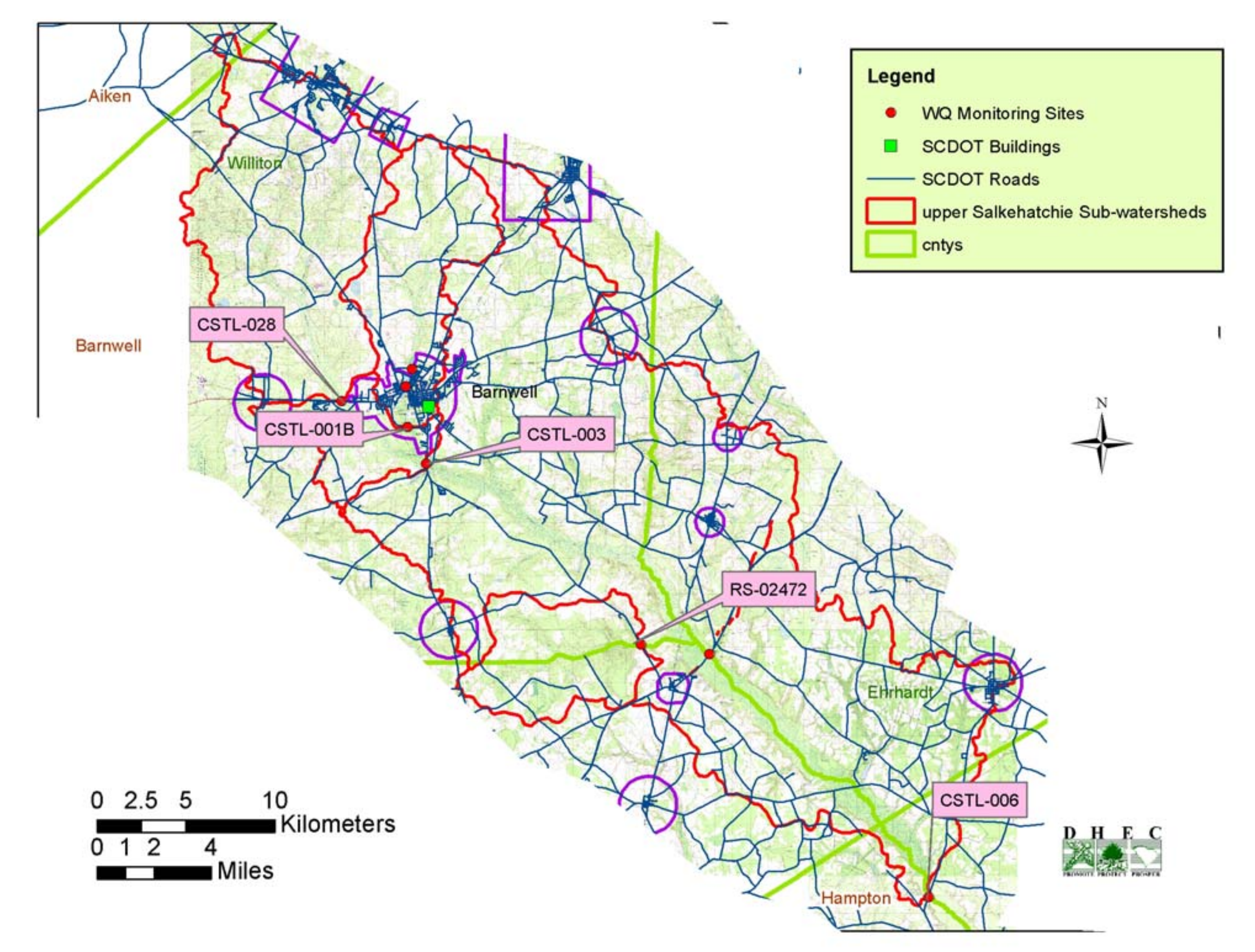

Figure 8. DOT owned roads in the upper Salkehatchie River watershed.

3.2 Nonpoint Sources in the upper Salkehatchie River Watershed

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 Little Salkehatchie River watershed. Nonpoint sources located in unregulated areas are subject to the LA and not the WLA component of the TMDL.

3.2.1 Wildlife

In these rural and suburban watersheds wildlife (mammals and birds), which is a source of fecal coliform bacteria, is possibly a significant though not major contributor. Wildlife in this area includes deer, raccoons, feral hogs 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. Waterfowl also may be significant contributors of fecal coliform bacteria, particularly in urban and suburban ponds, which often provide a desirable habitat for geese and ducks. Forest lands, which typically have only low concentrations of wildlife as sources of fecal coliform bacteria, usually have low loading rates for fecal coliform bacteria. The Turkey Creek and the upstream Salkehatchie (CSTL-001B, CSTL-003, CSTL-028) watersheds have an estimated population of deer of between 15 and 30 per mi^2; Wells Branch and the lower Salkehatchie River watersheds (CSTL-006) have between 30 and 45 deer per mi^2 (SCDNR, 2008).

3.2.2 Agricultural Activities

Agricultural activities that involve livestock and animal wastes are also potential sources of fecal coliform contamination of surface waters. Fecal matter can enter the waterway through wash off from the land by runoff or by direct deposition into the stream.

3.2.2.1 Agricultural Animal Facilities

Owners/operators of most commercial animal growing operations are required by R. 61-43, Standards for the Permitting of Agricultural Animal Feeding Operations (AFOs), to obtain permits for the handling, storage, treatment (if necessary) and disposal of the manure, litter and dead animals generated at their facilities (SC DHEC 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. South Carolina 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 a substantial number of AFOs in the upper Salkehatchie watershed (Figure 9; Table 5). The Turkey Creek (CSTL-001B) watershed has two operators with six chicken houses, which are designed for a total of 150,000 birds. The two operations have a combined 25 fields and 531 acres that are permitted for the application of poultry litter. One of these operators and another with facilities outside of these watersheds have fields within the headwater watershed of the Salkehatchie River (CSTL-028) that are permitted for the application of poultry litter. These two operators have a combined 15 fields with a total area of 442 acres within the headwater watershed. There are 15 operators in the lower sub-watershed (CSTL-006). However, all of these facilities and fields are in the upper part of this watershed and are distant from the impaired station.

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. Most AFOs have multiple land application sites that are rotated on routine basis. Land application sites are required by permit to apply no closer that 100' to surface waters..

3.2.2.2 Grazing Animals

Livestock, especially cattle, are potentially major contributors of fecal coliform bacteria to streams in the Salkehatchie watershed. Cattle on average produce some 1 E+11 cfu/day of fecal coliform bacteria per animal (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 SCDHEC. The 2007 USDA Agricultural Census of Agriculture reported large numbers of livestock (cattle and calves, goats, horses and ponies) in the counties that encompass the Salkehatchie River watershed (http://www.agcensus.usda.gov/Publications/2007/Full_Report/index.asp). The number of livestock was estimated for each of the TMDL sub-watersheds (Table 6) using the ratio of pastureland in the each sub-watershed to the pastureland in each county times the number of livestock in each county from the census. These estimates have not been verified. Although there are substantial numbers of goats, horses, and ponies in the watershed, cattle and calves were represented in the largest numbers. The watershed for CSTL-006, which is largely rural, was estimated to have the largest number of cattle and calves -- 4965. Based on the location of pastureland within the CSTL-006 watershed, it is estimated that most the cattle would be found in the upper part of the CSTL-006 watershed.

Evidence of direct loading by cattle to Savannah Creek, a tributary of the Salkehatchie just above CSTL-006, was observed during the survey of the watershed. Direct loading by cattle or other livestock to the creeks is likely to be a significant source of fecal coliform bacteria to CSTL-028, RS-02472, and CSTL-006.

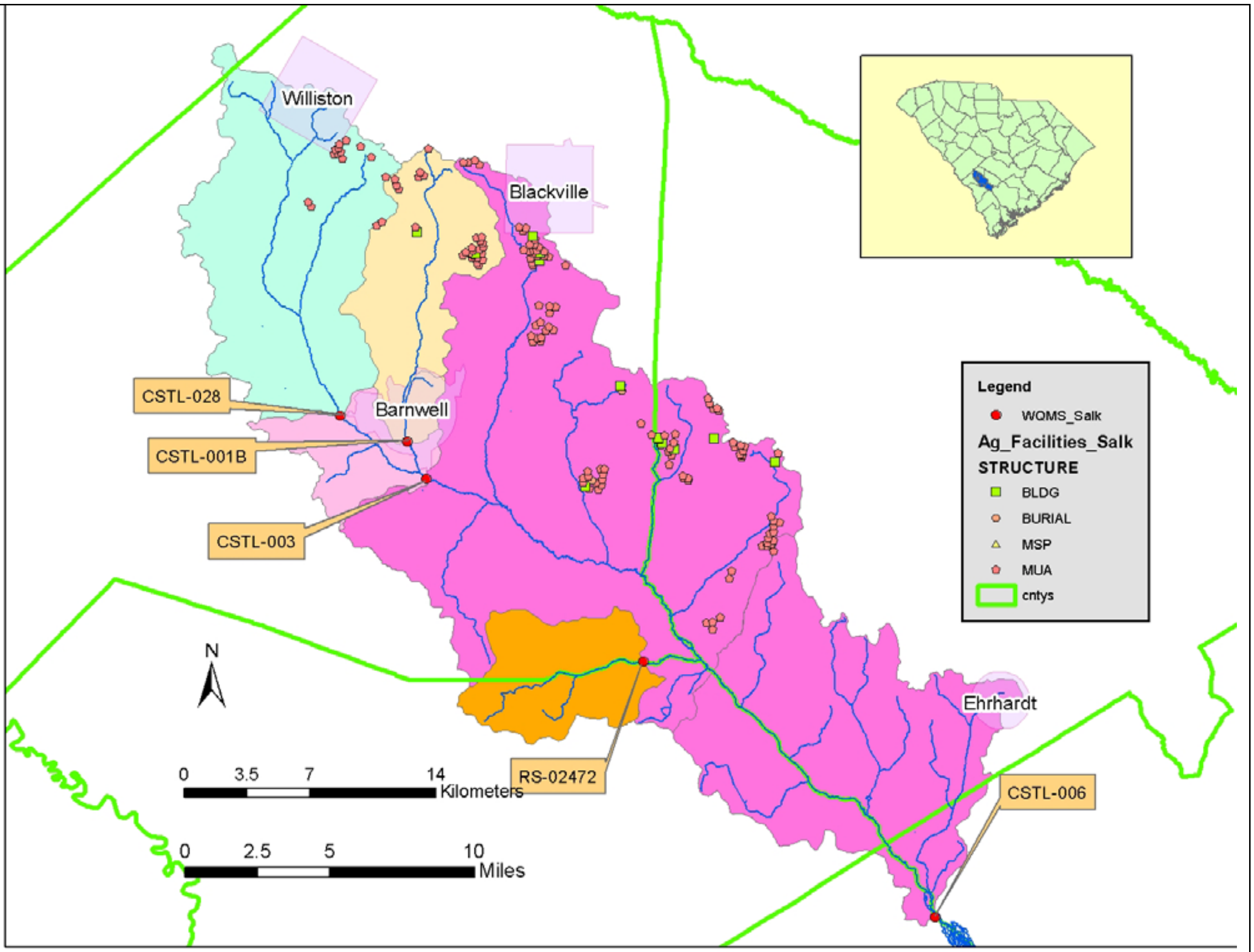

Figure 9. Map of permitted animal feeding operations (AFOs) in the upper Salkehatchie River watershed.

Table 5. DHEC permitted animal feeding operations in the upper Salkehatchie watershed.

Station	AFO Permit	Facility Name	Facility	Type of Animal	Number of Animals	Total Permitted Acres
CSTL-001B	ND0082121	Walker Nix Chicken Farm	2 Poultry Houses	Poultry - Breeders	26,000	NA
			Fields		NA	187
	ND0086304	MC Land, Cattle & Poultry	4 Poultry Barns	Poultry (Broliers)	124,000	NA
			2 Burial Sites		NA	NA
			Fields		NA	344
CSTL-028	ND0082996	KC Broiler Farms	Fields	Poultry - Broilers	NA	214
	ND0082121	Walker Nix Chicken Farm	Fields	Poultry - Breeders	NA	228
CSTL-006	ND0015571	Heatwole Farms Inc	Fields	Dairy	350	60
	ND0060135	Brubaker Farms, Inc	Dairy Barn	Dairy	250	NA
			Fields		NA	48
	ND0060836	Hege Dairy Farm	Dairy Barn	Dairy	75	NA
			Fields	Dairy	NA	18
	ND0071170	Julian Bair Farm	Fields	Poultry (Broilers)	NA	394
	ND0072044	Sunshower Place Ltd	Dairy Barn	Dairy	350	NA
	ND0072371	Brubaker Acres Inc	Dairy Barn	Dairy	250	NA
			Fields		NA	205
	ND0079219	Fickling Gene Poultry Facility	Poultry House	Poultry (Broilers)	50,000	
			Fields		NA	128
	ND0081311	Fickling Tal Breeder Farm	Poultry House	Poultry (Breeders)	26,000	NA
			Fields		NA	198
	ND0081418	Humble Acres Breeder Farm	Fields	Poultry (Breeders)	NA	185
	ND0081809	MSW Wiles Farms Inc	Poultry House	Poultry (Breeders)	26,000	NA
			Fields		NA	44
	ND0082121	Walker Nix Chickenfarm	Fields	Poultry (Breeders)	NA	111
	ND0083101	Meadow View Cattle Inc	Fields	Dairy	NA	102
	ND0083330	Danny Hege Dairy	Dairy Barn	Dairy	200	NA
			Fields		NA	322
			Burial Site		NA	NA
	ND0084689	Steve Sandifer & Son Farms	Poultry House	Poultry (Breeders)	80,800	NA
			Burial Site		NA	NA
	ND0086797	Brubaker Farms	Poultry House	Poultry (Broilers)	256,000	NA
			Burial Site		NA	NA

Table 6. Estimated Number of Livestock in the upper Salkehatchie watershed.

Type of Livestock	CSTL-001B		CSTL-028		CSTL-003		RS-02472		CSTL-006	
Cattle & calves		408		621		169		229		4965
Goats		49		102		28		38		203
Horses & ponies		17		36		12		13		257

3.2.3 Land Application of Industrial, Domestic Sludge or Treated Wastewater

Land application permits for industrial and domestic wastewater facilities may be covered under SC Regulation 61-9, Sections 503, 504, or 505. It is recognized that there may be operating, regulated land application sites located in the upper Salkehatchie River Watershed. If properly managed, waste is applied at a rate that ensures pollutants will be incorporated into the soil or plants and pollutants will not enter streams. Land applications sites can be a source of fecal coliform bacteria and stream impairment if not properly managed. Similar to AFO land application sites, the permitted land application sites described in this section are not allowed to directly discharge to the Salkehatchie River or its tributaries. Direct discharges from land applications sites to surface waters of the State are illegal and are subject to enforcement actions by SCDHEC.

Both Williston (ND0063061) and Ehrhardt (ND0083135) have NPDES-permitted domestic wastewater treatment facilities that apply treated wastewater to land (Table 7). There are no reported violations of fecal coliform limits by the Ehrhardt WWTP, but facility did not file any DMRs for three years (Table 7 Note). Williston reported a spill from its spray field in 2004 though any impact on receiving stream water quality is uncertain (Appendix B Table B-3).

Table 7. Wastewater dischargers permitted to land apply to spray fields in the upper Salkehatchie River watershed.

Facility Owner	NPDES Permit #	Flow (mgd)	Permit Expiration Date	Fecal Coli-form	# of Permit Vio-lations 2002-11 (Monthly means / Daily Maximums)
Ehrhardt, Town of (New)	ND0083135	0.06	9/30/2013	Yes	0 /0*
Williston, Town of	ND0063061	1.257	11/30/2018	Yes	0 / 10

* Note: Based on limited data because Ehrhardt did not provide DMRs between Aug 2007 and Jul 2011.

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 the Little Salkehatchie River 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.

The population and number of households that use sewers and septic systems were estimated by comparing the 2000 census GIS layer to the sewer line and city boundary GIS layers for each of the impaired watersheds (Table 8). In Table 8, “urban” refers to populations and households that are served by sewers. “Rural” refers to populations and households that use septic systems.

The sub-watersheds that include the City of Barnwell (CSTL-001B and CSTL-003) and Williston (CSTL-028) have large numbers of residences both with and without sewer service. Populations without sewer service in these sub-watersheds may have failing septic systems that are a source of fecal coliform bacteria to these impaired sites. Agricultural sources, primarily cattle with access to streams, are less significant in these two sub-watersheds.

The rural CSTL-006 sub-watershed also includes large areas without sewer service. Most of the population in this sub-watershed is clustered in the area around Barnwell and Blackville (Population: 3348; households: 1376) and is located considerable distance from the monitoring site. In the other sub-watersheds, populations are located closer to the monitoring sites.

Agricultural sources may be predominant in Wells Branch (RS-02472), but failing septic systems may also be a contributor to the impairment.

Table 8. Population and number of households by urban and rural breakdown by site.

Impaired Site	Urban		Rural	
	Population	Households	Population	Households
CSTL-028	1947	849	572	194
CSTL-001B	2346	1162	800	284
CSTL-003	1237	497	1450	608
RS-02472	0	0	180	85
CSTL-006	520	247	5692	2416

3.2.5 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 FC in untreated domestic wastewater range from 10^4 to 10^6 MPN/100mL (Metcalf and Eddy 1991). As was discussed in Section 3.1.2 twenty SSOs, which may have included leaking sewers, were reported in the upper Salkehatchie River watershed (Appendix B Table B-3).

Illicit sewer connections into storm drains result in direct discharges of sewage via the storm drainage system outfalls. The existence of illicit sewer connections to storm drains is well documented in many urban drainage systems. These sources are not likely to be significant in the upper Salkehatchie basin except at CSTL-001B and CSTL-003 where there are sewer lines and significant urbanization.

3.2.6 Urban Runoff

Similar to regulated MS4s, unregulated MS4 communities located within the upper Salkehatchie watershed may have the potential to contribute FC bacteria to stormwater runoff. If future MS4 stormwater permits are applicable to this watershed, then those discharges will be subject to the assumptions and requirements of the WLA portion of this TMDL.

Urban and suburban stormwater runoff from streets, parking lots and lawns can contribute large bacterial loads to receiving waters (Gaffield, 2003). While not a regulated MS4, the City of Barnwell is the predominant urban area in the Salkehatchie watershed. CSTL-001B and CSTL-003 are located just downstream of Barnwell (Figure 1). Urban runoff from the City of Barnwell may contribute to the impairment of the Salkehatchie River at CSTL-003 and to Turkey Creek (CSTL-001B). The Towns of Williston, Hilda, and Snelling are unlikely to be significant sources of fecal coliform bacteria to the impairment at CSTL-028, because of the distance upstream of the impaired station and their small size. Wells Branch has no urban area in its watershed. The only urban area in the CSTL-006 sub-watershed is Ehrhardt, which has a small population. None of these communities are presently covered by a MS4 permit. 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.

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 Black River 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 is appropriate water quality data. The load-duration curve method uses the cumulative frequency distribution of stream flow and pollutant concentration data to estimate the existing and the TMDL loads for a water body. Development of the load-duration curves for the Salkehatchie River, Turkey Creek, and Wells Branch are described in this chapter.

The load-duration curve method depends on an adequate period of record for flow data. The USGS gauge on the Salkehatchie River (02175500) south of Ehrhardt, SC is the reference gauge for these load-duration curves. This gauge has a more or less continuous period of record since Feb 14, 1951. For these TMDLs the record from 1/1/1995 through 9/30/2010 will be used.

Because the present and past point sources in the Salkehatchie River watershed represent a significant portion of the flow at the gauge, these sources (Appendix B Table B-2) were subtracted from the flow to calculate the reference flow for the upstream stations. The sum of the mean daily flows, reported monthly, was subtracted from each daily observed flow value. The resulting daily flow for the Salkehatchie River at the USGS gauge was multiplied by the ratio of the drainage area for each TMDL station to the drainage area for the USGS gauge as described below. The flows for Turkey Creek at CSTL-001B and for the Salkehatchie River at CSTL-003 were augmented by adding the flows from the appropriate NPDES dischargers (Table 9) to the calculated instream flows. The flow for the load-duration curves for CSTL-028 and RS-02472 were not augmented as there are no dischargers upstream of these sites. The flows from USGS gauge 02175500 were used as is for the CSTL-006 load-duration curve.

Table 9. NPDES dischargers whose flow were added to calculated flow from reference gauge

Stream	TMDL Site	NPDES Discharger	NPDES ID	Dates
Turkey Creek	CSTL-001B	Milliken & Company	SC0003903	1/1/1995 - 1/31/2010
Salkehatchie River	CSTL-003	Milliken & Company	SC0003903	1/1/1995 - 1/31/2010
		City of Barnwell WWTP	SC0025143	1-1-1995 - 3/31/2002
		City of Barnwell WWTP	SC0047872	4/1/2002 - 9/30/2010

The flows calculated for each station were then ranked from low to high and the values that exceed certain selected percentiles (0.05, 0.1, 0.15, etc) determined. The load-duration curves were generated by calculating the load from the observed fecal coliform concentrations, the flow rate that corresponds to the date of sampling, and a conversion factor. Fecal coliform data from 2000 through 2009 were used for Turkey Creek at CSTL-001B and Salkehatchie River at CSTL-028.

Data for 2000 and 2005 were used for the Salkehatchie River at CSTL-003 (There was one sample collected at CSTL-003 in 2009.) and CSTL-006. Fecal coliform data was only available for 2002 for Wells Branch, a "random" monitoring site.

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 calculated mid-point daily flow, the FC 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. That is 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 CSTL-001B is presented in Figure 10 as an example. Load-duration curves for all FC impaired stations are provided in Appendix D. Data used in the calculations, broken down by hydrologic category, are presented in Tables C-1 through C-5 (Appendix C)

For all curves, including Figure 10, the independent variable (X-Axis) represents the percentage of estimated flows greater than value x. The dependent variable (Y-Axis) represents the FC loading at each estimated flow expressed in terms of colony forming units per day (cfu/day). In each of the defined flow intervals for stations CSTL-028, RS-02472, and CSTL-006 existing and target loadings were calculated by the following equations:

Existing Load = Mid-Point Flow in Each Hydrologic Category x 90th Percentile FC Concentration x 10000
Target Load = Mid-Point Flow in Each Hydrologic Category x 380 (WQ criterion minus 5% MOS) x 10000
Percent Reduction = (Existing Load – Target Load) / Existing Load

For the defined flow intervals for stations CSTL-001B, existing and target loadings were calculated using the following equations.

Existing Load = (Mid-Point Flow in Each Hydrologic Category (Daily instream flow + DMR Monthly Average Flow from SC0003093)) x 90th Percentile FC Concentration x 10000
Target Load = (Mid-Point Flow in Each Hydrologic Category (Daily instream flow) x 380 (WQ criterion minus a 5% MOS) x 10000

Percent Reduction = (Existing Load – Target Load) / Existing Load

For the defined flow intervals for stations CSTL-003, existing and target loadings were calculated using the following equations.

Existing Load = (Mid-Point Flow in Each Hydrologic Category + DMR Monthly Average Flow from SC0003093 & SC0025143 (through 3/31/2002) or SC0047872 (after 3/31/2002)) x 90th Percentile FC Conc x 10000
Target Load = (Mid-Point Flow in Each Hydrologic Category + Design Flow for SC0047872) x 380 (WQ criterion minus 5% MOS) x 10000
Percent Reduction = (Existing Load – Target Load) / Existing Load

Note: Flow units are in m^3/day.

Instantaneous loads for each of the impaired stations were calculated as detailed above. Measured FC concentrations from each station for the period indicated above were multiplied by estimated flow (as described above) for each sampling date 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 10; Appendix D). 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. Appendix C).

Existing loads are plotted on the load-duration curves presented in Figure 10, Appendix D Figures D-1 though D-4. 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, excepting the high and low flow categories.

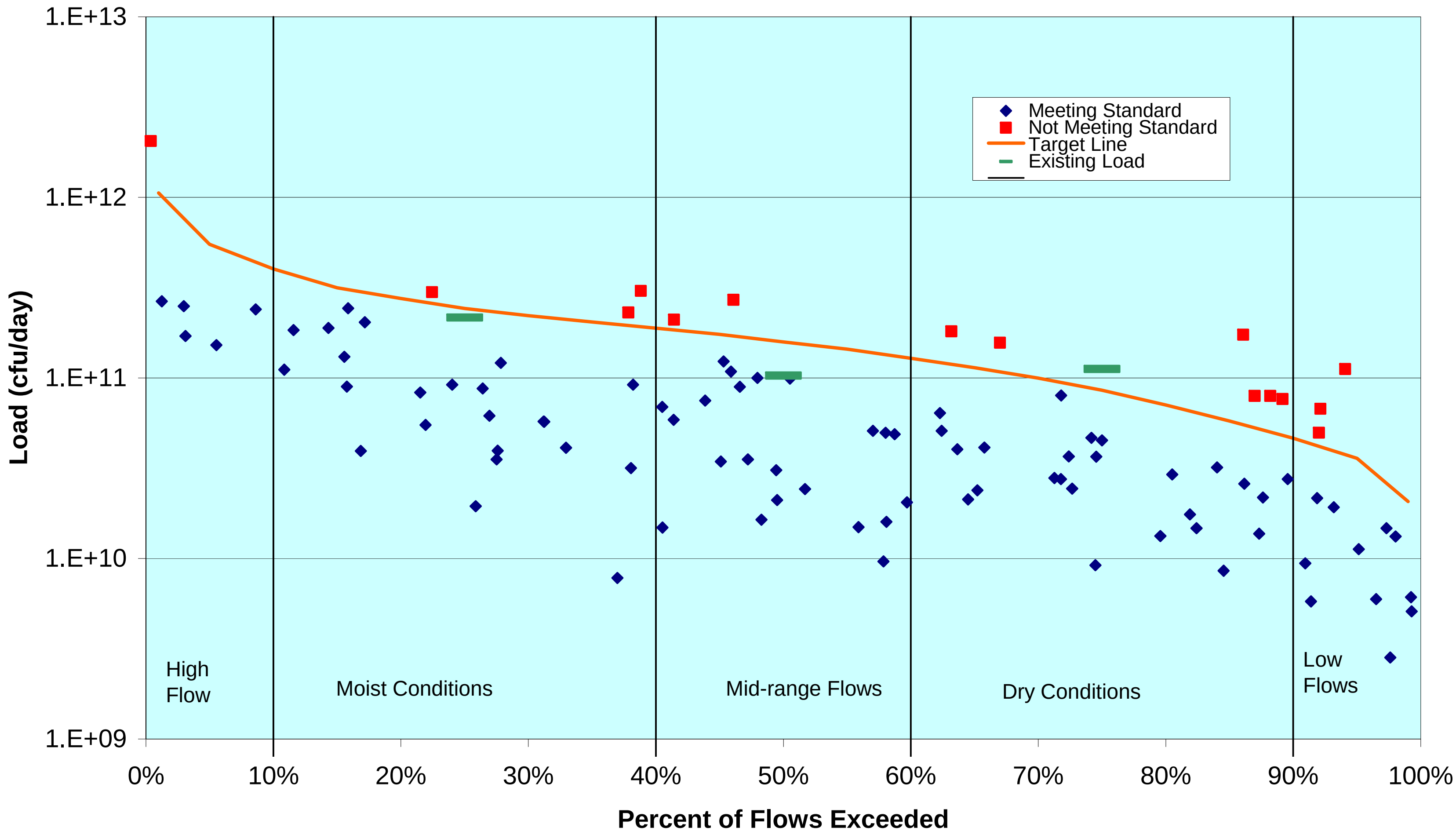

Figure 10. Load-Duration Curve for Turkey Creek at CSTL-001B.

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:

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

The TMDL is the total amount of pollutant that can be assimilated by the receiving water body while still achieving water quality standards. 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 (#), cfu, or organism counts (or resulting concentration), 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 %, which excludes the more extreme low and high flow conditions. The TMDL is determined from the hydrologic category that requires the largest percent reduction in load. The critical flow conditions for all locations are shown below in Table 10. Only the location RS-02472 had moist conditions as its critical condition. However, five of the eleven samples collected at this site were in the low flow range.

Table 10. Critical flow conditions and required percent reductions.

Stations		Waterbody	Moist Conditions	Mid-Range Flows	Dry Conditions
CSTL-001B		Turkey Creek at Clinton Street	NRR	NRR	37%
CSTL-028		Salkehatchie River at SC-64	NRR	17%	NRR
CSTL-003		Salkehatchie River at US-278	NRR	NRR	62%
RS-02472		Wells Branch at SC-300	64%	NRR	NRR
CSTL-006		Salkehatchie River at US-601	NRR	37%	NRR

Highlighted cells indicate critical flow conditions
NRR indicates No Reduction Required; load is below target.

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: urban runoff, cattle-in-streams, leaking sewers, failing septic systems as well as all point sources.

5.3 Wasteload Allocation

The wasteload allocation (WLA) is the portion of the TMDL allocated to NPDES-permitted point sources (US EPA, 1999). The WLA summation is determined by subtracting the margin of safety and the sum of the load allocation from the total maximum daily load. Note that all illicit dischargers, including SSOs, are illegal and not covered under the WLA of this TMDL.

5.3.1 Continuous Point Sources

The continuous point source, the City of Barnwell WWTP (SC0047872), has a WLA of 4.54E+10 cfu/day, based on the daily maximum limit of 400 cfu/100 ml. The Williston and Ehrhardt WWTPs have "no discharge" permits, so that they have no WLA. To determine the waste load allocation (WLA) for the permitted sanitary discharger, the design flow for the facility was multiplied by an allowable permitted maximum concentration of 400 cfu/100mL and a unit conversion factor. The WLA for the discharger, based on a permitted daily maximum of 400 cfu/100 ml, is presented in Table 11.

In addition, any future continuous discharges will be required to meet the prescribed loading for the pollutant of concern based on permitted flow and an allowable permitted maximum concentration of 400 cfu/100mL.

Table 11. Design flow (monthly average) and WLA for continuous dischargers in the upper Salkehatchie River watershed.

Impaired Station	Facility	Permit #	Design Flow (mgd)	WLA (cfu/day)
CSTL-003	City of Barnwell WWTP	SC0047872	3.0	4.54E+10

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" 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. Regulated 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 12 presents the reductions needed in each of the impaired segments. The reduction percentages in this TMDL also apply to the FC waste load attributable to those areas of the watershed which are covered or will be covered under NPDES MS4 permits.

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 non-regulated MS4 has not been clearly defined for the MS4 jurisdictional area. Loading from both types of sources (regulated and non regulated) typically occur in response to rainfall events, and discharge volumes as well as reoccurrence intervals are largely unknown. Therefore, the regulated MS4 is assigned the same percent reduction as the non-regulated sources in the watershed. The regulated MS4 entity is only responsible for implementing the TMDL WLA in accordance with MS4 permit requirements.

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. 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 authority or enforcement powers. SCDOT does not regulate land use or zoning, issue building or development permits.

Table 12. Percent reductions necessary to achieve target loads.

Stations	Waterbody	Percent Reduction
CSTL-001B	Turkey Creek at Clinton Street	37%
CSTL-028	Salkehatchie River at SC-64	17%
CSTL-003	Salkehatchie River at US-278	62%
RS-02472	Wells Branch at SC-300	64%
CSTL-006	Salkehatchie River at US-601	37%

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 and Table 13.

There are unregulated MS4s located in the watershed that are subject to the LA component of this TMDL. At such time that the unregulated entities become regulated NPDES MS4 entities and subject to applicable provisions of SC Regulations 61-68D, 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 16-year hydrological data set and 10-year water quality sampling data set, which includes data collected from all seasons.

5.6 Margin of Safety

The margin of safety (MOS) for these TMDLS is explicit. The explicit margin of safety is 5 % of the TMDL or 20 cfu/100mL calculated as the difference between the instantaneous criterion of 400 cfu/100 ml and the target load which is calculated from 95% of the standard. 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 13.

5.7 Total Maximum Daily Load

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 upper Salkehatchie River watershed are provided in Table 13.
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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 FC 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 13 indicates the percentage reduction or water quality standard for each impaired station of the Upper Salkehatchie Watershed TMDLs. 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.

Table 13. TMDL components for the Salkehatchie River, Turkey Creek, and Wells Branch.

Station	Existing Load	TMDL	Margin of Safety	Wasteload Allocation (WLA)			Load Allocation (LA)	
				Contin-uous Sources[1]	Non-Continuous Sources[2,5]	Non-Continuous SCDOT Sources [2, 5]	LA	Reduction to Meet LA[5]
	(cfu/day)	(cfu/day)	(cfu/day)	(cfu/day)	(% Reduction)		(cfu/day)	(% Reduction)
CSTL-001B	1.37E+11	8.44E+10	4.22E+09	See note below	42%	42% [4]	8.01E+10	42%
CSTL-028	3.99E+11	3.48E+11	1.74E+10	See note below	17%	0% [3]	3.31E+11	17%
CSTL-003	1.17E+12	4.66E+11	2.33E+10	4.54E+10	66%	66% [4]	3.97E+11	66%
RS-02472	2.71E+11	1.04E+11	5.22E+09	See note below	63%	0% [3]	9.92E+10	63%
CSTL-006	2.88E+12	1.92E+12	9.59E+10	See note below	37%	0% [3]	1.82E+12	37%

Table Notes:

1. WLAs are expressed as a daily maximum. 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 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. As long as the conditions within the SCDOT MS4 area remain the same the Department deems the contributions from SCDOT negligible and no reduction of FC bacteria is necessary. SCDOT must continue to comply with the provisions of its approved NPDES stormwater 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.
5. Percent reduction applies to existing instream load.

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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 the upper Salkehatchie River, Turkey Creek, and Wells Branch in order for these streams 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 6.1.1-6.2.6 presented below correspond with sections 3.1.1-3.2.6 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 the upper Salkehatchie River 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 or 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 upper Salkehatchie River 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 upper Salkehatchie River Watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL target accordingly.

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.

6.1 Point Sources

6.1.1 Continuous Point Sources

Continuous point source WLA reductions will be implemented through NPDES permits. As noted in Chapter 3.1.1 there is one domestic WWTP permitted to discharge fecal coliform bacteria into the Salkehatchie River. 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) are 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.

For SCDOT, existing and future NPDES MS4 permittees, compliance with terms and conditions of its NPDES permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP) and demonstrates consistency with the assumptions and requirements of the TMDL. For existing and future NPDES construction and Industrial stormwater permittees, compliance with terms and conditions of its permit is effective implementation of the WLA.

The Department acknowledges that progress with the assumptions and requirements of the TMDL by MS4s is expected to take one or more permit iteration. Progress towards 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 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.

6.2 Nonpoint Sources

6.2.1 Wildlife

Suggested forms of implementation for wildlife will vary widely due to geographic location and species. 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).

6.2.2 Agricultural Activities

Approximately one fourth of the land use in the upper Salkehatchie River 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 is deposited on the land or other surface open to rain, is washed off, and is then transported to nearby receiving waters. Also pollutants may be deposited directly in surface waters by livestock or wildlife. Therefore, for BMPs to be effective the transport mechanism of the pollutant, fecal coliform, needs to be identified.

At the time this TMDL document was developed there were two animal feeding operations (AFO) in the TMDL watersheds. These two AFOs and a third located outside of the watersheds were permitted to apply poultry litter to more than 950 acres of fields located in the upper Salkehatchie River (CSTL-028) and Turkey Creek (CSTL-001B) watersheds. 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 cfu/100 mL 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/

6.2.3 Land Application of Industrial, Domestic Sludge, or Treated Wastewater

There are no implementation recommendations for these sources at this time.

6.2.4 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 drain field, this could clog and strain the system to the point where a new drain field 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 drain field. 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 drain field or compact the soil in any way.
- Don't dig in your drain field 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 drain field except grass. Roots from nearby trees an 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

6.2.5 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 water quality in the upper Salkehatchie River watershed within and downstream of the City of Barnwell. Detection methods may include, but are not limited to: dye testing, air pressure testing, static pressure testing, and infrared photography.

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.

6.2.6 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 dooleys’ and pooch patches. Doggy dooleys 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 most of the upper Salkehatchie River 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.

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

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

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

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- Animal Feeding Operations Virtual Information Center. USEPA website: http://cfpub.epa.gov/npdes/afo/virtualcenter.cfm

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/

- 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

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- 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.nasda-hq.org/nasda/nasda/Foundation/state/states.htm

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APPENDIX A Fecal Coliform Data

Table A-1 Fecal coliform data for Turkey Crk, Wells Branch, and Salkehatchie River.

Station CSTL-001B		
Date		FC (cfu/ 100mL)
5/5/99		68
6/7/99		95
7/8/99		170
8/2/99		140
9/1/99		130
10/5/99		240
11/3/99		200
12/9/99		220
1/6/00		240
2/3/00		220
3/7/00		120
4/6/00		140
5/15/00		120
6/13/00		190
7/26/00		130
8/7/00		160
9/5/00	>	600
10/2/00		160
11/1/00		180
12/12/00		120
1/9/01		140
2/5/01		62
3/7/01		210
4/4/01		50
7/23/01		86
8/20/01		110
9/5/01		230
10/23/01		55
11/27/01		70
12/11/01		140
1/15/02		140
2/5/02		140
3/6/02		100
4/11/02		320
5/6/02		600
6/3/02		120
7/10/02		80

Station CSTL-001B		
Date		FC (cfu/ 100mL)
8/7/02		100
9/11/02		38
10/8/02		180
12/17/02		75
1/16/03		160
2/4/03		80
3/18/03		520
4/15/03		90
5/21/03		160
6/10/03		110
7/16/03		190
8/12/03		100
9/4/03		440
10/14/03		450
11/25/03		100
12/11/03		80
1/8/04		15
2/18/04		130
3/10/04		260
4/14/04	>	600
5/17/04		45
6/21/04		80
7/8/04		100
8/26/04		40
9/22/04		550
10/7/04		140
11/3/04		110
1/13/05		40
2/9/05		74
3/14/05		38
4/12/05		58
5/25/05		60
6/20/05		200
7/12/05		430
8/18/05		580
9/13/05		190
10/5/05		50

Station CSTL-001B		
Date		FC (cfu/ 100mL)
11/9/05		70
12/12/05		100
1/24/06		65
2/28/06		300
3/22/06	>	600
4/11/06		73
5/25/06		100
6/21/06		270
7/12/06	>	600
8/23/06	>	1200
9/21/06		200
10/24/06		150
11/6/06		200
12/5/06		60
1/11/07		31
2/13/07		200
3/13/07		240
4/24/07		200
5/22/07		220
6/18/07		140
7/18/07		160
8/23/07		190
10/22/07		71
11/6/07		440
12/10/07		100
1/13/09		50
2/10/09		27
3/18/09		180
4/21/09		30
5/5/09		200
6/23/09		160
7/7/09		570
8/12/09		1100
10/21/09		110
12/8/09		110

Station CSTL-003		
Date		FC (cfu/ 100mL)
1/25/99	>	600
2/24/99		180
3/24/99		80
4/7/99		50
5/5/99		180
6/7/99		50
7/8/99		300
8/2/99		95
9/1/99		92
10/5/99		410
11/3/99		210
12/9/99		120
1/6/00		240
2/3/00		270
3/7/00		50
4/6/00		44
5/15/00		180
6/13/00		480
7/26/00		110
8/7/00		980
9/5/00		540
10/2/00		220
12/12/00		200
1/13/05		120
2/9/05		140
3/14/05		140
4/12/05		100
5/25/05		87
6/20/05		120
7/12/05	>	600
8/18/05	>	1200
9/13/05		50
10/5/05		140
11/9/05		120
12/12/05		75
7/7/09		60

Station CSTL-028		
Date		FC (cfu/ 100mL)
1/25/99	>	600
2/24/99		420
3/24/99		80
4/7/99		64
5/5/99		56
6/7/99		42
7/8/99	>	300
8/2/99		150
9/1/99		80
10/5/99		270
11/3/99		240
12/9/99		140
1/6/00		370
2/3/00		110
3/7/00		40
4/6/00		48
5/15/00		70
6/13/00		20
7/26/00		92
8/7/00		60
9/5/00		160
10/2/00		95
11/1/00		180
12/12/00		85
1/9/01		300
2/5/01		110
3/7/01		160
4/4/01		140
7/23/01		50
8/20/01	>	300
9/5/01		220
10/23/01		45
11/27/01		160
12/11/01		480
1/15/02		530
2/5/02		280
3/6/02		280

Station CSTL-028		
Date		FC (cfu/ 100mL)
9/11/02		92
10/8/02		120
11/5/02		110
12/17/02		100
1/16/03		200
2/4/03		230
3/18/03		570
4/15/03		70
5/21/03		360
6/10/03		410
7/16/03		180
8/12/03		120
9/4/03	>	2000
10/14/03		160
11/25/03		200
12/11/03		390
1/8/04		90
2/18/04		95
3/10/04		120
4/14/04		190
5/17/04		180
6/21/04		70
7/8/04		36
8/26/04		200
9/22/04		190
10/7/04		65
11/3/04		50
1/13/05		140
2/9/05		180
3/14/05		120
4/12/05		87
5/25/05		46
6/20/05		58
7/12/05		120
8/18/05		67
9/13/05		73
10/5/05		110
11/9/05		120
1/24/06		93
2/28/06		210
3/22/06	>	600

Station CSTL-028		
Date		FC (cfu/ 100mL)
4/11/06		160
5/25/06		140
6/21/06		110
7/12/06		40
8/23/06	>	600
9/21/06		180
10/24/06		600
11/6/06		145
12/5/06		80
1/11/07		120
2/13/07		200
3/13/07		200
4/24/07		210
5/22/07		230
6/18/07		210
7/18/07		180
8/23/07		200
10/22/07		66
11/6/07		200
12/10/07		160
1/24/08		120
2/7/08		680
3/20/08		1400
4/22/08		120
5/7/08		60
6/10/08		90
7/22/08		890
9/30/08		100
10/21/08		180
11/12/08		180
12/10/08		40
1/13/09		77
2/10/09		65
3/18/09		210
4/21/09		33
5/5/09		510
6/23/09		60
7/7/09		1000
8/12/09		3100
10/21/09		160
12/8/09		120

Station RS-02472		
Date		FC (cfu/ 100mL)
2/14/02		1100
3/7/02		800
4/17/02		440
5/16/02		560
6/5/02	>	600
7/15/02		260
8/22/02		280
9/11/02		260
10/8/02		330
11/5/02		400
12/17/02		160

Station CSTL-006		
Date		FC (cfu/ 100mL)
1/7/1999		180
2/24/1999		160
3/10/1999		260
4/5/1999		80
7/15/1999		590
8/5/1999		96
9/1/1999		110
10/20/1999		180
11/30/1999		190
12/14/1999		600
1/5/2000		68
3/28/2000		64
4/6/2000		40
5/23/2000		30
6/8/2000		60
7/27/2000		130
8/22/2000		80
9/26/2000		420
10/24/2000		140
11/27/2000		160
12/28/2000		110
1/5/2005		100
2/10/2005		120
3/16/2005	>	600
4/6/2005		170
5/24/2005		300
6/14/2005		230
7/6/2005		240
8/4/2005	>	600
9/1/2005		140
10/5/2005		120
11/22/2005	>	600
12/15/2005		120

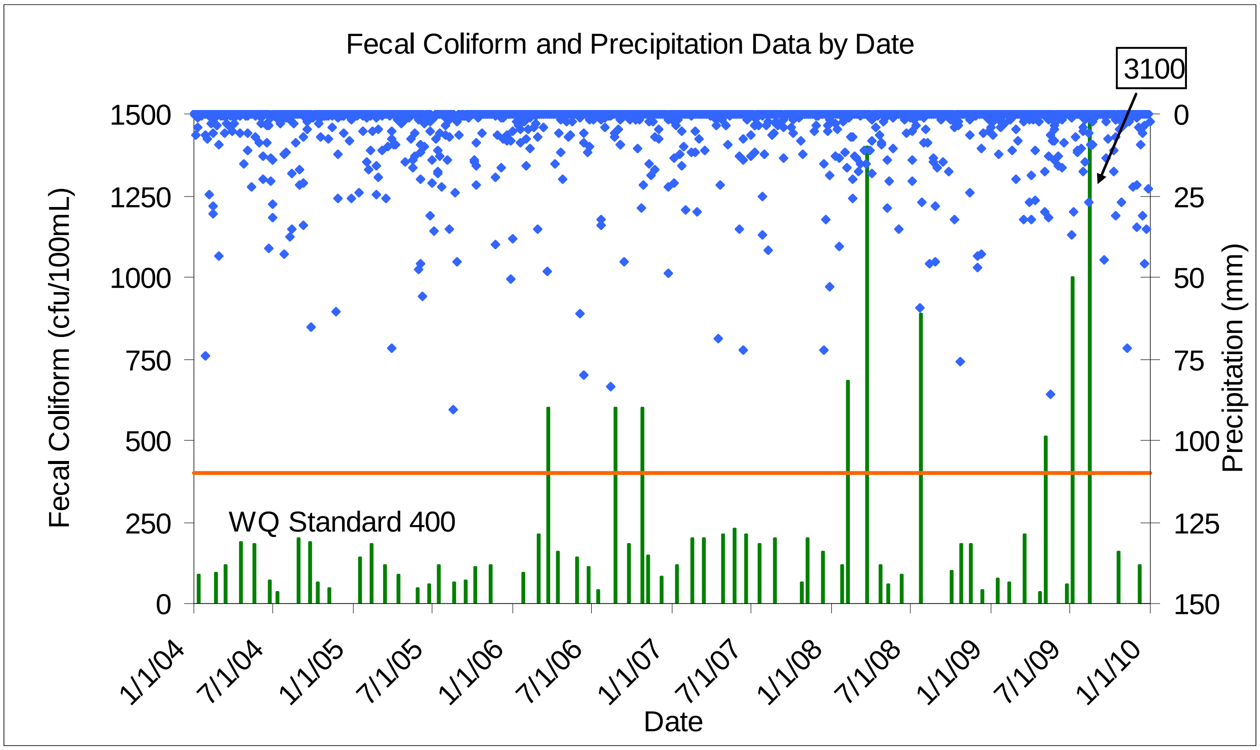

Figure A-1 Precipitation-fecal coliform bacteria plot for CSTL-028.

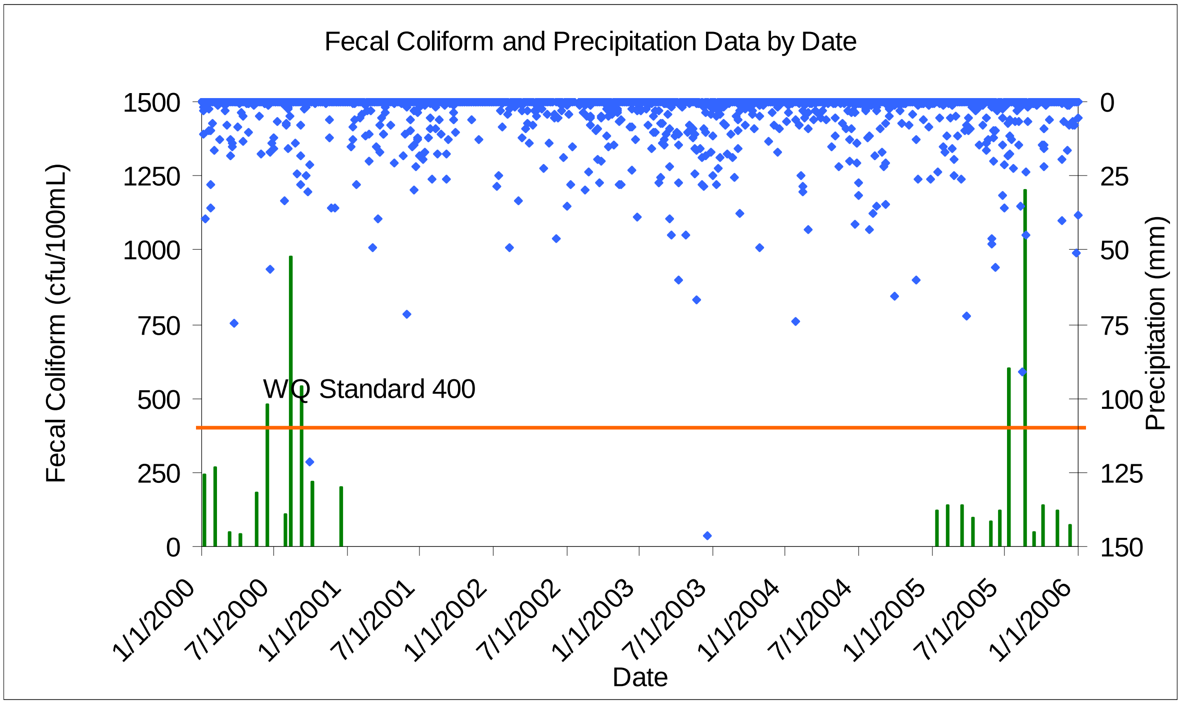

Figure A-2 Precipitation-fecal coliform bacteria plot for CSTL-003.

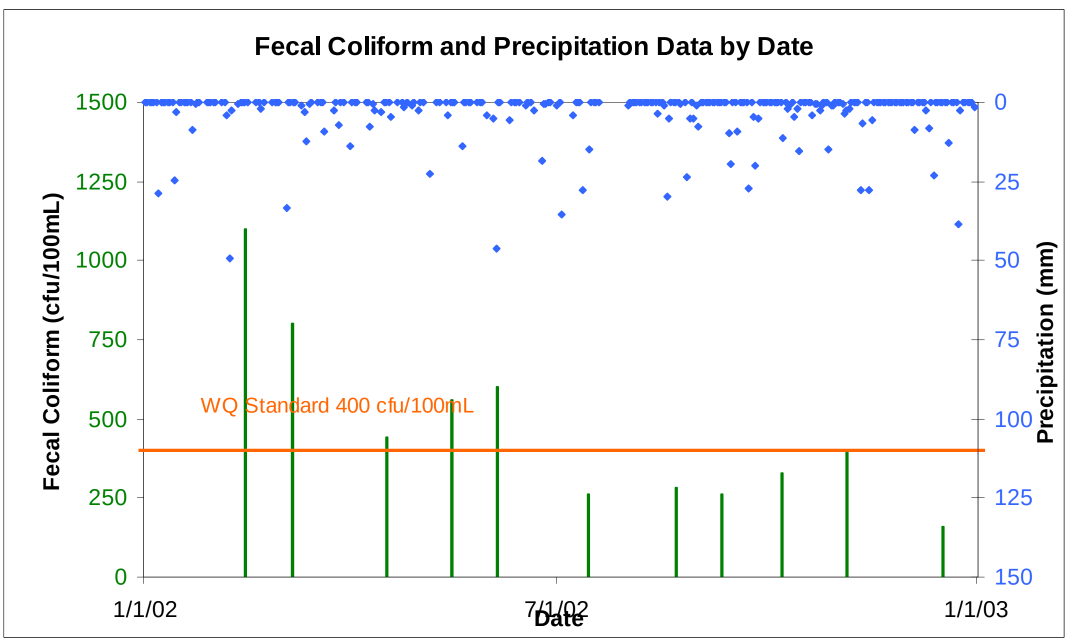

Figure A-3 Precipitation-fecal coliform bacteria plot for RS-02472.

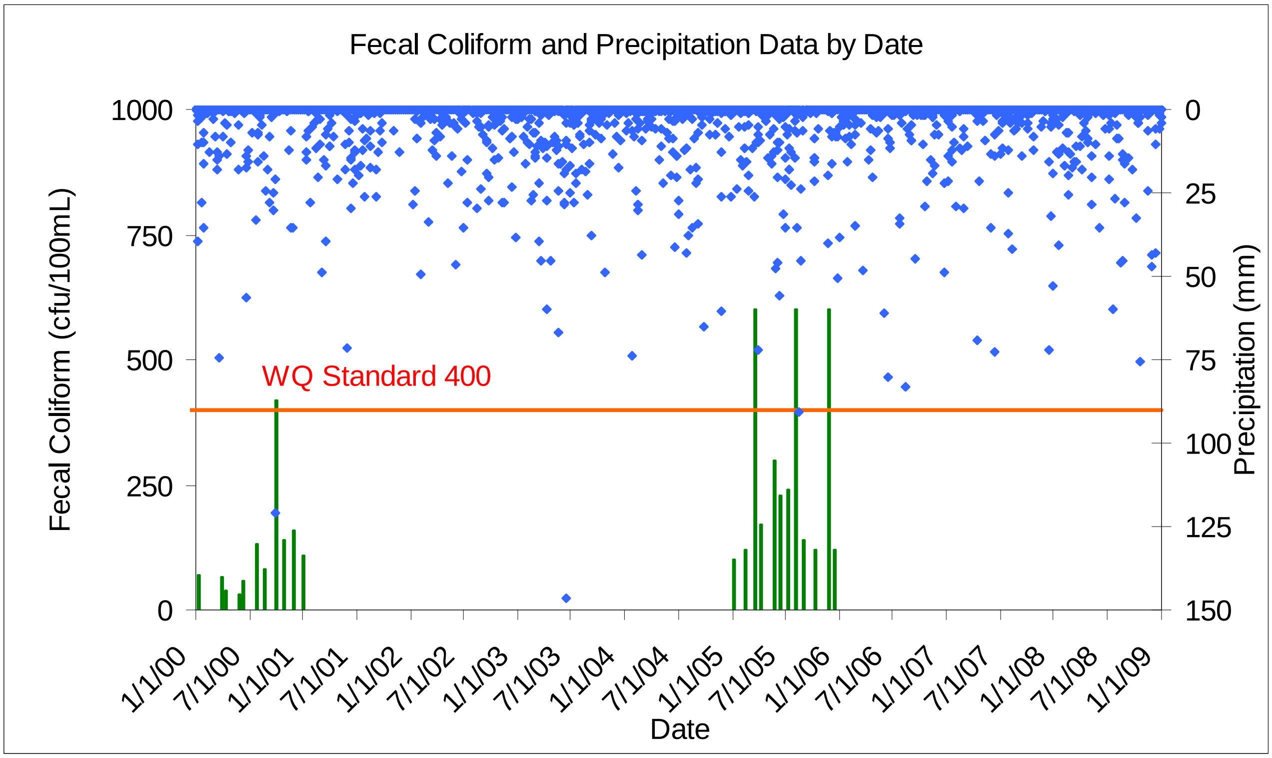

Figure A-4 Precipitation-fecal coliform bacteria plot for CSTL-006.

APPENDIX B Data from Continuous Point Sources

Table B-1. DMR Data for City of Barnwell WWTF SC0047872.

Date	Fecal Coliform Bacteria (cfu/100 mL)	
	Mon Mean	Daily Max
4/30/2002	10	59
5/31/2002	2	3
6/30/2002	1	3
7/31/2002	4	25
8/31/2002	5	15
9/30/2002	5	24
10/31/2002	6	17
11/30/2002	8	75
12/31/2002	2.5	38
1/31/2003	1	1
2/28/2003	1	3
3/31/2003	2	5
4/30/2003	3	8
5/31/2003	2	5
6/30/2003	5	18
7/31/2003	3	9
8/31/2003	21	140
9/30/2003	8	43
10/31/2003	14	21
11/30/2003	17	100
12/31/2003	2	19
1/31/2004	2	18
2/29/2004	14	43
3/31/2004	6.6	46
4/30/2004	6	2
5/31/2004	1	1
6/30/2004	3.4	16
7/31/2004	7	42
8/31/2004	8	6.3
9/30/2004	7.1	13
10/31/2004	20	52
11/30/2004	16	22
12/31/2004	11	103
1/31/2005	8	10

Date	Fecal Coliform Bacteria (cfu/100 mL	
	Mon Mean	Daily Max
2/28/2005	10	13
3/31/2005	2	9
4/30/2005	12	19
5/31/2005	2	9
6/30/2005	14	94
7/31/2005	5	9
8/31/2005	4	19
9/30/2005	10.5	14
10/31/2005	3	9
11/30/2005	5	15
12/31/2005	4	5
1/31/2006	6	45
2/28/2006	6	20
3/31/2006	3	13
4/30/2006	1	4
5/31/2006	5	38
6/30/2006	4	17
7/31/2006	12	38
8/31/2006	2	68
9/30/2006	9	47
10/31/2006	17	76
11/30/2006	8	49
12/31/2006	3.9	59
1/31/2007	3	53
2/28/2007	2	7
3/31/2007	3	34
4/30/2007	5	15
5/31/2007	5	35
6/30/2007	28	39
7/31/2007	8	27
8/31/2007	9	17
9/30/2007	5	11
10/31/2007	1	4
11/30/2007	1	2
12/31/07	2	28
01/31/08	3	22
02/29/08	2	15

Date	Fecal Coliform Bacteria (cfu/100 mL	
	Mon Mean	Daily Max
03/31/08	4	27
04/30/08	2	9
05/31/08	9	58
06/30/08	11	40
07/31/08	18	170
08/31/08	2	8
09/30/08	2	19
10/31/08	4	46
11/30/08	2	24
12/31/08	5	18
01/31/09	2	17
02/28/09	1	1
03/31/09	4	14
04/30/09	2	17
05/31/09	17	32
06/30/09	8	21
07/31/09	17	105
08/31/09	5	159
09/30/09	20	29
10/31/09	8	23
11/30/09	4	27
12/31/09	16	47
01/31/10	12	44
02/28/10	2	17
03/31/10	18	160
04/30/10	6	32
05/31/10	4	14
06/30/10	3	9
07/31/10	4	20
08/31/10	11	40
09/30/10	14	144
10/31/10	28	100
11/30/10	37	65
12/31/10	4	24

Table B-2. Flow Data for NPDES permitted dischargers, from DMRs.

	SC0025143	SC0047872	SC0003093	SC0042099	SC0004073
Date	Flow (mgd)				
1/31/1995	1.007		0.615	0.04	0.002
2/28/1995	1.05		0.614	0.0294	0.003
3/31/1995	0.8212		0.534	0.0263	0.006
4/30/1995	0.589		0.528	0.0192	0.003
5/31/1995	0.658		0.58	0.03	0.003
6/30/1995	0.688		0.709	0.24	0.0033
7/31/1995	0.654		0.604	0.012	0.0044
8/31/1995	0.887		0.628	0.21	0.0033
9/30/1995	0.772		0.608	0.025	0.003
10/31/1995	0.733		0.583	0.018	0.003
11/30/1995	0.708		0.55	0.023	0.003
12/31/1995	0.733		0.575	0.025	0.0033
1/31/1996	0.756		0.501	0.023	0.0033
2/29/1996	0.843		0.569	0.019	0.003
3/31/1996	0.951		0.6	0.007	0.0044
4/30/1996	0.91		0.543	0.02	0.003
5/31/1996	0.797		0.527	0.0108	0.003
6/30/1996	0.802		0.502	0.0163	0.0033
7/31/1996	0.773		0.465	0.0229	0.0033
8/31/1996	0.716		0.412	0.0369	0.0033
9/30/1996	0.681		0.364	0.0357	0.0033
10/31/1996	0.7		0.383	0.0368	0.0033
11/30/1996	0.645		0.352	0.0539	0.0033
12/31/1996	0.596		0.374	0.06	0.0033
1/31/1997	0.759		0.404	0.0515	0.0033
2/28/1997	0.978		0.445	0.0608	0.0033
3/31/1997	1		0.407	0.0673	0.0033
4/30/1997	0.924		0.418	0.0658	0.0033
5/31/1997	0.982		0.453	0.0585	0.0033
6/30/1997	1.048		0.466	0.0429	0.0033
7/31/1997	1.028		0.423	0.038	0.0044
8/31/1997	0.925		0.386	0.0326	0.0057
9/30/1997	0.9		0.429	0.0307	0.0033
10/31/1997	0.934		0.493	0.0198	0.0044
11/30/1997	0.897		0.462	0.0176	0.0057
12/31/1997	1.094		0.368	0.0164	0.0033
1/31/1998	1.685		0.403	0.0332	0.0044
2/28/1998	2.182		0.499	0.0239	0.0033
3/31/1998	2.07		0.459	0.0312	0.0033
4/30/1998	1.905		0.363	0.0279	0.0033

	SC0025143	SC0047872	SC0003093	SC0042099	SC0004073
Date	Flow (mgd)				
5/31/1998	1.488		0.311	0.0299	0.0033
6/30/1998	0.995		0.372	0.0213	0.0033
7/31/1998	0.88		0.355	0.0158	0.0033
8/31/1998	0.811		0.332	0.0176	0.0041
9/30/1998	0.947		0.563	0.0186	0.0026
10/31/1998	0.827		0.494	0.0215	0.0023
11/30/1998	0.757		0.443	0.0366	0.0063
12/31/1998	0.697		0.416	0.0376	0.0048
1/31/1999	0.917		0.438	0.0411	0.0045
2/28/1999	1.098		0.416	0.0456	0.005
3/31/1999	1.052		0.43	0.043	0.0048
4/30/1999	1.154		0.453	0.042	0.003
5/31/1999	1.102		0.381	0.0323	0.0031
6/30/1999	1.077		0.434	0.0277	0.003
7/31/1999	1.032		0.406	0.0266	0.003
8/31/1999	0.948		0.489	0.0275	0.003
9/30/1999	0.868		0.462	0.0262	0.003
10/31/1999	0.867		0.451	0.0331	0.003
11/30/1999	0.864		0.432	0.036	0.0044
12/31/1999	0.618		0.422	0.0269	0.0044
1/31/2000	0.665		0.447	0.0219	0.003
2/29/2000	0.717		0.457	0.022	0.0033
3/31/2000	0.847		0.498	0.0469	0.003
4/30/2000	1.008		0.406	0.0475	0.003291
5/31/2000	0.962		0.43	0.03	0.0033
6/30/2000	0.903		0.438	0.026	0.003
7/31/2000	0.908		0.428		0.003
8/31/2000	1.03		0.436	0.0225	0.003
9/30/2000	1.216		0.589	0.028	0.003
10/31/2000	1.022		0.473	0.029	0.003
11/30/2000	0.998		0.46	0.0172	0.003
12/31/2000	0.933		0.422	0.02	0.003
1/31/2001	0.907		0.375	0.02	0.003
2/28/2001	0.958		0.384	0.0235	0.003291
3/31/2001	1.334		0.48	0.033	0.003
4/30/2001	1.046		0.528	0.036	0.0033
5/31/2001	1.016		0.545	0.037	0.003
6/30/2001	1.091		0.495	0.0126	0.003
7/31/2001	0.998		0.407	0.016	0.003
8/31/2001	1.045		0.412	0.0183	0.003
9/30/2001	1.02		0.395	0.01538	0.003
10/31/2001	1.044		0.327	0.00921	0.003
11/30/2001	0.93		0.268	0.01219	0.003

	SC0025143	SC0047872	SC0003093	SC0042099	SC0004073
Date	**Flow (mgd)**				
12/31/2001	0.841		0.252	0.0135	0.003
1/31/2002	0.946		0.521	0.0157	0.003
2/28/2002	1.055		0.347	0.017	0.003
3/31/2002	0.999		0.498	0.0295	0.003
4/30/2002		0.723	0.298	0.0314	0.003
5/31/2002		0.623	0.336	0.0413	0.003
6/30/2002		0.78	0.38	0.2647	0.003
7/31/2002		0.889	0.337	0.017	0.003
8/31/2002		0.859	0.424	0.0222	0.003
9/30/2002		0.996	0.464	0.0164	0.003
10/31/2002		0.998	0.507	0.00939	0.003
11/30/2002		1.172	0.477	0.0128	0.003
12/31/2002		0.653	0.285	0.013	0.003
1/31/2003		0.729	0.377	0.11	0.003
2/28/2003		1.023	0.361	0.01	0.003
3/31/2003		2.623	0.413	0.0085	0.003
4/30/2003		2.234	0.409	0.0069	0.0033
5/31/2003		1.5	0.442	0.00482	0.003
6/30/2003		1.982	0.432	0.0417	0.003
7/31/2003		1.415	0.371	0.035	0.003
8/31/2003		1.265	0.376	0.0351	0.003
9/30/2003		0.995	0.45	0.035	0.003
10/31/2003		0.889	0.401	0.035	0.003
11/30/2003		0.877	0.387	0.0048	0.003
12/31/2003		0.916	0.284	0.0102	0.003
1/31/2004		0.978	0.251	0.0121	0.003
2/29/2004		1.141	0.451	0.013	0.003
3/31/2004		0.973	0.464	0.013	0.003
4/30/2004		0.781	0.443	0.005	0.0033
5/31/2004		0.78	0.479	0.006	0.0033
6/30/2004		0.844	0.509	0.013	0.0033
7/31/2004		0.814	0.481	0.0139	0.0033
8/31/2004		0.951	0.499	0.0203	0.0033
9/30/2004		0.921	0.551	0.02	0.0033
10/31/2004		0.839	0.504	0.0229	0.0033
11/30/2004		0.821	0.49	0.018	0.0033
12/31/2004		0.778	0.389	0.0173	0.0033
1/31/2005		0.878	0.432	0.016	0.0033
2/28/2005		0.911	0.518	0.03	0.0033
3/31/2005		1.016	0.48	0.026	0.0033
4/30/2005		0.93	0.441	0.02014	0.0033
5/31/2005		1.044	0.467	0.018	0.0033
6/30/2005		1.308	0.516	0.012	0.0033

	SC0025143	SC0047872	SC0003093	SC0042099	SC0004073
Date	Flow (mgd)				
7/31/2005		1.318	0.478	0.015	0.0033
8/31/2005		1.27	0.542	0.0086	0.0033
9/30/2005		1.147	0.427	0.0104	0.0033
10/31/2005		1.23	0.37		
11/30/2005		1.218	0.334		
12/31/2005		1.228	0.311		
1/31/2006		1.368	0.451		
2/28/2006		1.299	0.436		
3/31/2006		1.215	0.453		
4/30/2006		1.035	0.492		
5/31/2006		1.047	0.44		
6/30/2006		1.102	0.4		
7/31/2006		1.149	0.331		
8/31/2006		0.993	0.295		
9/30/2006		1.004	0.253		
10/31/2006		0.923	0.219		
11/30/2006		0.863	0.249		
12/31/2006		0.883	0.249		
1/31/2007		1.074	0.316		
2/28/2007		1.231	0.337		
3/31/2007		1.198	0.421		
4/30/2007		1.124	0.425		
5/31/2007		1.081	0.389		
6/30/2007		1.092	0.449		
7/31/2007		1.022	0.462		
8/31/2007		1.203	0.448		
9/30/2007		1.085	0.396		
10/31/2007		1.064	0.325		
11/30/2007		1.078	0.28		
12/31/2007		1.118	0.305		
1/31/2008		1.277	0.254		
2/29/2008		1.276	0.337		
3/31/2008		1.219	0.397		
4/30/2008		1.091	0.307		
5/31/2008		1.027	0.373		
6/30/2008		1.091	0.299		
7/31/2008		1.139	0.295		
8/31/2008		1.106	0.327		
9/30/2008		0.959	0.241		
10/31/2008		1.052	0.266		

	SC0025143	SC0047872	SC0003093	SC0042099	SC0004073
Date	Flow (mgd)				
11/30/2008		1.065	0.142		
12/31/2008		1.167	0.156		
1/31/2009		1.159	0.176		
2/28/2009		1.114	0.148		
3/31/2009		1.079	0.248		
4/30/2009		1.144	0.214		
5/31/2009		1.212	0.216		
6/30/2009		0.694	0.177		
7/31/2009		0.623	0.175		
8/31/2009		0.612	0.154		
9/30/2009		0.604	0.187		
10/31/2009		0.63	0.155		
11/30/2009		0.706	0.084		
12/31/2009		1.128	0.081		
1/31/2010		1.311	0.021		
2/28/2010		1.253	0		
3/31/2010		0.92	0		
4/30/2010		0.664	0		
5/31/2010		0.617	0		
6/30/2010		0.569	0		
7/31/2010		0.573	0		
8/31/2010		0.645	0		
9/30/2010		0.629	0		

Table B-3 . Reported Sanitary Sewer Overflows for Bamberg and Barnwell Counties that are in upper Salkehatchie River watershed. NR indicates not reported.

Observed Date	Amount Reported (gal)	Cause	Reached Surface Water	Waterbody
Barnwell, City of: SC0025143				
9/24/1998	600	Blockage	Yes	NR
1/31/2000	500	Blockage	Yes	NR
3/20/2000	> 500	NR	Yes	NR
6/22/2001	600	Pump Failure	No	NR
10/16/2001	0	Blockage	No	NR
Barnwell, City of: SC0047872				
6/12/2002	44,880	Blockage	No	NR
7/1/2005	Few	NR	Yes	NR
9/1/2006	150	Blockage	NR	NR
9/29/2008	2,100	Blockage	Yes	Lake Edgar Brown
4/6/2009	528	Blockage	Yes	Lake Edgar Brown
6/28/2009	1,000	Power failure	Yes *	Turkey Creek
9/14/2009	1,120	Blockage	Yes *	Ditch
12/28/2009	1,200	Hole	Yes	Turkey Creek at DNR fish hatchery
3/7/2011	40	Blockage	No	NR
3/24/2011	47,880	Blockage	Yes	Turkey Creek swamp
Hanesbrands: SS0211001				
10/22/2002	500	Blockage in storm sewer	Yes	NR
Williston, Town of: ND0063061				
2/6/1998		Pump Failure	NR	NR
1/31/2002	5000	Pump failure	No	NR
4/10/2003	500	Heavy Rainfall	Yes	NR
4/21/2003	NR	Stormwater issue.	NR	NR
6/30/2004	NR	Spray field	Yes	NR
3/4/2005	0	Blockage	No	NR
3/21/2005	0	Blockage	No	NR
4/20/2005	0	Blockage	Yes	Folk Pond
10/25/2007	1000	Blockage	Yes	UT to Rosemary Creek

* - Other information reported seems to contradict information that spill reached surface water.

APPENDIX C Calculation of Existing and TMDL Loads

Table C-1. Calculation of existing loads, target loads, and percent reductions for CSTL-001B Turkey Creek.

Calculation of the Existing Load and Target Load by Hydrologic Range

Existing Load calculated as: 90th percentile Fecal Coliform Concentration *x* mid-point Augmented Flow

Target Load calculated as: 380 (Standard - MOS) *x* mid-point instream flow

CSTL-001B: Turkey Creek

Date	FC (cfu/ 100ml)	Rank of Flows	Percen-tile of Flows	Augmented Mid-point Flow * (m^3/day)	Instream Mid-point Flow * (m^3/day)	90th Percen-tile FC Conc	Existing Load (cfu/day)	Target Load **	Per-cent Reduc-tion
High Flows				1.47E+05		365	5.38E+11	5.43E+11	-1.0%
3/18/2003	520	22	0.4%						
8/12/2003	100	72	1.3%						
2/18/2004	130	173	3.0%						
4/15/2003	90	177	3.1%						
6/10/2003	110	322	5.6%						
3/7/2001	210	507	8.8%						
Moist Conditions (Midpoint: 25%)				6.60E+04		356	2.35E+11	2.37E+11	-0.6%
8/20/2001	110	622	10.8%						
7/16/2003	190	668	11.6%						
2/3/2000	220	823	14.3%						
12/8/2009	110	853	14.8%						
5/21/2003	160	896	15.6%						
2/28/2006	300	911	15.8%						
4/4/2001	50	989	17.2%						
3/10/2004	260	991	17.2%						
12/11/2003	80	1234	21.5%						
12/12/2000	120	1250	21.7%						
9/4/2003	440	1289	22.4%						
1/15/2002	140	1413	24.6%						
1/11/2007	31	1465	25.5%						
6/18/2007	140	1535	26.7%						
3/6/2002	100	1589	27.6%						
4/12/2005	58	1607	27.9%						
1/24/2006	65	1618	28.1%						
4/24/2007	200	1621	28.2%						
12/12/2005	100	1749	30.4%						
11/25/2003	100	1794	31.2%						

2/9/2005	74	1965	34.2%						
1/8/2004	15	2069	36.0%						
3/18/2009	180	2122	36.9%						
2/5/2001	62	2187	38.0%						
10/14/2003	450	2193	38.1%						
4/21/2009	30	2222	38.6%						
4/14/2004	600	2266	39.4%						
Mid-Range Flows (Midpoint: 50%)				4.29E+04	4.02E+04	267	1.14E+11	1.53E+11	-33.4%
1/9/2001	140	2320	40.3%						
7/12/2005	430	2433	42.3%						
3/7/2000	120	2441	42.4%						
12/17/2002	75	2537	44.1%						
10/2/2000	160	2570	44.7%						
6/21/2006	270	2608	45.3%						
2/13/2007	200	2661	46.3%						
1/6/2000	240	2681	46.6%						
3/22/2006	600	2692	46.8%						
2/4/2003	80	2709	47.1%						
1/13/2009	50	2751	47.8%						
9/5/2001	230	2766	48.1%						
3/14/2005	38	2828	49.2%						
12/5/2006	60	2907	50.5%						
4/11/2006	73	2912	50.6%						
3/13/2007	240	2948	51.3%						
2/10/2009	27	3213	55.9%						
1/13/2005	40	3247	56.4%						
4/6/2000	140	3302	57.4%						
12/11/2001	140	3320	57.7%						
2/5/2002	140	3326	57.8%						
5/17/2004	45	3394	59.0%						
Dry Conditions (Midpoint: 75%)				**2.40E+04**	**2.11E+04**	**571**	**1.37E+11**	**8.01E+10**	**41.5%**
5/25/2005	60	3477	60.4%						
9/21/2006	200	3516	61.1%						
1/16/2003	160	3588	62.4%						
11/27/2001	70	3632	63.1%						
7/26/2000	130	3682	64.0%						
8/18/2005	580	3725	64.8%						
6/21/2004	80	3830	66.6%						
10/7/2004	140	3852	67.0%						
9/22/2004	550	3935	68.4%						
10/21/2009	110	3946	68.6%						
10/24/2006	150	4058	70.5%						
4/11/2002	320	4062	70.6%						
11/3/2004	110	4188	72.8%						

7/8/2004	100	4229	73.5%						
11/6/2006	200	4234	73.6%						
8/7/2000	160	4319	75.1%						
6/20/2005	200	4340	75.5%						
8/26/2004	40	4356	75.7%						
6/23/2009	160	4529	78.7%						
11/9/2005	70	4555	79.2%						
12/10/2007	100	4671	81.2%						
5/5/2009	200	4762	82.8%						
7/23/2001	86	4784	83.2%						
10/23/2001	55	4864	84.6%						
7/7/2009	570	4901	85.2%						
8/23/2006	1200	4926	85.6%						
11/1/2000	180	5044	87.7%						
5/6/2002	600	5063	88.0%						
5/25/2006	100	5107	88.8%						
7/18/2007	160	5137	89.3%						
Low Flows				1.31E+04		600	7.84E+10	4.97E+10	36.7%
5/22/2007	220	5190	90.2%						
7/10/2002	80	5225	90.8%						
11/6/2007	440	5227	90.9%						
8/12/2009	1100	5247	91.2%						
10/5/2005	50	5271	91.6%						
7/12/2006	600	5276	91.7%						
9/5/2000	600	5322	92.5%						
9/13/2005	190	5336	92.8%						
10/8/2002	180	5469	95.1%						
5/15/2000	120	5525	96.1%						
10/22/2007	71	5546	96.4%						
8/23/2007	190	5642	98.1%						
9/11/2002	38	5660	98.4%						
6/13/2000	190	5674	98.6%						
6/3/2002	120	5709	99.3%						
8/7/2002	100	5719	99.4%						

* These flows are calculated flow augmented by NPDES flows from Miliken Plant and used to estimate the existing load only.

** Target load is calculated from instream flow only, because the discharge from the Milliken Plant is going away.

Table C-2. Calculation of existing loads, target loads, and percent reductions for CSTL-028 Salkehatchie River.

Calculation of the Existing Load and Target Load by Hydrologic Range

Existing Load calculated as: 90th percentile Fecal Coliform Concentration *x* mid-point Flow

Target Load calculated as: 380 (Standard - MOS) *x* mid-point flow

CSTL-028: Salkehatchie River

Date	FC (cfu/ 100ml)	Rank	Percen-tile	Mid-point Flow (m^3/day)	90th Percen-tile FC Conc	Existing Load (cfu/day)	Target Load	Percent Re-duction
High Flows								
3/18/2003	570	21	0.4%					
8/12/2003	120	71	1.2%					
2/18/2004	95	171	3.0%					
4/15/2003	70	176	3.1%					
6/10/2003	410	319	5.5%					
3/7/2001	160	497	8.6%					
Moist Conditions (Midpoint: 25%)				1.35E+05	418	5.64E+11	5.12E+11	9.1%
8/20/2001	300	622	10.8%					
7/16/2003	180	664	11.5%					
2/3/2000	110	823	14.3%					
12/8/2009	120	879	15.3%					
5/21/2003	360	893	15.5%					
2/28/2006	210	910	15.8%					
4/4/2001	140	982	17.1%					
3/10/2004	120	990	17.2%					
1/24/2008	120	1066	18.5%					
12/12/2000	85	1244	21.6%					
12/11/2003	390	1249	21.7%					
9/4/2003	2000	1291	22.4%					
1/15/2002	530	1397	24.3%					
1/11/2007	120	1473	25.6%					
6/18/2007	210	1527	26.5%					
3/6/2002	280	1567	27.2%					
4/12/2005	87	1588	27.6%					
1/24/2006	93	1596	27.7%					
4/24/2007	210	1608	28.0%					
11/25/2003	200	1793	31.2%					
2/9/2005	180	1923	33.4%					
12/10/2008	40	2000	34.8%					
3/20/2008	1400	2042	35.5%					
1/8/2004	90	2093	36.4%					

3/18/2009	210	2155	37.5%					
10/14/2003	160	2182	37.9%					
2/5/2001	110	2185	38.0%					
4/14/2004	190	2247	39.1%					
4/21/2009	33	2267	39.4%					
Mid-Range Flows (Midpoint: 50%)				**8.70E+04**	**458**	**3.99E+11**	**3.31E+11**	**17.0%**
1/9/2001	300	2318	40.3%					
7/12/2005	120	2401	41.7%					
3/7/2000	40	2416	42.0%					
10/2/2000	95	2548	44.3%					
12/17/2002	100	2563	44.6%					
2/7/2008	680	2564	44.6%					
6/21/2006	110	2607	45.3%					
1/6/2000	370	2656	46.2%					
2/13/2007	200	2671	46.4%					
3/22/2006	600	2674	46.5%					
2/4/2003	230	2710	47.1%					
9/5/2001	220	2763	48.0%					
1/13/2009	77	2795	48.6%					
3/14/2005	120	2800	48.7%					
4/11/2006	160	2872	49.9%					
3/13/2007	200	2924	50.8%					
12/5/2006	80	2939	51.1%					
1/13/2005	140	3233	56.2%					
2/10/2009	65	3276	57.0%					
4/6/2000	48	3290	57.2%					
2/5/2002	280	3328	57.9%					
12/11/2001	480	3347	58.2%					
5/17/2004	180	3372	58.6%					
Dry Conditions (Midpoint: 75%)				4.57E+04	385	1.76E+11	1.74E+11	1.3%
5/25/2005	46	3456	60.1%					
9/21/2006	180	3540	61.5%					
1/16/2003	200	3591	62.4%					
11/27/2001	160	3664	63.7%					
7/26/2000	92	3673	63.9%					
8/18/2005	67	3688	64.1%					
6/21/2004	70	3787	65.8%					
10/7/2004	65	3820	66.4%					
9/22/2004	190	3890	67.6%					
11/5/2002	110	3992	69.4%					
10/21/2009	160	4022	69.9%					
4/11/2002	260	4086	71.0%					
10/24/2006	600	4108	71.4%					
11/3/2004	50	4152	72.2%					
7/8/2004	36	4203	73.1%					

4/22/2008	120	4265	74.1%					
11/6/2006	145	4273	74.3%					
6/20/2005	58	4293	74.6%					
8/7/2000	60	4304	74.8%					
8/26/2004	200	4323	75.2%					
10/21/2008	180	4475	77.8%					
11/12/2008	180	4506	78.3%					
11/9/2005	120	4569	79.4%					
6/23/2009	60	4591	79.8%					
5/7/2008	60	4626	80.4%					
12/10/2007	160	4685	81.4%					
7/23/2001	50	4757	82.7%					
5/5/2009	510	4793	83.3%					
10/23/2001	45	4864	84.6%					
8/23/2006	600	4940	85.9%					
7/7/2009	1000	4946	86.0%					
11/1/2000	180	5000	86.9%					
5/25/2006	140	5062	88.0%					
5/6/2002	130	5070	88.1%					
7/18/2007	180	5091	88.5%					
5/22/2007	230	5172	89.9%					
Low Flows								
9/5/2000	160	5218	90.7%					
7/10/2002	20	5227	90.9%					
9/30/2008	100	5249	91.3%					
11/6/2007	200	5255	91.4%					
10/5/2005	110	5265	91.5%					
7/12/2006	40	5283	91.8%					
9/13/2005	73	5310	92.3%					
8/12/2009	3100	5328	92.6%					
10/8/2002	120	5417	94.2%					
5/15/2000	70	5496	95.5%					
10/22/2007	66	5549	96.5%					
7/22/2008	890	5597	97.3%					
8/23/2007	200	5622	97.7%					
9/11/2002	92	5642	98.1%					
6/13/2000	20	5658	98.4%					
6/10/2008	90	5681	98.8%					
6/3/2002	160	5708	99.2%					
8/7/2002	42	5712	99.3%					

Table C-3. Calculation of existing loads, target loads, and percent reductions for CSTL-003 Salkehatchie River.

Calculation of the Existing Load and Target Load by Hydrologic Range

Existing Load calculated as: 90th percentile Fecal Coliform Conc *x* mid-point Augmented Flow

Target Load calculated as: 380 (Standard - MOS) *x* mid-point instream flow + Design Flow (3 mgd) for SC0047872 - WLA

CSTL-003: Salkehatchie River at US-278

Date	FC (cfu/100 ml)	Rank of Flows	Per-cen-tile	Mid-point Instream Flow	Mid-point Flow - Augmented	Design Flow for Target	90th Per-cen-tile FC Conc	Existing Load (cfu/day)	Target Load	% Re-duction
					(m^3/day)					
High Flows										
NA										
Moist Conditions (Midpoint: 25%)				3.10E+05	3.15E+05	11356	242	7.63E+11	1.22E+12	-60.2%
2/3/2000	270	818	14.2%							
12/12/2000	200	1240	21.6%							
4/12/2005	100	1591	27.7%							
12/12/2005	75	1778	30.9%							
2/9/2005	140	1924	33.4%							
Mid-Range Flows (Midpoint: 50%)				2.00E+05	2.05E+05	11356	384	7.89E+11	8.05E+11	-2.0%
3/7/2000	50	2411	41.9%							
7/12/2005	600	2431	42.3%							
10/2/2000	220	2555	44.4%							

1/6/2000	240	2646	46.0%							
3/14/2005	140	2802	48.7%							
1/13/2005	120	3235	56.2%							
4/6/2000	44	3294	57.3%							
Dry Conditions (Midpoint: 75%)				**1.05E+05**	**1.10E+05**	**11356**	**1068**	**1.17E+12**	**4.43E+11**	**62.2%**
5/25/2005	87	3464	60.2%							
7/26/2000	110	3678	63.9%							
8/18/2005	1200	3705	64.4%							
8/7/2000	980	4315	75.0%							
6/20/2005	120	4325	75.2%							
11/9/2005	120	4582	79.7%							
7/7/2009	60	4914	85.4%							
Low Flows										
9/5/2000	540	5264	91.5%							
10/5/2005	140	5288	91.9%							
9/13/2005	50	5334	92.7%							
5/15/2000	180	5506	95.7%							
6/13/2000	480	5659	98.4%							

Table C-4. Calculation of existing loads, target loads, and percent reductions for RS-02472 Wells Branch.

Calculation of the Existing Load and Target Load by Hydrologic Range

Existing Load calculated as: 90th percentile Fecal Coliform Concentration *x* mid-point Flow

Target Load calculated as: 380 (Standard - MOS) *x* mid-point flow

RS-02472: Wells Branch at SC-300

Date	**FC (cfu/ 100ml)**	**Rank of Flows**	**Percen-tile**	**Mid-point Flow (m^3/day)**	**90th Percen-tile FC Conc**	**Existing Load (cfu/day)**	**Target Load**	**Percent Reduction**
High Flows								
NA								
Moist Conditions (Midpoint: 25%)				**4.78E+04**	**1070**	**5.11E+11**	**1.82E+11**	**64.5%**
2/14/2002	1100	954	16.6%					
3/7/2002	800	1520	26.4%					
Mid-Range Flows (Midpoint: 50%)				3.08E+04	412	1.27E+11	1.17E+11	7.8%
12/17/2002	160	2558	44.5%					
4/17/2002	440	3218	55.9%					
Dry Conditions (Midpoint: 75%)				1.62E+04	386	6.25E+10	6.15E+10	1.6%
11/5/2002	400	3987	69.3%					
7/15/2002	260	4324	75.2%					
Low Flows				6.25E+03	584	3.65E+10	2.38E+10	34.9%
5/16/2002	560	5263	91.5%					
8/22/2002	280	5362	93.2%					
10/8/2002	330	5412	94.1%					
9/11/2002	260	5637	98.0%					
6/5/2002	600	5678	98.7%					

Table C-5. Calculation of existing loads, target loads, and percent reductions for CSTL-006 Salkehatchie River.

Calculation of the Existing Load and Target Load by Hydrologic Range

Existing Load calculated as: 90th percentile Fecal Coliform Concentration *x* mid-point Gauged Flow

Target Load calculated as: 380 (Standard - MOS) *x* mid-point Gauged flow

CSTL-006: Salkehatchie River at US-601

Date	FC (cfu/100 ml)	Rank of Flows	Percentile	Mid-point Gauged Flow (m^3/day)	90^{th} Percentile FC Conc	Existing Load (cfu/day)	Target Load	% Reduction
High Flows								
5/23/2000	30	4983	2.6%					
6/8/2000	60	4753	7.1%					
8/22/2000	80	4713	7.8%					
10/5/2005	120	4669	8.7%					
Moist Conditions (Midpoint: 25%)				7.43E+05	220	1.63E+12	2.82E+12	-72.7%
10/24/2000	140	4579	10.5%					
7/27/2000	130	3777	26.1%					
7/6/2005	240	3108	39.2%					
Mid-Range Flows (Midpoint: 50%)				**4.79E+05**	**600**	**2.88E+12**	**1.82E+12**	**36.7%**
5/24/2005	300	3059	40.2%					
4/6/2000	40	2960	42.1%					
9/1/2005	140	2812	45.0%					
6/14/2005	230	2717	46.9%					
8/4/2005	600	2593	49.3%					
1/5/2005	100	2559	50.0%					
1/5/2000	68	2519	50.7%					
3/16/2005	600	2371	53.6%					
12/28/2000	110	2345	54.1%					
Dry Conditions (Midpoint: 75%)				2.52E+05	385	9.68E+11	9.56E+11	1.3%
12/15/2005	120	1946	61.9%					
2/10/2005	120	1896	62.9%					
11/22/2005	600	1323	74.1%					
11/27/2000	160	1232	75.9%					
3/28/2000	64	1195	76.6%					
4/6/2005	170	898	82.4%					

Low Flows								
9/26/2000	420	6	99.9%					

APPENDIX D Load-duration and Flow-duration Curves

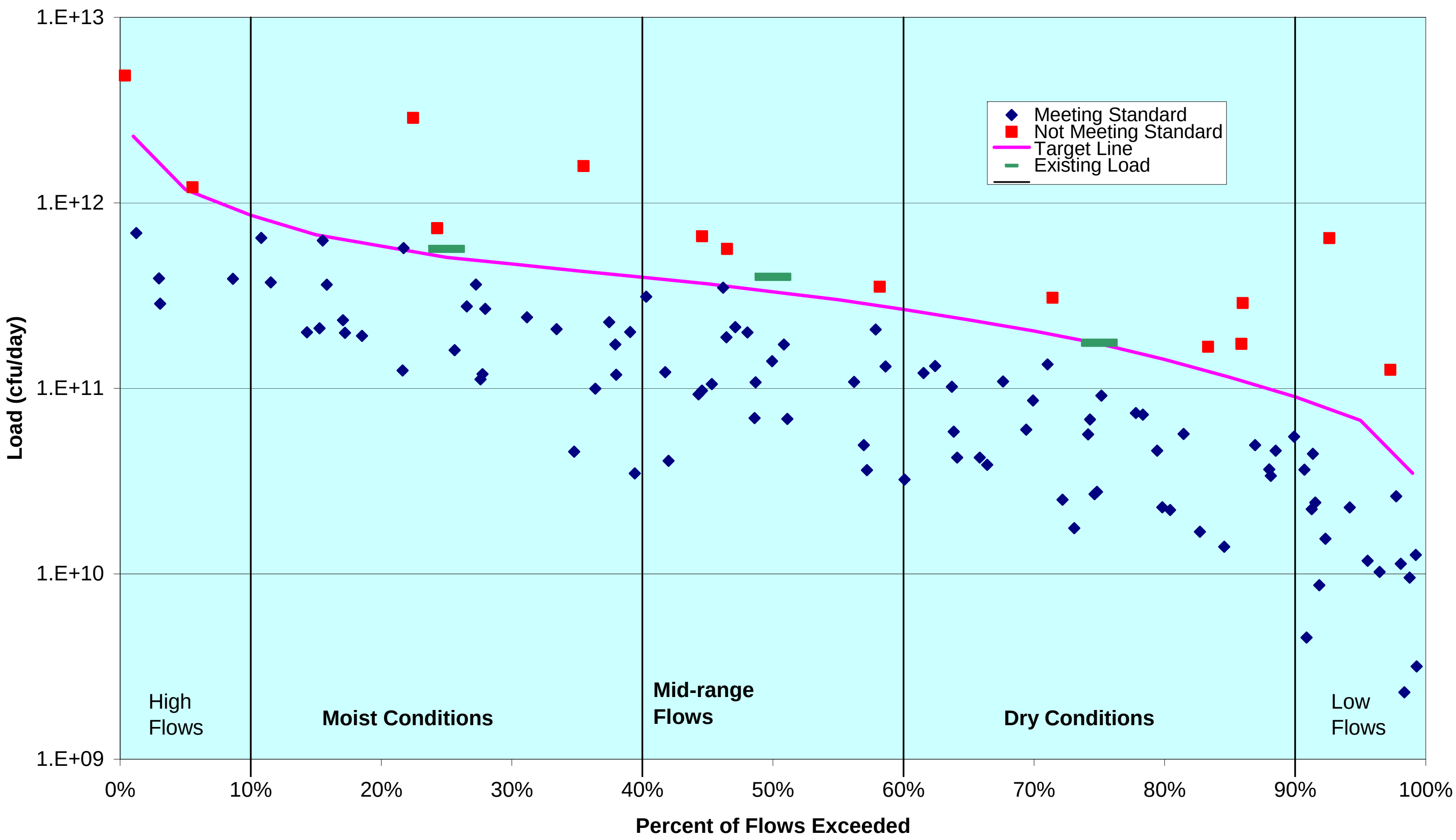

Figure D-1 Load-duration curve for the Salkehatchie River CSTL-028.

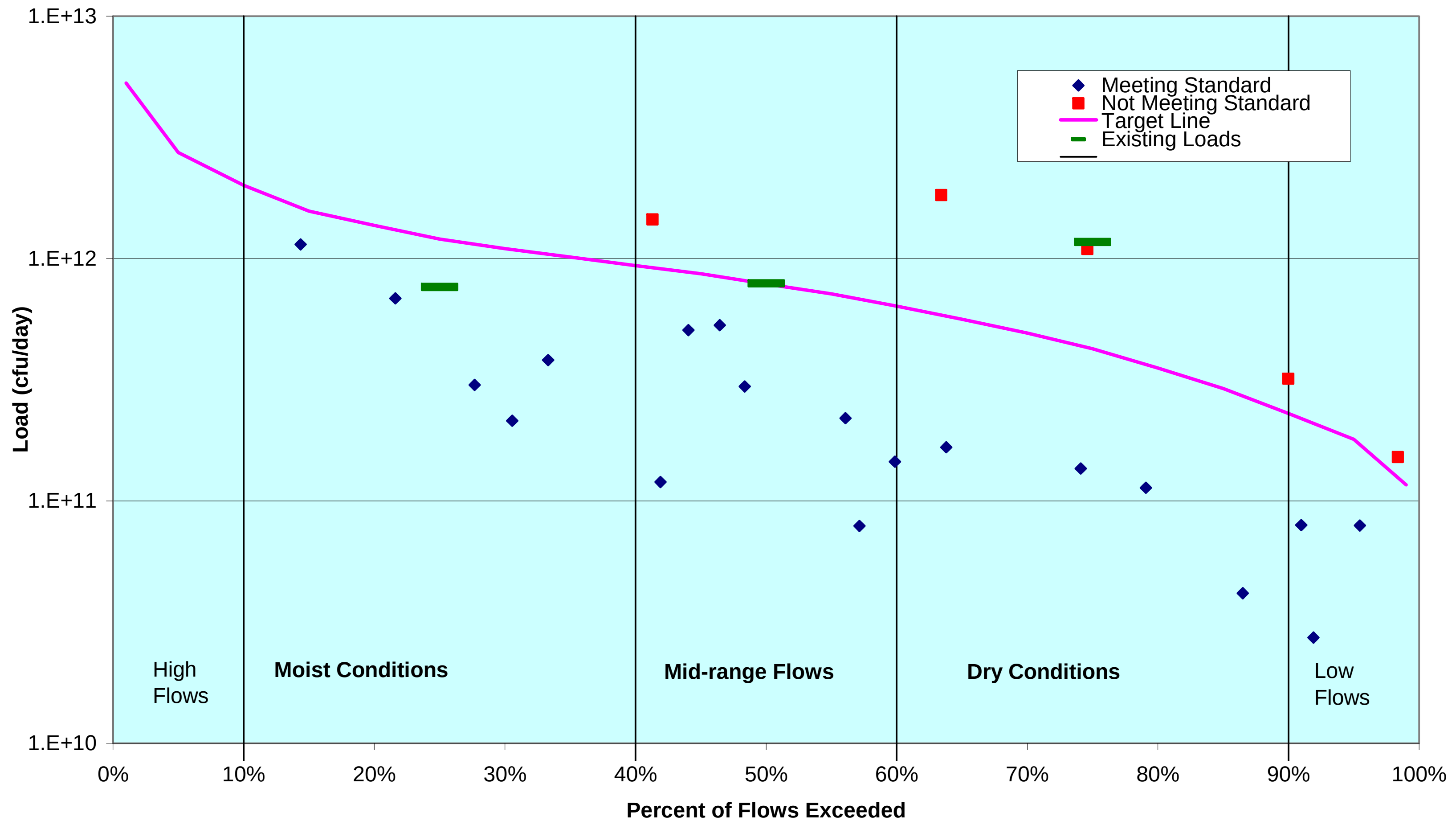

Figure D-2 Load-duration curve for the Salkehatchie River CSTL-003.

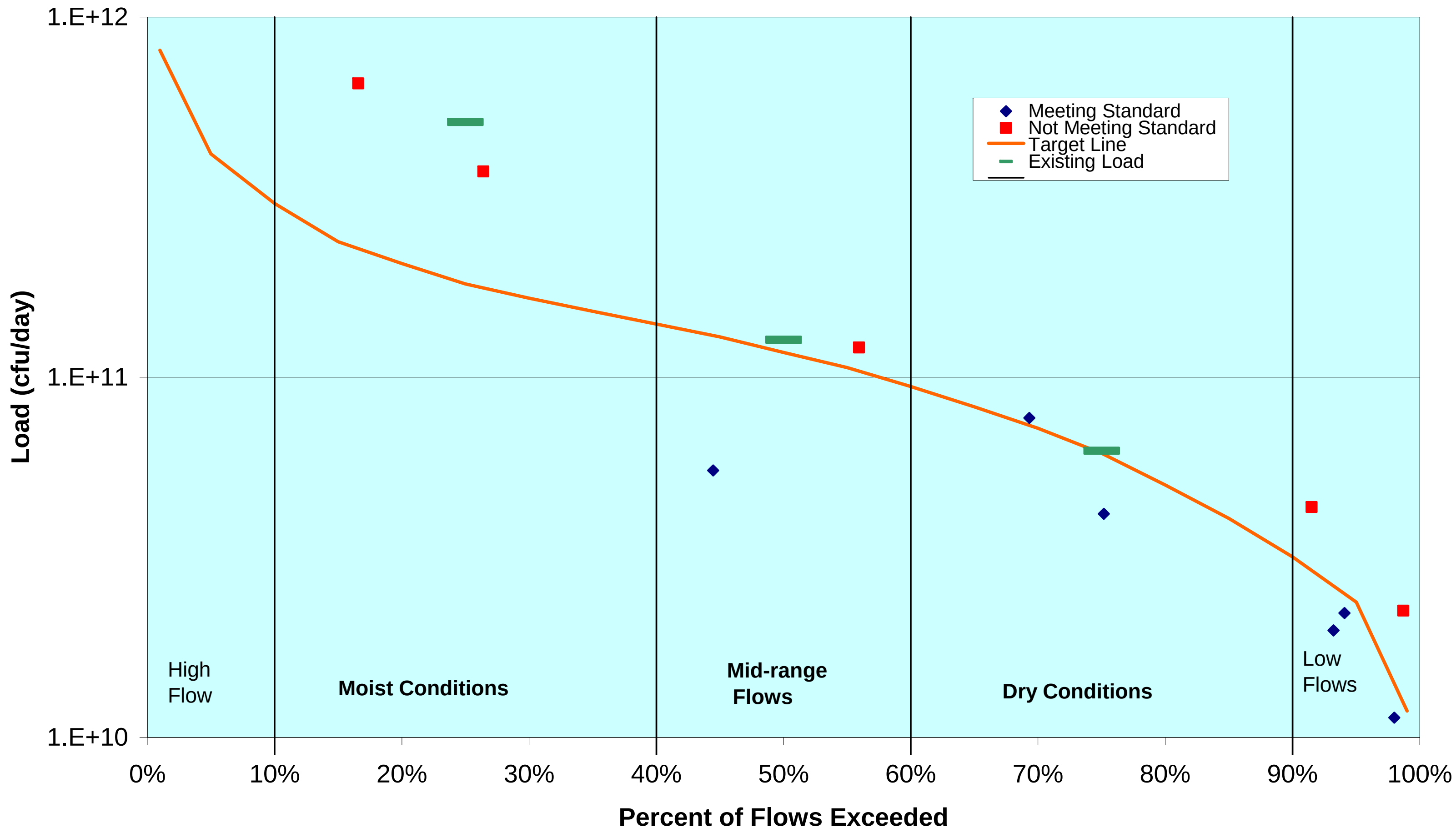

Figure D-3 Load-duration curve for Wells Branch at RS-02472.

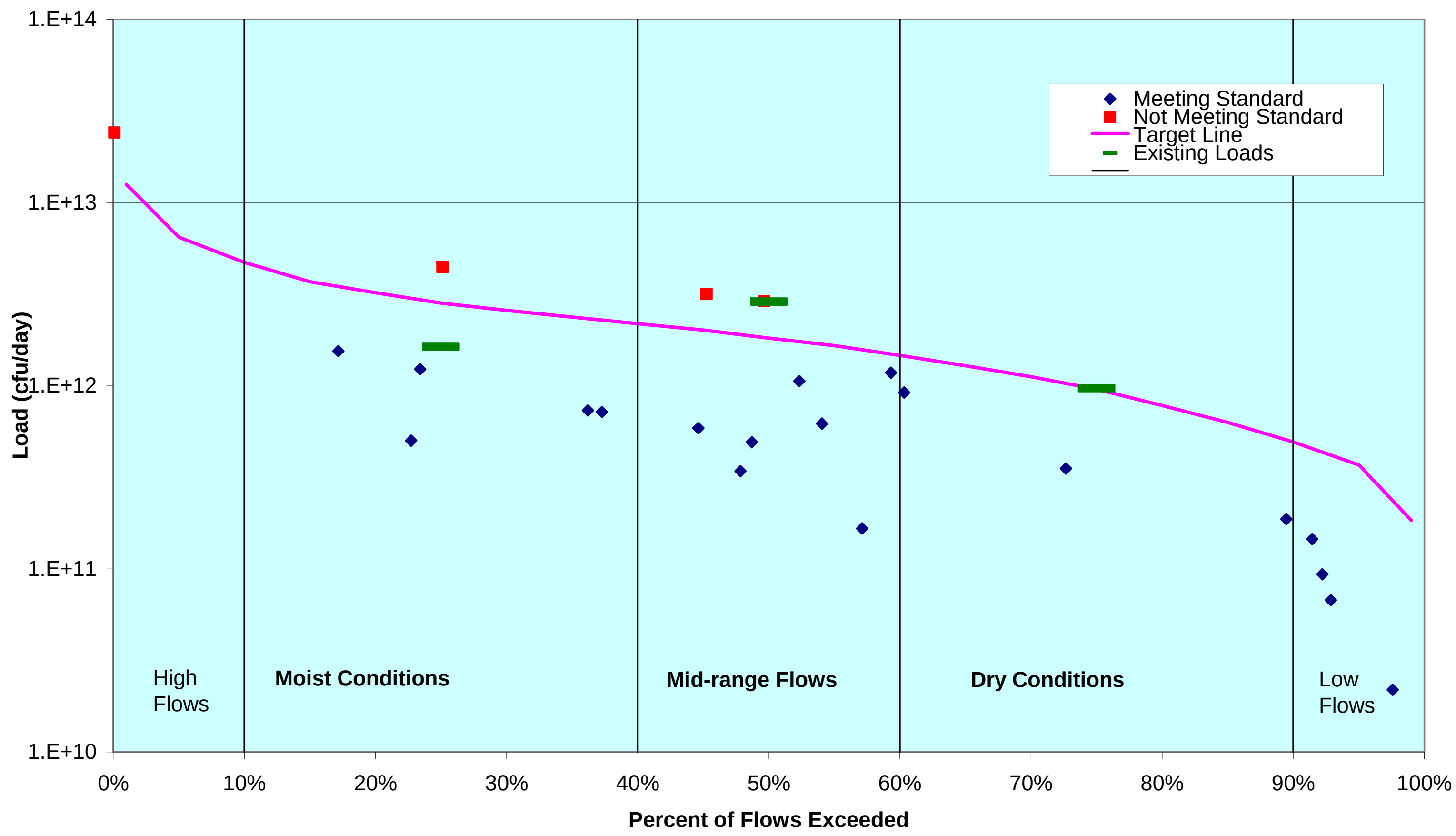

Figure D-4 Load-duration curve for Salkehatchie River at CSTL-006.

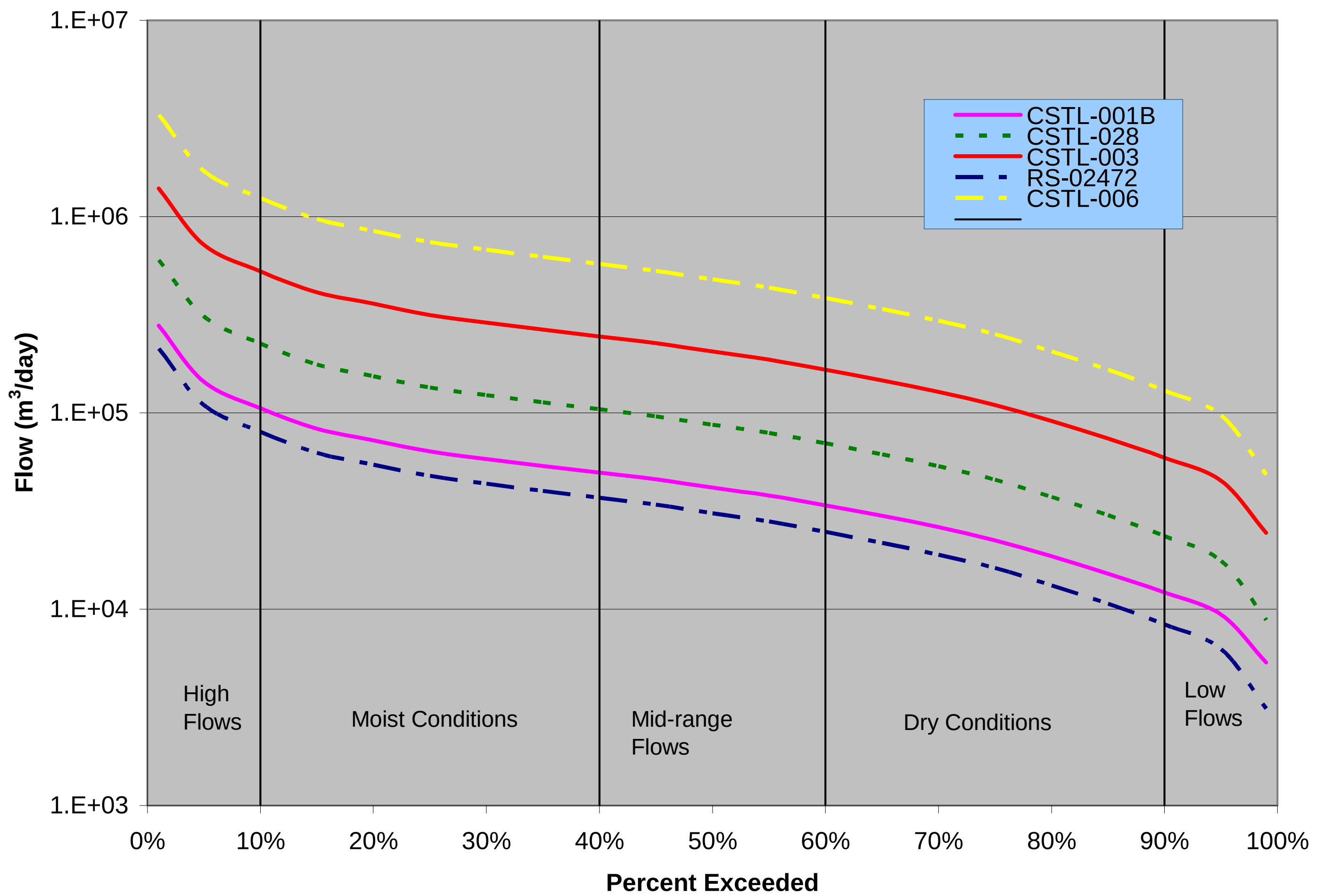

Figure D-5 Flow-duration curves for Turkey Creek, Wells Branch, and the Salkehatchie River.

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

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.tetratech-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 F PUBLIC PARTICIPATION

Responsiveness Summary

Comments were received from the following:

South Carolina Department of Transportation

<u>General Comments</u>

Comment 1:

It is important that SCDHEC develop TMDLs that are implementable, defensible reasonable, and achieve the goal of the waterbody meeting its appropriate use designation. It is also important that SCDHEC understands the role and responsibility of SCDOT in carrying out its mission to provide transportation for the citizens of South Carolina and its limited authority to regulate activities that are not covered under its authority. The issues related to this TMDL, and all others, are watershed-based and 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 initial development of this TMDL.

Response 1:

SCDHEC (the Department) acknowledges this statement.

Comment 2:

TMDLs must consider all potential sources of fecal coliform (FC), 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, SCDHEC 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, even if SCDOT reduced their FC contribution by 42% and 66% (the actual current contribution has not been determined) the stream could still be impaired for FC. However, since SCDOT is the identified permitted contributor, they would be in violation of their NPDES permit and subject to sanctions by SCDHEC and 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.

Response 2:

SCDHEC typically identifies potential sources of fecal coliform bacteria, but does not quantify individual sources. Limited data and resources do not usually allow SCDHEC to quantify individual sources. SCDHEC typically provides aggregate FC bacteria reductions required for all non-continuous point sources, in the form of a wasteload allocation (WLA), and all non point sources in the form of a load allocation (LA).

A percent reduction is required for all potential sources, including SCDOT. 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. Regulated stormwater discharges are required to target the percentage reduction or achieve the existing instream standard for the pollutant of concern Maximum Extent Practicable (MEP).

For SCDOT, existing and future NPDES MS4 permittees, compliance with terms and conditions of its NPDES permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP) and demonstrates consistency with the assumptions and requirements of the TMDL. For existing and future NPDES construction and Industrial stormwater permittees, compliance with terms and conditions of its permit is effective implementation of the WLA.

Specific Comments

Comment 3:

Current language:
"The most likely sources of fecal coliform bacteria to Turkey Creek and the Salkehatchie River at CSTL-003 are failing septic systems, urban runoff, leaking sewers, and overflowing sewers. The mostly likely sources to the remaining sub-watersheds are cattle in the streams and failing septic systems."

SCDOT agrees with this statement. These sources should be addressed by appropriate reduction requirements in the TMDL. Requiring SCDOT to reduce loading may not significantly improve water quality at the impaired stations.

Response 3:

FC Bacteria reductions are required from all sources, including SCDOT, in order to achieve the TMDL target. 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. Regulated stormwater discharges are required to target the percentage reduction or achieve the existing instream standard for the pollutant of concern Maximum Extent Practicable (MEP).

Illicit discharges and leaking sanitary sewers are illegal and, as such, are not assigned TMDL WLA or LA percent reductions. If these events do occur, SCDHEC has compliance and enforcement mechanisms in place to address the situation.

The following language will replace the cited language: 'For SCDOT, existing and future NPDES MS4 permittees, compliance with terms and conditions of its NPDES permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP) and demonstrates consistency with the assumptions and requirements of the TMDL. For existing and future NPDES construction and Industrial stormwater permittees, compliance with terms and conditions of its permit is effective implementation of the WLA.'

Comment 4:

Current language:
"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."

Replace with "For SCDOT, compliance with terms and conditions of its NPDES MS4 permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP)."

Response 4:

The Abstract, page ii and Section 6.1.2, page 37 of the TMDL document has been revised to include the following:

"For SCDOT, existing and future NPDES MS4 permittees, compliance with terms and conditions of its NPDES permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP) and demonstrates consistency with the assumptions and requirements of the TMDL. For existing and future NPDES construction and Industrial stormwater permittees, compliance with terms and conditions of its permit is effective implementation of the WLA."

Comment 5:

Current language:
"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."

Replace with "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."

Response 5:

The referenced footnote below Table Ab-1 and Table 13 have been revised accordingly.

Comment 6:

"Sources of fecal coliform bacteria are usually diffuse or nonpoint sources such as stormwater runoff, failing septic systems, and leaking sewers"

Other sources such as failing septic systems, agricultural runoff and leaking sewers are listed throughout the TMDL document. However, table Ab-1 does not list the Load Allocations for all of the mentioned sources.

Response 6:

SCDHEC typically provides aggregate FC bacteria reductions required for all non-continuous point sources, in the form of a wasteload allocation (WLA), and all non point sources in the form of a load allocation (LA). Because limited data may be available, it is difficult to quantify loadings from individual sources.

Failing septic systems and agricultural runoff are required to meet the LA as listed in Table Ab-1 on page ii. Leaking sewers are not prescribed a WLA or LA because such discharges are illegal and, if present in the watershed, are subject to compliance/enforcement mechanisms.

Comment 7:

Water Quality Assessment
This section does not include information such as where the samples were tested and what protocols were used in the testing. SCDOT requests that this information be added to this section.

Response 7:

All SCDHEC data were collected in accordance with a Quality Management Plan (http://www.scdhec.gov/environment/envserv/docs/QMPJuly2008.pdf) as well as our Standard Operating Procedure (SOP) entitled "Environmental Investigations Standard Operating Procedures and Quality Assurance Manual". Water quality samples collected at all locations were analyzed for FC bacteria at the Aiken Regional SCDHEC Office.

Comment 8:

Current Language:
"A graph of precipitation vs fecal coliform bacteria for Turkey Creek (Figure 6) shows no meaningful correlation between rainfall and fecal coliform bacteria concentrations. Likewise a graph of turbidity vs fecal coliform bacteria (Figure 7) shows only a weak correlation……However, none of the other sites exhibited a correlation between either precipitation or turbidity and fecal coliform concentrations either. The lack of a strong association between fecal coliform bacteria concentrations and precipitation suggests that there are multiple sources of fecal coliform bacteria in these streams and that both continual sources, such as failing septic systems, leaking sewer lines, or illicit discharges and runoff related sources are important."

Runoff generated from SCDOTs operation is rainfall driven. Since there is only a weak positive correlation between FC and rain the load given to SCDOT is not justified.

Response 8:

A percent reduction is required for all potential sources, including SCDOT. 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. Regulated stormwater discharges are required to target the percentage reduction or achieve the existing instream standard for the pollutant of concern Maximum Extent Practicable (MEP).

Response 2 indicates that SCDOT's compliance with the terms and conditions of their MS4 permit is effective implementation of the WLA to the MEP.

Comment 9:

Current language:
"Indicators such as FC, enterococci, or E. coli are measured to represent pathogens."

1n 1986, the EPA recommended moving from FC to enterococci or E.coli since FC has been shown to not correspond well with the presence of pathogens. A TMDL should not be based on an invalid indicator.

Response 9:

TMDL wasteload allocations (WLAs) and load allocations (LAs) are based upon existing water quality standards. SCDHEC's current water quality standards include on fecal coliform as an indicator of primary contact recreational use support in freshwaters, such as the upper Salkehatchie River.

South Carolina is currently proposing a change from fecal coliform bacteria to Escherichia coli (E. coli) bacteria as a primary contact recreational use standard in all freshwaters (Classes FW, TN, TPGT, and TPT). If E. coli is promulgated in R.61-68 and becomes the applicable water quality standard for recreational use in freshwaters, all freshwater sites assessed for fecal coliform bacteria and included on the 303(d) list for recreational use impairment will become sites listed as impaired due to E. coli bacteria. Only after the E. coli primary contact recreational use standard is promulgated in R.61-68, will TMDLs be developed to address E. coli bacteria impairments.

Comment 10:

Current language:
"Regarding municipal and private sanitary wastewater treatment facilities – "if these facilities are discharging wastewater that meets their permit limits, they are not causing impairment."

If SCDOT and other MS4s are meeting the measurable goals in their NPDES permits to the maximum extent practicable (MEP), they should be held to the same standard as WWTFs and not be subject to percent reduction requirements. In fact, SCDHEC's own statement in the second specific comment above acknowledges that permit changes may have to be made for other permitted entities to achieve the TMDL goals.

Response 10:

The percent reductions provided in the TMDL WLAs and LAs represent the percent reduction required in order to meet the water quality standard. If existing and current MS4s (including SCDOT) demonstrate they have either targeted the percent reduction or achieved the water quality standard for FC bacteria to the MEP then they are being held to the same standard as a continuous point source (i.e. WWTF). All continuous discharges are required to the meet the water quality standard at the end of pipe.

Comment 11:

Current language:
"In these rural and suburban watersheds wildlife (mammals and birds), which is a source of fecal coliform bacteria, is possibly a significant though not major contributor."

Wildlife has been recognized as a significant source, but no explicit reduction percentage has been allocated to that source.

Response 11:

SCDHEC typically provides aggregate FC bacteria reductions required for all non-continuous point sources, in the form of a wasteload allocation (WLA), and all non point sources in the form of a load allocation (LA). Because limited data may be available, it is difficult to quantify loadings from individual sources. Contributions from wildlife are recognized as nonpoint sources and may be reduced just like other nonpoint sources in order to achieve the load allocation (LA) component of the TMDL (See table Ab-1, page ii, and Table 13, page 33).

The Department recognizes that SCDOT may not have control over certain wildlife such as deer, raccoons or other mammals.

Also, see Section 5.3.2, pages 30-31 of the TMDL document:
“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 zoning, issue building or development permits.”

Comment 12:

Current language:
“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.” …. “Failed or non-conforming septic systems, can be a contributor of FC to Salkehatchie River and its tributaries. Wastes from failing septic systems enter surface waters either as direct overland flow or via groundwater. Although loading to steams 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.”

Since leaking sanitary sewers, illicit discharges and failing septic systems are acknowledged as significant contributors to the FC bacteria load and are regulated, the entities that operate and maintain them should not be exempt from the TMDL simply because their contribution may be difficult to ascertain or they are already permitted separately. They should be listed as contributors and assigned a percent reduction. Short of listing each source, the percent reduction for other contributors should at the very least be reduced to account for these sources.

Response 12:

Illicit discharges and leaking sanitary sewers are illegal and, as such, are not assigned TMDL WLA or LA percent reductions. If these events do occur, SCDHEC has compliance and enforcement mechanisms in place to address the situation.

Failing septic systems may be covered under the LA component of the TMDL and assigned a percent reduction (See table Ab-1, page ii, and Table 13, page 33). Implementation of the TMDL may include a program to identify and remediate failing septic systems in these watersheds.

Comment 13:

Current language:
"The sub-watersheds that include the City of Barnwell (CSTL-001B and CSTL-003) and Williston (CSTL-028) have large numbers of residences both with and without sewer service. Populations without sewer service in these sub-watersheds may have failing septic systems that are a source of fecal coliform bacteria to these impaired sites."

These failing septic systems were not quantified and a load reduction was not given to these sources.

Response 13:

Failing septic systems may be covered under the LA component of the TMDL and assigned a percent reduction (See table Ab-1, page ii, and Table 13, page 33). Implementation of the TMDL may include a program to identify and remediate failing septic systems in these watersheds.

Comment 14:

Current language:
"Dogs, cats, and other domesticated pets are the primary source of FC deposited on the urban landscape."

This source should be addressed when assigning load allocations for the impaired stations within this TMDL watershed. SCDOT has no control over dogs, cats, and other domesticated pets.

Response 14:

The Department recognizes that SCDOT may not have control over dogs, cats, and other domestic pets.

Also, see Section 5.3.2, pages 30-31 of the TMDL document:

“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 zoning, issue building or development permits.”

Amendments to TMDL Document

The following has been added to Section 6.1.2, page 37 of the TMDL document:

The Department acknowledges that progress with the assumptions and requirements of the TMDL by MS4s is expected to take one or more permit iteration. Progress towards 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.

Appendix E Evaluating the Progress of MS4 Programs: Meeting the Goals of TMDLs and Attaining Water Quality Standards was left out the draft TMDL document during the advertised public comment period (02/29/12-03/30/12). This section is a standard inclusion in FC TMDL documents and the language has now been added to Appendix E before the TMDLs are finalized.