Total Maximum Daily Load Document
The Black Creek Watershed
(Hydrologic Unit Codes 030402010601, 030402010602, 030402010603 030402010604, 030402010605, 030402010606, 030402010701, 030402010702, 030402010703, 030402010704, 030402010705, 030402010706, 030402010707, 030402010708, 030402010709, 030402010710)
Fecal Coliform Bacteria,
Indicator for Pathogens

Prepared for:

D H E C

PROMOTE PROTECT PROSPER

January 2012

Prepared by:

Banu Varlik

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 the maximum amount of pollutant a water body 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 discharger, a load allocation (LA) for all nonpoint sources, and an explicit and/or implicit margin of safety (MOS). A fecal coliform TMDL was developed for station numbers PD-078, PD-134, PD-141, PD-258, RS-01023, RS-03507 AND RS-06027 within the Black Creek watershed located in Chesterfield, Darlington, Florence counties, and a very small portion in Lee County, SC. Seven stations along Black Creek with in Chesterfield, Darlington and Florence counties, SC are listed as impaired on the State's 2010 §303(d) list due to excessive fecal coliform numbers documented during 1999-2008 assessment period.

Dominant landuse in the Black Creek watershed is cultivated crops, followed by evergreen forests. There are 8 NPDES permitted dischargers and currently there are five MS4 entities within the watershed which are Darlington County, the City of Florence, Florence County, the town of Quinby and South Carolina Department of Transportation (SCDOT). Probable sources of fecal contamination include agricultural runoff, failing septic systems and wildlife. The load-duration curve methodology was used to calculate existing and TMDL loads for the impaired segments. Existing pollutant loadings and proposed TMDL reductions for critical hydrologic conditions are presented in Table Ab-1. Critical hydrologic conditions were defined as either moist, mod-range, or dry depending on which condition demonstrated the highest load reductions necessary to meet water quality standards. In order to achieve the target load (slightly below water quality standards) the Black Creek, reductions in the existing loads up to 83% will be necessary. Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. For SCDOT, compliance with terms and conditions of its NPDES MS4 permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP). Required load reduction in the LA portion of this TMDL can be implemented through voluntary measures and are eligible for CWA §319 grants.

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

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

Station	Existing Load (cfu/day)	TMDL (cfu/day)	Margin of Safety (cfu/day)	Wasteload Allocation (WLA)			Load Allocation (LA)	
				Continuous Sources[1] (cfu/day)	Non-Continuous Sources [2, 4] (% Reduction)	Non-Continuous SCDOT[3, 4] (% Reduction)	Load Allocation (cfu/day)	%Reduction to Meet LA[4]
PD-078	3.60E+12	4.65E+12	2.32E+11	1.09E+11	0%[5]	0%[5]	4.31E+12	0%[5]
PD-137	1.93E+10	3.85E+09	1.93E+08	See note below	81%	81%	3.66E+09	81%
PD-141	1.62E+10	2.85E+09	1.43E+08	See note below	83%	83%	2.71E+09	83%
PD-258	2.07E+10	3.47E+09	1.73E+08	See note below	84%	84%	3.30E+09	84%
RS-01023	1.91E+09	1.17E+09	5.84E+07	See note below	42%	42%	1.11E+09	42%
RS-03507	2.30E+11	6.77E+10	3.39E+09	See note below	72%	72%	6.43E+10	72%
RS-06027	6.88E+10	1.20E+10	5.98E+08	See note below	83%	83%	1.14E+10	83%

Table Notes:

1. WLAs are expressed as a daily maximum. Existing and future continuous dischargers are required to meet the prescribed loading for the pollutant of concern. Loadings were developed based upon permitted flow and an allowable permitted maximum concentration of 400cfu/100ml.
2. Percent reduction applies to all NPDES-permitted stormwater discharges, including current and future MS4, construction and industrial discharges covered under permits numbered SCS & SCR. Stormwater discharges are expressed as a percentage reduction due to the uncertain nature of stormwater discharge volumes and recurrence intervals. Stormwater discharges are required to meet percentage reduction or the existing instream standard for pollutant of concern in accordance with their NPDES permit.
3. By implementing the best management practices that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 permit to address fecal coliform, the SCDOT will comply with this TMDL and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 permit.
4. Percent reduction applies to existing instream load.
5. Contingent upon approval by USEPA, PD-078 will not be included on the 2012 303(d) list for FC bacteria. As long as ambient conditions remain the same no reduction is needed.

Contents

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 fecal coliforms 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 with the waterbody (USEPA, 2001). Acute gastrointestinal illnesses affect millions of people in the Unites States and cause billions of dollars in costs each year (Gaffield et al. 2003). Infections including respiratory, eye, ear, nose, throat, and skin diseases may also occur, of which many are caused by contaminated drinking water (USEPA, 1986). Improperly treated wastewater and untreated stormwater runoff has also been associated with a number of disease outbreaks, most notably an outbreak in Milwaukee affecting an estimated 403,000 people in 1993 (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 in nature and originate from stormwater runoff, failing septic systems, agricultural runoff, and leaking sewers. Occasionally, the source of the pollutant is a point source. Section 303(d) of the Clean Water Act (CWA) and Environmental Protection Agency's (EPA) Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop total maximum daily loads (TMDLs) for water bodies not meeting designated uses under technology-based pollution controls. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and in stream water quality conditions so that states can establish water quality-based controls to reduce pollution and restore and maintain the quality of water resources (USEPA, 1991).

The State of South Carolina has placed 7 monitoring stations in the Black Creek watershed on South Carolina's 2010 Section §303(d) list for impairment due to fecal coliform bacteria. These stations are identified on Table 1 and Figure 1. Note that all impaired locations at the time of TMDL development are located below Lake Robinson and Lake Prestwood.

Table 1. Black Creek Watershed Fecal Coliform Impaired Waters.

Waterbody	Station Number	Description
Black Creek	PD-078*	Black Creek at SC 327
Snake Branch	PD-137	Snake Branch at Woodmill St - Hartsville
60” tile to ditch	PD-141	60” tile discharging to ditch across road at Darlington SWT (tributary to Swift Creek)
Snake Branch	PD-258	Snake Branch at RR Ave in Hartsville
Swift Creek	RS-01023	Swift Creek Tributary at CR 213, just N of Darlington
Boggy Swamp	RS-03507	Boggy Swamp at S-16-50, 4.9 mi NE of Hartsville
Ashby Branch	RS-06027	Ashby Branch at Culvert on S-21-1511 (Clark St) next to Quinby United Methodist Church

* Contingent upon approval by USEPA, PD-078 will not be included on the 2012 303(d) list for FC bacteria.

1.2 Watershed Description

The headwaters of the Black Creek are located south of Pageland in upper Chesterfield County and flows in a southeasterly direction across Chesterfield County through Sand Hill State Forest into Lake Robinson, approximately 3.2 miles from Darlington County border. Lake Robinson dam is located 2.2 miles downstream from the border of Chesterfield-Darlington Counties. After flowing for 5.6 miles, the Black Creek forms the Prestwood Lake northeast of Hartsville. Without any other major impoundments, the Black Creek flows through Darlington and Florence Counties. The Black Creek watershed consists of approximately 547 stream miles and 3374 acres of lakes (SCDHEC 2007).

There are two major drainage areas within the Black Creek watershed and these are defined as follows:

1. The Black Creek/Lake Robinson (HUC 0304020106) watershed consists of the headwaters of the Black Creek and its tributaries to the Lake Robinson dam and occupies 109,343 acres of the Sandhills region of South Carolina. There are 175.2 stream miles and 2452.8 acres of lakes within this watershed. The Carolina Sandhills National Wildlife Refuge extends across the center of the watershed. Between the refuge and Lake Robinson lies the Sandhills State Forest.

2. The Black Creek (HUC 0304020107) watershed consists of the lower Black Creek and it tributaries from Lake Robinson dam to the Pee Dee River and occupies 186,969 acres of the Sandhills and Upper Coastal Plain regions of South Carolina. There are 371.3 stream miles and 920.8 acres of lakes in the watershed.

Landuse within the Black Creek watershed is predominantly cultivated crops (25.85%) and evergreen forest (20.1%), followed by woody wetlands (13.8%) (Table 2). Developed lands (low, medium, and high intensity and open space) compromise

approximately 9.62 % of the total watershed area, as determined by the 2001 National Land Cover Data Set (NLCD, 2001).

Lake Robinson and Lake Prestwood are centrally located in the watershed. There are currently no impaired sites located upstream of the impoundments (all impaired locations are below Lake Prestwood). Finally, it is believed that fecal coliform bacteria loadings to the lakes would have minimal influence below Lake Prestwood. Because of these three reasons, this document will emphasize fecal coliform bacteria reductions necessary below Lake Prestwood in order for impaired sites to achieve the water quality standard for the pollutant of concern.

Table 2. The Black Creek Watershed Overall Land Use (derived from NLCD 2001).

Black Creek Landuse	Black Cr (mi2)	Black Creek (% of Total Area)
Developed, Open Space	26.1	5.81%
Developed, Low Intensity	11.9	2.65%
Developed, Medium Intensity	3.7	0.83%
Developed, High Intensity	1.5	0.33%
Total Developed	43.2 mi2	9.62%
Deciduous Forest	26.4	5.89%
Evergreen Forest	90.3	20.10%
Mixed Forest	9.1	2.04%
Total Forest	125.8 mi2	28.03%
Pasture/Hay	23.4	5.2 %
Cultivated Crops	116.1	25.85 %
Total Agricultural	139.5 mi2	31.05%
Open Water	5.0	1.11%
Woody Wetlands	62.0	13.8 %
Emergent Herbaceous Wetland	1.4	0.31 %
Total Wetlands/Open Water	68.4 mi2	15.22%
Scrub/Shrub	9.9	2.19%
Grassland/Herbaceous	61.4	13.66%
Barren Land	1.0	0.22%
Total Other	72.3 mi2	16.07%
Total	449.2 mi2	100 %

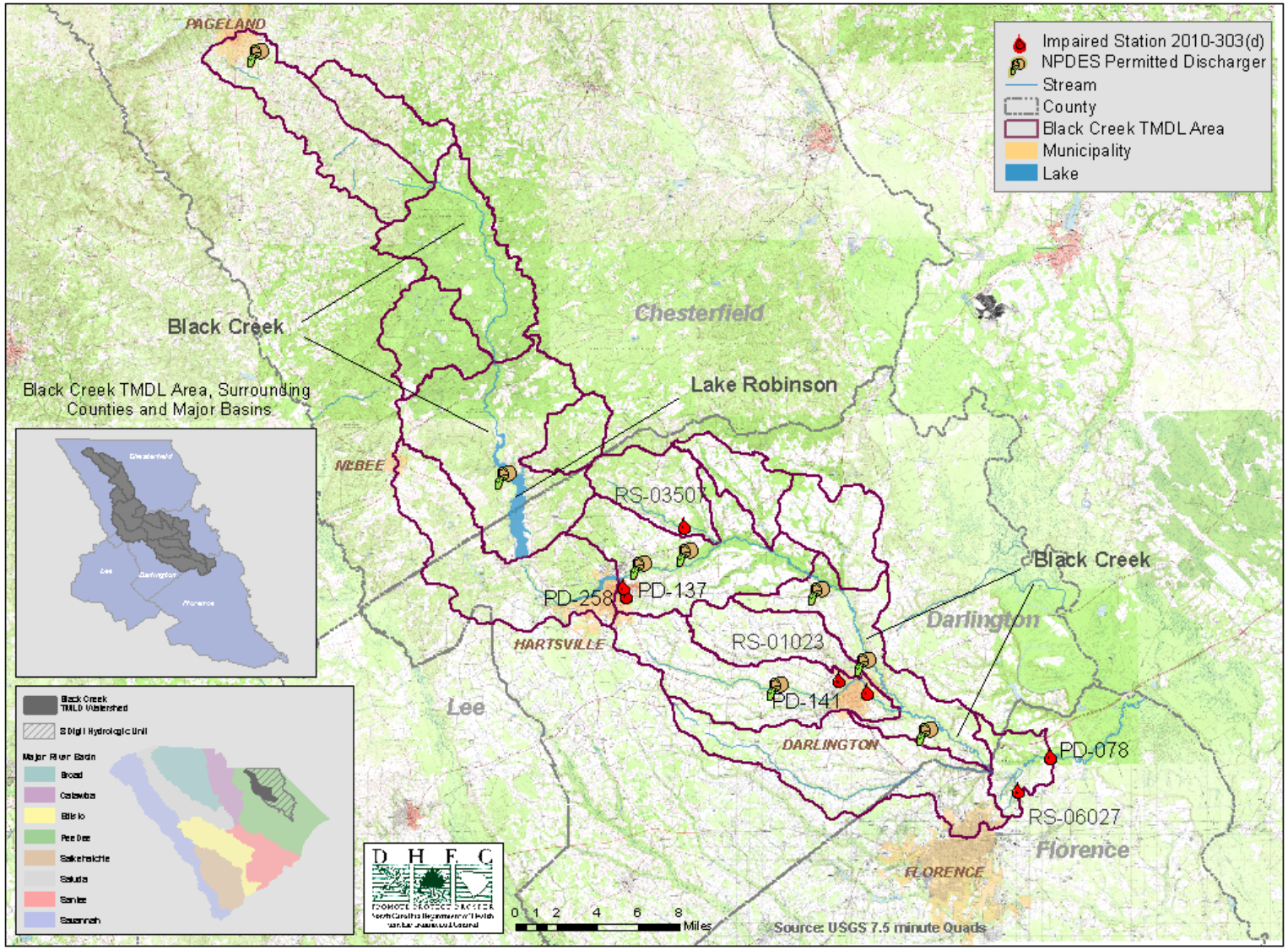


Figure 1: General view of the Black Creek watershed.

There are 31 NPDES permitted dischargers in this watershed. Eight of these are individual permits that have been issued to municipal and industrial dischargers. Of the remaining, 20 are general permits, which are permits issued under 40 CFR 122.28 that authorizes a category of discharges under the CWA and are not specifically tailored for and individual discharger but rather for one or more categories or subcategories of discharges. There are also 3 no discharge (ND) permits that are land application permits, which prohibit the permit holder to discharge to surface waters.

1.3 Water Quality Standard

Regulation 61-69 (SCDHEC, 2006), classifies portions of the impaired stream segments of the Black Creek basin as "Freshwater", however, certain portions of the Black Creek, from S.C. 145 to U.S. 52, have site specific standards for dissolved oxygen (DO) and for pH, and designated as "Freshwater*" (FW*). Note that the FW* water quality classification is used for waterbodies that have site-specific standards for some pollutants. In the aforementioned portions of the Black Creek Watershed, the FW* designation does not pertain to fecal coliform bacteria. Therefore the FW* designation is not relevant for the purposes discussions in this TMDL document.

Regulation 61-68 (SCDHEC, 2008) describes "Freshwater" as follows:

"Freshwaters are 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 aquatic community of fauna and flora. Suitable also for industrial and agricultural uses."

South Carolina's water quality standard (WQS) for fecal coliform in freshwater is:

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

Primary contact recreation is not limited to large streams and lakes. Even streams that are too small to swim in, will allow small children the opportunity to play and immerse their hands and faces. Essentially all perennial streams should therefore be protected from pathogen impairment.

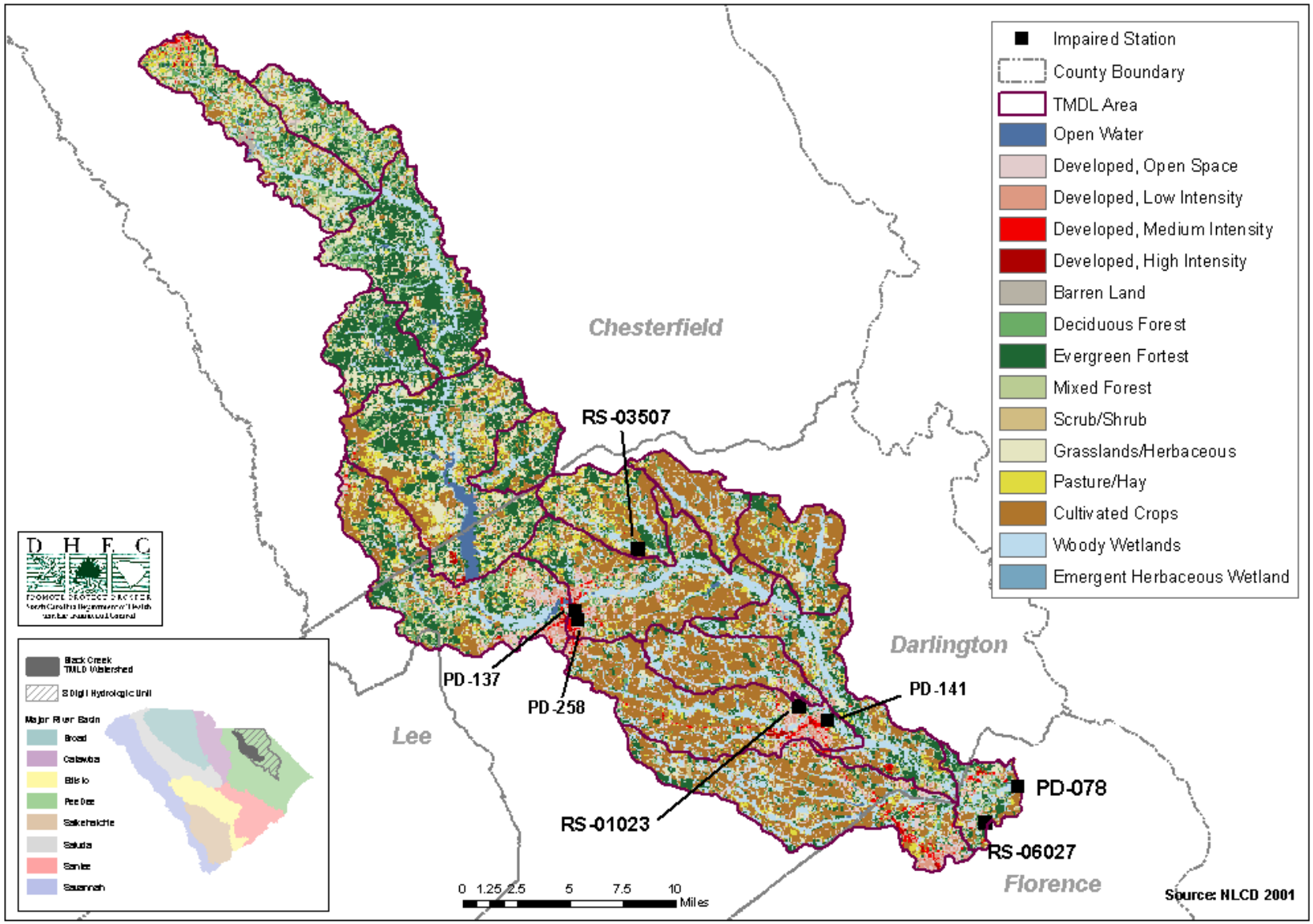


Figure 2: Landuse within the Black Creek TMDL watershed.

2.0 WATER QUALITY ASSESSMENT

The South Carolina Department of Health and Environmental Control (SCDHEC) currently **has** 18 monitoring locations within the Black Creek watershed. Ten of these monitoring sites are along the main stem of the Black Creek. Four of the sites are along Lake Prestwood and Lake Robinson, and the remaining sites are along tributaries of Black Creek (SCDHEC 2007). Of these 18 monitoring sites, currently 15 of them are in inactive status.

Waters in which no more than 10% of the samples collected over a five year period and 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 due to fecal coliform WQS exceedances and placed on South Carolina's §303(d) list[1].

At the time of initial TMDL development, there were seven locations that were considered impaired due to fecal coliform WQS exceedances. Those sites were included on the approved 2010 §303(d) list. However, based on an assessment of more recent data, it has been determined that one of these sites is currently meeting the water quality standard for fecal coliform bacteria. PD-078 will be removed or "delisted" from the §303(d) list for fecal coliform bacteria in 2012. Due to the expected change in impairment status once the 2012 §303(d) list is finalized, the Department believes it is appropriate to present a data summary that includes more recent data, where available, at the time of completing these TMDLs. Table 3 provides a summary of the number of the samples collected, number of exceedances and exceedance percentage. Figure 3 illustrates samples exceeding the water quality standard for monitoring conducted at PD-078 between 2004 and 2011 (shown in green), as well as precipitation data shown in blue.

For station PD-078, a positive correlation was observed between fecal coliform and flow (r= 0.28) and a weaker positive correlation was observed for fecal coliform and rain (r= 0.17). For station PD-137, a positive correlation was observed between fecal coliform and rain (r= 0.37). For station PD-141, a negative correlation was observed between fecal coliform and flow (r= -0.26). For station PD-258, a negative correlation was observed between fecal coliform and flow (r= -0.21). For station RS-01023, a positive correlation was observed between fecal coliform and rain (r= 0.13). For station RS-03507, a positive correlation was observed between fecal coliform and rain (r= 0.26) weak. For station RS-06027, a strong positive correlation was observed between fecal coliform and rain (r= 0.92). The remaining precipitation versus fecal coliform concentration figures are shown in Appendix B.

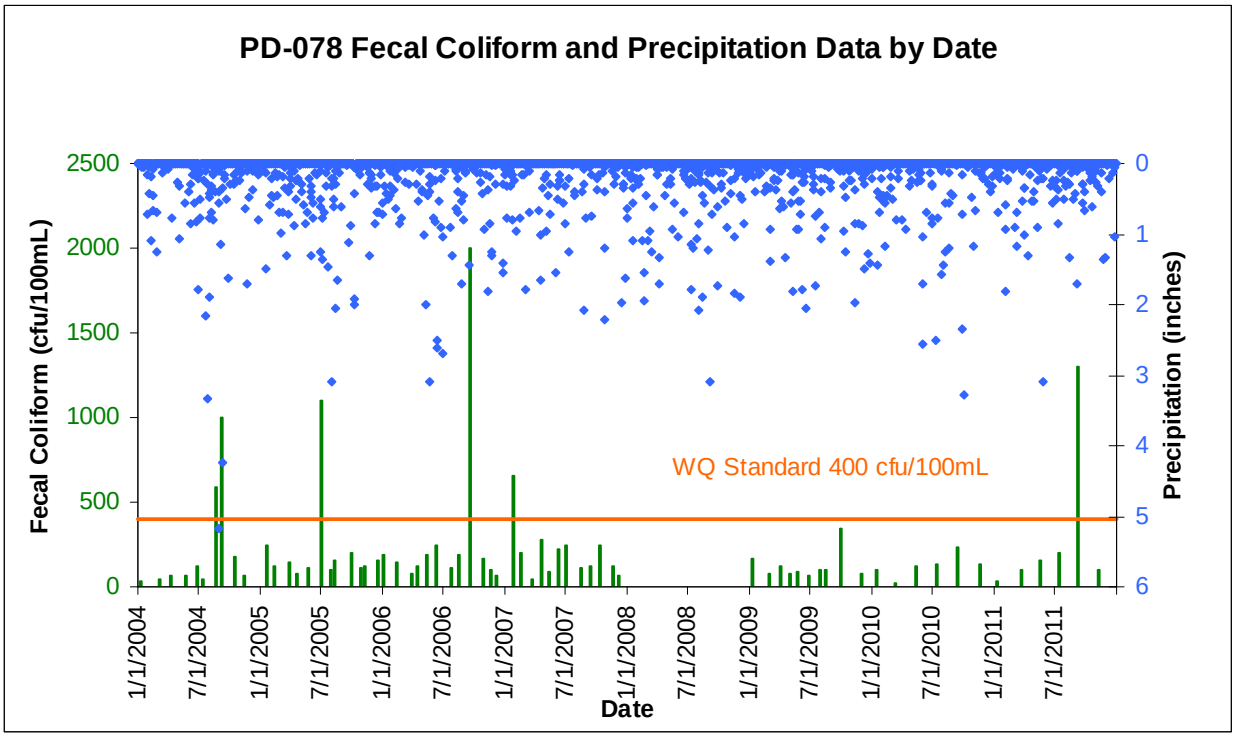
[1] The frequency of sampling was fewer than five samples within a 30-day period; therefore the water quality assessment was based on the 10% standard (400/100 mL).

Table 3. Fecal Coliform Data Summary for Impaired Stations (1999 - 2011)

Station	Waterbody	Number of Samples	Number of Samples >400/100mL	% of Samples Exceed WQS
PD-078*	Black Creek	68	6	8.8%
PD-137	Snake Branch	21	6	28.6%
PD-141	60” tile to ditch (tributary to Swift Creek)	30	17	56.6%
PD-258	Snake Branch	61	47	77.0%
RS-01023	Swift Creek	8	3	37.5%
RS-03507	Boggy Swamp	12	2	16.6%
RS-06027	Ashby Branch	11	6	54.5%

* Contingent upon approval by USEPA, PD-078 will not be included on the 2012 303(d) list for FC bacteria.

Figure 3. Precipitation and fecal coliform data by date for Station PD-078.



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 recreations in and lakes and streams a risk to public health. Indicators such as fecal coliform bacteria, enteroccoci, or *E. coli* are easier to measure, have similar sources as pathogens, and persist in surface waters for a similar or longer length of time. These bacteria are not in themselves disease causing, but indicate the potential presence of organism 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 continuous point sources, such as factories and wastewater treatment facilities, has been greatly reduced. These point sources are required by the CWA to obtain a NPDES permit. In South Carolina NPDES permits require that dischargers of sanitary wastewater must meet the state standard for fecal coliform at the point of discharge. Municipal and private sanitary wastewater treatment facilities may occasionally be sources of pathogen or fecal coliform bacteria pollution. However, if these facilities are discharging wastewater that meets their permit limits, they are not causing impairment provided that a daily maximum limit is being met as specified in the TMDL. 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 construction or industrial sites. MS4s may require NPDES discharge permits under the NPDES Stormwater regulations. These sources are also required to comply with the state standard for the pollutant(s) of concern. If discharges from regulated MS4 entities and from construction and industrial sites meet the percentage reduction or the water quality standard as prescribed in Section 5 of this TMDL document and required in their permit(s), they should not be causing or contributing to an instream FC bacteria impairment.

3.1 Point Sources

Point sources are defined as pollutant loads discharged at a specific location from pipes, outfalls, and conveyance channels from either municipal wastewater treatment plants, industrial waste treatment facilities, or regulated stormwater discharges. Point sources can be further broken down into continuous and non-continuous.

3.1.1 Continuous Point Sources

There are numerous active NPDES dischargers in this watershed, some of which are covered under South Carolina General Permits (SCG). Currently there are 8 active NPDES permitted facilities in the Black Creek watershed, of which 3 are considered 'minor' dischargers, and 5 are 'major' dischargers. Domestic wastewater facilities (dischargers) with a permitted flow of less then 1.0 million gallon a day (MGD) are considered 'minor' and those discharging more than 1.0 MGD are considered 'major'. Of these 8 NPDES permits, 4 facilities are industrial in nature and 4 facilities are domestic in nature**.** A majority of the NPDES permitted dischargers with fecal coliform limits on their effluent are domestic sanitary dischargers. However, some industrial NPDES permitted dischargers (such as aquaculture, leather tanning and finishing, meat and poultry facilities) can have fecal coliform in their effluents and are subject to limits in their effluent for fecal coliform bacteria.

For the purpose of developing this TMDL document, there are currently only 3 NPDES continuous dischargers allowed to discharge fecal coliform bacteria within the TMDL watershed. All three facilities discharge treated domestic, sanitary effluent within the affected watershed. Table 4 includes a list of all individually permitted wastewater dischargers with fecal coliform bacteria limits on their permit and the associated downstream impaired monitoring station.

The Hartville WWTP (SC0021580) is currently the largest of the 4 municipal dischargers in the watershed. Currently, this plant is permitted to discharge up to 5.5 MGD to the Black Creek. Discharge monitoring records (DMR) do not show any violations of fecal coliform limits by this discharger.

The Darlington/Black Creek WWTP (SC0039624) is currently the second largest of the 4 municipal dischargers in the watershed. This plant currently is permitted to discharge 1.6 MGD to the Black Creek. Discharge Monitoring Reports (DMR) show this plant had 6 violations of their fecal coliform limits from 2000 to end of 2008. DMRs for other 2 municipal dischargers do not indicate violations of permit limits for fecal coliform.

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 Treated Sanitary Waste Dischargers in the Black Creek Watershed

Downstream Monitoring Station	Facility Name	Permit Number	Permit Type
*	Pageland/Southeast WWTP	SC0021539**	Minor Municipal
PD-078	Hartsville WWTP	SC0021580**	Major Municipal
PD-078	Darlington/Black Creek WWTP	SC0039624**	Major Municipal
PD-078	DCW & SA Swift Creek WWTP	SC0043231**	Minor Municipal

***** No impaired stations below this NPDES permitted facility, or the closest station downstream from the facility is at a distance where the impact is negligible.
**All facilities are required to meet an end of pipe daily maximum FC bacteria limit of 400 cfu/100 ml, regardless flow.

3.1.2 Non-Continuous Point Sources

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

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 may be covered by the NPDES Storm Water Construction General Permit from DHEC (SCR100000). Where permitted 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.

Similar to regulated MS4s, potentially designated MS4 entities (as listed in 64 FR, 235, P.68837) or other unregulated MS4 communities located in the Black Creek watershed and surrounding watersheds may have the potential to contribute FC bacteria in stormwater runoff. These unregulated entities are subject to the LA for the purposes of this TMDL.

The SCDOT is one of the designated MS4s within the watershed. The SCDOT operates under NPDES MS4 SCS040001 and owns and operates roads in the watershed.

However, the Department recognizes that SCDOT is not a traditional MS4 in that is does not possess statutory taxing or has enforcement powers. SCDOT does not regulate landuse or zoning, issue building or development permits. Current developed land use for the entire TMDL watershed is 9.6%. Based on current Geographic Information System (GIS) information (available at time of TMDL development) there are currently no SCDOT rest areas or other facilities located in the referenced watershed area.

Other MS4s within the Black Creek watershed are Darlington County (SCR033101), City of Florence (SCR034101), City of Quinby (SCR034103), and Florence County (SCR034102).

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.

Sanitary sewer overflows (SSOs) to surface waters have the potential to severely impact water quality. These untreated sanitary discharges result in excursions of the WQS. It is the responsibility of the NPDES wastewater discharger, or collection system operator for non-permitted 'collection only' systems, to ensure that releases do not occur. Unfortunately, releases to surface waters from SSOs are not always preventable or reported. There were 304 reported releases in Chesterfield, Darlington and Florence Counties between 1998 and 2008, resulting in the release of over 10.2 million gallons of untreated sanitary waste. It is not known what percentage of these releases occurred specifically in the Black Creek watershed. It has been shown that fecal coliform concentrations in typical SSOs are reported as 10^5 to 10^7 MPN/100 mL (Novotny et al 1989). At the time of the TMDL development, it is not known if any reported SSOs have entered the State waters.

3.2 Nonpoint Sources

Nonpoint source pollution is defined as pollution that is not released through pipes but rather originates from multiple sources over a relatively large area. Nonpoint sources can be divided into source activities related either to land or water use including failing septic tanks, improper animal-keeping practices, agriculture, forestry practices, wildlife and urban and rural runoff.

Nonpoint source pollution, as well as point source pollution, is the other 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 Black Creek watershed. Nonpoint sources located in unregulated areas are subject to the LA and not the WLA of the TMDL document.

3.2.1 Wildlife

Wildlife (mammals and bird) can be a significant contributor of fecal coliform bacteria. Wildlife in this area typically includes deer, squirrels, raccoons, feral hogs, feral dogs, beavers, and other mammals as well as a variety birds. Wildlife wastes are carried into nearby streams by runoff following rainfall or deposited directly in streams. Waterfowl also may be a significant contributor of fecal coliform bacteria in this watershed, especially in impounded areas, which provide a desirable habitat for geese and ducks.

In 2008, SCDNR estimated that there are less than 15 to approximately 30 deer per square mile within the Black Creek watershed (SCDNR 2008). SCDNR estimated deer density based on suitable habitat (forests, croplands, and pastures). The fecal coliform production rage for deer has been shown to be 3.47×10^8 cfu/head-day in a study conducted by Yagow (1999), of which only a portion will enter the water.

3.2.2 Agricultural Activities

Agricultural activities that involve livestock, animal wastes, or unstabilized surfaces are potential sources of fecal coliform contamination of surface waters. Fecal matter can enter the waterway via runoff from the land or by direct deposition into the stream. Agricultural activities may represent a significant source of fecal coliform in the Black Creek watershed due to the fact that these activities constitute a large portion of the land use. Unstabilized soil directly adjacent to surface waters can contribute to fecal coliform loading during periods of runoff after rain events. During these events, fertilizer and wildlife wastes can be transported into the creek and carried downstream.

3.2.2.1 Agricultural Animal Facilities

Owners/operators of most commercial animal growing operations are required by SC Regulations 61-43, Standards for the Permitting of Agricultural Animal Facilities, to obtain permits for the handling, storage, treatment (if necessary) and disposal of the manure, litter and dead animals generated at their facilities (SCDHEC 2002). The requirements of R. 61-43 are designated to protect water quality; therefore, we have a reasonable assurance that facilities operating in compliance with this regulation should not contribute to downstream water quality impairments. SC currently does not have any confined animal feeding operations (CAFOs) under NPDES coverage; however, the State does have permitted animal feeding operations (AFOs) covered under R. 61-43. These permitted animal feeding 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 subject to enforcement actions by SCDHEC.

There are currently 28 active permitted animal feeding operations (AFOs) in the Chesterfield, Darlington, and Florence County limits of the Black Creek watershed. These facilities consist of one dairy, one duck, one quail, nine broiler poultry, one layers poultry, one pullet poultry, and fourteen turkey operations (Table 5).

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.

Table 5. Permitted Animal Feeding Operations within the Black Creek Watershed.

Downstream Monitoring Station	AFO Permit	Facility	Type of Livestock	Number of Animals	Total Permitted Acres
PD-078	ND0016098	Chaplin Brothers Dairy	Dairy	200	155.4
PD-078	ND0076341	Gallus Farms	Ducks	80,000	52.5
PD-078	ND0072974	Collins Broiler Facility	Poultry (Broilers)	16,000	116.1
PD-078	ND0084271	Dearfield Farms	Poultry (Broilers)	4,400	Burial
PD-078	ND0070866	Easterling Broiler Farms	Poultry (Broilers)	120,000	101.8
PD-078	ND0073563	Evans Mitchell/Broiler Facility	Poultry (Broilers)	29,962	21.7
PD-078	ND0073750	Howle Farm	Poultry (Broilers)	120,000	127.3
PD-078	ND0070572	Jordan Broiler Facility	Poultry (Broilers)	60,000	41.9
PD-078	ND0073733	Melton Philip/Broiler Facility	Poultry (Broilers)	120,000	342.5
PD-078	ND0085391	Ticks Creek Farm	Poultry (Broilers)	120,000	BURIAL
PD-078	ND0067270	Young RJ Broiler Facility	Poultry (Broilers)	120,000	578.1
PD-078	ND0061948	Egg and I Farm	Poultry (Layers)	1,002,000	90.8
PD-078	ND0066001	McFarlan Farm	Poultry (Pullets)	80,000	219.4
PD-078	ND0069272	Pee Dee Hatchery/Tower Farm	Quail	1,440,000	178.7

PD-078	ND0078492	4 D's Farm	Turkey	45,000	257.0
PD-078	ND0066010	Brockmill Farm	Turkey	54,400	219.4
PD-078	ND0075591	Knight Richard & Gina/Turkey	Turkey	45,000	216.4
PD-078	ND0076422	Mac and Mac Farm #128	Turkey	45,000	110.4
PD-078	ND0066028	Pee Dee Farm	Turkey	54,400	219.4
PD-078	ND0066036	Pleasant Grove Farm	Turkey	54,000	219.4
PD-078	ND0066044	Quail Hollow Farm	Turkey	81,600	219.4
PD-078	ND0065048	Robertson Ray/Turkey Facility	Turkey	12,000	13.0
PD-078	ND0086142	Stewart Farms	Turkey	48,000	0
PD-078	ND0076571	T & K Farm	Turkey	45,000	31.0
PD-078	ND0062537	Treetop Farm	Turkey	24,000	219.4
PD-078	ND0078034	W Windham Farms	Turkey	16,000	116.1
PD-078	ND0066052	Watson Farm	Turkey	12,000	219.4
PD-078	ND0078891	Wayne Growout Turkey Facility	Turkey	45,00	879.7

3.2.2.2 Grazing Animals

Livestock, especially cattle, are frequently major contributors of fecal coliform bacteria to streams. Cattle on average produce some 1.0E-11 cfu/day per animal of fecal coliform bacteria (ASAE 1998). Grazing cattle and other livestock may contaminate streams with fecal coliform bacteria indirectly by runoff from pastures or directly by defecating into streams and ponds. The grazing of unconfined livestock (in pastures) is not regulated by SC DHEC. The Unites States Department of Agriculture's National Agricultural Statistics Service reported 17945 cattle and calves in Chesterfield, Darlington and Florence Counties in 2007 (USDA 2007). Since the surface area contribution from Lee County (0.76 mi^2) is very small compared to other 3 counties, and the landuse is mostly forested areas, grassland, and cultivated crops, cattle and calve count do not include Lee County. Based on 2001 NLCD, there are approximately 8,928 acres of pasture land

within the TMDL watershed. Assuming a uniform distribution of livestock and landuse, there are approximately 0.013 livestock per acre, for a total of 115 cattle and calves estimated to be in the TMDL watershed. Direct loading by cattle or other livestock to surface waters with in the Black Creek watershed is likely to be a significant source of fecal coliform. It is estimated that 115 cattle and calves would produce approximately 1.15E+12 cfu/day of fecal coliform bacteria.

BMP installation could minimize the impact of grazing animals to surface waters of the State. A study conducted in 1998 by the American Society of Agricultural and Biological Engineers (ASABE 1998) has shown that a vegetative buffer measuring 6.1 meters (20.0 feet) in width can reduce fecal runoff concentrations from 2.0E+7 to an immeasurable amount once filtered through the buffer. A buffer of this width was also shown to reduce phosphorus and nitrogen concentrations by 75%. Installing fencing along the streams within the watershed where livestock are present would also eliminate the direct contact of cattle with the streams. It has also been shown that installing water troughs within a pasture area in a West Virginia study reduced the amount of time cattle spent drinking directly from streams by 92% (ASABE 1998). An indirect result of this was a 77% reduction in stream bank erosion.

3.2.3 Land Application of Industrial, Domestic Sludge or Treated Wastewater

NPDES-permitted industrial and domestic wastewater treatment processes may generate solid waste bi-products, also know as sludge. In some cases, facilities may be permitted to land apply sludge at designated locations and under specific conditions. There are also some NPDES-permitted facilities authorized to land apply treated effluent at designated locations and under specific conditions. 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 Black Creek Watershed. If properly managed, waste is applied at a rate that ensures nutrients will be incorporated into the soil or plants and nutrients will not enter streams. Land applications sites can be a source of nutrients 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 Black Creek and its tributaries. Direct discharges from land applications sites to surface waters of the State are illegal and are subject to enforcement actions by SCDHEC.

3.2.4 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 waster to the surrounding environment. Quantifying these sources is extremely speculative without direct monitoring of the source because the magnitude is directly proportional to the volume and its proximity to the surface water. Typical values of fecal coliform in

untreated domestic wastewater range from 10^4 to 10^6 MPN/100mL (Metcalf and Eddy 1991).

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. Monitoring of storm drain outfall during dry weather is needed to document the presence or absence of sewage in the drainage systems.

3.2.5. Failing Septic Systems

Studies demonstrate that wastewater located four feet below properly functioning septic systems contains 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 Black creek and its 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.

Within the TMDL area and based on the 2000 U.S. population census (U.S. Census Bureau 2000), there are estimated to be 20546 homes with an approximate population of 46781 people. Of these, it is estimated that 11896 homes with a population of 27930 people are on septic systems within the Black Creek watershed spanning Chesterfield, Darlington and Florence Counties. Of the total number of households, 8650 homes with an estimated population of 18851 people within the watershed rely on a community sewer system.

3.2.6 Urban and Suburban Stormwater Runoff

Dogs, cats and other domesticated pets are the primary source of fecal coliform deposited on the urban landscape. According to a 2002 study conducted by the American Veterinary Medical Association (AVMA 2002), there are 0.58 dogs and 0.66 cats on average per household within an urban setting. Based on U.S. census data (U.S. Census Bureaus 2000), it is estimated that there are 20546 households within the Black Creek watershed. There are approximately 11917 dogs in the watershed. It has been shown that dogs produce approximately 0.32 pounds of fecal waste per day (Geldrich, et al., 1962). This results in an estimated 3813 pounds of waste deposited by domesticated dogs in the watershed per day. Based on the AVMA study and observations by Geldrich and others, cats produce approximately 0.15 pounds of fecal waste per day. There are approximately 13560 cats in the drainage area producing 2034 pounds of waste per day. There are also ‘urban’ wildlife, squirrels, raccoons,

pigeons, and other birds in the watershed, all of which contribute to the fecal coliform load.

As previously described, there are currently four regulated small MS4s located in the Black Creek Watershed. Regulated MS4s are subject to the WLA component of the TMDL. Similar to regulated MS4s, potentially designated MS4 entities (as listed in Federal Register 64, 235, p. 688837) or other unregulated MS4 communities located in the Black Creek watershed may have the potential to contribute fecal coliform bacteria in stormwater runoff.

Roads, facilities and/or properties owned and operated by the South Carolina Department of Transportation (SCDOT) is/are currently covered under NPDES MS4 SCS040001, hence covered under the WLA portion of the TMDL. There may be other non-regulated roads (county roads) within the watershed that could contribute to FC loadings within the Black Creek watershed. Runoff from properties including but not limited to ditches, culverts and right of ways may have the potential to contribute or convey fecal coliform loading.

4.0 LOAD-DURATION CURVE METHOD

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

The load-duration curve method depends on an adequate period of record for flow data. USGS gage 02130980 near Quinby on the Black Creek was used to provide an adequate record. This gage began recording daily flows in October of 2001 and provides the flow data required to establish the flow duration curve for station PD-078. Flow data for an eight-year period (2004-2011) was used to establish flow duration curves. There were no records missing for this station (i.e., there is not missing data). For stations PD-137, PD-141, PD-258, RS-01023, RS-03507 and RS-06027, data from USGS gauge 02130900 near McBee was used for analysis. This gage began recording flows in October of 1959.

The flow records were used to estimate adjusted flows at each of the 7 impaired monitoring stations. Drainage areas of each sampling station were delineated using USGS topographic maps and ArcView software. The drainage areas for each monitoring station was calculated and used to estimate flows based on the ratio of the monitoring station drainage area to the appropriate USGS gage. For example, the USGS 02130980 on the Black Creek near Quinby gage records flow from 438 square

miles (sq mi). The drainage area at monitoring station PD-078[2] is approximately 437.79 square miles, or 99.9 % of the total drainage area at USGS gage 02130980. Mean daily flow for the PD-078 monitoring station was assumed to be 99.9 % of the daily flow at the Black Creek Quinby gage.

Flow duration curves were developed by ranking flow 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 exceedances. A high number of exceedances 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 excluded from the development of a TMDL due to their infrequency.

A target load-duration curve was created by calculating the allowable load using daily flow, the fecal coliform WQS concentration and a unit conversion factor. The water quality target was set at 380 cfu/100ml for the instantaneous criterion, which is 5 percent lower than the water quality criteria of 400 cfu/100ml. A five percent explicit Margin of Safety (MOS) was reserved from the water quality criteria in developing target load-duration curves. The load-duration curve for station PD-078 is presented in Figure 4 as an example. Load-duration curves for all fecal coliform impaired stations are provided in Appendix A.

For all curves, including Figure 4, the independent variable (X-Axis) represents the percentage of estimated flows greater than value x. The dependent variable (Y-Axis) represent the fecal coliform loading at each estimated flow expressed in terms of colony forming units per day (cfu/day). In each of the defined flow intervals for stations PD-078, PD-137, PD-141, PD-258, RS-01023, RS-03507, and RS-06027 existing and target loadings were calculated by the following equations:

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

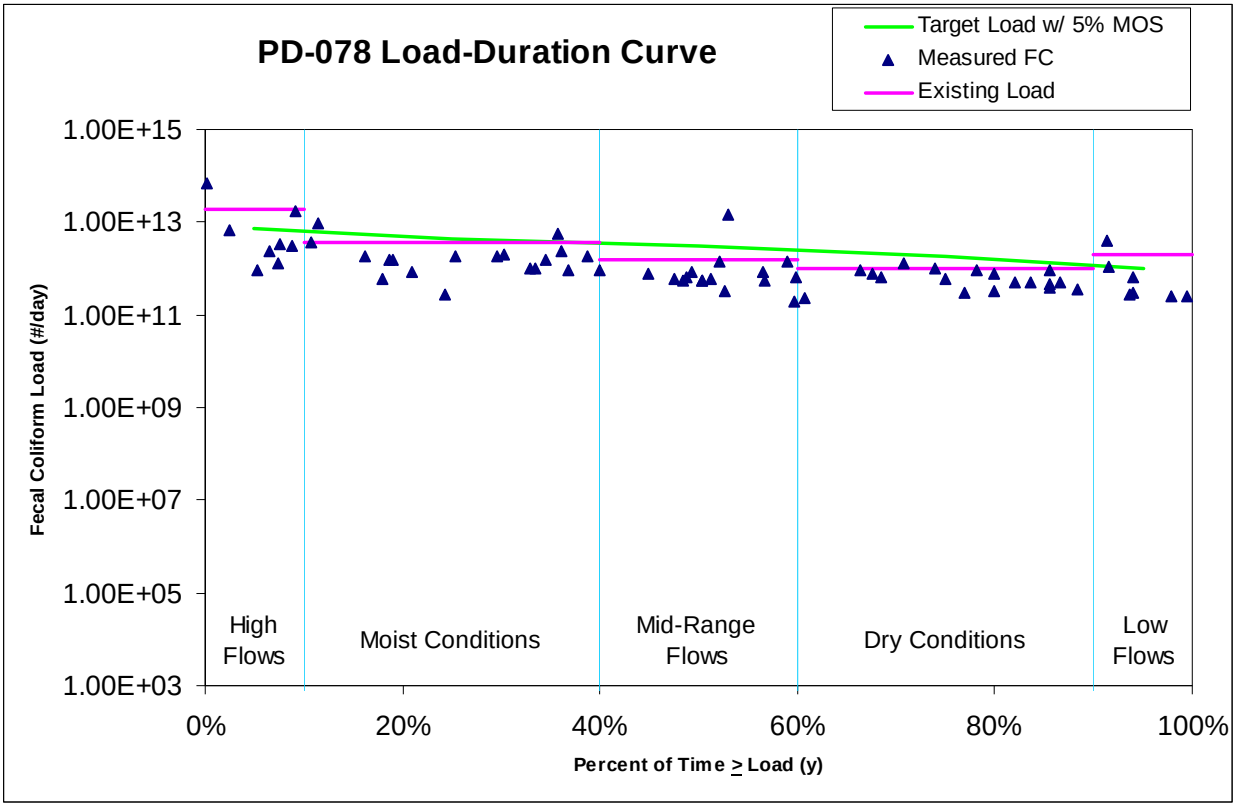
Instantaneous loads for each of the impaired stations were calculated. Available measured fecal coliform concentrations from 1999 through 2011 were multiplied by

[2] Total drainage area of station PD-078 minus the drainage areas of the other impaired stations within the TMDL watershed.

measured (or estimated flow based on drainage area) flow on the day of sampling and a unit conversion factor. These data were plotted on the load-duration graph based on the flow duration interval for the day of sampling. Samples above the target line are violations of the WQS while samples below the line are in compliance (Figure 4; Appendix A). 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 concentrations within each hydrologic category were multiplied by the flow at each category midpoint (i.e., flow at the 25 % duration interval for the Moist Conditions, 50 % interval for Mid-Range, and 75 % for Dry Condition). Existing loads are plotted on the load-duration curves presented in Appendix A as well as the example for station PD-078 in Figure 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 than the WQS will be attained under all flow conditions.

Figure 4. Load Duration Curve for the Black Creek Station PD-078



* Contingent upon approval by USEPA, PD-078 will not be included on the 2012 303(d) list for FC bacteria.

5.0 DEVELOPMENT OF TOTAL MAXIMUM DAILY LOAD

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

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

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

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

5.1 Critical Conditions

This TMDL is based on the flow recurrence interval between 10% and 90% and excludes extreme high and low flow conditions; flows that are characterized as 'Low' or 'High' in Figure 4 and Appendix A were not included in the analysis. The critical condition for each monitoring station is identified as the flow condition requiring the largest percent reduction, within the 10 - 90% duration intervals. Critical conditions for the Black Creek watershed pathogen impaired segments are listed in Table 6. These data indicate that for the majority of the stations, wet weather results in larger bacteria loads and is therefore the critical condition for those stations.

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 point and nonpoint sources are included in this value. The existing load for each station in the Black Creek watershed is provided in Appendix C.

At the time of initial TMDL development, there were seven locations in the TMDL watershed considered impaired due to fecal coliform. These sites were included on the approved 2010 §303(d) list. However, based on an assessment of more recent data, it has been determined that one of these sites is currently meeting the water quality standard for fecal coliform bacteria. PD-078 will be removed or "delisted" from the §303(d) list for fecal coliform bacteria in 2012. Due to the expected change in impairment status once the 2012 §303(d) list is finalized, the Department believes it is appropriate to indicate that no fecal coliform bacteria reduction will be necessary for PD-078.

Table 6. Percent Reduction Necessary to Achieve Target Load by Hydrologic Category

Station	Waterbody	Wet Conditions	Moist Conditions	Mid-Range Flow	Dry Conditions
PD-078*	Black Creek	NRN	NRN	NRN	NRN
PD-137	Snake Branch	N/A	59%	81%	46%
PD-141	60" Tile to ditch (tributary to Swift Creek)	N/A	42%	68%	83%
PD-258	Snake Branch	N/A	47%	80%	84%
RS-01023	Swift Creek	N/A	42%	N/A	NRN
RS-03507	Boggy Swamp	N/A	NRN	NRN	72%
RS-06023	Ashby Branch	N/A	83%	73%	57%

Highlighted cells indicate critical condition.
NRN = As long as ambient conditions remain the same no reduction is needed. Existing load below target load.
* Contingent upon approval by USEPA, PD-078 will not be included on the 2012 303(d) list for FC bacteria.

5.3 Wasteload Allocation

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

5.3.1 Continuous Point Sources

There are four active permitted domestic dischargers in the Black Creek watershed (See Table 4). To determine the WLA for the four permitted sanitary dischargers, the average monthly permitted flow for these facilities was multiplied by the instantaneous WQS (400cfu/100mL) and a unit conversion factor. The WLA for each of these dischargers, based on a permitted daily maximum of 400 cfu/100mL, is presented in Table 7. The WLA for the largest sanitary waste water facility, Hartsville WWTP, in the Black Creek watershed is 8.34E+12 cfu/day based on an average monthly permitted flow of 5.5 MGD. For the Darlington WWTP, the WLA was determined to be 2.43E+12 cfu/day based on an average permitted monthly flow of 1.6 MGD. For DCW&SA WWTP, WLA is 1.73E+11 cfu/day which is based on an average monthly permitted flow of 0.114 MGD. Since the Pageland South WWTP is at the headwaters of the watershed and is unlikely to cause or contribute to fecal coliform impairments in the TMDL watershed (see Figures 5a and 5b), there is no WLA for this facility.

Table 7. Average Monthly Permitted Flow and WLAs for the NPDES Wastewater Dischargers in the Black Creek Watershed.

Downstream Monitoring Station	Facility Name	NPDES Permit #	Average Monthly Permitted Flow (MGD)	WLA (#/day)
*	Pageland South	SC0021539	0.6	n/a
PD-078	Hartsville WWTP	SC0021580	5.5	8.34E+10
PD-078	Darlington WWTP	SC0039624	1.6	2.43E+10
PD-078	DCW&SA WWTP	SC0043231	0.114	1.73E+09

***** No impaired monitoring stations below this NPDES permitted facility.

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 5 presents the reduction needed in the impaired segment. The reduction percentage in this TMDL also applies to the fecal coliform waste load attributable to those areas of the watershed, which are covered or will be covered under NPDES MS4 permits. Compliance by an entity with responsibility for the MS4, with the terms of its individual MS4 permit may fulfill any obligations it has towards implementing these TMDLs.

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

1. An inventory of service boundaries of the MS4 covered in the MS4 permit, provided as ARCGIS compatible shape files.

2. An inventory of all existing and planned stormwater discharge points, conveyances, and drainage areas for the discharge points, provided as ARCGIS compatible shape files. If drainage areas are not known, any information that would help estimate the drainage areas should be provided. The percentage of impervious surface within the MS4 area should also be provided.

3. Appropriate and relevant data should be provided to calculate individual pollutant contributions for the MS4 permitted entities. At a minimum, this information should include precipitation, water quality, and flow data for stormwater discharge points.

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

Table 8. Percent Reductions Necessary to Achieve Target Loads.

Station	Waterbody	% Reduction
PD-078	Black Creek	NRN
PD-137	Snake Branch	81
PD-141	60” tile to ditch (tributary to Swift Creek)	83
PD-258	Snake Branch	81
RS-01023	Swift Creek	42
RS-03507	Boggy Swamp	72
RS-06023	Ashby Branch	83

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

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 9. There may also be other unregulated MS4s located in the watershed that are subject to the LA component of this TMDL. At such time that the reference entities, or other future unregulated entities become regulated NPDES MS4 entities and subject to applicable provisions of SC Regulation 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 an 12-year hydrological data set and 12 month water quality sampling data set, which includes data collected from all seasons.

5.6 Margin of Safety

The margin of safety (MOS) may be explicit and/or implicit. The explicit margin of safety is 5% of the TMDL or 20 counts/100mL of the instantaneous criterion of 400 cfu/100 mL (380 cfu/100mL). Target loads are therefore 95% of the assimilative capacity (TMDL) of the waterbody. The MOS is expressed as the value calculated from the critical condition defined in Section 5.1 and is the difference between the TMDL and the sum of the WLA and LA. The calculated values of the MOS for each station are given in Table 9.

5.7 TMDL

For most pollutants, TMDLs are expressed as a mass load (e.g., kilograms per day). For bacteria, however, TMDLs are expressed in terms of cfu or organism counts (or resulting concentration), in accordance with 40 CFR 130.2(l). Only the instantaneous water quality criterion was targeted because there is insufficient data to evaluate against the 30-day geometric mean. The target load is defined as the load (from point and nonpoint sources) minus the MOS that a stream segment can receive while meeting the WQS. The TMDL value is the median target load within the critical condition (i.e., the middle value within the hydrologic category that requires the greatest load reduction) plus WLA and MOS. Black Creek watershed extends from the Town of Pageland, Chesterfield County, to near the City of Florence, Florence County. The overall drainage area is 449.2 mi^2. Lakes Robinson and Prestwood are located in approximately the middle of the overall watershed (Figure 5a). There are currently no sites impaired for fecal coliform bacteria located in or upstream of the two impoundments. The presence of these lakes may limit the downstream transport of FC bacteria from the upper part of the watershed. Therefore, this TMDL document addresses reductions for 7 station included in the 2010 303(d) list downstream from these lakes as illustrated in Figure 5b. Values for each component of the TMDL for the impaired segments of the Black Creek watershed are provided in Table 9.

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

Table 10 indicates the MS4 entities responsible for meeting the percentage reductions or water quality standard, whichever is less restrictive, by individual sub watershed (WQM Station). Note that all future regulated NPDES-permitted stormwater discharges will also be required to meet the prescribed percentage reductions, or the water quality standard, to the maximum extent practicable, where applicable. It should be noted that in order to meet the WQS for fecal coliform bacteria, prescribed load reductions must be targeted from all sources, including NPDES permitted and nonpoint sources. Compliance by an entity with responsibility for the MS4 with the terms of its individual MS4 permit may fulfill any obligations it has toward implementing this TMDL.

Table 9. TMDL Components for the Fecal Coliform Impaired Segments in the Black Creek Watershed, below Lake Prestwood. Loads are expressed as colony forming units (cfu) per day.

Station	Existing Load (cfu/day)	TMDL (cfu/day)	Margin Of Safety (cfu/day)	Wasteload Allocation (WLA)			Load Allocation (LA)	
				Continuous Sources[1] (cfu/day)	Non-Continuous Sources [2, 4] (% Reduction)	Non-Continuous SCDOT[3,4] (% Reduction)	Load Allocation (cfu/day)	%Reduction to Meet LA[4]
PD-078	3.60E+12	4.65E+12	2.32E+11	1.09E+11	0%[5]	0%[5]	4.31E+12	0%[5]
PD-137	1.93E+10	3.85E+09	1.93E+08	See note below	81%	81%	3.66E+09	81%
PD-141	1.62E+10	2.85E+09	1.43E+08	See note below	83%	83%	2.71E+09	83%
PD-258	2.07E+10	3.47E+09	1.73E+08	See note below	84%	84%	3.30E+09	84%
RS-01023	1.91E+09	1.17E+09	5.84E+07	See note below	42%	42%	1.11E+09	42%
RS-03507	2.30E+11	6.77E+10	3.39E+09	See note below	72%	72%	6.43E+10	72%
RS-06027	6.88E+10	1.20E+10	5.98E+08	See note below	83%	83%	1.14E+10	83%

Table Notes:

1. WLAs are expressed as a daily maximum. Existing and future continuous dischargers are required to meet the prescribed loading for the pollutant of concern. Loadings were developed based upon permitted flow and an allowable permitted maximum concentration of 400cfu/100ml.
2. Percent reduction applies to all NPDES-permitted stormwater discharges, including current and future MS4, construction and industrial discharges covered under permits numbered SCS & SCR. Stormwater discharges are expressed as a percentage reduction due to the uncertain nature of stormwater discharge volumes and recurrence intervals. Stormwater discharges are required to meet percentage reduction or the existing instream standard for pollutant of concern in accordance with their NPDES permit.

3. By implementing the best management practices that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 permit to address fecal coliform, the SCDOT will comply with this TMDL and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 permit.

4. Percent reduction applies to existing instream load.

5. Contingent upon approval by USEPA, PD-078 will not be included on the 2012 303(d) list for FC bacteria. As long as ambient conditions remain the same no reduction is needed.

Table 10. Regulated MS4 Entities Currently Responsible for Meeting Percentage Reduction or WQ Standard by Monitoring Station.

Station	WLA % Reduction	Existing Regulated MS4 Entities in Watershed
PD-078	0%*	SCDOT SCS040001 City of Quinby SCR034103 Darlington County SCR033101 Florence County SCR034102 City of Florence SCR034101
PD-137	81%	SCDOT SCS040001
PD-141	83%	SCDOT SCS040001
PD-258	84%	SCDOT SCS040001
RS-01023	42%	SCDOT SCS040001
RS-03507	72%	SCDOT SCS040001
RS-06027	83%	SCDOT SCS040001 City of Quinby SCR034103 Florence County SCR034102

It should be noted that in order to meet the WQS for fecal coliform bacteria, prescribed load reductions must be targeted from all sources including NPDES permitted and nonpoint sources.

* Contingent upon approval by USEPA, PD-078 will not be included on the 2012 303(d) list for FC bacteria. As long as ambient conditions remain the same no reduction is needed.

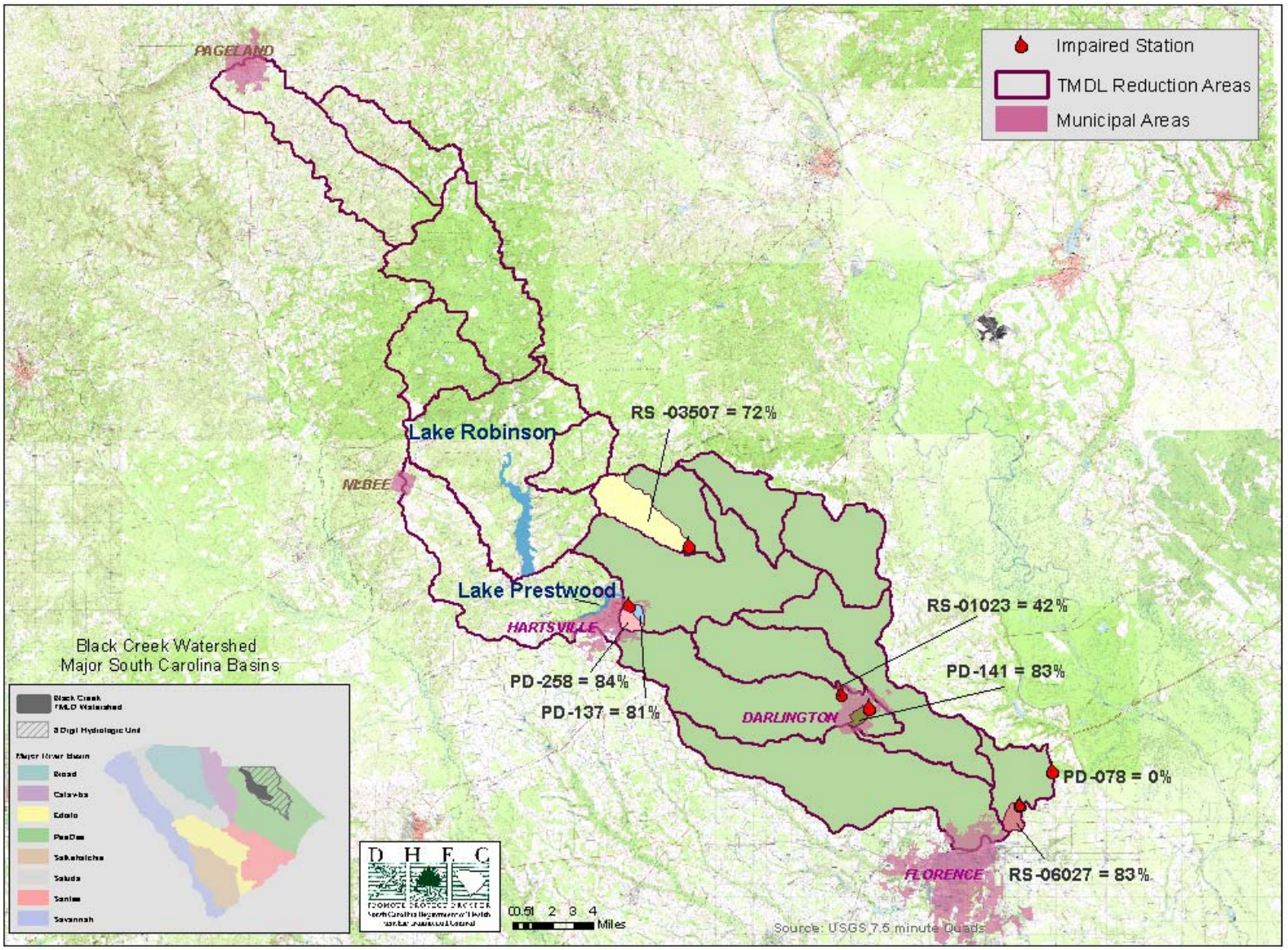


Figure 5a. General view of the Black Creek watershed and percent reductions necessary to achieve target loads by station.

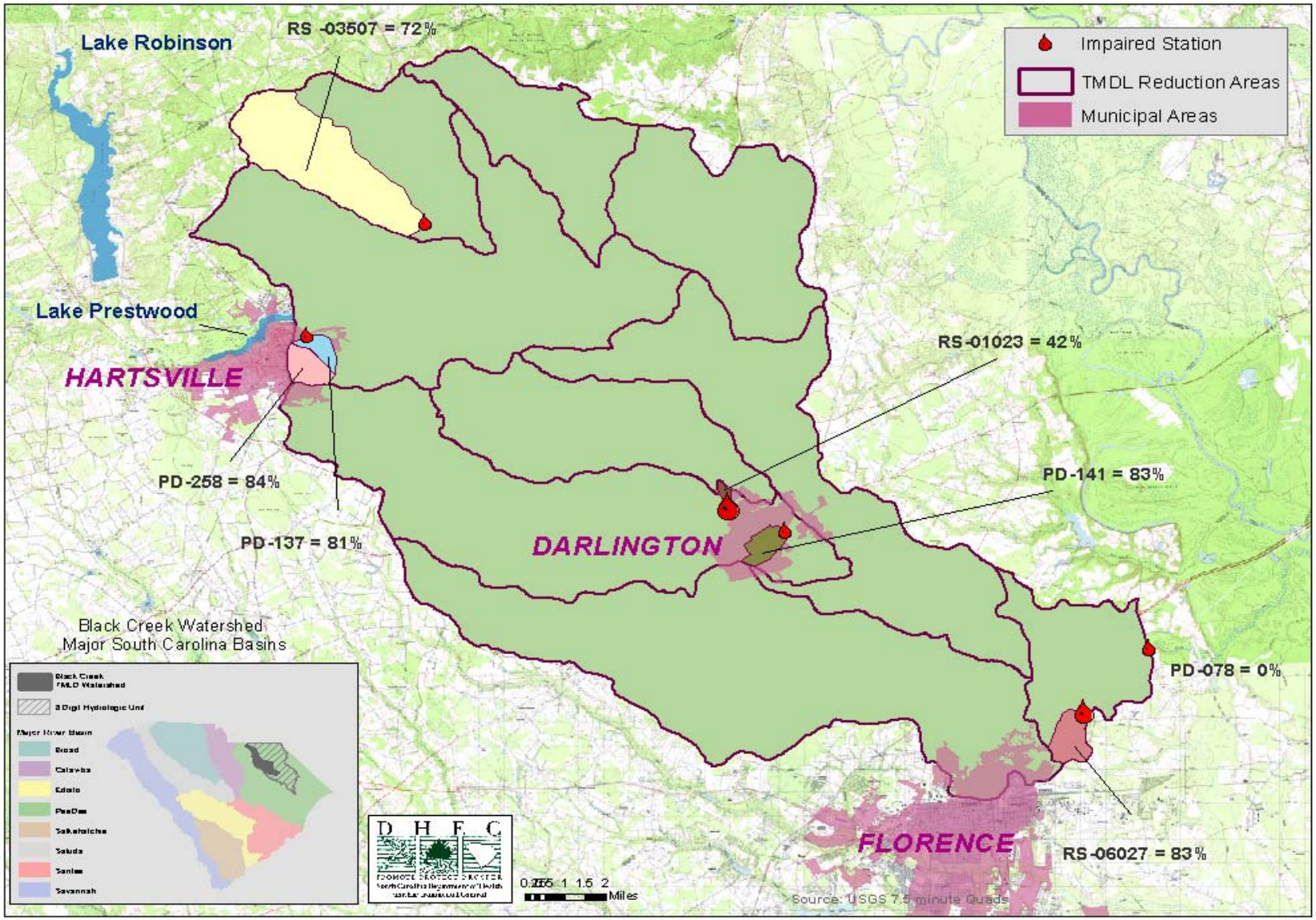


Figure 5b. Detailed view of the area with applicable percent reductions necessary to achieve target loads, by station.

6.0 IMPLEMENTATION

The implementation of both point (WLA) and non-point (LA) source components of the TMDL are necessary in order to meet water quality standard. Using existing authorities and mechanisms, an implementation strategy providing information on how point and non point sources of pollution are being abated or may be abated in order to meet water quality standards is provided. Sections 6.1.1-6.1.7 presented below correspond with sections 3.1.1-3.2.5 of the source assessment presented in the TMDL document. As the implementation strategy progresses, DHEC will 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. A 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 Black Creek and its tributaries. Congress amended the Clean Water Act in 1987 to establish the Section 319 Nonpoint Source Management Program. Under Section 319, States receive grant money to support a wide variety of activities including the restoration of impaired waters.

TMDL implementation projects are given highest priority for 319 funding. CWA §319 grants are not available for implementation of the WLA component of this TMDL nor within the MS4 jurisdictional boundary. Additional resources are provided in Section 7.0 of this TMDL document.

SCDHEC will also work with the existing agencies in the area to provide nonpoint source education in the Black Creek watershed. Local sources of nonpoint source education and assistance include the Natural Resource Conservation Service (NRCS), the Clemson University Cooperative Extension Service, Florence Darlington Stormwater Consortium, 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 Black Creek Watershed. As additional data and/or information becomes available, it may become necessary to revise and/or modify the TMDL target accordingly.

6.1 Implementation Strategies

The strategies presented in this document for implementation of the referenced TMDL are not inclusive and are to be used only as guidance. The strategies are informational suggestions which may or may not lead to the required load reductions being met for the referenced watershed while demonstrating consistency with the assumptions and requirements of the TMDL. Application of certain strategies provided within may be voluntary and they are not a substitute for actual NPDES permit conditions.

6.1.1 Continuous Point Sources

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

6.1.2 Non-Continuous Point Sources

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

The level of monitoring necessary, deployment of structural and non-structural BMPs, evaluation of BMP performance, and optimization or revisions to the existing pollutant reduction goals of the SWMP or any other plan is TMDL and watershed specific. Hence, it is expected that NPDES permit holders evaluate their existing SWMP or other plans in a manner that would effectively address implementation of this TMDL with an acceptable schedule and activities for their permit compliance. The Department staff (permit writers, TMDL project managers, and compliance staff) is willing to assist in developing or updating the referenced plan as deemed necessary. Please see Appendix H 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. 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. Achieving the WLA reduction for the TMDL may constitute MS4 compliance with its SWMP, provided the MEP definition is met, even where the numeric percent reduction may not be achieved in the interim.

Regulated MS4 entities are required to develop a SWMP that includes the following: public education, public involvement, illicit discharge detection & elimination, construction site runoff control, post construction runoff control, and pollution prevention/good housekeeping. These measures are not exhaustive and may include additional criterion depending on the type of NPDES MS4 permit that applies. These examples are recognized as acceptable stormwater practices and may be applied to unregulated MS4 entities or other interested parties in the development of a stormwater management plan.

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

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

storm drains free of debris and monitor what is entering local waterways through storm drains (USEPA, 2005).

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

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

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

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

MS4 communities are encouraged to utilize partnerships when developing and implementing a stormwater management program. Watershed associations, educational entities, and state, county, and city governments are all examples of possible partners with resources that can be shared. For additional information on partnerships contact the SCDHEC Watershed Manager for the waterbody of concern online at: http://www.scdhec.gov/environment/water/shed/contact.htm. For additional information on stormwater discharges associated with MS4 entities please see SCDHEC's NPDES web page online at
http://www.scdhec.gov/environment/water/swnpdes.htm as well as 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

6.1.3 Wildlife

Suggested forms of implementation for wildlife will vary widely due to geographic location and species. During a source assessment it was noted that waterfowl were present. Deterrents could be used to keep waterfowl away from lawns in close proximity to surface waters. These include non-toxic sprays, decoys, kites, noisemakers, scarecrows, and plastic owls. Homeowners should be educated on the impacts of feeding wildlife or planting food plots in close proximity to surface waters. Please check local and federal laws before applying deterrents or harassing wildlife. Additional information may be obtained from the "Managing Pet and Wildlife Waste to Prevent Contamination of Drinking Water" bulletin provided by USEPA (2001).

6.1.4 Agricultural Activities

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

There are currently 28 animal feeding operations (AFO) located in the Black Creek watershed. The following are BMP suggestions for these farms.

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

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

The agricultural BMPs listed above are a sample of the many accepted practices that are currently available. Many other techniques such as conservation tillage, responsible pest management, and precision agriculture also exist and may contribute to an improvement in overall water quality in the watershed. Education should be provided to local farmers on these methods as well as acceptable manure spreading and holding (stacking sheds) practices.

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

NRCS provides financial and technical assistance to help South Carolina landowners address natural resource concerns, promote environmental quality, and protect wildlife habitat on property they own or control. The cost-share funds are available through the

Environmental Quality Incentives Program (EQIP). EQIP helps farmers improve production while protecting environmental quality by addressing such concerns as soil erosion and productivity, grazing management, water quality, animal waste, and forestry concerns. EQIP also assists eligible small-scale farmers who have historically not participated in or ranked high enough to be funded in previous sign ups. Please visit www.sc.nrcs.usda.gov/programs/ for more information, including eligibility requirements.

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

6.1.5 Leaking Sanitary Sewers and Illicit Discharges

Leaking sanitary sewers and illicit discharges, although illegal and subject to enforcement, may be occurring in the watershed at any time. It should be recognized that these activities may occur in unregulated portions of the watershed. Due to the high concentration of pollutant loading that is generally associated with these discharges, their detection may provide a substantial improvement in overall water quality in the Black Creek watershed. 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.

6.1.6 Failing Septic Systems

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

Don't use your toilet as a trash can or poison your system and the groundwater by pouring harmful chemicals and cleansers down the drain. Harsh chemicals can kill the bacteria that help purify your wastewater.

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

6.1.7 Urban Runoff

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

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

Some additional urban BMPs that can be adopted in public parks are doggy 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 the Black Creek watershed is rural in nature, many of the urban runoff practices discussed in this section can be applied to individual households in the watershed. Education should be provided to individual homeowners in the referenced watershed on the contributions to FC loading from pet waste. Education to homeowners in the watershed on the fate of substances poured into storm drain inlets should also be provided. For additional information on urban runoff please see the SCDHEC Nonpoint Source Runoff Pollution homepage at http://www.scdhec.gov/environment/water/npspage.htm.

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

7.0 RESOURCES FOR POLLUTION MANAGEMENT

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

7.1 General Information for Urban and Suburban Stormwater Mitigation

- Clemson University, Carolina Clear, Florence Darlington Stormwater Consortium: http://www.clemson.edu/public/carolinaclear/consortiums/flodar_home/index.html
- Managing Stormwater in Your Community. A Guide for Building an Effective Post-Construction Program. July 2008. EPA Publication No: 833-R-08-001. Available at: http://www.cwp.org/Resource_Library/Center_Docs/SW/pcguidance/Manual/PostConstructionManual.pdf
- International stormwater BMP Database. Available at: http://www.bmpdatabase.org/
- 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
- Citizen's Guide to Clean Water. Palmetto Conservation Foundation, S.C. Department of Health and Environmental Control. Available at: http://www.scdhec.net/environment/water/docs/citgd.pdf
- Stormwater Management Volume Two: Stormwater Technical Manual. Massachusetts Department of Environmental Management. 1997. Available at: http://www.mass.gov/dep/water/laws/swmpolv2.pdf
- 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: Techniques for Reducing Nonpoint Source Pollution in the Coastal Zone. 1992. Metropolitan Washington Council of Governments. Washington, DC. Source: Information Center, Metropolitan Washington Council of Governments, 777 North Capitol St., N.E., Suite 300, Washington, DC 20002-4201; or call (202) 962-3256; Reference No. 92705. http://www.mwcog.org/
- Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs, by T.R. Schueler, 1987. Metropolitan Washington Council of Governments. Washington, DC. Publ. No. 87703

Microbes and Urban Watersheds: Concentrations, Sources, and Pathways, by Schueler, T. R. 1999. W*atershed Protection Techniques* 3(1): 554-565.

- 2004 Stormwater Quality Manual. Connecticut Department of Environmental Protection 2004. Available at: http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325704

- BMP Retrofit Pilot Program – Final Report. California Department of Transportation. January 2004. Report ID CTSW – RT – 01 -050 Available at: http://www.dot.ca.gov/hq/env/stormwater/special/newsetup/_pdfs/new_technology/CTSW-RT-01-050.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.stormh2o.com/may-june-2003/moonlight-beach-urban.aspx

- Operation, Maintenance, and Management of Stormwater Management Systems. Livingston, Shaver, Skupien, and Horner. August 1997. Watershed Management Institute. Available at: http://stormwaterfinance.urbancenter.iupui.edu/PDFs/ommswm.pdf through http://stormwaterfinance.urbancenter.iupui.edu/archive.htm

- Stormwater Control Operation and Maintenance. Available at: 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 for Highways and Bridges. Massachusetts Highway Department. May 2004. Available at: http://www.mhd.state.ma.us/downloads/projDev/swbook.pdf

- University of New Hampshire Stormwater Center. Available at: http://www.unh.edu/erg/cstev/index.htm#

- EPA's Stormwater website: http://cfpub.epa.gov/npdes/home.cfm?program_id=6

7.2 Illicit Discharges

- Illicit Discharge Detection and Elimination Manual - A Handbook for Municipalities. 2003. New England Interstate Water Pollution Control Commission. Available at: http://www.neiwpcc.org/neiwpcc_docs/iddmanual.pdf

- Model Ordinances to Protect Local Resources – Illicit Discharges. USEPA webpage: http://www.epa.gov/owow/nps/ordinance/discharges.htm

7.3 Pet Waste

- SC Green Guide. Information You Can Use. A publication of S.C. Department of Health and Environmental Control. Available at: http://www.scdhec.net/administration/library/ML-025396.pdf

- National Management Measure to Control Non Point Source Pollution from Urban Areas – Draft. USEPA 2002. EPA 841-B-05-004, November 2005. 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

- Polluted Stormwater, Stormwater Series. S.C. Sea Grant Extension Program. Available at: http://www.scseagrant.org/pdf_files/NPSbrochure.pdf

- Source Water Protection Practices Bulletin: Managing Pet and Wildlife Waste to Prevent Contamination of Drinking Water. USEPA. 2001. EPA 916-F-01-027. Available at: http://www.epa.gov/safewater/sourcewater/pubs/fs_swpp_petwaste.pdf

7.4 Wildlife

- An example of a bylaw prohibiting the feeding of wildlife: Prohibiting Feeding of Wildlife. Town of Bourne Bylaws Section 3.4.3. Available at: http://www.townofbourne.com/Town%20Offices/Bylaws/chapter__3.htm

- Integrated Management of Urban Canadian Geese. M Underhill. 1999. Conference Proceedings, Waterfowl Information Network. Available at: http://wildlife1.wildlifeinformation.org/s/00ref/proceedingscontents/ProceedingsRef100_WATERFOWLINFORMATIONNETWORK/Paper11.htm

- Managing Problems Caused by Urban Canadian Geese. Jack H. Berryman Institute for Wildlife Damage Management and International Association of Fish and Wildlife Agencies by Allen Gosser, Michael Conover and Terry Messmer. 1997. Berryman Institute Publication 13, Utah State University, Logan. 8pp. Available at: http://www.berrymaninstitute.org/pdf/geese.pdf

7.5 Septic Systems

- Septic System Maintenance. Developed cooperatively by the Clemson University Extension Service and the South Carolina Department of Health and Environmental Control Office of Ocean and Coastal Resource Management. Available at: http://www.scdhec.net/health/envhlth/onsite_wastewater/docs/septic_tank_maintenance.pdf

OCRM: Onsite Septic System Management. Available at: http://www.scdhec.com/environment/ocrm/plan_tech/presentations_photos.htm

National Onsite Wastewater Recycling Association. Available at: http://www.nowra.org/

- Septic Systems. USEPA Webpage: http://cfpub.epa.gov/owm/septic/home.cfm

7.6 Field Application of Manure

- Animal Waste Management. U.S. Department of Agriculture Natural Resources Conservation Service. Available at: http://www.wsi.nrcs.usda.gov/products/W2Q/AWM/AWM_home.html
- Natural Resources Conservation Service Conservation Standard Practice: Irrigation Water Management. Code 449. United States Department of Agriculture (USDA) 2005. Available at: ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/449.pdf
- Natural Resources Conservation Service Conservation Standard Practice: Filter Strip. Code 393. United States Department of Agriculture (USDA). 2008. Available at: ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/393.pdf
- Buffer Strips: Common Sense Conservation. USDA Natural Resource Conservations Service. Website. Available at: http://www.nrcs.usda.gov/feature/buffers/
- Natural Resources Conservation Service Conservation Standard Practice: Riparian Forest Buffer. Code 391. United States Department of Agriculture (USDA). 2003. Available at: ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/391.pdf
- Natural Resources Conservation Service Conservation Standard Practice: Practice-Riparian Herbaceous Cover. Code 390. United States Department of Agriculture (USDA). 2005. Available at: ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/390.pdf

7.7 Grazing Management

- Natural Resources Conservation Service Conservation Standard Practice: Stream Crossing. Code 578. United States Department of Agriculture (USDA). 2003. Available at: ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/578.pdf
- Guidance Specifying Management Measures for Nonpoint Source Pollution in Coastal Waters. Chapter 2. Management Measures for Agricultural Sources. Grazing Management. USEPA. Available at: http://www.epa.gov/owow/nps/MMGI/Chapter2/ch2-2e.html

7.8 Animal Feeding Operations and Barnyards

- National Management Measures to Control Nonpoint Source Pollution from Agriculture. USEPA 2003. Report: EPA 841-B-03-004. Available at: http://www.epa.gov/owow/nps/agmm/index.html
- Agricultural Waste Management Field Handbook. National Engineering Handbook Part 651. United States Department of Agriculture NRCS. Available At: http://www.wsi.nrcs.usda.gov/products/W2Q/AWM/handbk.html
- Manure Management Planner. Software for creating manure management plans. Available at: http://www.agry.purdue.edu/mmp/
- Animal Feeding Operations Virtual Information Center. USEPA website: http://cfpub.epa.gov/npdes/afo/virtualcenter.cfm

7.9 Federal Agricultural 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.sc.nrcs.usda.gov/. To pursue obtaining funding, contact a local NRCS coordinator. Contact information is available at: http://www.sc.nrcs.usda.gov/contact/Watershed%20Teams/pee_dee.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

- County soil survey maps are available from NRCS at: http://soils.usda.gov

- 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.org/cms/8833.aspx
- Waterborne Pathogens in Agricultural Wastewater. Rosen, B. H., 2000. USDA, NRCS, Watershed Science Institute. Available at:

  ftp://ftp-fc.sc.egov.usda.gov/WSI/pdffiles/Pathogens_in_Agricultural_Watersheds.pdf

8.0 REFERENCES AND BIBLIOGRAPHY

American Society of Agricultural and Biological Engineers (ASABE). 1998. Vegetative Filter Strip Removal of Cattle Manure Constituents in Runoff. *Transactions of the ASAE*, Vol. 41(5): 1375-1381

Ayres Associates 1993. Onsite Sewage Disposal Systems Research in Florida. The Capacity of Fine Sandy Soil for Septic Tank Effluent Treatment: A Field Investigation at an In-Situ Lysimeter Facility in Florida.

Bonta, J.V. and B. Cleland. 2003. Incorporating Natural Variability, Uncertainty, and Risk into Water Quality Evaluations Using Duration Curves. *Journal of American Water Resource Association* 39(12):1481-1496

Corso P.S., Kramer M.H., Blair K.A., Addiss D.G., Davis J.P., Haddix A.C. 2003 Cost of illness in the 1993 Waterborne *Cryptosporidium* outbreak, Milwaukee, Wisconsin. Emerg Infect Dis: 9 (4)

Gaffield, S. J., Goo R. L., Richards L.A., and R. J. Jackson. 2003. Public Health Effects of Inadequately Managed Stormwater. *American Journal of Public Health* 93(9): 1527-1533.

Geldrich, E., Borden R., Huff C., Clark H. and Kabler P. 1962. Type Distribution of Coliform Bacteria in the Feces of Warm Blooded Animals. Journal of Water Pollution Control Federation (34):295

Metcalf & Eddy Inc. 1991. Wastewater Engineering: Treatment, Disposal, Reuse. McGraw-Hill. Third Edition. rev. by George Tchobanoglous and Franklin L. Burton

National Land Cover Data Set (NLCD). 2001. Nation-wide Landsat-7 Imagery 1999. Available through the Multi-Resolution Land Characteristics (MRLC) Consortium. http://www.mrlc.gov/

Novotny, V., K.R. Imhoff, M. Olthof, and P.A. Krenkel. 1989. Karl Imhoff's Handbook of Urban Drainage and Wastewater Disposal. John Wiley & Sons, New York.

SCDHEC. 2002. Standards for the Permitting of Agricultural Animal Facilities (Regulation 61-43). Bureau of Water. Columbia, SC

SCDHEC. 2003. Water Pollution Control Permits (Regulation 61-9) Office of Environmental Quality Control, Columbia, SC.

SCDHEC. 2006. Regulation 61-69, Classified Waters. 38pp.

SCDHEC. 2008. Regulation 61-68, Water Classifications and Standards. 65pp.

SCDHEC. 2007. Watershed Water Quality Assessment: Pee Dee River Basin. Technical Report No. 005-07, 2nd Edition.

United States Department of Agriculture (USDA). 2007. National Agriculture Statistics Service. 2007 Cattle statistics by county. Available at http://www.nass.usda.gov/Statistics_by_State/South_Carolina/Publications/County_Estimates/index.asp

United States Environmental Protection Agency (USEPA). 1986. Ambient water quality criteria for bacteria – 1986. Office of Water, EPA-A440/5-84-002.

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

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

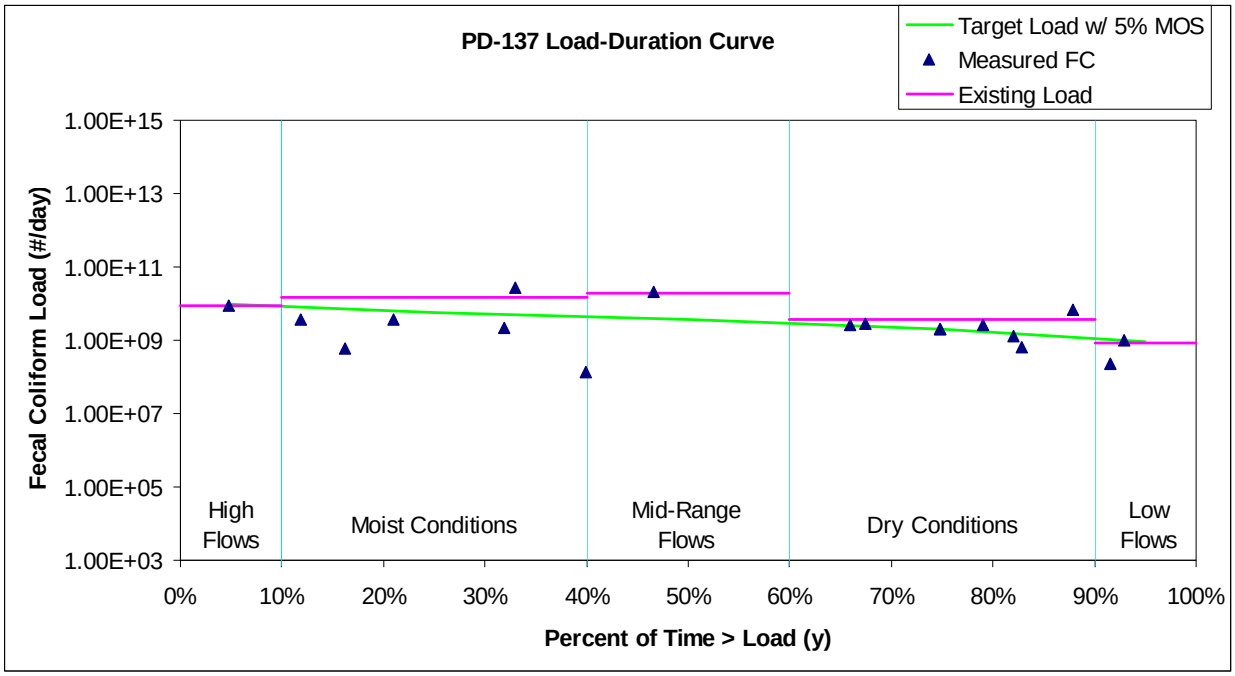
US Geological Survey. 2008. Water-Resources Real-time Data South Carolina Water Year. United States Geological Survey. Available at http://waterdata.usgs.gov/nw

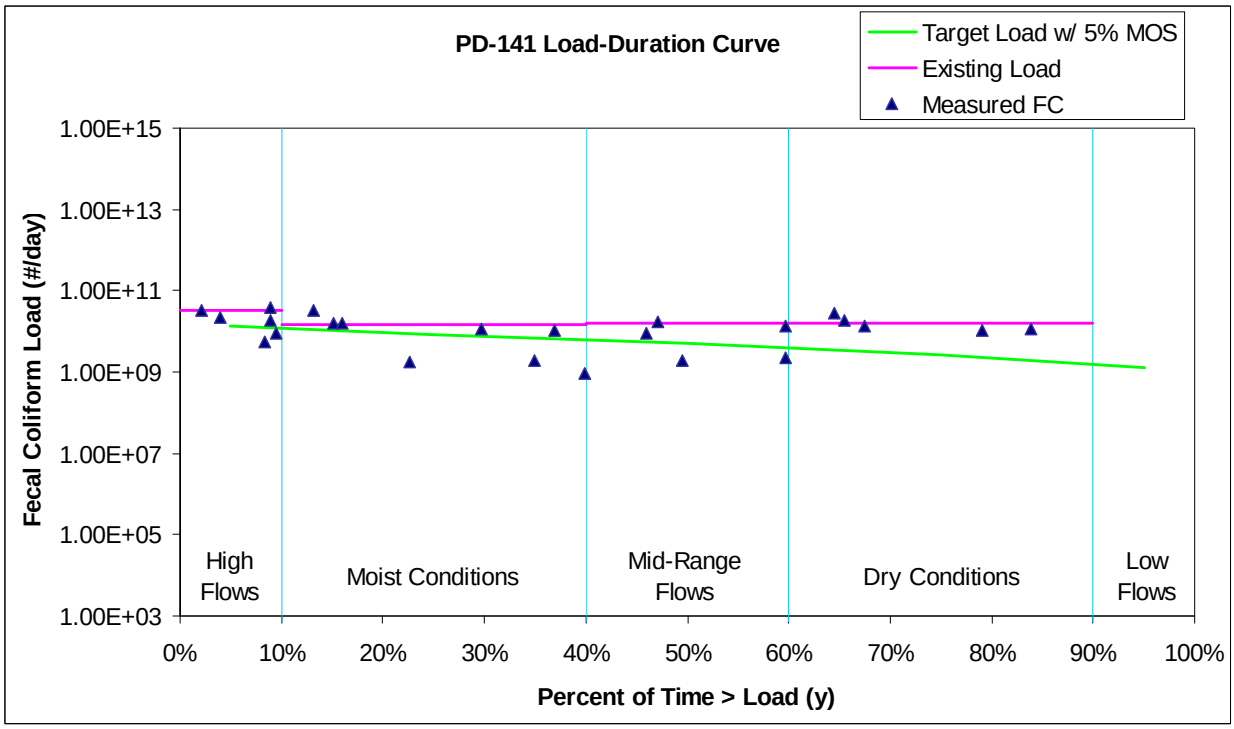
Water Quality Planning and Management, Title 40 Code of Federal Regulations, Pt. 130.2(i). 2006 ed.

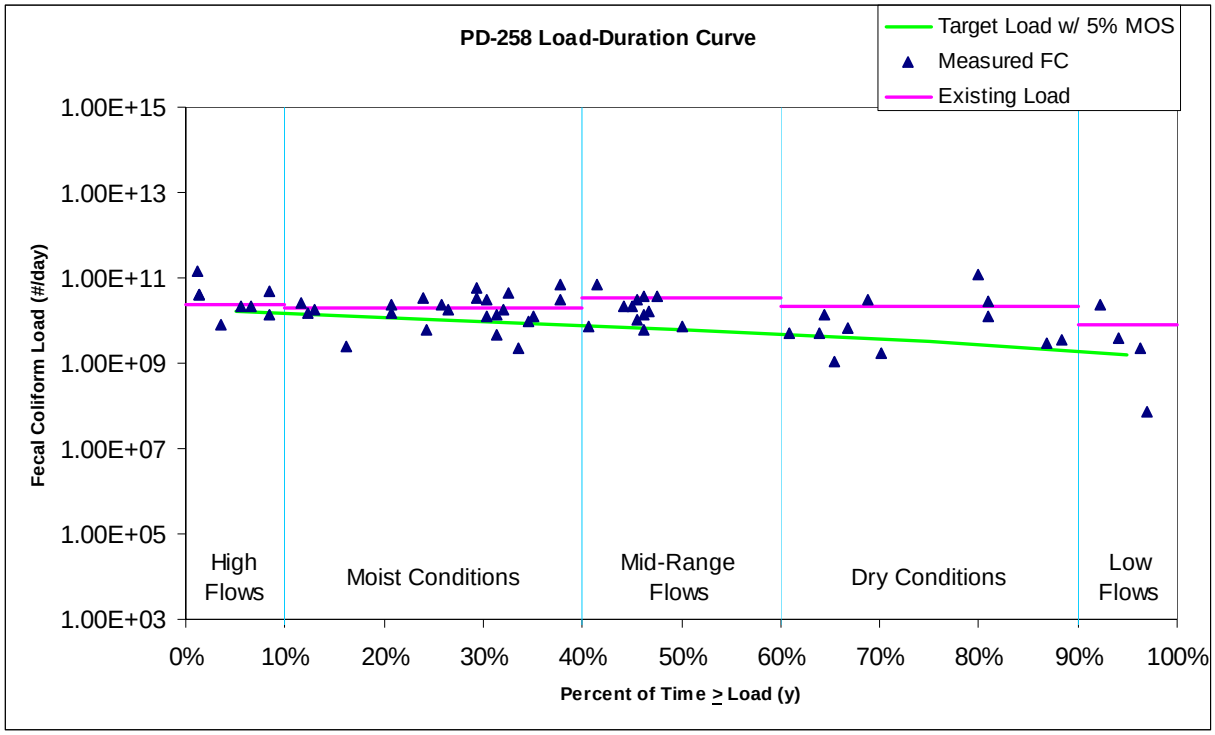
Yagow, G. 1999. Unpublished monitoring data. Mountain Run TMDL Study. Submitted to Virginia Department of Environmental Quality. Richmond, Virginia.

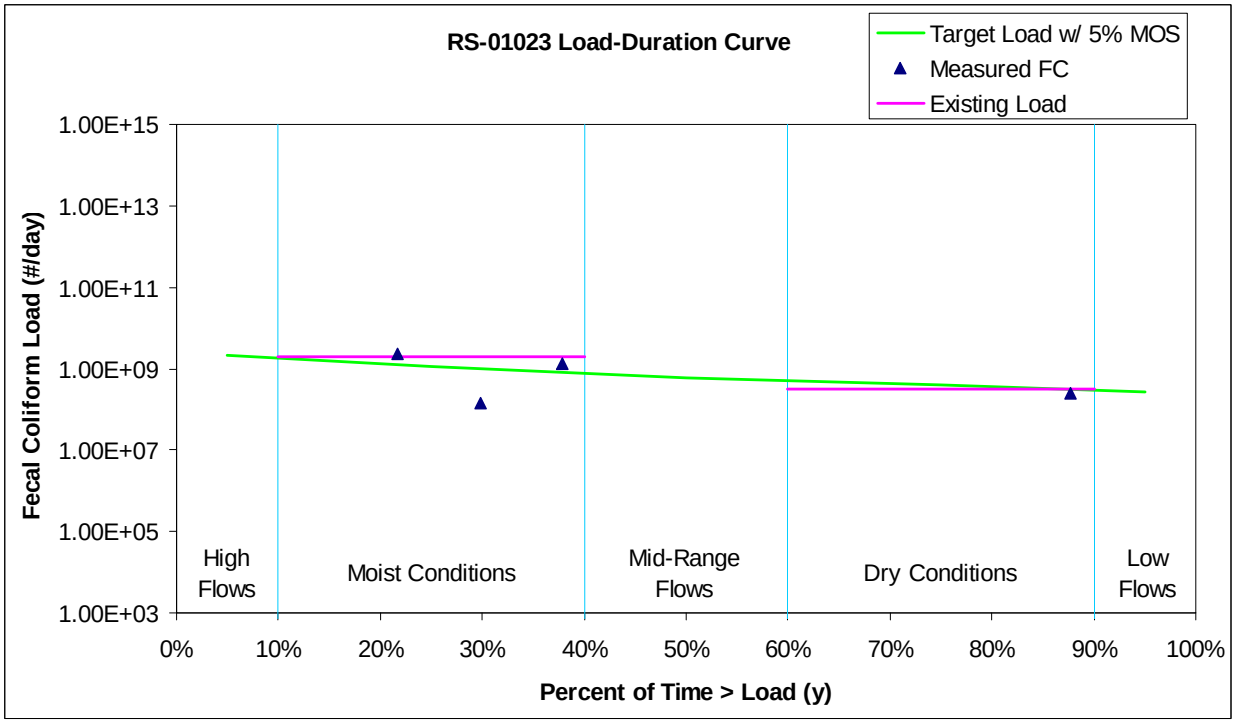
Wise, Karl., J, Heathcott, Brent L., Gonzales, Martin L. 2002. Results of the AVMA Survey on Companion Animal Ownership in US Pet-Owning Households. Journal of the American Veterinary Medical Association. Vol. 221(11): 1572-1573

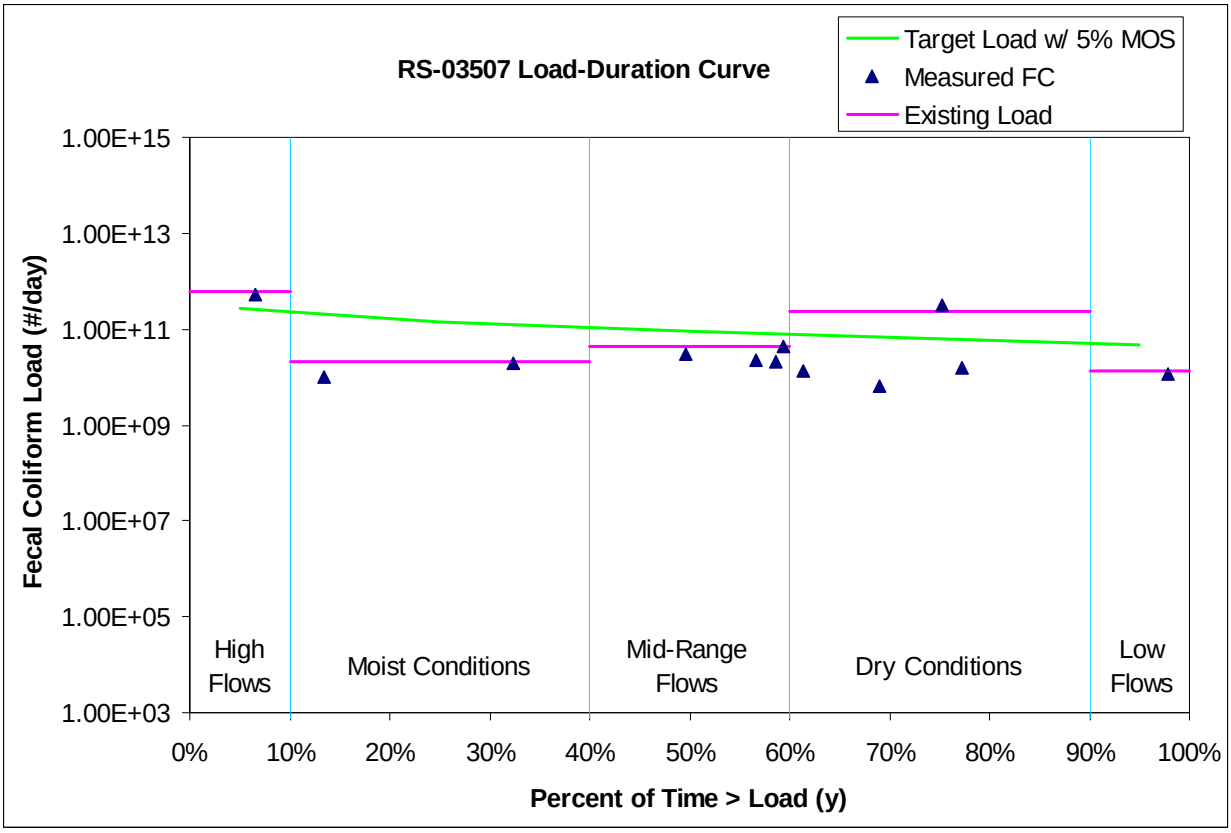
Appendix A: Load Duration Curves

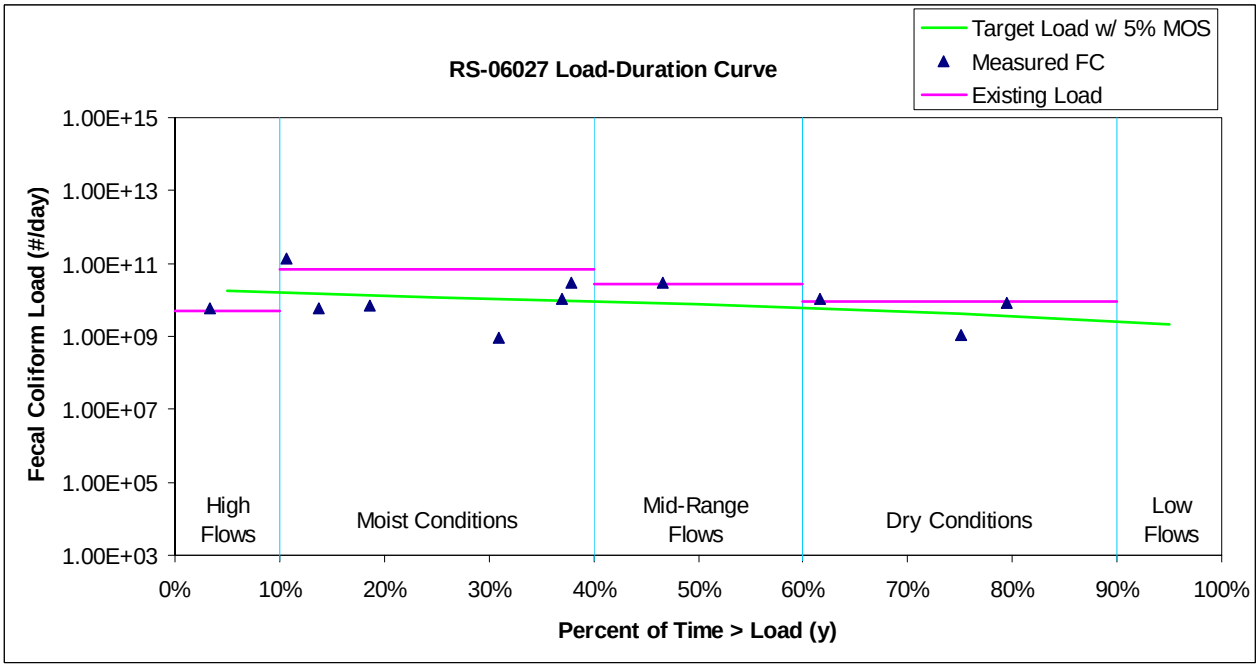

PD-137 Load-Duration Curve
Target Load w/ 5% MOS
Measured FC
Existing Load
Fecal Coliform Load (#/day)
1.00E+15
1.00E+13
1.00E+11
1.00E+09
1.00E+07
1.00E+05
1.00E+03
High Flows
Moist Conditions
Mid-Range Flows
Dry Conditions
Low Flows
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time > Load (y)


PD-141 Load-Duration Curve
Target Load w/ 5% MOS
Existing Load
Measured FC
Fecal Coliform Load (#/day)
1.00E+15
1.00E+13
1.00E+11
1.00E+09
1.00E+07
1.00E+05
1.00E+03
High Flows
Moist Conditions
Mid-Range Flows
Dry Conditions
Low Flows
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time > Load (y)

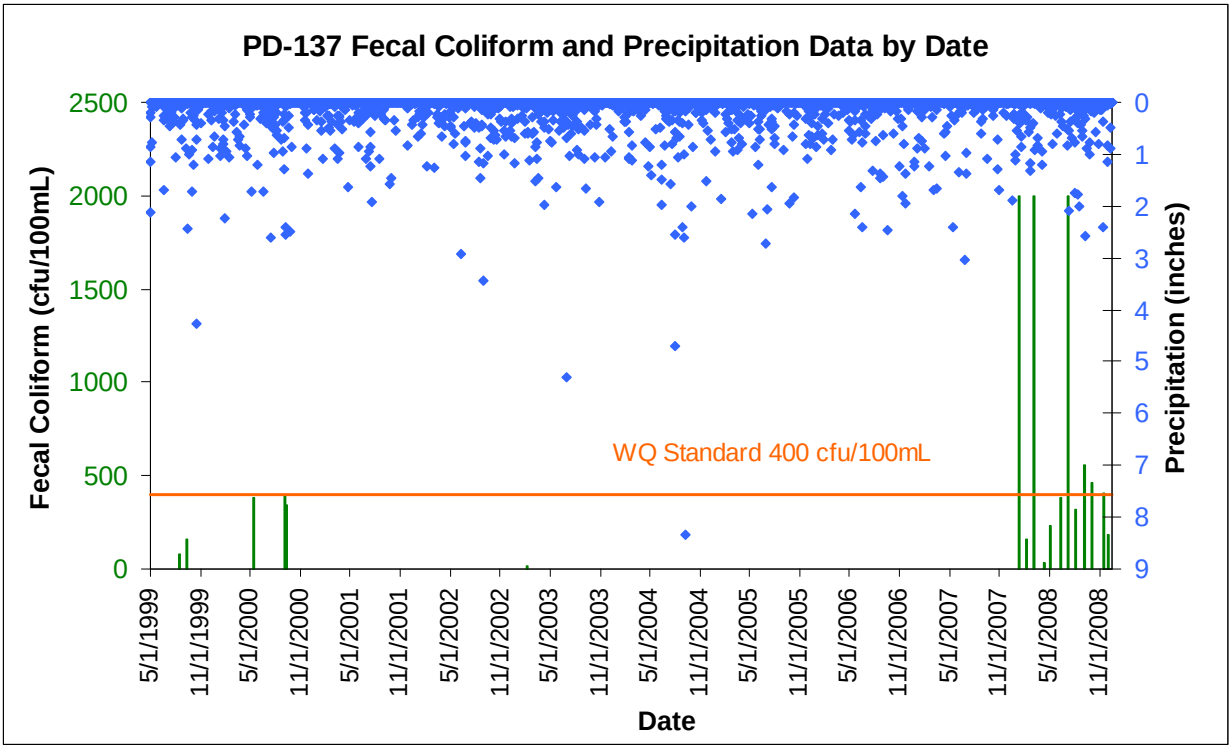

PD-258 Load-Duration Curve
Target Load w/ 5% MOS
Measured FC
Existing Load
Fecal Coliform Load (#/day)
1.00E+15
1.00E+13
1.00E+11
1.00E+09
1.00E+07
1.00E+05
1.00E+03
High Flows
Moist Conditions
Mid-Range Flows
Dry Conditions
Low Flows
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time ≥ Load (y)

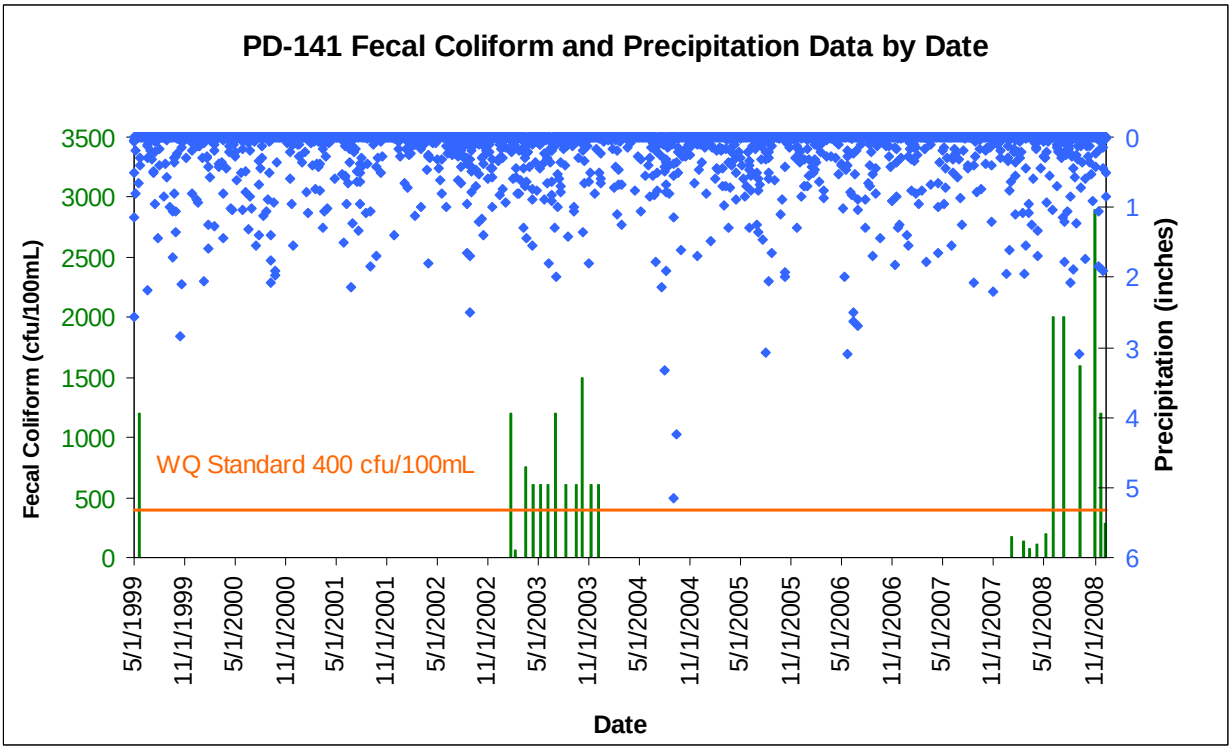

RS-01023 Load-Duration Curve
Target Load w/ 5% MOS
Measured FC
Existing Load
Fecal Coliform Load (#/day)
1.00E+15
1.00E+13
1.00E+11
1.00E+09
1.00E+07
1.00E+05
1.00E+03
High Flows
Moist Conditions
Mid-Range Flows
Dry Conditions
Low Flows
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time > Load (y)

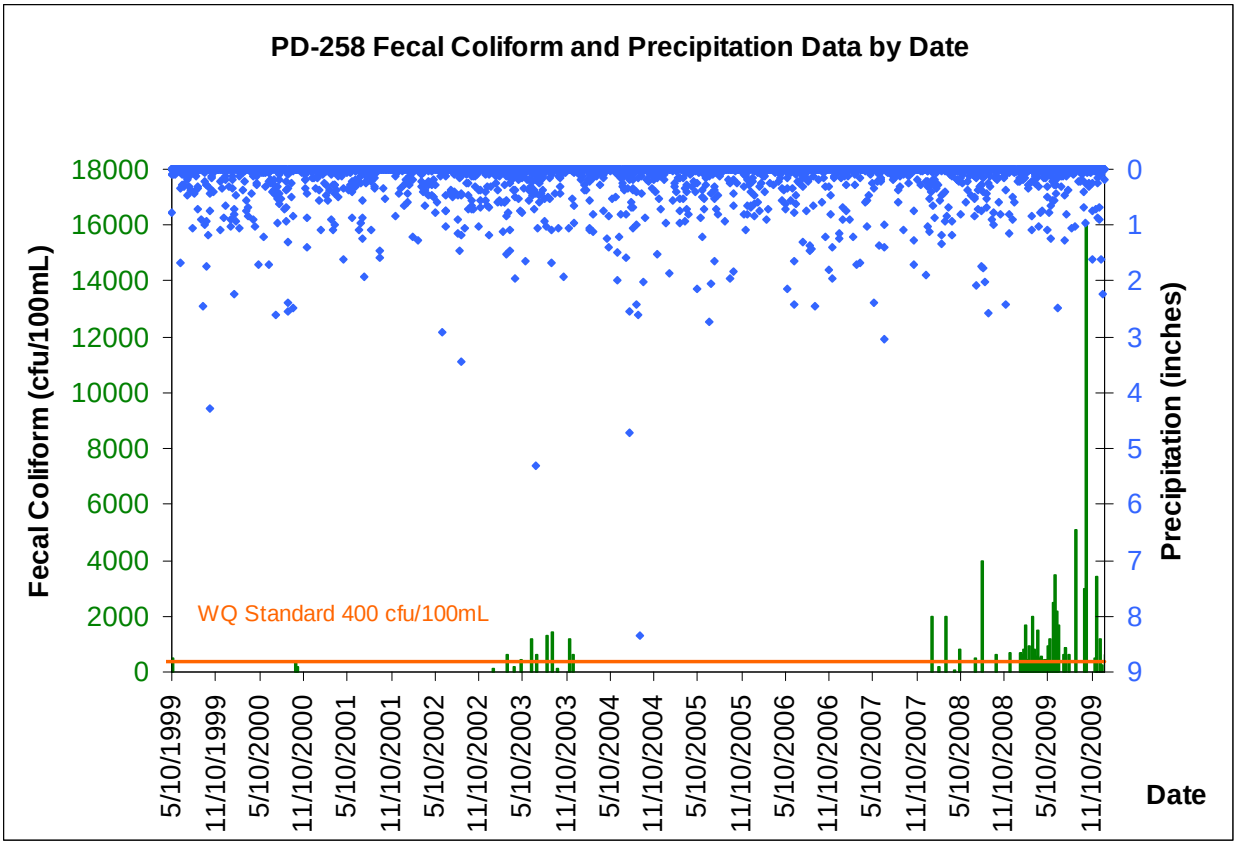

RS-03507 Load-Duration Curve
Target Load w/ 5% MOS
Measured FC
Existing Load
Fecal Coliform Load (#/day)
1.00E+15
1.00E+13
1.00E+11
1.00E+09
1.00E+07
1.00E+05
1.00E+03
High Flows
Moist Conditions
Mid-Range Flows
Dry Conditions
Low Flows
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time > Load (y)

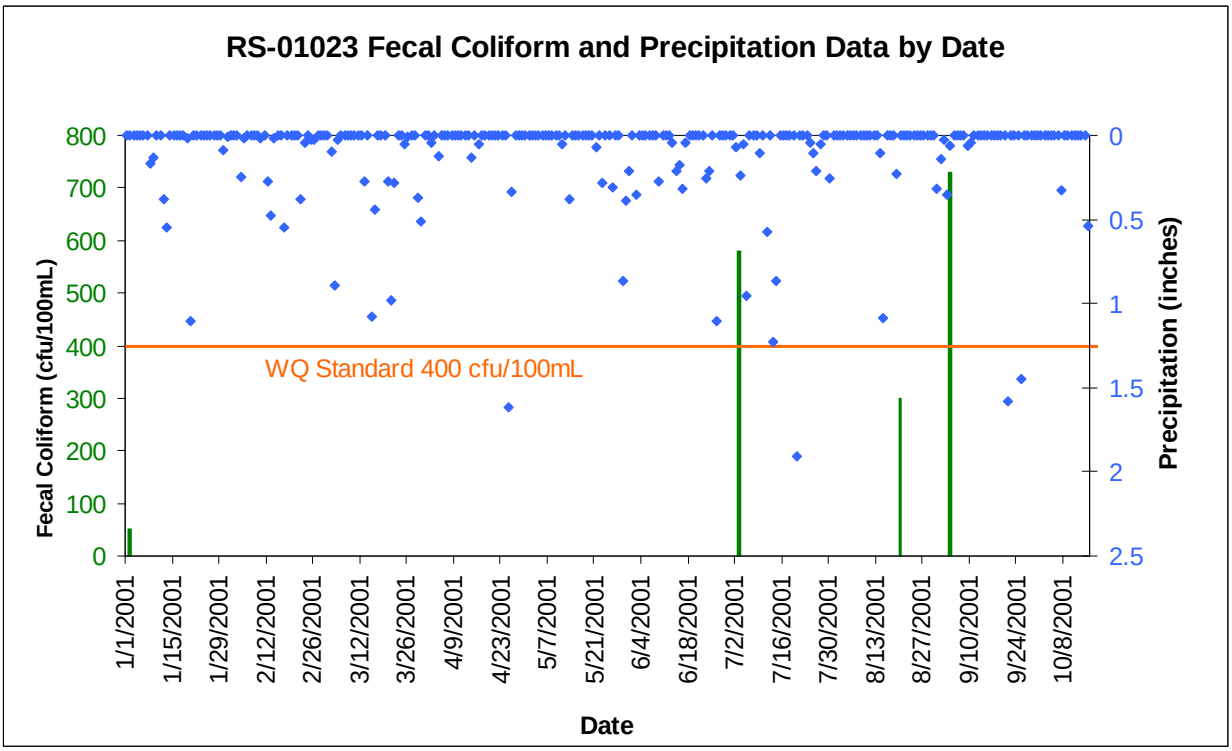

RS-06027 Load-Duration Curve
Target Load w/ 5% MOS
Measured FC
Existing Load
Fecal Coliform Load (#/day)
1.00E+15
1.00E+13
1.00E+11
1.00E+09
1.00E+07
1.00E+05
1.00E+03
High Flows
Moist Conditions
Mid-Range Flows
Dry Conditions
Low Flows
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time > Load (y)

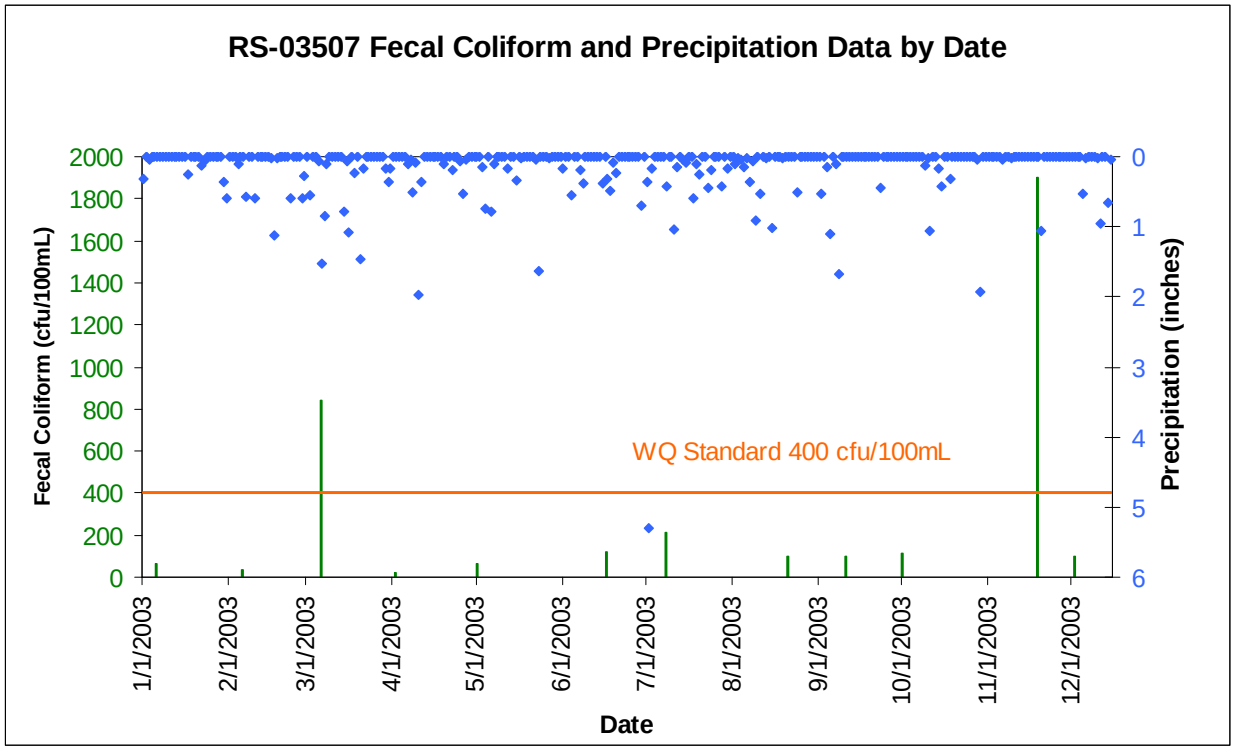
Appendix B: Rain Charts

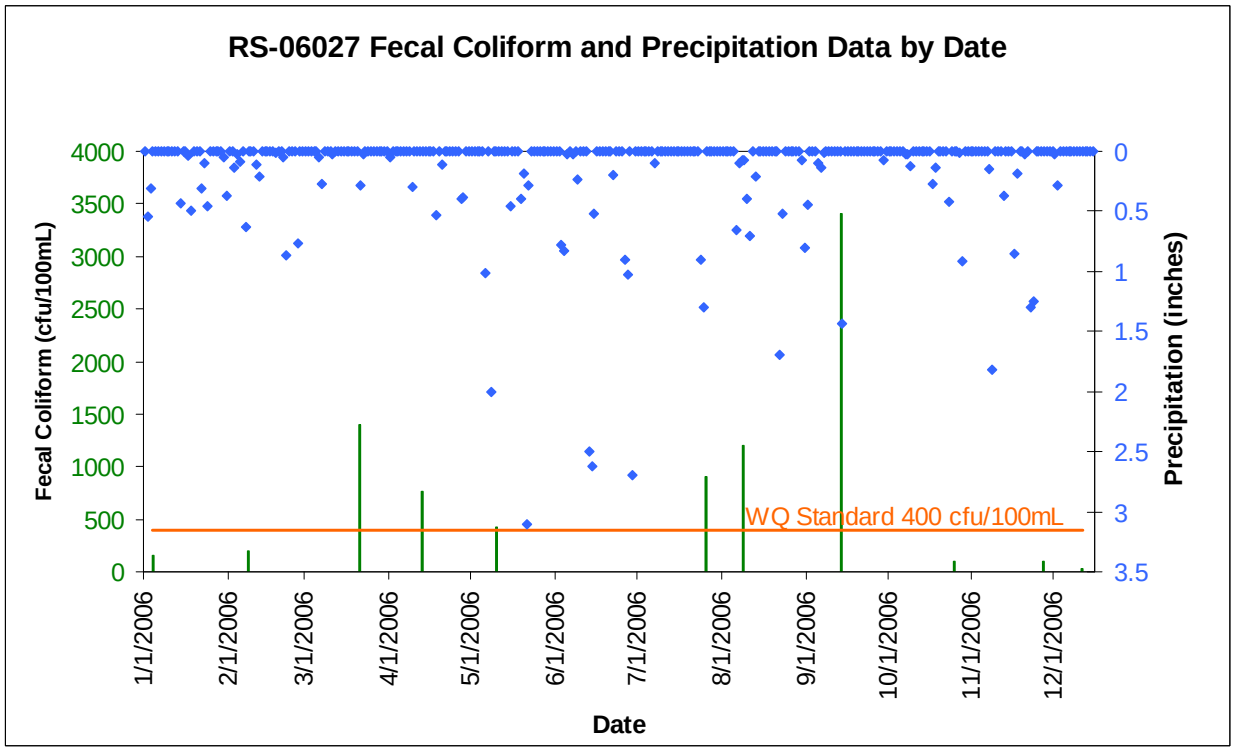

PD-137 Fecal Coliform and Precipitation Data by Date
Fecal Coliform (cfu/100mL)
Precipitation (inches)
WQ Standard 400 cfu/100mL
Date
2500
2000
1500
1000
500
0
0
1
2
3
4
5
6
7
8
9
5/1/1999
11/1/1999
5/1/2000
11/1/2000
5/1/2001
11/1/2001
5/1/2002
11/1/2002
5/1/2003
11/1/2003
5/1/2004
11/1/2004
5/1/2005
11/1/2005
5/1/2006
11/1/2006
5/1/2007
11/1/2007
5/1/2008
11/1/2008


PD-141 Fecal Coliform and Precipitation Data by Date
Fecal Coliform (cfu/100mL)
Precipitation (inches)
WQ Standard 400 cfu/100mL
Date
3500
3000
2500
2000
1500
1000
500
0
0
1
2
3
4
5
6
5/1/1999
11/1/1999
5/1/2000
11/1/2000
5/1/2001
11/1/2001
5/1/2002
11/1/2002
5/1/2003
11/1/2003
5/1/2004
11/1/2004
5/1/2005
11/1/2005
5/1/2006
11/1/2006
5/1/2007
11/1/2007
5/1/2008
11/1/2008

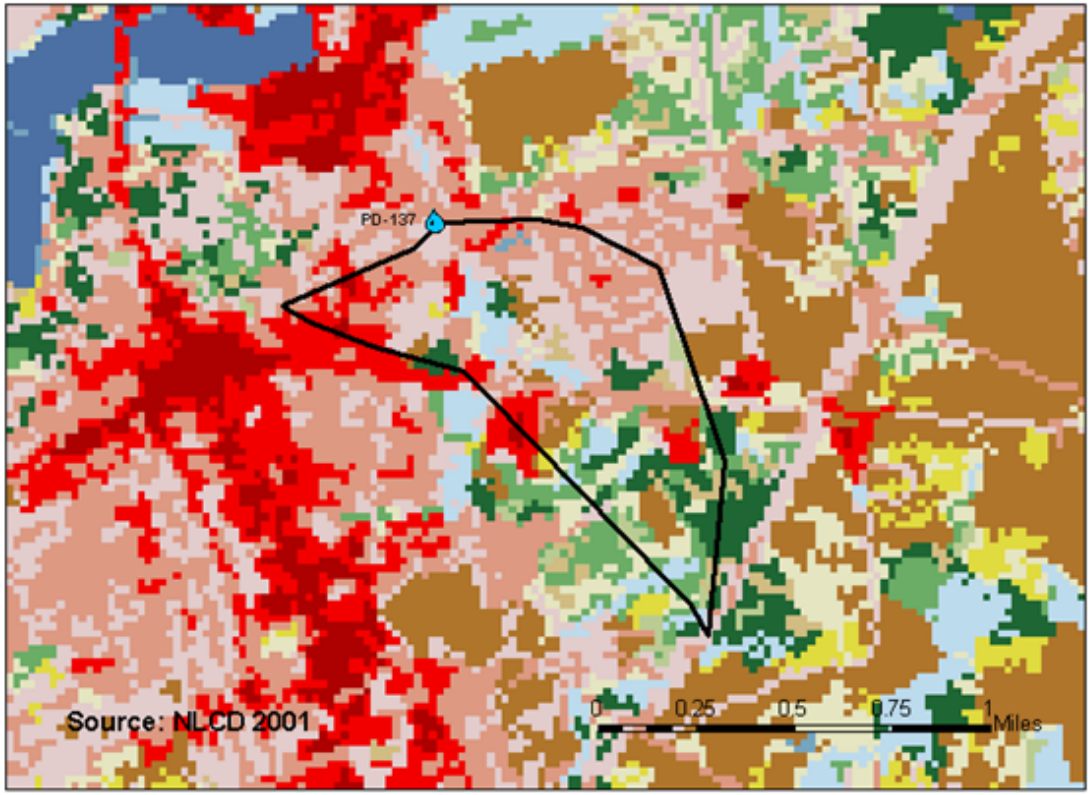

PD-258 Fecal Coliform and Precipitation Data by Date
Fecal Coliform (cfu/100mL)
Precipitation (inches)
WQ Standard 400 cfu/100mL
Date
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0
1
2
3
4
5
6
7
8
9
5/10/1999
11/10/1999
5/10/2000
11/10/2000
5/10/2001
11/10/2001
5/10/2002
11/10/2002
5/10/2003
11/10/2003
5/10/2004
11/10/2004
5/10/2005
11/10/2005
5/10/2006
11/10/2006
5/10/2007
11/10/2007
5/10/2008
11/10/2008
5/10/2009
11/10/2009

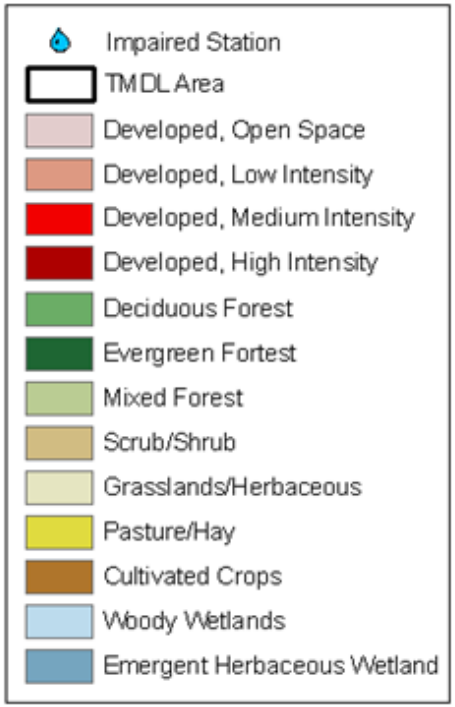

RS-01023 Fecal Coliform and Precipitation Data by Date
Fecal Coliform (cfu/100mL)
Precipitation (inches)
WQ Standard 400 cfu/100mL
Date
800
700
600
500
400
300
200
100
0
0
0.5
1
1.5
2
2.5
1/1/2001
1/15/2001
1/29/2001
2/12/2001
2/26/2001
3/12/2001
3/26/2001
4/9/2001
4/23/2001
5/7/2001
5/21/2001
6/4/2001
6/18/2001
7/2/2001
7/16/2001
7/30/2001
8/13/2001
8/27/2001
9/10/2001
9/24/2001
10/8/2001

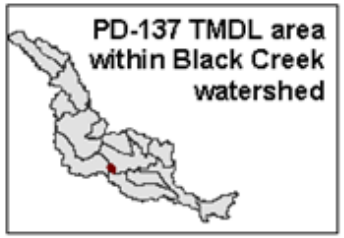

RS-03507 Fecal Coliform and Precipitation Data by Date
Fecal Coliform (cfu/100mL)
Precipitation (inches)
WQ Standard 400 cfu/100mL
Date
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
1/1/2003
2/1/2003
3/1/2003
4/1/2003
5/1/2003
6/1/2003
7/1/2003
8/1/2003
9/1/2003
10/1/2003
11/1/2003
12/1/2003


RS-06027 Fecal Coliform and Precipitation Data by Date
Fecal Coliform (cfu/100mL)
Precipitation (inches)
WQ Standard 400 cfu/100mL
Date
4000
3500
3000
2500
2000
1500
1000
500
0
0
0.5
1
1.5
2
2.5
3
3.5
1/1/2006
2/1/2006
3/1/2006
4/1/2006
5/1/2006
6/1/2006
7/1/2006
8/1/2006
9/1/2006
10/1/2006
11/1/2006
12/1/2006

Appendix C: Landuse Maps and Landuse Summaries by Impaired Station

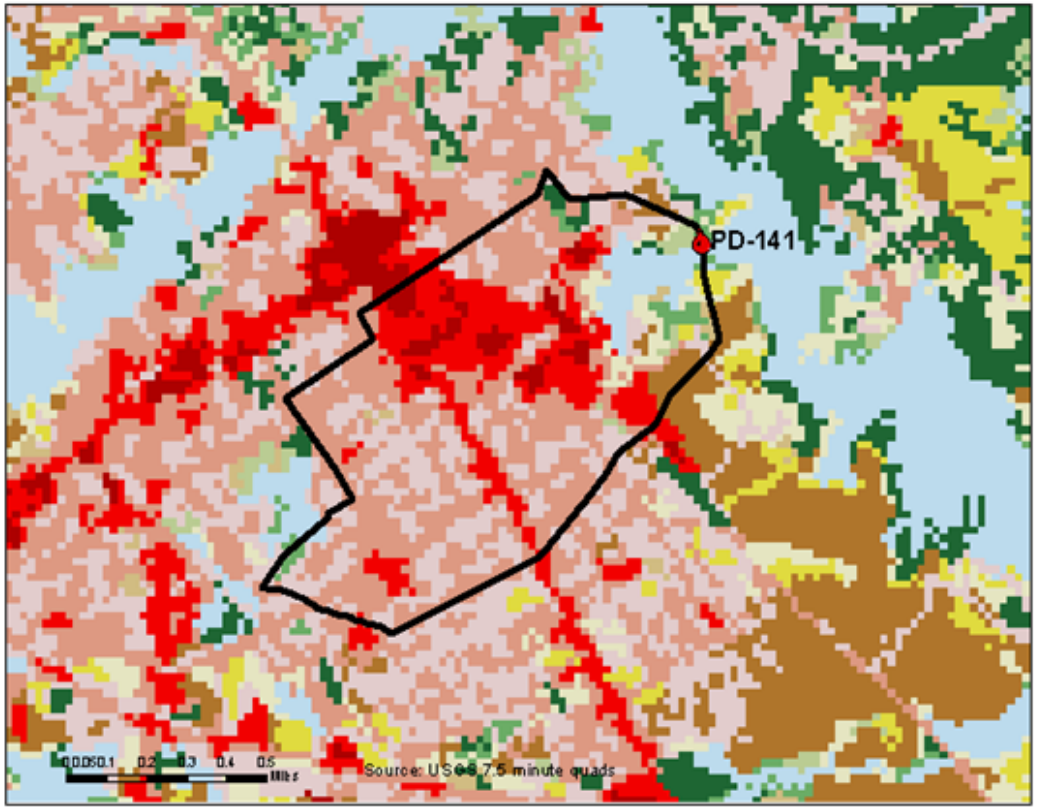






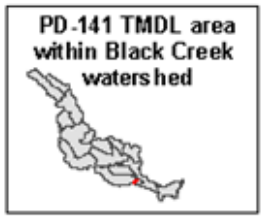
Landuse Type (NLCD 2001)	Landuse (mi2)	Landuse (%)
Developed	0.28	57.2
Forested/Non-Cultivated	0.13	26.2
Pasture/Crop	0.04	8.8
Wetlands	0.04	7.7
Total	**0.49**	**100%**

Landuse summary for station PD-137 (NLCD 2001)



- Impaired Station
- TMDL Area
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Scrub/Shrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands

Landuse Type (NLCD 2001)	Landuse (mi2)	Landuse (%)
Developed	0.6	85.7
Forested/Non-Cultivated	0.05	7.1
Pasture/Crop	0.02	2.3
Wetlands	0.03	4.9
Total	**0.7**	**100.0**

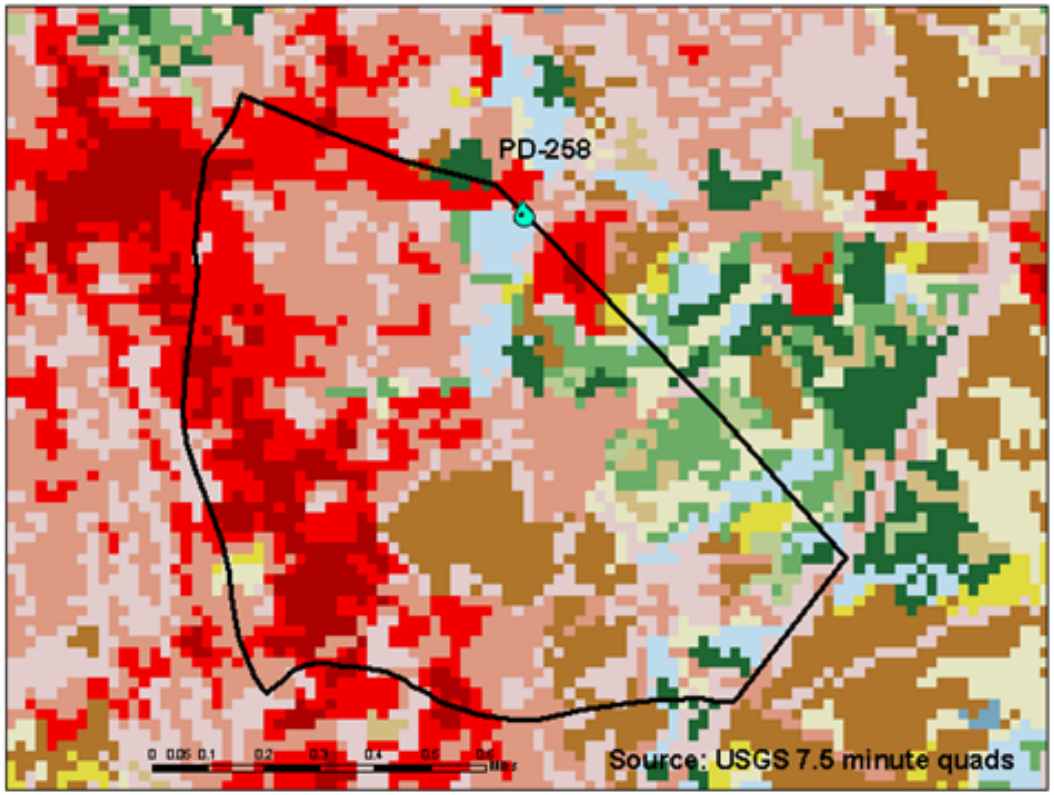


D H E C

PROMOTE PROTECT PROSPER

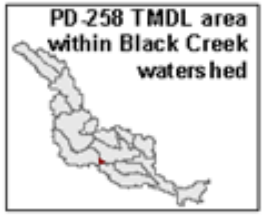
South Carolina Department of Health and Environmental Control

Landuse summary for station PD-141 (NLCD 2001)



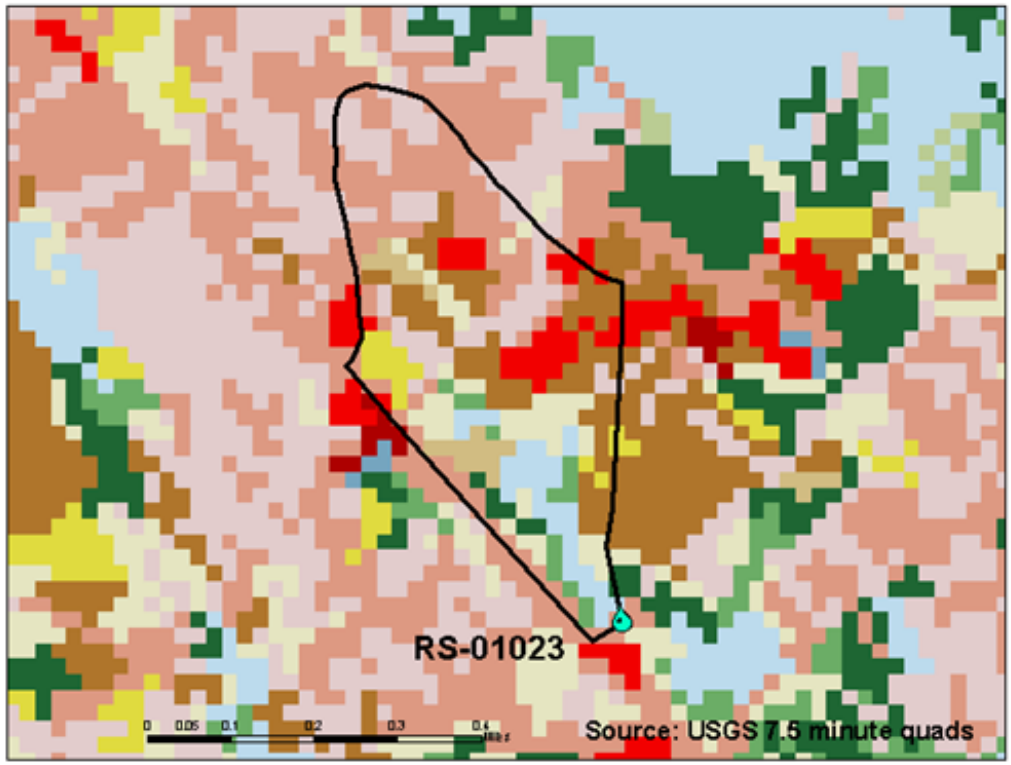
Impaired Station
TMDL Area
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Deciduous Forest
Evergreen Forest
Mixed Forest
Scrub/Shrub
Grassland/Herbaceous
Pasture/Hay
Cultivated Crops
Woody Wetlands

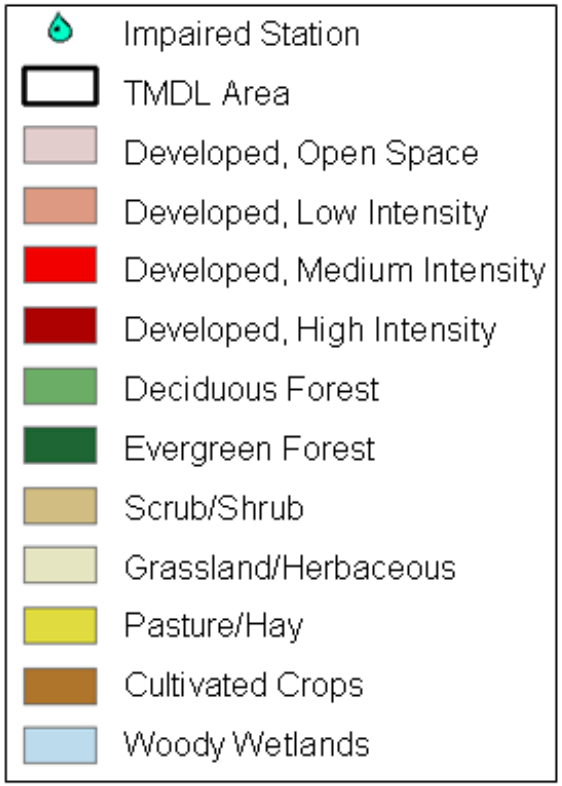
Landuse Type (NLCD 2001)	Landuse (mi2)	Landuse (%)
Developed	0.6	69.7
Forested/Non-Cultivated	0.12	13.9
Pasture/Crop	0.1	11.8
Wetlands	0.04	4.7
Total	**0.86**	**100.0**



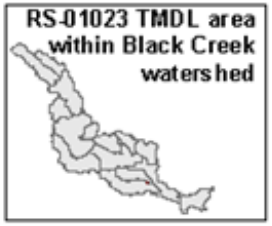
D H E C
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

Landuse summary for station PD-258 (NLCD 2001)



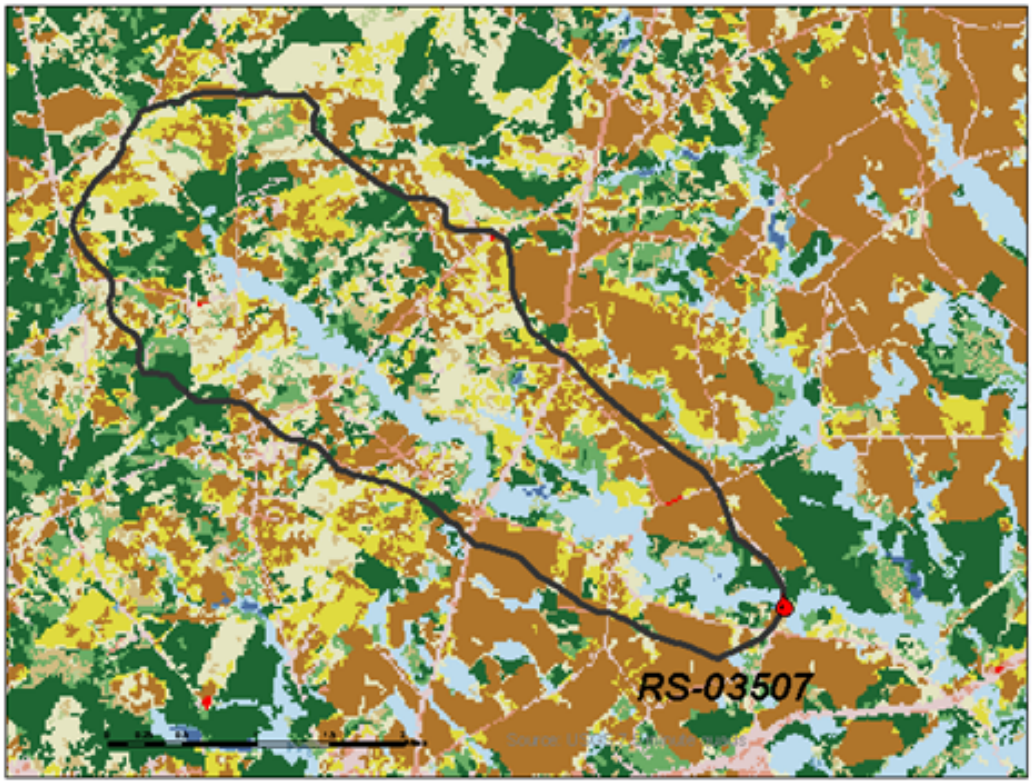


Landuse Type (NLCD 2001)	Landuse (mi2)	Landuse (%)
Developed	0.07	48.8
Forested/Non-Cultivated	0.03	21.7
Pasture/Crop	0.03	21.4
Wetlands	0.01	8.0
Total	**0.14**	**100.0**



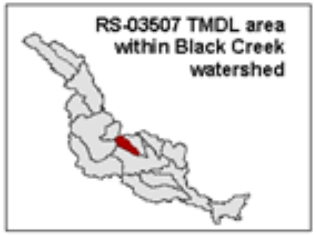
D H E C
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

Landuse summary for station RS-01023 (NLCD 2001)



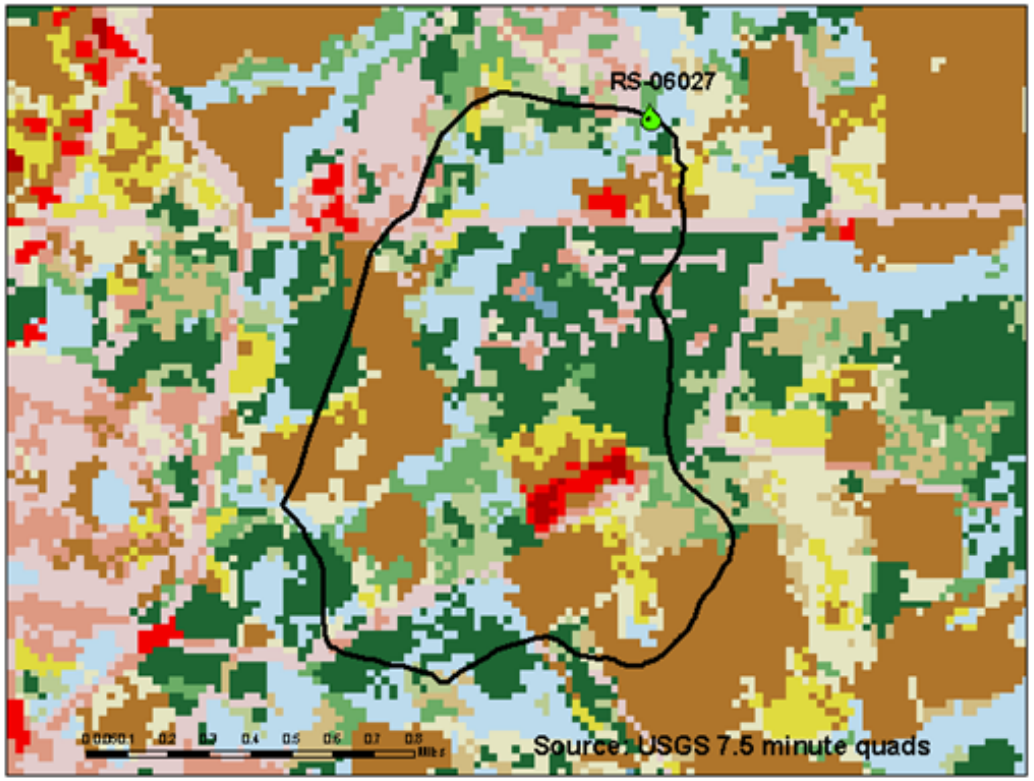
- Impaired Station
- TMDL Area
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Scrub/Shrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetland

Landuse Type (NLCD 2001)	Landuse (mi2)	Landuse (%)
Developed	0.45	5.7
Forested/Non-Cultivated	3.78	47.6
Pasture/Crop	2.81	35.3
Wetlands	0.91	11.4
Total	**7.95**	**100.0**



D H E C
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

Landuse summary for station RS-03507 (NLCD 2001)



- Impaired Station
- TMDL Area
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Scrub/Shrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetland

Landuse Type (NLCD 2001)	Landuse (mi2)	Landuse (%)
Developed	0.1	11.7
Forested/Non-Cultivated	0.5	46.1
Pasture/Crop	0.3	28.3
Wetlands	0.2	13.9
Total	**1.1**	**100.0**

D H E C
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

Landuse summary for station RS-06027 (NLCD 2001)

Appendix D: Figures

Figure D-1. Station PD-258

Figure D-2: Station RS-03507

Figure D-3: Station RS-06027, on Ashby Branch

Figure D-3b: Station RS-06027, on Ashby Branch

Figure D-4: Station PD-141

Figure D-5: Station RS-01023

Appendix E: Fecal Coliform Data Summaries by Station

PD-078	1/7/2004	36	#/100ml
PD-078	3/3/2004	50	#/100ml
PD-078	4/5/2004	70	#/100ml
PD-078	5/18/2004	65	#/100ml
PD-078	6/24/2004	120	#/100ml
PD-078	7/8/2004	45	#/100ml
PD-078	8/16/2004	590	#/100ml
PD-078	9/2/2004	1000	#/100ml
PD-078	10/14/2004	180	#/100ml
PD-078	11/9/2004	68	#/100ml
PD-078	1/18/2005	240	#/100ml
PD-078	2/10/2005	120	#/100ml
PD-078	3/24/2005	140	#/100ml
PD-078	4/18/2005	74	#/100ml
PD-078	5/19/2005	110	#/100ml
PD-078	6/30/2005	1100	#/100ml
PD-078	7/27/2005	100	#/100ml
PD-078	8/9/2005	160	#/100ml
PD-078	9/29/2005	200	#/100ml
PD-078	10/27/2005	110	#/100ml
PD-078	11/3/2005	120	#/100ml
PD-078	12/15/2005	160	#/100ml
PD-078	1/3/2006	190	#/100ml
PD-078	2/8/2006	140	#/100ml
PD-078	3/28/2006	76	#/100ml
PD-078	4/13/2006	120	#/100ml
PD-078	5/10/2006	190	#/100ml
PD-078	6/8/2006	240	#/100ml
PD-078	7/19/2006	110	#/100ml
PD-078	8/14/2006	190	#/100ml
PD-078	9/18/2006	2000	#/100ml
PD-078	10/25/2006	170	#/100ml
PD-078	11/15/2006	100	#/100ml
PD-078	12/6/2006	68	#/100ml
PD-078	1/22/2007	660	#/100ml
PD-078	2/15/2007	200	#/100ml
PD-078	3/21/2007	44	#/100ml
PD-078	4/17/2007	280	#/100ml
PD-078	5/8/2007	89	#/100ml
PD-078	6/7/2007	220	#/100ml
PD-078	7/2/2007	240	#/100ml
PD-078	8/14/2007	110	#/100ml
PD-078	9/11/2007	120	#/100ml

PD-078	10/9/2007	240	#/100ml
PD-078	11/15/2007	120	#/100ml
PD-078	12/3/2007	71	#/100ml
PD-078	1/8/2009	170	#/100ml
PD-078	2/23/2009	79	#/100ml
PD-078	3/31/2009	120	#/100ml
PD-078	4/29/2009	78	#/100ml
PD-078	5/20/2009	92	#/100ml
PD-078	6/23/2009	70	#/100ml
PD-078	7/28/2009	100	#/100ml
PD-078	8/11/2009	100	#/100ml
PD-078	9/28/2009	340	#/100ml
PD-078	11/30/2009	80	#/100ml
PD-078	1/12/2010	95	#/100ml
PD-078	3/10/2010	24	#/100ml
PD-078	5/12/2010	120	#/100ml
PD-078	7/8/2010	130	#/100ml
PD-078	9/8/2010	230	#/100ml
PD-078	11/18/2010	130	#/100ml
PD-078	1/5/2011	29	#/100ml
PD-078	03/23/11	98	#/100ml
PD-078	05/17/11	160	#/100ml
PD-078	07/12/11	200	#/100ml
PD-078	09/07/11	1300	#/100ml
PD-078	11/03/11	96	#/100ml

PD-137	5/11/1999	0	#/100ml
PD-137	8/11/1999	80	#/100ml
PD-137	9/9/1999	160	#/100ml
PD-137	5/11/2000	380	#/100ml
PD-137	6/1/2000	0	#/100ml
PD-137	8/30/2000	390	#/100ml
PD-137	9/6/2000	340	#/100ml
PD-137	10/11/2000	0	#/100ml
PD-137	2/6/2003	12	#/100ml
PD-137	1/10/2008	2000	#/100ml
PD-137	2/4/2008	160	#/100ml
PD-137	3/4/2008	2000	#/100ml
PD-137	4/11/2008	32	#/100ml
PD-137	5/1/2008	230	#/100ml
PD-137	6/11/2008	380	#/100ml
PD-137	7/7/2008	2000	#/100ml
PD-137	8/4/2008	320	#/100ml
PD-137	9/3/2008	560	#/100ml

PD-137	10/2/2008	460	#/100ml
PD-137	11/12/2008	410	#/100ml
PD-137	12/2/2008	180	#/100ml
PD-141	5/18/1999	1200	#/100ml
PD-141	9/23/1999	0	#/100ml
PD-141	10/19/1999	0	#/100ml
PD-141	5/23/2000	0	#/100ml
PD-141	8/15/2000	0	#/100ml
PD-141	9/5/2000	0	#/100ml
PD-141	10/18/2000	0	#/100ml
PD-141	1/16/2003	1200	#/100ml
PD-141	2/6/2003	56	#/100ml
PD-141	3/11/2003	750	#/100ml
PD-141	4/8/2003	600	#/100ml
PD-141	5/6/2003	600	#/100ml
PD-141	6/4/2003	600	#/100ml
PD-141	7/1/2003	1200	#/100ml
PD-141	8/5/2003	600	#/100ml
PD-141	9/11/2003	600	#/100ml
PD-141	10/6/2003	1500	#/100ml
PD-141	11/5/2003	600	#/100ml
PD-141	12/2/2003	600	#/100ml
PD-141	1/3/2008	170	#/100ml
PD-141	2/14/2008	140	#/100ml
PD-141	3/6/2008	76	#/100ml
PD-141	4/2/2008	110	#/100ml
PD-141	5/5/2008	200	#/100ml
PD-141	6/3/2008	2000	#/100ml
PD-141	7/10/2008	2000	#/100ml
PD-141	9/3/2008	1600	#/100ml
PD-141	10/28/2008	2900	#/100ml
PD-141	11/18/2008	1200	#/100ml
PD-141	12/4/2008	280	#/100ml
PD-258	5/11/1999	520	#/100ml
PD-258	5/11/2000	0	#/100ml
PD-258	9/5/2000	0	#/100ml
PD-258	10/4/2000	400	#/100ml
PD-258	10/11/2000	180	#/100ml
PD-258	1/6/2003	104	#/100ml
PD-258	3/6/2003	600	#/100ml
PD-258	4/2/2003	170	#/100ml
PD-258	5/1/2003	410	#/100ml
PD-258	6/17/2003	1200	#/100ml
PD-258	7/8/2003	600	#/100ml

PD-258	8/21/2003	1300	#/100ml
PD-258	9/11/2003	1400	#/100ml
PD-258	10/2/2003	100	#/100ml
PD-258	11/19/2003	1200	#/100ml
PD-258	12/2/2003	600	#/100ml
PD-258	1/10/2008	2000	#/100ml
PD-258	2/4/2008	200	#/100ml
PD-258	3/4/2008	2000	#/100ml
PD-258	4/11/2008	80	#/100ml
PD-258	5/1/2008	800	#/100ml
PD-258	7/7/2008	500	#/100ml
PD-258	8/4/2008	4000	#/100ml
PD-258	10/2/2008	620	#/100ml
PD-258	12/2/2008	690	#/100ml
PD-258	1/13/2009	690	#/100ml
PD-258	1/21/2009	600	#/100ml
PD-258	1/28/2009	800	#/100ml
PD-258	2/3/2009	1700	#/100ml
PD-258	2/9/2009	430	#/100ml
PD-258	2/18/2009	930	#/100ml
PD-258	2/25/2009	330	#/100ml
PD-258	3/4/2009	2000	#/100ml
PD-258	3/11/2009	790	#/100ml
PD-258	3/18/2009	530	#/100ml
PD-258	3/25/2009	1500	#/100ml
PD-258	4/1/2009	490	#/100ml
PD-258	4/6/2009	540	#/100ml
PD-258	4/14/2009	330	#/100ml
PD-258	4/22/2009	430	#/100ml
PD-258	4/29/2009	420	#/100ml
PD-258	5/6/2009	940	#/100ml
PD-258	5/13/2009	1200	#/100ml
PD-258	5/19/2009	380	#/100ml
PD-258	5/28/2009	2500	#/100ml
PD-258	6/2/2009	3500	#/100ml
PD-258	6/10/2009	2200	#/100ml
PD-258	6/16/2009	1200	#/100ml
PD-258	6/23/2009	1700	#/100ml
PD-258	7/8/2009	600	#/100ml
PD-258	7/22/2009	890	#/100ml
PD-258	7/28/2009	20	#/100ml
PD-258	8/4/2009	600	#/100ml
PD-258	8/31/2009	5100	#/100ml
PD-258	10/8/2009	3000	#/100ml

PD-258	10/12/2009	16000	#/100ml
PD-258	11/16/2009	490	#/100ml
PD-258	11/23/2009	3400	#/100ml
PD-258	12/7/2009	1200	#/100ml
PD-258	12/15/2009	230	#/100ml
PD-258	12/29/2009	600	#/100ml

RS-01023	1/2/2001	52	#/100ml
RS-01023	3/8/2001	0	#/100ml
RS-01023	4/11/2001	0	#/100ml
RS-01023	5/30/2001	0	#/100ml
RS-01023	7/3/2001	580	#/100ml
RS-01023	8/20/2001	300	#/100ml
RS-01023	9/4/2001	730	#/100ml
RS-01023	10/10/2001	0	#/100ml
RS-03507	1/6/2003	66	#/100ml
RS-03507	2/6/2003	36	#/100ml
RS-03507	3/6/2003	840	#/100ml
RS-03507	4/2/2003	22	#/100ml
RS-03507	5/1/2003	62	#/100ml
RS-03507	6/17/2003	120	#/100ml
RS-03507	7/8/2003	210	#/100ml
RS-03507	8/21/2003	98	#/100ml
RS-03507	9/11/2003	100	#/100ml
RS-03507	10/1/2003	110	#/100ml
RS-03507	11/19/2003	1900	#/100ml
RS-03507	12/2/2003	98	#/100ml
RS-06027	1/4/2006	150	#/100ml
RS-06027	2/8/2006	200	#/100ml
RS-06027	3/21/2006	1400	#/100ml
RS-06027	4/13/2006	760	#/100ml
RS-06027	5/10/2006	420	#/100ml
RS-06027	7/26/2006	910	#/100ml
RS-06027	8/9/2006	1200	#/100ml
RS-06027	9/14/2006	3400	#/100ml
RS-06027	10/25/2006	100	#/100ml
RS-06027	11/27/2006	100	#/100ml
RS-06027	12/11/2006	32	#/100ml

Appendix F: Data Tables

90th Percentile Fecal Coliform Concentrations (#/100 mL)						
Hydrologic Category Range	High Flow 0-10	Moist Cond. 10-40	Mid Range 40-60	Dry Flow 60-90	Low Flow 90-100	Samples
PD-078	1030	310	205	209	724	68
PD-137	340	938	2000	704	350	21
PD-141	930	660	1200	2270	N/A	30
PD-258	520	720	1940	2390	1786	61
RS-01023	N/A	655	N/A	300	N/A	8
RS-03507	840	58	183	1359	110	12
RS-06027	100	2300	1400	880	N/A	11

Mid Point Hydrologic Category Flow (cfs)					
Hydrologic Category (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
PD-078	760.64	474.77	317.85	203.9	109.95
PD-137	1.06	0.63	0.39	0.21	0.10
PD-141	1.48	0.88	0.55	0.29	0.14
PD-258	1.84	1.09	0.68	0.35	0.18
RS-01023	0.23	0.12	0.06	0.04	0.03
RS-03507	29.42	15.02	10.08	6.92	5.15
RS-06027	1.97	1.22	0.79	0.44	0.24

Existing Load (#/day)					
Hydrologic Category (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
PD-078	1.92E+13	3.60E+12	1.59E+12	1.04E+12	1.95E+12
PD-137	8.82E+09	1.44E+10	1.93E+10	3.59E+09	8.72E+08
PD-141	3.38E+10	1.42E+10	1.62E+10	1.62E+10	N/A
PD-258	2.34E+10	1.92E+10	3.25E+10	2.07E+10	7.96E+09
RS-01023	N/A	1.91E+09	N/A	3.04E+08	N/A
RS-03507	6.05E+11	2.13E+10	4.52E+10	2.30E+11	1.39E+10
RS-06027	4.82E+09	6.88E+10	2.72E+10	9.43E+09	N/A

Target Load (#/day)					
Hydrologic Category (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
PD-078	7.44E+12	4.65E+12	3.11E+12	2.00E+12	1.08E+12
PD-137	1.04E+10	6.16E+09	3.85E+09	2.04E+09	9.97E+08
PD-141	1.45E+10	8.63E+09	5.39E+09	2.85R+09	1.40E+09
PD-258	1.80E+10	1.06E+10	6.7E+09	3.47E+09	1.72E+09
RS-01023	2.20E+09	1.17E+09	6.22E+08	4.06E+08	2.79E+08
RS-03507	2.88E+11	1.47E+11	9.87E+10	6.77E+10	5.04E+10
RS-06027	1.93E+10	1.2E+10	7.77E+09	4.29E+09	2.31E+09

Load Reduction Necessary (#/day)					
Hydrologic Category (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
PD-078	N/A	N/A	N/A	N/A	N/A
PD-137	N/A	8.24E+09	1.55E+10	1.55E+09	N/A
PD-141	1.93E+10	5.57E+09	1.081E+10	1.34E+10	N/A
PD-258	5.39E+09	8.51E+09	2.58E+10	1.73E+10	5.97E+09
RS-01023	N/A	7.4E+08	N/A	N/A	N/A
RS-03507	N/A	N/A	N/A	1.62E+11	N/A
RS-06027	N/A	5.68E+10	1.94E+10	5.14E+09	N/A

% Load Reduction Necessary					
Hydrologic Category (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
PD-078	N/A	N/A	N/A	N/A	N/A
PD-137	N/A	59%	81%	46%	N/A
PD-141	N/A	42%	68%	83%	N/A
PD-258	N/A	47%	80%	84%	N/A
RS-01023	N/A	42%	N/A	N/A	N/A
RS-03507	N/A	N/A	N/A	72%	N/A
RS-06027	N/A	83%	73%	57%	N/A

Appendix G: Site Specific Information

Station RS-06027

Station RS-06027 on Ashby Branch is located on Clark Street next to Quinby United Methodist Church in Florence County. A site visit was conducted on March 16, 2009 to this and several other fecal coliform impaired sites within the Black Creek watershed.

The major landuses within a quarter of a mile radius of this station are: developed open spaces, low intensity development areas, evergreen, deciduous, mixed forest, woody wetlands, pasture and hay areas, and high intensity development.

The immediate area of the impaired station had a lot of trash, including food wrappers and tires, which hinder the flow of streams and may create environments conducive to the growth of bacteria (See Figures G-1 through G-4).

Figure G-1: Station RS-06027, on Ashby Branch. The picture below was taken while standing on Clark Street and depicts area upstream.

Figure G-2: Station RS-06027, on Ashby Branch. The picture below was taken while standing on the right bank of Ashby Branch depicts area upstream of Clark Street.

Figure G-3: Station RS-06027, on Ashby Branch. The picture below was taken while standing on the right bank of Ashby Branch depicts area upstream of Clark Street. Note the erosion under the road.

Figure G-4: Station RS-06027, on Ashby Branch. The picture below was taken while standing on the right bank of Ashby Branch depicts area upstream of Clark Street. Note the debris.

Also around the vicinity of the impaired station were several households with dogs that were outside during the site visit. One of the households, located downstream from Clark Street on the right bank of Ashby Branch, has a small pond in their property which is also seen on Florence East 7.5 minute USGS topographic map. From the topographic map, it can be seen that this pond connects to the Ashby Branch.

Upstream of Clark Street seems to have eroded either naturally, or during the process of placing piping (Figure G-5).
Also, the cement culvert downstream from Clark Street seems to be broken (Figure G-5).

Figure G-5: Station RS-06027, on Ashby Branch. The picture below was taken while standing on the right bank of Ashby Branch depicts area downstream of Clark Street. Note the broken pipe.

There are several recommended best management practices (BMP) for this station. The primary goals of the BMPs need to be to prevent fecal coliform bacteria from reaching the streams and also preventing and eliminating the microhabitats that may be conducive for bacterial growth.

By organizing a river sweep and clearing the trash and debris from the stream, the water in the stream may begin to flow. Currently, the water in the stream is not flowing which may contribute to the stagnation and may provide habitats for bacteria growth.

Eroded part of the Ashby Branch, under Clark Street needs to be addressed as well. Continued erosion causes water quality problems by increasing turbidity, providing surfaces for bacteria to attach and under extreme circumstances, by filling in the streams.

The broken cement culvert on the downstream portion of the Clark Street also needs to be addressed. Potentially, this broken culvert may be preventing the flow of water in Ashby Branch.

Station RS-01023

Station RS-01023 is on an unnamed ephemeral tributary of Swift Creek on Blue Street (CR213) in Darlington County. A site visit was conducted on March 16, 2009 to this and several other fecal coliform impaired sites within the Black Creek watershed.

The major landuses within a quarter of a mile radius of this station are: low and high intensity developed areas, mixed forest, woody wetlands, and pasture and hay areas.

During the site visit, Department personnel were approached by a local resident residing near the unnamed tributary of Swift Creek. The resident informed the Department staffs that during rain events there usually are odor problems, and also sewer back-ups in the vicinity of Blue Street and Main Street.
There was trash and other debris in the stream and on stream banks that may hinder the flow of water in the tributary. It would be advantageous to clean up the debris to promote the flow of water.

Figure G-6: Trash and debris in the stream and stream banks near station RS-01023

Figure G-7: Foaming in the unnamed tributary of Swift Creek, downstream from Blue Street.

Also, foaming in the tributary was observed and requires further investigation, specially for illicit discharges

Station RS-03507

Station RS-03507 is located on Boggy Swamp, Darlington County. There is no urban development in the vicinity of the station and the area is mostly wooded. There are two homesteads on opposite banks of the swamp and upstream from these homes are wooded areas.

Figure G-8: Station RS-03507 on Boggy Swamp.

On the right slope of the stream bank, there is a homestead and fenced area for animals: A dog and one goat were seen in the fields.

Figure G-9: Upstream view from station RS-03507 on Boggy Swamp.

The fecal coliform exceedances in the area are most likely to be due to domesticated animals and wooded areas which are suitable habitats for wild animals. However, it is recommended to determine if the residences in the watershed are having septic system problems and also determine if buffers are needed around the farms and homesteads, or if there are existing buffers, it needs to be determined if they need to be widened.

PD-141 60” tile to ditch

This station is a ditch that flows into Swift Creek. Upstream from the station is a culvert running from the direction of City of Darlington towards Swift Creek. There was some trash on the banks.

G-10: Upstream of station PD-141. Note the trash.

Possible sources of the fecal coliform exceedances may be due to run of from the surrounding area, which range from developed open spaces to high intensity development. Also, there are cultivated crop areas, forested areas, pasture-hay, and herbaceous grasslands.

PD-258 on Snake Branch

On site visit conducted on January 16, 2009, DHEC staff was joined by local residents, Jay James and Jennie Williamson, and also by Darlington County Director of Planning, Doug Reimold. Department staff were told that the residents around the vicinity of PD-258 have complained about odor problems. There is a sewer line going across the Railroad Avenue Bridge, and since odor was noted, there may be problems with the lines and may need to be checked.

A second site visit was conducted by the Department staff and March 16, 2009 and the following observations were made.

The vicinity of the station has multiple railroad tracks, apartment buildings, a College, a few small businesses. See figures G-11 and G-12.

G-11: Railroad tracks and apartment buildings in the vicinity of PD-258 on Snake Branch.

G-12: Vicinity of PD-258 on Snake Branch.

Also, under the Railroad Avenue Bridge, the stream banks were littered with trash and debris (See Figure G-13). Presence of debris and trash hinder the natural flow of streams and may provide suitable habitat for survival of bacteria. It would be beneficial to clean the stream of debris and plant vegetative buffers to limits the runoff from the surrounding areas.

G-13: Railroad Avenue Bridge down stream of PD-258. Note the debris in the stream and stream banks.

Appendix H: Evaluating the Progress of MS4 Programs

Evaluating the Progress of MS4 Programs:

Meeting the Goals of TMDLs and Attaining Water Quality Standards

Bureau of Water

August 2008

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

1. Calculate pollutant load reduction for each best management practice (BMP) deployed:
    - Retrofitting stormwater outlets
    - Creation of green space
    - LID activities (e.g., creation of porous pavements)
    - Creations of riparian buffers
    - Stream bank restoration
    - Scoop the poop program (how many pounds of poop were scooped/collected)
    - Street sweeping program (amount of materials collected etc.)
    - Construction & post-construction site runoff controls
2. Description & documentation of programs directed towards reducing pollutant loading
    - Document tangible efforts made to reduce impacts to urban runoff
    - Track type and number of structural BMPs installed
    - Parking lot maintenance program for pollutant load reduction
    - Identification and elimination of illicit discharges
    - Zoning changes and ordinances designed to reduce pollutant loading
    - Modeling of activities & programs for reducing pollutant reductions
3. Description & documentation of social indicators, outreach, and education programs
    - Number/Type of training & education activities conducted and survey results

- Activities conducted to increase awareness and knowledge – residents, business owners. What changes have been made based on these efforts? Any measured behavior or knowledge changes?
- Participation in stream and/or lake clean-up events or activities
- Number of environmental action pledges

4. Water quality monitoring: A direct and effective way to evaluate the effectiveness of stormwater management plan activities.
   - Use of data collected from existing monitoring activities (e.g., SCDHEC data for ambient monitoring program available through STORET; water supply intake testing; voluntary watershed group's monitoring, etc)
   - Establish a monitoring program for permitted outfalls and/or waterbodies within MS4 areas as deemed necessary– use a certified lab
   - Monitoring should focus on water quality parameters and locations that would both link pollutant sources and BMPs being implemented
5. Links:
   - Evaluating the Effectiveness of Municipal Stormwater Programs. September 2007. EPA 833-F-07-010
   - The BMP database - http://www.bmpdatabase.org/BMPPerformance.htm (this link is specifically to the BMP performance page, and lot more)
   - EPA's STORET data warehouse - http://www.epa.gov/storet/dw_home.html
   - EPA Region 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 stormwater 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

Responsiveness Summary Black Creek FC TMDLs

Comments were received from the following:
Mr. B. W. (Bunny) Anderson
City of Florence, City of Hartsville, Darlington County, Florence County
Mr. J. J. (Jay) James
Mr. Evander (Van) Whitehead
Mr. Ben Williamson

Mr. B. W. (Bunny) Anderson

Comment 1:
"I agree to the Black Creek TMDL Document, but ask your consideration to adding wild animals , storm damage and natural causes to this study. Beaver on my farm and other farms in the watershed has caused health problems, flooding, loss of important vegetation damage to roads ,and loss of valuable cropland and woodland. Soil quality has been reduced effecting crop and timber production. Wild hogs, wild dogs and other canines are increasing in numbers and damage , taking its tole on the environment including water quality."

Response 1:
The South Carolina Department of Health and Environmental Control (SCDHEC, the Department) appreciate your support of the TMDLs and your comments have been noted. Section 3.2.1 of the draft document includes and acknowledgement that wildlife may be a contributor of fecal coliform bacteria in the Black Creek Watershed. While the document identifies some mammal species, feral hogs, feral dogs and beavers are not mentioned. These species will be added to Section 3.2.1 as potential contributors of fecal coliform bacteria.

Comment 2:
"Storm damage and over - turned trees have clogged and reduced oxygen in some areas of Black Creek causing rerouting or damning of an important fishing water body."

Response 2:
Storm related damage and downed trees, as related to dissolved oxygen levels in the Black Creek, are beyond the scope of this draft TMDL document.

Comment 3:
"I feel there are more problems with animal waste and septic tank failure than realized in the report."

Response 3:
Animal waste and septic tank failures are nonpoint sources of pollution acknowledged in the Section 3.2 of the draft TMDL document. The Department believes that these are some of the sources of fecal coliform bacteria in the Black Creek Watershed; however,

it is difficult to quantify contributions from these sources for the purposes of TMDL development. Although these TMDLs makes allocations for nonpoint sources of pollution, approval of this draft TMDL document by United States Environmental Protection Agency (USEPA) does not give any additional regulatory authority to SCDHEC to either regulate animal waste contributions or malfunctioning septic tanks. Therefore, as mentioned in the draft TMDL document and during public meetings, local entities are encouraged to work together to leverage for resources and work towards improvements.

If you have more information regarding animal waste entering surface waters and failing septic systems, please contact your local government.

City of Florence, City of Hartsville, Darlington County, Florence County

General Comments

Comment 1:
"All numbers less than 10 need to be in text format, i.e. seven should be written out and not 7."

Response 1:
See Below.

Comment 2:
"Black Creek is a specific creek name; it is not "the Black Creek", remove "the" wherever this occurs. Otherwise, in reference to "the Black Creek watershed", "the" is appropriate."

Response 2:
See Below.

Comment 3:
"All numbers greater than 1000 should include a comma, i.e. 1,000."

Response 3:
See Below.

Comment 4:
"Ensure that references to the South Carolina Department of Health and Environmental Control are referenced as SCDHEC, DHEC, or SC DHEC. Be consistent throughout the document.**"**

Response 4:
See Below.

Comment 5:
“Remove any photos from the Appendices of stations that are not on the impaired list as part of this TMDL. Identifying impairments where none have been identified is both misleading and incorrect.”

Response 5:
See Below.

Comment 6:
“All tables and figures that reference monitoring stations should be sorted from up-stream station to down-stream station. Sorting the stations in this way will aid in locating the stations, analyzing the data, and, possibly, identifying the source of the impairment.”

Response 6:
Response, General Comments 1-6:
Comments 1-6 were not substantive in nature and, consequently, did not result in a revised source assessment or alternative TMDL reductions for the Black Creek Watershed. All comments were considered. Revisions to the draft TMDL document were made where appropriate and deemed necessary by the Department.

Referenced Comments

Comment 1:
“Comment, P.2, Abstract, paragraph 1: The reference to PD-134 should be PD-137.”

Response 1:
PD-134 has been changed to PD-137.

Comment 2:
“Comment, P.2, Abstract, paragraph 2: Quinby is not the only regulated MS4 in the watershed. MS4s include Florence County, the City of Florence, Quinby and Darlington County. Please revise.”

Response 2:
The sentence has been changed to reflect all of the existing, regulated MS4s in the Black Creek watershed.

Comment 3:
“**Comment, p.6, Section 1.1, paragraph 2:** Second sentence includes a typo. “Re” should be “are”.”

Response 3:
The suggested change was made to the document.

Comment 4:

“Comment, p.6, Section 1.1, paragraph 2: Delete the word “are” from the phrase “leaking sewers are among other sources””

Response 4:
The referenced sentence has been changed to: “Sources of fecal coliform bacteria are usually diffuse or nonpoint in nature and originate from stormwater runoff, failing septic systems, agricultural runoff, and leaking sewers.”

Comment 5:
“Comment, p.6, Section 1.1, paragraph 2: In the last sentence “in stream” should by hyphenated to “in-stream”.”

Response 5:
The Department believes that “in stream” is being expressed appropriately and no changes were made in the document.

Comment 6:
“Comment, p.6, Section 1.1, paragraph 3 and Table 1: It should be clearly noted that all stations listed, except PD-078, are located within tributaries of Black Creek. Reference should be made to the remaining stations actually located within Black Creek that are not listed as impaired for FC or have been removed from the 2010 303(d) list due the “Standard Attained”. At a minimum, references to available data should be included for Stations PD-21, RS-01043, PD-025, and PD-027. We understand budgetary constraints limit the number of stations that can be continuously monitored; however, data from when these stations, where active, should be included in this analysis.”

Response 6:
It is clearly stated within the paragraph that the seven impaired stations are within the Black Creek “watershed”. The reference to “watershed” as opposed to individual tributaries is appropriate and consistent. Furthermore, this section is an introduction and detailed descriptions and references to individual tributaries are made in the following sections and throughout the draft TMDL document. It is not within the scope of this draft TMDL document to include data for stations meeting the water quality standards as it may lead to further confusion. Any citizen can access the water quality data through www.epa.gov/storet or by contacting the appropriate watershed manager for the station within one of the eight watersheds in South Carolina.

Comment 7:
“Comment, p.6, Section 1.2, paragraph 1: “Chesterfield-Darlington County” should be “Chesterfield and Darlington Counties”.”

Response 7:
The sentence refers to the border between Chesterfield and Darlington County. A change will be made to reference “Chesterfield-Darlington Counties.”

Comment 8:
"Comment, p.6, Section 1.2, paragraph 1: The third sentence should change from "the Black Creek forms the Prestwood…" to "Black Creek flows into Prestwood…"

Response 8:
Technically, Lake Prestwood was formed by damming the Black Creek, therefore the Black Creek forms Lake Prestwood. The suggested change will not be made to the document.

Comment 9:
"Comment, p.6, Section 1.2, paragraph 1: In the last sentence, remove "is" from "The Black Creek watershed is consists of…"

Response 9:
The suggested change has been made to the document.

Comment 10:
"Comment, p.8, Section 1.2, paragraph 1: The first sentence should be revised to read: "The two major drainage areas within the Black Creek watershed are defined as follows:"

Response 10:
The Department believes that the first sentence on Page 4 is appropriate as written and no changes were made to the document.

Comment 11:
"Comment, p.8, Section 1.2, item #1: Add a comma after "Lake Robinson dam**,**"

Response 11:
The Department believes that a comma is unnecessary and no change was made to the document.

Comment 12:
"Comment, p.8, Section 1.2, item #1: The second sentence should be revised to "There are 175.2 stream miles and 2,452.8 acres of lakes **within** this watershed."

Response 12:
The suggested change was made to the document.

Comment 13:
"Comment, p.8, Section 1.2, item #2: Remove "primarily the" from the first sentence."

Response 13:
The suggested change was made to the document.

Comment 14:

"Comment, p.8, Section 1.2, paragraph 2: In the second sentence, change "compromise" to "comprise"."

Response 14:
The suggested change was made to the document.

Comment 15:
"Comment, p.8, Section 1.2, items #1 and #2: Indent the two watershed descriptions to separate them from the other descriptions in this section."

Response 15:
The Department believes that a formatting change is unnecessary and no change was made to the document

Comment 16:
"Comment, p.8, Section 1.2, paragraph 2: It is understood that the NLDC data set is used to determine land use characteristics of the watershed. However, is the 2001 data the most current available? Since the data set used to develop flow and water quality results is from 2002-2007, it would serve the TMDL document more appropriately if more up to date data could be used for land use analysis."

Response 16:
NLCD 2001 data was the most recent published landuse data available at the time the draft TMDL document was made available for public comment. Until very recently, NLCD 2006 data was considered provisional. Final versions of any credible landuse information/data requires several years to be published and the 2006 landuse data did not become finalized until well after the Black Creek TMDL document was made available for public comment.

The Department has calculated landuse within the Black Creek watershed utilizing 2006 NLCD data for comparison with the NLCD data (see below). These data demonstrate that overall landuse changes are negligible in the watershed between 2001 and 2006; therefore the Department does not believe it is necessary to change the landuse summary in the draft TMDL document (Table 2, page 5).

LANDUSE	NLCD 2006 (mi2)	NLCD 2001 (mi2)	% NLCD 2006	% NLCD 2001	DIFFERENCE (2001-2006)
Open Water	5.67	5.01	1.26	1.11	-0.15
Developed, Open Space	27.30	26.09	6.08	5.81	-0.27
Developed, Low Intensity	12.50	11.92	2.78	2.65	-0.13
Developed, Medium Intensity	4.06	3.73	0.90	0.83	-0.07
Developed, High Intensity	1.46	1.47	0.32	0.33	0.01
Barren Land	1.40	1.00	0.31	0.22	-0.09

Deciduous Forest	16.93	26.44	3.77	5.89	2.12
Evergreen Forest	92.54	90.28	20.59	20.10	-0.49
Mixed Forest	6.61	9.14	1.47	2.04	0.57
Scrub/Shrub	35.59	9.86	7.92	2.19	-5.73
Grassland/Herbaceous	38.92	61.35	8.66	13.66	5.00
Pasture/Hay	15.30	23.35	3.40	5.20	1.80
Cultivated Crops	121.27	116.10	26.98	25.85	-1.13
Woody Wetlands	68.14	61.97	15.16	13.80	-1.36
Emergent Herbaceous Wetland	1.73	1.41	0.38	0.31	-0.07
TOTAL	449.40	449.11			

Comment 17:
"Comment, p.8, Section 1.2, Table 2: The column headers should be revised to accurately reflect the data presented. The two left columns should have "Total Area" and "Total Watershed Percentage", or something similar as the headers. Labeling them as "Black Creek" is insufficient."

Response 17:
It would not be accurate to label the "Black Cr (mi2)" column "total area". The "Black Cr (mi2)" column is merely a portion of the whole watershed in square miles broken into landuse categories.

The "Black Creek (%)"column has been changed to "Black Creek (% of total area).

Comment 18:
"Comment, p.8, Section 1.2 last paragraph: Where are the 31 NPDES permitted dischargers/facilities located in relation to the impaired stations? Add an additional map that shows all 31 NPDES permitted dischargers. In addition, if there are permitted sludge fields located within the watershed, note them as well."

Response 18:
Locations of all NPDES permitted dischargers are not relevant to these TMDLs since majority of these discharges do not contain fecal coliform in their effluent and these TMDLs are for fecal coliform impaired stations. Those dischargers with fecal coliform limits on their effluent have been indentified on the existing maps within the draft TMDL document. Furthermore, it would add to the existing confusion if NPDES permittees without wasteload allocations were to be identified and included in the document. The suggested change will not be made to the document; however, Section 3.2.3., Page 18 has been added to address the presence of land application sites for Industrial, Domestic Sludge or Treated Wastewater. Please see additional language below:

3.2.3 Land Application of Industrial, Domestic Sludge or Treated Wastewater

NPDES-permitted industrial and domestic wastewater treatment processes may generate solid waste bi-products, also know as sludge. In some cases, facilities may be permitted to land apply sludge at designated locations and under specific conditions. There are also some NPDES-permitted facilities authorized to land apply treated effluent at designated locations and under specific conditions. 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 Black Creek Watershed. If properly managed, waste is applied at a rate that ensures nutrients will be incorporated into the soil or plants and nutrients will not enter streams. Land applications sites can be a source of nutrients 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 Black Creek and its tributaries. Direct discharges from land applications sites to surface waters of the State are illegal and are subject to enforcement actions by SCDHEC.

.

Comment 19:

"Comment, p.8, Section 1.2, last paragraph: Revise the third sentence from "Of the remaining, 20", to simply "Twenty". Since this paragraph is referencing the 31 overall permits, there is no need to refer to "remaining"."

Response 19:

The Department believes that a change is unnecessary and no change was made to the document

Comment 20:

"Comment, p.8, Section 1.2, last paragraph: The phrase "and are not specifically tailored for and individual", the second "and" should be "an"."

Response 20:

The suggested change was made to the document.

Comment 21:

"Comment, p.8, Section 1.2, last paragraph: The last sentence should be revised to read "There are also three no discharge (ND) permits that are land application permits prohibiting the permit holder from discharging to surface waters."

Response 21:

The Department believes that a change is unnecessary and no change was made to the document.

Comment 22:

"Comment, p.10, Section 1.3, first paragraph: The first sentence needs additional clarification for FW*. A definition of this term should be added after the FW definition below it."

Response 22:
Additional clarification has been added to Section 1.3, page 7. Please see additional language below:

"Note that the FW* water quality classification is used for waterbodies that have site-specific standards for some pollutants. In the aforementioned portions of the Black Creek Watershed, the FW* designation does not pertain to fecal coliform bacteria. Therefore the FW* designation is not relevant for the purposes of discussions in this TMDL document."

For additional information regarding site specific standards please see Water Classification & Standards (R. 61-69 SCDHEC 2006).

Comment 23:
"Comment, p.10, Section 1.3, first paragraph: The first sentence should be reworded to read "Regulation 61-69 (SCDHEC, 2006), classifies portions of the impaired stream segments of the Black Creek basin as "Freshwater" (FW). In addition, certain portions of Black Creek are designated as FW*, and have site specific standards for dissolved oxygen (DO) and pH from S.C. 145 to U.S. 52."

Response 23:
See Response 22.

Comment 24:
"Comment, p.10, Section 1.3, first paragraph: The "Primary contact" paragraph should be expanded to define primary and secondary contact. There is insufficient information defined herein to talk about potential pathogen concerns without defining the parameters of contact."

Response 24:
All waterbodies, including Black Creek and it's tributaries are protected for primary and secondary contact recreational use. Regulation 61-68 (SCDHEC, 2008) outlines the water quality standard for fecal coliform bacteria that will insure that the designated uses for both primary and secondary contact recreation will be maintained. The water quality standard for fecal coliform bacteria is equivalent to the TMDL target outlined in the draft document.

Per Regulation 61-68 (SCDHEC, 2008): "**Primary contact recreation** means any activity with the intended purpose of direct water contact by the human body to the point of complete submergence, including but not limited to swimming, water skiing, and skin diving".

Per Regulation 61-68 (SCDHEC, 2008): "**Secondary contact recreation** means any activity occurring on or near the water which does not have an intended purpose of direct water contact by the human body to the point of complete submergence, including but not limited to fishing, boating, canoeing, and wading".

Comment 25:
"Comment, p.10, Section 2.0, first paragraph: Change "have" to "has" at the end of the first line."

Response 25:
The suggested change was made to the document.

Comment 26:
"Comment, p.10, Section 2.0, first paragraph: The end of the third line should read "…Robinson and **the** remaining…"

Response 26:
The suggested change was made to the document.

Comment 27:
"Comment, p.10, Section 2.0, first paragraph: As noted above, reference should be made to stations that were recently removed from the 2010 303(d) list, due the "Standard Attained" (Stations PD-021 & PD-025). When were these stations placed on inactive status?"

Response 27:
This is a technical document with sufficient referencing to guide the reader to the literature cited. The 2010 303(d) list can be accessed at the following link: http://www.scdhec.gov/environment/water/tmdl/docs/tmdl_10-303d.pdf. Appendix A includes all sites removed from the 2008 303(d) list during the 2010 303(d) listing cycle. Sites PD-021 and PD-025 are included in Appendix A.

Sites PD-021 and PD-025 were previously sampled for fecal coliform bacteria once/month every fifth year, in a rotating hydrologic basin cycle. The sites were last sampled for fecal coliform bacteria in 2008. The sites became inactive at that time and are currently not scheduled for sampling in the future. Resource constraints and budget reductions have resulted in the sites being deactivated by the Department.

Comment 28:
"Comment, p.10, Section 2.0, second paragraph: The phrase "are considered to comply" should be changed to "are considered in compliance with"."

Response 28:
The Department believes that a change is unnecessary and no change was made to the document.

Comment 29:
"Comment, p.10, Section 2.0, third paragraph: It appears there is less than a five year period of sampling for station PD-078. What is the percentage of samples collected over a five year period that exceeds 400 cfu/100 ml at station PD-078? It should be noted that PD-078 first appeared as impaired for FC on the 2010 303(d) list with TMDL target date noted as 2023."

Response 29:
Table 3 clearly shows the number of samples collected from each station, percent exceedance of these samples as well as the number of samples exceeding the water quality standards. TMDL target dates are noted on the 303(d) list for planning purposes between the Department and the USEPA. The Department has the discretion to complete a project before its due date. Furthermore, PD-078 was included in the calculations of these TMDLs and in the draft TMDL document to help the local community and stakeholders to leverage for resources and work toward water quality improvements.

Comment 30:
"Comment, p.10, Section 2.0, fourth paragraph: This paragraph needs to be examined for factual accuracy to determine whether any correlations exist between fecal coliform, flow and rainfall. Are the "r" values described in this section actually "r^2" values? If so, then there are extremely weak correlations, at best, between the parameters. If they are actually "r" values, only the "r^2" values should be used for analysis and correlation, which, except for RS-06027, show no correlation at all. While it is understood that a limited data set was used to develop this TMDL, and that a standard flow vs. concentration analysis that is accepted TMDL development practice, this section attempts to make claims of correlation where none exist. This should be removed from this document. If it is to remain, the information should be presented in a table and sorted from up-stream to down-stream station."

Response 30:
In statistics, *r* value has a range between -1 to 1. Since the values in the referred paragraph has some negative values, it is apparent that the correct statistics, *r* = Pearson's correlation coefficient, was used during the TMDL calculations to estimate population correlation. Coefficient of determination, r^2, must lie between 0 and 1, and is used in the determination of goodness of a fit of linear regression. The document does not imply the strength or weakness in regards to the magnitude of the correlations, but merely indicates if the correlation is positive or negative. The Department believes that a change is unnecessary and no change was made to the document.

Comment 31:
"Comment, p.10, Section 2.0, Table 3: The table indicates that Black Creek is in much better shape than the TMDL document portrays. The inclusion of more recent data may show Black Creek can adequately assimilate FC. The problem appears to in

select tributaries of Black Creek. TMDL's should be developed for Snake Branch, Boggy Swamp, Swift Creek and Ashby Branch – not Black Creek."

Response 31:
The associated summary data from 1999-2007 demonstrates that all sites were not meeting the FC bacteria standard at the time of TMDL development. TMDLs were initially calculated for the impaired stations on the referenced tributaries and the Black Creek because these sites are impaired and included on the 2010 303(d) List. However, after the draft TMDL document had been placed on a 30-day public comment period, data from the 2006-2010 time period were assessed for development of the 2012 303(d) list. Assessment results demonstrated that PD-078 (Black Creek) is no longer impaired for FC bacteria. All other sites described in the draft TMDL document remain impaired for FC bacteria. In the interest of addressing the commenter's concern regarding the inclusion of more recent data in evaluating the impairment status, all available 2009-2011 data were also included in the load duration curves, where available. For site PD-078, a TMDL was developed but the TMDL did not demonstrate a reduction was necessary on the mainstem Black Creek. In effect, there is additional assimilative capacity for FC bacteria at that location. All other sites remain impaired for FC and continue to require a reduction in order to meet the TMDLs described in the draft document. Table Ab-1, Table 9, Table 10 and, where applicable, load-duration curves illustrated in Figure 4 and Appendix A were updated in the document.

Comment 32:
"Comment, p.11, Section 2.0, Figure 3: It is understood that the development of this TMDL began in 2008. However, since then, there has been a release of the 2010 303(d) list including subsequent monitoring. Is it not suitable to use data through the end of 2008, at a minimum, for the development of this TMDL? This is specifically critical for PD-078, with an exceedance percentage of only 0.8% over the 10% threshold for TMDL development. Appendix B includes data for all other stations through the end of 2008. Additionally, PD-078 is not included in Appendix B at all. Since this station is the basis for the inclusion of a watershed-wide WLA reduction that will be applied to all MS4s within the Black Creek watershed, and thus tied to overall NPDES Phase II permit compliance, it is requested that further justification be included in this document, including the usage of water quality monitoring data through the end of 2008 to justify the reduction requirements of the watershed."

Response 32:

Inclusion of a station in the 303(d) list of impaired waters is done in accordance with federal guidelines and the Clean Water Act. Based on comments received during the advertised public comment period, all available DHEC fecal coliform data through 2011 were used in the calculations of TMDLs. For PD-078, a precipitation chart was included as Figure 3, page 10 and a load duration curve chart as Figure 4, page 22; therefore they were not included in Appendix B of the document.

See Response 31 for additional details.

Comment 33:
"Comment, p.11, Section 2.0, Figure 3: Unusual spikes in FC counts may be an indicator of a significant violation or errors in sampling and/or testing. Isolated FC counts that are suddenly 1000% higher than average should trigger an immediate investigative response and possibly the issuance of a public health alert or the test result should be considered suspect and disregarded."

Response 33:
The comment is noted.

Comment 34:
"Comment, p.12, Section 3.0, first paragraph: "However, if these facilities are discharging wastewater that meets their permit limits, they are not causing impairment provided that a daily maximum limit is being met as specified in the TMDL." This statement is not correct in relation to the permitted dischargers in that they are not currently regulated by the TMDL. Their discharge is determined by their 7Q10, or similar, discharge requirements. With the implementation of this TMDL, it is possible to modify their peak discharge requirements, as a BMP, to assist in meeting overall WLA requirements. This sentence should be revised to define what these facilities' discharge requirements are and reiterate that they are required to meet current DHEC standards based on their permit requirements, regardless of the TMDL. Thus, they are not contributing to the exceedances observed in the watershed. It is understood that this is the intent of this sentence, but it should be clarified further."

Response 34:
The referenced statement is correct because the NPDES permitted sanitary discharges must meet 400 cfu/100 ml at the end of their pipe before their effluent mixes with surface waters. Furthermore, for NPDES permitted discharger' fecal coliform limit, the volume of instream flow is not relevant as the permit limit is applicable at the end of their pipe, not after mixing with instream flow. Once the TMDL becomes final, existing NPDES permitted dischargers will be required to meet the WLA as prescribed in the TMDL document, which is equivalent to the water quality standard for fecal coliform bacteria.

It is also true that, whether the TMDL is established or not, the existing discharge permit limits will not be impacted because the current permit requires each facility to meet the 400 cfu/ 100 ml WQS at the end of pipe.

Comment 35:
"**Comment, p.12, Section 3.0, second paragraph:** *"MS4s may require NPDES discharge permits under the NPDES Stormwater regulations."* This sentence is confusing. Does it mean that MS4s may be required to be covered under the NPDES stormwater Phase I or II permit program, or that the MS4 may require construction activities to have a stormwater permit? Please clarify. If the latter is correct, all

construction activities, greater than 1 acre, within an MS4 are required to have a stormwater permit through the MS4."

Response 35:
The sentence only pertains to regulated MS4s and another way of stating is that MS4s may be required to obtain NPDES discharge permits under the NPDES Stormwater regulations. The sentence is not meant to imply that the MS4 may require all construction activities, greater than one acre and within an MS4, to be required to have a stormwater permit through the MS4.

Comment 36:
"**Comment, p.12, Section 3.0, second paragraph:** *"These sources are also required to comply with the state standard for the pollutant(s) of concern."* This statement is not correct. The stormwater permit does not currently include numerical effluent limitations. The only requirement of the stormwater permit is to demonstrate progress toward water quality improvement, and in the case of TMDLs, improvement towards WLA compliance. However, there are no requirements regarding pollutant(s) of concern if they are not explicitly included in a TMDL that encompasses the MS4 area."

Response 36:

The Department believes that the sentence is accurate and should remain in the document. SCSR03000 is the current MS4 permit relevant to regulated small MS4s, including those affected by these TMDLs. The permit can be found at the following link: http://www.scdhec.gov/environment/water/docs/scs000000.pdf. While there are currently **no numeric effluent limitations** applicable for fecal coliform, Part 3.1.2 states: "Your SWMP must include a section describing how implementation of your SWMP will provide Reasonable Assurance that discharges will not cause or contribute to violations of the water quality standard in Impaired Water Bodies." This supports inclusion of the aforementioned statement in the TMDL document as discharges from regulated MS4 must demonstrate compliance with applicable water quality standards and with the Maximum Extent Practicable (MEP) standard.

Comment 37:
"**Comment, p.12, Section 3.1, first paragraph:** *"Point sources can also include pollutant loads contributed by tributaries to the main receiving water stream or river.*" This is only true by definition if the tributary is defined as a point source through a MS4 area or discharge channel from a regulated facility. This statement is too vague in that it implies that a named or unnamed stream can be defined as a point source. While technically correct, that point source (tributary) would have either a non-point or point source contribution that would make it impaired, and thus the upstream source of pollution would supersede it in relation to regulatory compliance or pollution loading reduction."

Response 37:

The Department has removed the statement from the draft TMDL document.

Comment 38:
"Comment, p.12, Section 3.1.1, first paragraph: Line 6: "Majority of the NPDES permitted dischargers…" should read "A majority of NPDES permitted dischargers…"

Response 38:
The suggested change was made to the document.

Comment 39:
"Comment, p.12, Section 3.1.1, first paragraph: Final sentence of the paragraph should be reworded to read: "Table 4 includes a list of all individually permitted wastewater dischargers and their associated downstream impaired stream station."

Response 39:
The final sentence of Section 3.1.1, second paragraph, page 12 has been changed to "Table 4 includes a list of all individually permitted wastewater dischargers with fecal coliform bacteria limits on their permit and the associated downstream impaired monitoring station."

Comment 40:
"Comment, p.12, Section 3.1.1, first paragraph: The paragraph is confusing and includes too many descriptions of the various discharges. There is reference to types of dischargers that aren't in the watershed, and if they are regulated facilities required to meet water quality discharge standards, it may not be necessary to include information on whether they are major or minor dischargers."

Response 40:
The aforementioned paragraph has been changed and a second paragraph added for clarity. Note that the revised first paragraph is only meant to characterize the types of discharges in the watershed, whether industrial or domestic in nature, and includes facilities that are not permitted to discharge fecal coliform bacteria. The following has been added/revised:

"There are numerous active NPDES dischargers in this watershed, some of which are covered under South Carolina General Permits (SCG). Currently there are 8 active NPDES permitted facilities in the Black Creek watershed, of which 3 are considered "minor" dischargers, and 5 are "major" dischargers. Domestic wastewater facilities (dischargers) with a permitted flow of less then 1.0 million gallon a day (MGD) are considered "minor" and those discharging more than 1.0 MGD are considered "major". Of these 8 NPDES permits, 4 facilities are industrial in nature and 4 facilities are domestic in nature**.** A majority of the NPDES permitted dischargers with fecal coliform limits on their effluent are domestic sanitary dischargers. However, some industrial NPDES permitted dischargers (such as aquaculture, leather tanning and finishing, meat and poultry facilities) can have fecal coliform in their effluents and are subject to limits in their effluent for fecal coliform bacteria.

For the purpose of developing this TMDL document, there are currently only 3 NPDES continuous facilities allowed to discharge fecal coliform bacteria within the TMDL watershed. All three facilities discharge treated domestic, sanitary effluent within the affected watershed. NPDES permitted facilities with fecal coliform limits on their permit and the adjacent closest downstream impaired segment that receives the discharge is provided in Table 4."

Comment 41:
"Comment, p.12, Section 3.1.1, second paragraph: The first sentence refers to "4 municipal dischargers". This section refers to individually permitted industrial facilities. While the only four facilities defined in this section are WWTPs, and they are municipal dischargers, since this section is about continuous point source discharges, that phrase should be revised to "four industrial permitted facilities"."

Response 41:
See response 40.

Comment 42:
"Comment, p.13, Section 3.1.1, Table 4: Under permit type, it may be more pertinent to include the permitted discharge limitations for the facilities. If they are all required to have less than 400 #/100mL discharge concentrations, their overall permit type is irrelevant in relation to the overall TMDL. Consider revising to provide more relevant information in the table.**"**

Response 42:
All NPDES permitted dischargers with fecal coliform in the effluent have the same permit limit of 400 cfu/100 ml that must be met at the end of their outfall pipe before mixing with instream flow. Furthermore, there are enforcement mechanisms if these limits are violated. For clarity, the flowing footnote has been added to Table 4, Page 13: "**All facilities are required to meet an end of pipe daily maximum fecal coliform bacteria limit of 400 cfu/100 ml, regardless flow".

For additional information, see Response 34.

Comment 43:
"Comment, p.13, Section 3.1.1, Table 4: The bullet below the table gives an option as to whether the facility has no impaired station below it, or the station is far enough below the facility as to not be impacted by the discharge. Since there is only one facility in the list with this asterisk, please define which condition applies to that facility."

Response 43:
The asterisk (*) below Table 4 clearly defines that Pageland/Southeast WWTP does not have the potential to impact any of the impaired stations. The other dischargers that may impact any of the stations are also identified.

Comment 44:
"Comment, p.13, Section 3.1.1, Table 4: Add a column noting the distance from the facilities to PD-078. Discuss where these facilities are in relation to PD-021 and PD-025, which were de-listed for FC from the 2010 303(d) list."

Response 44:
The distance of the NPDES permitted dischargers are not relevant to the draft TMDL document because these dischargers must meet the state water quality standard of 400 cfu/100 ml before their treated effluent enters state waters.

PD-021 and PD-025 were not included in the document (including Table 4) because no TMDLs were calculated for FC bacteria at those sites. References to PD-021 and PD-025 were removed from Appendix G (mislabeled Appendix E in original draft) of the document.

Comment 45:
"Comment, p.13, Section 3.1.2, fourth paragraph: Spell out the first occurrence of SCDOT."

Response 45:
The suggested change was made to the document.

Comment 46:
"Comment, p.13, Section 3.1.2, second paragraph: The final sentence states: *"These activities are not subject to the WLA portion of the TMDL."* Just because a discharge is not currently regulated does not mean that WLA allocation is not applicable. It simply means that the WLA cannot be enforced on these discharges. Should an unregulated stormwater discharge in this watershed be retrofitted or restored to reduce pollutant discharge, the WLA should be used as guidance to reduction requirements, even though it's not an enforceable requirement."

Response 46:
The document acknowledges that that there may be other stormwater discharges not covered under permits numbered SCS and SCR that occur in the referenced watershed. These discharges are subject to the LA component of the TMDL. Implementation of the LA is voluntary and not required under an NPDES permit. For the purposes of planning or retrofitting, an unregulated MS4 may use the WLA as guidance but is subject to the LA reductions in the TMDL document. Both the WLA and LA percent reductions are equivalent and based upon aggregate loadings used to establish the existing condition instream.

Comment 47:
"Comment, p.13, Section 3.1.2, third paragraph: The final sentence states: *"These unregulated entities are subject to the LA for the purposes of this TMDL."* This should be revised. The LA should be **applied** under these circumstances. The word "subject"

implies regulatory authority and compliance, which is currently not applicable under stormwater and TMDL regulations."

Response 47:
The Department does not currently have the authority to require unregulated MS4s to be responsible for load reductions prescribed in the TMDL document. The use of the word "subject" is not meant by the Department to imply regulatory responsibility, authority or compliance.

Comment 48:
"Comment, p.13, Section 3.1.2, fourth paragraph:*"Current developed land use for the entire TMDL watershed is 9.6%."* This sentence is misplaced, and unless there is additional information defining SCDOT's percentage of this development, it should be excluded from this paragraph."

Response 48:
The Department believes that placement of the referred sentence is appropriate and a change will not be made to the document.

Comment 49:
"Comment, p.13, Section 3.1.2, fifth paragraph: The City of Florence is within the Black Creek watershed and should be included in this paragraph. This paragraph should also include the percentages of each MS4 within the overall watershed. This TMDL is highly applicable to the MS4s in relation to WLA compliance and their overall potential contribution to the watershed, on a percentage basis, should be acknowledged."

Response 49:
The suggested change was made to the document.

Comment 50:
"Comment, p.13, Section 3.1.2, sixth paragraph: *"However there may be industrial or construction activities going on at any time that could produce stormwater runoff."* This seems like a vague generalization in relation to stormwater runoff. What does this mean? How should they be required to comply with the TMDL LA or WLA? Add some description on how these operations should be working to meet stormwater compliance, if applicable. If not applicable, remove the sentence."

Response 50:
The referenced statement is an acknowledgement that there may be industrial and construction activities in the watershed covered under NPDES stormwater permit or not covered by permit. The former is subject to the WLA and the latter subject to the LA. For permitted activities covered under SCR000000 and SCR100000, compliance with the terms and conditions of the their permit is compliance with the assumptions and requirements of the TMDL. Section 6.1.2 of this document provides some guidance for

stormwater permit holders (including industrial and construction) for demonstrating compliance but specific activities required to demonstrate compliance with the stormwater permit are out of the scope of this TMDL document.

The Department has removed this sentence from the draft TMDL document.

Comment 51:
"Comment, p.13, Section 3.1.2, seventh paragraph: *"It is not known what percentage of these releases occurred specifically in the Black Creek watershed."* Why not? While all SSOs aren't tracked and reported to DHEC, DHEC does have a record of the ones that have been. A description of where the release occurred is required when reported. This can easily be mapped and included as part of the TMDL document. In fact, it's even possible to correlate the reported occurrences to the date and time of the sampling event to determine whether the SSOs may have contributed to the higher fecal coliform readings within the watershed. Please evaluate the value of assessing this data and including it in the TMDL. Several of the monitoring stations would be significantly affected if SSOs were the sole-source of the problem, and through elimination would bring the stations into compliance without the necessity for watershed-wide implementation of WLA and LA requirements."

Response 51:
Sanitary Sewer Overflows (SSO) are not always reported, and when reported locations descriptions may be vague. In many cases, the reported SSO is only included in an internal DHEC database in association with a collection system, City or County name. Furthermore, the amounts reported are estimates at best, and would not provide a good representation of the impact SSOs may have on FC levels in the Black Creek Watershed. The Department believes the best characterization of SSOs in the Black Creek Watershed is provided in Section 3.1.2. of the draft TMDL document.

Comment 52:
"Comment, p.14, Section 3.1.2, first paragraph: *"At the time of the TMDL development, it is not know if any reported SSOs have entered the State waters."* Revise to read "At the time of the TMDL development, it was not known if any reported SSOs had entered the State waters."

Response 52:
The suggested change was made to the document.

Comment 53:
"Comment, p.14, Section 3.1.2, first paragraph: *"At the time of the TMDL development, it is not know if any reported SSOs have entered the State waters."* Reporting data should include information regarding release location and receiving waters. It is imperative that this information be evaluated and included in this TMDL document. With limited monitoring data, a small number of SSOs entering receiving waters of the State could greatly alter the WLA and LA requirements of this TMDL."

Response 53:
Information reported to the Department has been evaluated and included in the draft document. The comment is noted. See Response 51 for additional information.

Comment 54:
"Comment, p.14, Section 3.2.1, second paragraph: The last sentence states that "of which only a portion will enter the watershed" in reference to fecal coliform loading from deer. Since this paragraph estimates the overall number of deer in the watershed, all fecal coliform generated by these deer remain within the watershed. This sentence should be revised. While not all fecal coliform directly enters the waterways, it has the potential to do so and should not be discarded as a source."

Response 54:
The sentence has been changed to "…enter the water".

Comment 55:
"Comment, p.14, Section 3.2.1, second paragraph: The first sentence that reads: *"…estimated that there are less than 15 to approximately 30 deer…"* should be revised to "estimated that there are approximately 15 to 30 deer…"

Response 55:
The Black Creek watershed spans a large area and based on the information from SC Department of Natural Resources (http://www.dnr.sc.gov/wildlife/deer/deermap.html), some areas have less the 15 deer per square mile and some areas have 30 deer per square mile. The sentence as it is written is correct although the word "then" has been changed to "than".

Comment 56:
"Comment, p.14, Section 3.2.2: The third sentence should include "of fecal coliform" after "may represent a significant source"."

Response 56:
The suggested change was made to the document.

Comment 57:
"Comment, p.15, Section 3.2, second paragraph: Have any of the 28 active AFO's been cited for violations within the time frame of the TMDL analysis? If so, does the date of the violation(s) correspond with spikes in the fecal count at impaired stations?"

Response 57:
Compliance status of the AFOs within the Black Creek watershed at the time of the TMDL development is not known and is beyond the scope of this document. Note that a facility violation would not necessarily mean that the facility had contributed fecal coliform loading to a waterbody.

Comment 58:

“Comment, p.15 & 16, Section 3.2: Again, PD-078 is downstream of everything in the watershed. Reference should be made to the closest downstream station from the facility and whether or not the station has been listed or delisted from the 2010 303(d) list.”

Response 58:
These animal feeding operations may have more then one track of land that are located in various locations within the Black Creek watershed. The sprayfields for the facilities may also be operating at various times, depending upon operations. It would be difficult to determine exactly which water quality monitoring site(s) would be downstream from a facility and the associated sprayfields. This would not result in a revised TMDL, WLA or LA by water quality monitoring station. Therefore the Department feels the information presented as it is sufficient for the purposes of these TMDLs.

Comment 59:
“Comment, p.16, Section 3.2.2: This section should include the total estimated number of livestock and cattle within the watershed. Due to the rural nature of the watershed, the total estimated loading should be included as a source quantity. Excluding a quantitative assessment removes the validity of this as a source.”

Response 59:
“Section 3.2.2.2, Page 17 of the draft TMDL document provides an estimate of 17,945 cattle and calves within the Chesterfield, Darlington and Florence Counties. The following will be added to the paragraph to provide more watershed-specific information: “Based on 2001 NLCD, there are approximately 8,928 acres of pasture land within the TMDL watershed. Assuming a uniform distribution of livestock and landuse, there are approximately 0.013 livestock per acre, for a total of 115 cattle and calves estimated to be in the TMDL watershed. Direct loading by cattle or other livestock to surface waters with in the Black Creek watershed is likely to be a significant source of fecal coliform. It is estimated that 115 cattle and calves would produce approximately 1.15E+12 cfu/day of fecal coliform bacteria.”.

Comment 60:
“Comment, p.16, Section 3.2.2.2, first paragraph: The last line “with in” should be “within”.”

Response 60:
The suggested change was made to the document.

Comment 61:
“**Comment, pg.16, Section 3.2.2.2:** Add “(20 ft)” after 6.1 meters.”

Response 61:
The suggested change was made to the document.

Comment 62:

“Comment, p.16, Section 3.2.2.2, second paragraph: Remove the reference to stream bank erosion in the final sentence. While sediment may be a conduit for fecal coliform transport, there is no description to quantify the amount of fecal coliform reduced under these conditions. If there is statistical information as to the percent reduction of fecal coliform associated with the amount of increased stream stabilization, please include, otherwise, this is superfluous information that is not needed in the document.”

Response 62:
Stream bank erosion and increases in fecal coliform levels have been documented in numerous, peer-reviewed journals. It has also been documented that bank stabilization leads to water quality improvements. The suggested change will not be made in the document.

Comment 63:
“Comment, p.17, Section 3.2.4, first paragraph: The end of the third line, Black creek should be capitalized to Black Creek.”

Response 63:
The suggested change was made to the document.

Comment 64:
“Comment, p.17, Section 3.2.4, second paragraph: Remove the phrase “and based on the 2000 U.S. population census” and move “(U.S. Census Bureau 2000)” to the end of that same sentence.”

Response 64:
The suggested change will not be made to the document since this is the citation style used throughout the draft TMDL document.

Comment 65:
“Comment, p.17, Section 3.2.4, second paragraph: Remove the last sentence. There is no need to define the number of sanitary sewer households in reference to this failing septic system section.”

Response 65:
The number of households and people served by community sewer system is provided for additional information. Including the referenced information on the draft TMDL document has been found to be useful during the planning and implementation phase of the TMDL. During the planning phase, stakeholders interested in TMDL implementation have used the numbers in this section to determine the amount of funds to request and/or the amount of funds to allocate to the correction of problems related to septic tank failures.

Comment 66:

“Comment, p.17, Section 3.2.5, first paragraph: Include the overall estimate of dogs in the watershed.”

Response 66:
The suggested change has been made to the document.

Comment 67:
“Comment, p.17, Section 3.2.5, second paragraph: Discussions related to the City of Quinby and other permitted MS4s are non-continuous point sources and should not be included in this section of the document. Regardless of their permitting status, all MS4s are non-continuous point sources.”

Response 67:
The reference to the City of Quinby has been removed from Section 3.2.6 (formerly 3.2.5), page 20 and replaced with “As previously described, there are currently four regulated small MS4s located in the Black Creek Watershed. Regulated MS4s are subject to the WLA component of the TMDL”.

References in Section 3.2.5 to other regulated MS4s are only meant to establish the fact that there are both regulated MS4s (subject to the wasteload allocation) and non-regulated MS4 (subject to the load allocation) within the Black Creek Watershed. It is **not** true that all of these are characterized as non-continuous point sources, as “point sources” provides a regulatory meaning that is not relevant to unregulated MS4s or other urban runoff.

Comment 68:
“Comment, p.17, Section 3.2.5, third paragraph: This paragraph contradicts statements in previous sections of the document. If there are not applicable discharges from SCDOT roads, as previously discussed in the document, the TMDL should not be applying a different standard to the non-SCDOT roads.”

Response 68:
SCDOT has a state wide MS4 permit and therefore subject to wasteload allocations. SCDOT does have applicable discharges within the watershed and those discharges are accounted for in the non-continuous point source section of the document. However, the document does go on to acknowledge “…that SCDOT is not a traditional MS4 in that is does not possess statutory taxing or has enforcement powers. SCDOT does not regulate landuse or zoning, issue building or development permits.” This statement is **not** meant to be interpreted as there are **not** applicable discharges from SCDOT roads.

The final paragraph in Section 3.2.6 was meant to recognize that there are other non-regulated roads, not covered under any MS4 permit, that are subject to under the load allocation of the TMDLs. Those roads are not owned/operated by SCDOT. See Response 46 for additional information.

Comment 69:
"Comment, p.18, Section 4.0, second paragraph: The third sentence "was" should be changed to "were". Again, PD-078 is downstream of everything in the watershed. Reference should be made to the closest downstream station from the facility and whether or not the station has been listed or delisted from the 2010 303(d) list."

Response 69:
There is no "was" in the third sentence of the referenced paragraph. The Department does not understand the purpose in identifying whether there is an unimpaired site below a facility. In the case of continuous facility discharges, see Responses 34, 42, 44 for compliance responsibilities within TMDL areas. In the case of non-continuous stormwater discharges from regulated industrial facilities, see Response 50 for compliance responsibility within TMDL areas,

Comment 70:
"Comment, p.18, Section 4.0, second paragraph: Fifth line: add "gage" after USGS; and "gage recorded flow from" should be revised to "has a drainage area of approximately"."

Response 70:
"Gauge" has been inserted following "USGS". The remaining part of the sentence will not be changed.

Comment 71:
"Comment, p.18, Section 4.0, third paragraph: In the last sentence change "not used in" to "excluded from"."

Response 71:
The suggested change has been made to the document.

Comment 72:
"Comment, p.18, Section 4.0, last paragraph: This paragraph states that data was used between 1999 and 2008. This is not true for all stations. This section should be revised to "available data between 1999 and 2008" or something similar."

Response 72:
As previously noted in earlier responses, the load duration curves have been modified to include 2009-2011 FC bacteria data, where available. With the exception of PD-078, the above statement is correct encompassing all the stations and the range of years (through 2011). For clarity, the sentence will be revised to "With the exception of PD-078, available measured fecal coliform concentrations from 1999 through 2011 were multiplied by measured (or estimated flow based on drainage area) flow on the day of sampling and a unit conversion factor." In the case of PD-078, available measured data from 2004 through 2011 were used for the calculations. PD-078 was considered unique because more recent data suggests that the impairment at this site no longer exists."

See Responses 31 and 32 for additional details.

Comment 73: "Comment, p.20, Section 5.2: The existing load data is in Appendix F, not Appendix C, as referenced."

Response 73:
The suggested change has been made to the document.

Comment 74:
"Comment, p.21, Section 5.3.1: Please be consistent with units. Average permitted monthly flow should not be expressed in MGD. The purpose of the TMDL is to reduce the overall loading rates of FC to Black Creek. Thus the standard should be based on the MGD, i.e. the peak daily permissible (permitted) discharge. If the daily load is going to be extrapolated to a monthly loading, that's acceptable, but to discuss monthly averages and provide a daily discharge standard is not utilizing consistent loading methods. Please revise for consistency. Similarly, Table 7 should be revised."

Response 74:
The units are consistent. In the case of NPDES permits for continuous discharges of treated domestic wastewater, average monthly flows are always expressed in million gallons per day (MGD). Most of these permits have not been written to include daily maximum flow limits. Regardless of flow, the NPDES permitted discharges must meet their permit requirements of 400 cfu/100 ml at the end of their pipes. See also Responses 34, 42 and 44. The suggested changes will not be made to the document.

Comment 75:
"Comment, p.21, Section 5.3.1: The "WLAs" defined for the WWTPs in this section are not WLAs to reduce discharge of FC, they are simply the DHEC standard extrapolated on a daily basis. This section is unnecessary. There is no feasible reason to define a WLA for the WWTPs that is simply an extrapolation of the DHEC 400 cfu/100mL standard. This is handled in the regulatory process through individual permitting in relation to WWTP compliance. Should the TMDL require a reduction, or define necessary reduction for future continuous point sources, this section may be applicable, but rehashing the existing standard on a daily basis does not make sense in the application of the TMDL. If there is an impairment of FC that is deemed in exceedance of the DHEC standard, a reduction percentage should be applied to all contributors in the watershed, and should not be just applied to some select entities (MS4s). This section does not address future development of continuous point source discharges in the watershed. Furthermore, the interpretation of this section is that any future continuous point source discharger would be held to the DHEC standard, while the non-continuous point sources are being held to a different WLA. This does not seem like a logical approach if the overall goal of the TMDL is to reduce loading of FC. By giving the WWTPs a WLA, this document could be interpreted that the point source dischargers can release higher concentrations of FC as long as they are below the daily WLA. This is incorrect. Please rewrite this section to define a concentration threshold (DHEC standard is sufficient) instead of a daily WLA."

Response 75:
The TMDL document is written to address all potential sources of fecal coliform bacteria, including that from regulated continuous and non-continuous point sources.

As noted by the commenter and previously in Responses 34, 42, 44 all regulated continuous dischargers are required to meet the water quality standard for fecal coliform bacteria at the end of their pipe, regardless of flow. If the facility is operating as permitted then the discharge is not contributing to a water quality impairment for the pollutant of concern. There are explicit references to this affect in the document and, if a facility is operating at less than the permitted flow, the facility will not be allowed to exceed the 400 cfu/ 100ml water quality standard. In effect, the WLA threshold will not be achieved by the facility under a reduced flow scenario. If an existing facility expands or future facility is permitted then they will be required to meet a WLA based on the permitted flow and the same water quality standard for fecal coliform bacteria. See Section 5.7, paragraph 3, footnote 2, Table Ab-1 and Table 7 for language in the TMDL document addressing existing and future NPDES continuous dischargers.

Comment 76:
"Comment, p.21, Section 5.3.1: Please remove the "n/a" from the Pageland South WWTP WLA. As discussed above, continuous point sources typically have a concentration threshold they must meet with their DMRs. Headwater stream protection is critical to the overall health of a watershed, and if the headwaters are impaired, meeting WLA downstream to attain WQ standards becomes more difficult."

Response 76:
As explained in the draft TMDL document, Pageland WWTP is located near the top of the watershed and therefore a does not have a WLA. The facility is not covered by these TMDLs. Despite the lack of a WLA, the facility's permit will include end of pipe limits which are equivalent to the water quality standard for fecal coliform bacteria. See Responses 34, 42, 44, and 75 for additional information regarding fecal coliform limits for continuous discharges.

The final sentence in Section 5.3.1 has been changed to the following: "Since the Pageland South WWTP is at the headwaters of the watershed and is unlikely to cause or contribute to fecal coliform impairments in the TMDL watershed (see Figures 5a and 5b), there is no WLA for this facility."

Comment 77:
"Comment, P.23, Section 5.7: The statement "The presence of these lakes may limit the downstream transport of FC bacteria from the upper part of the watershed" should be revised or removed. It is not scientifically accurate to assume that the lake will remove FC from the water bodies. Several studies have been conducted throughout the county, most notably through NC State Cooperative Extension, regarding the removal efficiency of FC from wet ponds, with results indicating a high variability in effectiveness. This variability, along with the probability of additional FC contributions

from waterfowl within the lakes, actually increases the potential that these lakes may be contributing to downstream FC concerns. “

Response 77:
Lakes Robinson and Prestwood are large quite and they are not wet ponds, a.k.a. stormwater retention ponds. The referenced fact sheet “Urban Waterways, Removal of Pathogens in Stormwater” presents an analysis of common stormwater BMPs and the pathogen removal efficiencies of these BMPs, not large lakes.

The Department believes the referenced statement is valid and the outfall from Lake Prestwood is a logical breakpoint for characterizing the potential sources of fecal coliform impairments identified in this TMDL document. By implementing source reductions below the lakes, the Department believes that that the impaired locations will effectively demonstrate improvement towards meeting the water quality standard for fecal coliform bacteria and ultimately the goals of the TMDLs. See also Amendments 1 and 2 (end of response to comments).

For additional clarification, the following has been added to the Secion 5.7, p. 25, paragraph 1: “There are currently no sites impaired for fecal coliform bacteria located in or upstream of the two impoundments.”

Comment 78:
“Comment, p.24, Section 5.7: Table 10 incorrectly identifies the MS4s responsible for compliance with the WLA reductions. At a minimum, all permitted MS4s are responsible for meeting the WLA for PD-078. Requiring Quinby alone to address WLA for this station will not meet the required reduction in overall loading since this MS4 is located at the lower end of the watershed and contributes a minimal portion of the fecal loading. Unless this TMDL is going to address specified area and loading contributions (which the data is currently insufficient to establish), this table should be removed from the document and the station WLA applied to each applicable MS4 through stormwater permitting requirements independent of this TMDL document. If the table is to remain, the other permitted MS4s in the watershed, Florence County, the City of Florence and Darlington County, must be included. However, since the MS4 areas will be expanding with the new permit cycle to potentially include the City of Hartsville and an expanded area of Darlington County, the TMDL document will be outdated upon publication. It is recommended that this table be removed.”

Response 78:
Table 10 has been corrected and shows all the currently-regulated MS4 by impaired monitoring site. . It should be noted that when a new MS4 permit is issued or the coverage area is expanded, the MS4 permit requires the permit holder to demonstrate compliance with the assumptions and requirements of the TMDLs. Therefore, when City of Hartsville is issued an MS4 permit, it will become subject of the WLA reductions calculated for the Black Creek watershed. The City of Hartsville currently has an unregulated MS4 presence in the watersheds draining to PD-137, RS-03507 and PD-

078. Presumably, when an MS4 permit is issued, the City will become subject to WLA reductions set forth for those sites.

Comment 79:
"Comment, p.43, Appendix A: For Station RS-03507, there is only one measured exceedance event under the critical "dry conditions", with three events occurring below the target load. Please explain why the existing load line is appears equal to the highest measured FC event in the monitoring period. This does not appear to reflect the mid-point flow and 90th percentile exceedance criteria established for determining the WLA. Based on the statistical data, and lack of correlation between the r values, it seems that an overall WLA reduction of 72% is excessive for this station."

Response 79:
The Load Duration data input and equations have been confirmed by the Department. What appears to be an "existing load" line through the highest measured value is actually at the 90th percentile value, which is a calculated value, and less than the highest measured value. Calculating a percentage reduction from the highest measured value would have resulted and in a higher percentage reduction required to meet this TMDL..

Comment 80:
"Comment, p.49, Appendix C: The maps in this section need to be revised. It is more important to show landmarks, roads, municipal boundaries, MS4 areas, etc., than land use in these maps. These are the only maps in this document that clearly show the locations of the stations. In addition, these maps should delineate the entire watersheds draining to the stations, not just the station sub-basins. Since the impairments should be applied to all upstream drainages, this needs to be clearly shown on these maps for use by the regulated areas**."**

Response 80:
There are adequate and numerous descriptions of station locations throughout the draft TMDL document. The maps in this section will not be revised since it is important for fecal coliform TMDLs to provide information regarding the dominant landuses within a watershed. The drainage areas shown and used for the calculations are the actual drainage areas. However, if there are two stations on the same tributary, such as PD-137 and PD-258 on Snake Branch, there will be two different drainage areas as it should be.

Once these TMDLs are approved by the EPA, GIS shapefiles of both the TMDL sites and TMDL watersheds will be made available to MS4 entities and anyone else interested in developing their own maps for planning/implementation purposes. Shapefiles will be made available at the following link: http://www.scdhec.gov/gis/GIS.aspx. .

Comment 81:

“Comment, p.56, Appendix D: What do these figures represent? It seems that these are photos of the actual DHEC monitoring station locations. If so, please include photos of all stations utilized in this report. Add captions to the figures.”

Response 81:
The Department has included additional photographs as supplementary information for Appendix D of the document. The Department did not take representative photographs of sampling locations PD-137 and PD-078 during the windshield survey so photographs of these sites are not included. Also, while there are captions associated with the photos in Appendix D, there are captions included with photographs of sites in Appendix G.

Comment 82:
“Comment, p.56, Appendix D: All Figures are mislabeled as “Figures C”.”

Response 82:
All figures have been corrected to reflect Appendix D.

Comment 83:
“Comment, p.58, Appendix D: Figure C-3 is mislabeled as Station RS-06207, it should be RS-06027.”

Response 83:
Figure D-3 has been corrected.

Comment 84:
“Comment, p.67, Appendix G: All Figures are mislabeled as “Figures E”. References in the text are also similarly mislabeled.”

Response 84:
All figures have been corrected to reflect Appendix G.

Comment 85:
“Comment, p.68, Appendix G, third paragraph:
The introduction discusses trash, which can be conducive to the development of bacteria. This is correct, but not with respect to fecal coliform. Please remove or clarify.”

Response 85:
The statement is meant to express that the presence of these materials can reduce the flow of a stream and may create an environment where bacteria levels can persist and populations grow. If there is a source of fecal coliform bacteria adjacent to the waterbody, then high concentrations of fecal coliform bacteria may be documented instream and concentrations may be elevated for a longer period of time.

Comment 86:

“Comment, p.70, Appendix G: Revise formatting and include sentence on same page as referenced photo.”

Response 86:
The Department has made an attempt to provide the best formatting for Appendix G of the document.

Comment 87:
“Comment, p.71, Appendix G: Figure E-5 is referencing sewer pipes, but photos in this section only depict water lines and a broken stormwater culvert.”

Response 87:
The reference to “sewer pipes” has been changed to: “Upstream of Clark Street seems to have eroded either naturally, or during the process of placing piping (Figure G-5).”

Comment 88:
“Comment, p.72, Appendix G: Figures E-6 & E7 appear to be photos of a PVC sewer clean-out cap – not a sewer check valve.”

Response 88:
Figures G-6, G-7 and references to these photographs have been deleted from the document. The remaining photographs in Appendix G have been renumbered accordingly. Upon further review it was determined that the metal cover to the PVC clean-out cap was labeled “water” and not “sewer”. However, please note the comments made by the local resident who informed the Department staff of odor and sewer backup problems following rain events.

Comment 89:
“Comment, p.72, Appendix G: The sentence at the bottom of the page does not reference any photo documentation. This should be included in the summary of this station on p. 71.”

Response 89:
Figures 6 and 7 were removed from the document resulting in the referenced sentence to become part of the summary for Station RS-01023.

Comment 90:
“Comment, p.73, Appendix G: The second sentence describing Station RS-03507, “not” should be changed to “no”.”

Response 90:
The referenced sentence was changed to include “There is no urban development…”

Comment 91:
“Comment, p.75, Appendix G: PD-021 is not an impaired station in this watershed. All reference and photo documentation should be removed from the TMDL.”

Response 91:
The suggested change has been made to the document.

Comment 92:
"Comment, p.77, Appendix G: PD-025 is not an impaired station in this watershed. All reference and photo documentation should be removed from the TMDL."

Response 92:
The suggested change has been made to the document.

Mr. J. J. (Jay) James

Comment 1:

"The TMDL process has generated significant public comments and press coverage in this area. Unfortunately, much of the public discussion and press coverage has centered on the premise that Black Creek is "contaminated," "impaired," and/or "polluted." While this may be true, the draft TMDL document certainly does not document it. Of the seven reported "impaired" stations, only one is in Black Creek proper, PD-078. This station is in Florence County and is, I believe, the last sampling station on Black Creek proper. It appears that of the seven stations the most extensive sampling data was for PD-078. This data shows that only five out of forty-six samplings exceeded allowed limits. The data also shows that there has been no sampling at this station since 2008."

Response 1:
Public awareness and stakeholder interest in local projects is always desirable and encouraged and to that end the Department has attended several locally held meetings and met with stakeholders for field trips. Furthermore, the Department has commenced a §319 demonstration project in Hartsville, SC. If a draft TMDL document is approved by USEPA, stakeholders can leverage for resources and work towards water quality improvements.

The Department's 303(d) listing methodology, which is approved by the USEPA, allows for no greater that 10% exceedances of the 400 cfu/100 ml standard. Based on the available water quality data assessed for development of the 2010 303(d) list, one station on the main stem of the Black Creek and six stations on its tributaries were considered impaired due to exceedances of the water quality standard for fecal coliform bacteria.

Of the sites considered impaired due to fecal coliform bacteria, only PD-078 remains an active monitoring site within the TMDL watershed. Sites listed as "impaired" will continue to be considered "impaired" until the time additional data are collected that refute the impairment status.

Site PD-078 is considered a base or integrator site according to the statewide ambient monitoring strategy. The term essentially means that the site will continue to be sampled once/every other month and every year.

Budget reductions implemented by the Department have impacted the water quality monitoring program. There have been both reductions in sampling frequency and an overall reduction in the number of locations sampled statewide. This has resulted in no sampling at station PD-141 since 2008. There was one sample collected from PD-137 in 2009 and 36 samples were collected from PD-258 in 2009.

Sites RS-01023, RS-03507, and RS-06027 were sampled as a "random" or "probability-based" component of the statewide ambient monitoring strategy. The goal of "random" monitoring is to sample a location once/month for one year only. There are no plans to revisit these locations after one year and there may be additional "random" locations in the future.

After the draft TMDL document had been placed on a 30-day public comment period, data from the 2006-2010 time period were assessed for development of the 2012 303(d) list. Assessment results demonstrated that PD-078 (Black Creek) is no longer impaired for FC bacteria. All other sites described in the draft TMDL document remain impaired for FC bacteria. In the interest of addressing commenters' concern regarding the inclusion of more recent data in evaluating the impairment status, all available 2009-2011 data were also included in the load duration curves, where available. For site PD-078, a TMDL was developed but the TMDL did not demonstrate a reduction was necessary on the mainstem Black Creek. In effect, there is additional assimilative capacity for FC bacteria at that location. All other sites remain impaired for FC and continue to require a reduction in order to meet the TMDLs described in the draft document. Table Ab-1, Table 9, Table 10 and, where applicable, load-duration curves illustrated in Figure 4 and Appendix A were updated in the document.

Comment 2:
"On pages 77 and 78 of the draft report, there is a brief narrative concerning PD-025 which is also on Black Creek proper (Society Hill Road). It is my understanding that this station is not considered to be impaired for fecal coliform bacteria, and I therefore question its inclusion in the draft report. I note that the picture on the front of the draft report was taken from the bridge at this station and actually shows land owned by me. I also do not understand the inclusion of PD-021 on page 75. Is it impaired?"

Response 2:
Stations PD-021 and PD-025 were inadvertently included in the draft TDML document. Cover photo was chosen simply because it shows the natural beauty of the Black Creek rather an unflattering photograph. References to Sites PD-021 and PD-025 were removed from Appendix G of the document.

Comment 3:

"Of the other six impaired stations, at least four consist of drainages that would be considered mainly or entirely urban (PD-137 and PD-258 are both on Snake Branch which goes through the City of Hartsville; PD-141 is mostly or entirely within the City of Darlington; and RS-01023 is a very small drainage just north of the City of Darlington and flowing to within the City of Darlington [into Swift Creek]). It is possible that Ashby Branch (RS-06027) would also be mainly an urban drainage, but I do not have enough information. The draft report addresses the distinct possibility that agricultural operations and wildlife may be contributing to fecal coliform bacteria contamination of Black Creek. I do not believe, however, an examination of the causes of contamination of most of the stations which are said to be impaired will disclose the existence or nonexistence of contamination from agricultural or wildlife sources."

Response 3:
Appendix C of the draft TMDL document summarizes the landuse characteristics' of the stations within the Black Creek watershed. Page 65 of the draft TDML document has the landuse summary for station RS-06027 with 11.7% developed landuse. The Department considers all potential sources that may contribute to water quality impairments including but not limited to agricultural facilities and wildlife. In regards to agricultural facilities, not having or having a mismanaged manure management plan, allowing livestock to enter surface waters, livestock grazing near surface waters, spreading of manure are among the potential reasons for elevated levels of fecal coliform bacteria in certain portions of the TMDL watershed.

Comment 4:
"Comment 3 is not meant to diminish the likelihood that contamination exists in these urban drainages and that this contamination contributes to degradation of Black Creek. The draft report identifies that there have been numerous reported sanitary sewer overflows in the past ten years or so. It is possible that some of these overflows have entered the urban drainages in question. It is possible that many of the overflows have also entered Black Creek or tributaries of Black Creek by more direct means through storm drainages. I am aware that within the past two or three years the City of Darlington has taken steps to improve some of its sanitary sewer collection system and storm drainage system, and I suspect that the City of Hartsville has undertaken similar efforts. Whether these efforts are improving the water quality in the urban drainages is a question which should be answered by further monitoring presumably and by inquiry of City representatives as to what efforts have been undertaken and what the likely outcome of the efforts should be."

Response 4:
Your comment has been noted.

Comment 5:
"It took me a while to figure out where RS-01023 was. I now know that this drainage runs from somewhere in the vicinity of the intersection of North Main Street and Smith Avenue, north of Darlington, in a more or less southerly direction under Blue Street and from there to Swift Creek (the length of the drainage may be less than one mile). In recent weeks, this

drainage has been completely dry. I note also that there has been no sampling data since 2001. The draft report indicates that during a site visit on March 16, 2009, a resident informed the staff that during rain events there are usually odor problems and also sewer backups. I am not sure about the accuracy of this information. I am uncertain as to the existence of sewer collection lines in the vicinity of Blue Street. Personnel with the City of Darlington could readily provide this information. I note that I have personally seen sanitary sewer overflows on North Main Street several hundred yards south of RS-01023 during heavy rain events but have not seen such within the last two or three years. I do not believe that significant resources should be allocated to a study of this drainage."

Response 5:
Station RS-01023 is on a tributary of Swift Creek and is an ephemeral stream. Ephemeral streams are influenced greatly by rainfall events (i.e storm events) and, consequently, may contain elevated fecal coliform bacteria levels if sanitary sewer overflows occur adjacent to the stream. The document acknowledges this possibility. The document includes the observations of a resident but does not include the exact location and extent of an SSO event in the watershed.

The final sentence in the referenced comment can be interpreted in more than one way by the Department. Allocation of resources by the Department to conduct a source assessment and develop a TMDL for site RS-01023 was necessary because the site is considered impaired and has been included on the 2010 303(d) list of impaired waters. Allocation of resources to address SSOs and leaking sewer lines will be at the discretion of the local municipality that owns and operates the collection system present in the affected area. The City of Darlington is the responsible party of the collection system present within the watershed for RS-01023.

Comment 6:
"I note that the Black Creek Land Trust has under protection, either in the form of fee ownership or in the form of conservation easement agreements with private landowners, approximately 3,400 acres of land on Black Creek and Swift Creek (as well as Beaver Dam Creek which is just above the TMDL study area). I note further that there are other protected lands within or immediately above the TMDL area such as the Segars-McKinnon Heritage Preserve which is partially on Prestwood Lake and partially just upstream on Black Creek, Kalmia Gardens which is just upstream on Black Creek, and the Sand Hills State Forest and the Sand Hills National Wildlife Refuge which are upstream above Lake Robinson. These protected properties should provide help for Black Creek in meeting standards. They further evidence the desire and determination of people in this area to protect Black Creek."

Response 6:
Your comment has been noted and the Department agrees that protection of land (adjacent to waterways) through easements will promote protection for the watershed as a whole.

Comment 7:

“Like Mr. Whitehead and Mr. Williamson, I am distressed by the lack of sampling that is occurring on Black Creek and the lack of sampling data on which the conclusions in this draft TMDL are based. Mr. Whitehead has addressed these issues very well, and I will say no more with respect to them.”

Response 7:
Your comment has been noted by the Department. See Response 1 for additional details.

Mr. Evander (Van) Whitehead

Comment 1:
“To achieve the public health goals of the Clean Water Act, the monitoring of fecal coliform should be frequent and readily communicated to the members of the public who may be exposed to the associated pathogens. It is important to keep in mind that the presence of pathogens in Black Creek is dynamic and is influenced by many variables including temperature, rain cycles, *etc*. DHEC discusses some of these factors in the TMDL itself. Consequently, infrequent monitoring of fecal coliform is not likely to give an accurate representation of pathogen levels which could vary week to week.”

Response 1:
The comment has been noted by the Department.

The Department’s 303(d) listing methodology, which is approved by the USEPA, allows for no greater that 10% exceedances of the 400 cfu/100 ml standard. Based on the available water quality data assessed for development of the 2010 303(d) list, one station on the main stem of the Black Creek and six stations on its tributaries were considered impaired due to exceedances of the water quality standard for fecal coliform bacteria.

Of the sites considered impaired due to fecal coliform bacteria, only PD-078 remains an active monitoring site within the TMDL watershed. Sites listed as “impaired” will continue to be considered “impaired” until the time additional data are collected that refute the impairment status.

Site PD-078 is considered a base or integrator site according to the statewide ambient monitoring strategy. The term essentially means that the site will continue to be sampled once/every other month and every year.

Budget reductions implemented by the Department have impacted the water quality monitoring program. There have been both reductions in sampling frequency and an overall reduction in the number of locations sampled statewide. This has resulted in no sampling at station PD-141 since 2008. There was one sample collected from PD-137 in 2009 and 36 samples were collected from PD-258 in 2009.

Sites RS-01023, RS-03507, and RS-06027 were sampled as a “random” or “probability-based” component of the statewide ambient monitoring strategy. The goal of “random”

monitoring is to sample a location once/month for one year only. There are no plans to revisit these locations after one year and there may be additional "random" locations in the future.

After the draft TMDL document had been placed on a 30-day public comment period, data from the 2006-2010 time period were assessed for development of the 2012 303(d) list. Assessment results demonstrated that PD-078 (Black Creek) is no longer impaired for FC bacteria. All other sites described in the draft TMDL document remain impaired for FC bacteria. In the interest of addressing commenters' concern regarding the inclusion of more recent data in evaluating the impairment status, all available 2009-2011 data were also included in the load duration curves, where available. For site PD-078, a TMDL was developed but the TMDL did not demonstrate a reduction was necessary on the mainstem Black Creek. In effect, there is additional assimilative capacity for FC bacteria at that location. All other sites remain impaired for FC and continue to require a reduction in order to meet the TMDLs described in the draft document. Table Ab-1, Table 9, Table 10 and, where applicable, load-duration curves illustrated in Figure 4 and Appendix A were updated in the document.

Comment 2:
"Based on the data reported in the TMDL, it appears that DHEC's monitoring strategy is failing in both respects: infrequent monitoring and delayed reporting. Admittedly, there are financial and workload considerations for DHEC but when the monitoring program falls below a certain threshold the whole system loses credibility and effectiveness. As reported in Section 1.3 of the TMDL, 15 of 18 monitoring sites in the Black Creek watershed are inactive. That is unacceptable. Three active monitoring stations along the 547 stream miles of Black Creek is not enough and will not allow DHEC to properly isolate and address water quality problems that may be identified as existing somewhere within the expanses between those stations."

Response 2:
Your comment has been noted by the Department. See Response 1 for additional details.

Comment 3:
"In failing to effectively monitor Black Creek, DHEC is not satisfying the requirements or end goals of the Clean Water Act. These shortcomings undermine DHEC's claim regarding implementation of the TMDL: "As the implementation strategy progresses, DHEC will continue to monitor the effectiveness of implementation measures and evaluate water quality where deemed appropriate." TMDL p. 27. The monitoring strategy needs to reflect a scientifically sound sampling regime – one which includes an adequate number of monitoring stations and a statistically robust sampling schedule. As reflected in Table 3 and Appendix E of the TMDL, monitoring station RS-01023 was only monitored eight times between 1999 and 2007 and all of those samples were taken in 2001. The last reported sampling date for any of the stations is December 2008. Statistics aside, it is perplexing to be proposing load allocations and other solutions using almost three-year-old data for a highly variable pollutant which today could be far better or worse than any of the aging data suggests. It is my understanding that DHEC

is required to consider any relevant information in preparing a TMDL, which should include DHEC's own data over the last three years."

Response 3:
South Carolina has an extensive network of water quality monitoring stations and the Clean Water Act does not specify how many stations or a minimum sample size are required for a waterbody. Nor is there a minimum sampling requirement for the development of the 303(d) list or TMDLs.

Sites RS-01023, RS-03507, and RS-06027 were sampled as a "random" or "probability-based" component of the statewide ambient monitoring strategy. The goal of "random" or "probability-based" monitoring is to sample a location once/month for one year only. There are no plans to revisit these locations after one year and there may be additional "random" locations in the future. If there is no water instream at the time a sampling event is conducted, no sample can be taken. In the case of RS-01023, only 8 out of a maximum of 12 sampling events were conducted.

Also see the following link for additional details: http://www.scdhec.gov/environment/water/docs/strategy.pdf. In particular, note pages 16-20 of the State of South Carolina Monitoring Strategy document.

Also see Response 1 for additional details.

Comment 4:
"Finally, DHEC needs to improve its communication with the public as to the sample results. Waiting for a 303(d) listing to know a waterbody is impaired is too late. I understand that DHEC must meet accepted QA/QC standards with the data it collects, but there is no reason DHEC cannot share the data even at the preliminary stage."

Response 4:

All DHEC ambient water quality data is collected in accordance with the Department's Quality Assurance Management Plan (QAMP). Sample collection results become final after data has been reviewed for acceptable QA/QC standards. The evaluation process can take up to one year before data is released to the public as final.

Provisional water quality data are available to the public at any time through submittal of a written request to the Department's Freedom of Information (FOI) Office.

Note that the Department only assesses water quality data once every two years for the purposes of determining and reporting attainment status. The two-year time-frame is consistent with Clean Water Act (CWA) reporting requirements and is appropriate given available resources. Impairment status of a waterbody is determined every two years after all relevant data are considered final.

Comment 5:

"DHEC states in the TMDL that SCDOT has "no facilities located in the referenced watershed area." TMDL at p. 13. Are the State roads and bridges throughout the Black Creek Watershed not SCDOT facilities covered by its MS4 permit? Has SCDOT considered installing filtration basins adjacent to bridges or scupper drains on bridges to capture and treat stormwater runoff coursing over those structures? Several of the pictures contained in the TMDL appendix reflect substantial erosion at the edges of roads and bridges. The waters flowing off of SCDOT's impervious surfaces clearly have the potential to transport fecal coliform and other pathogens, and should be addressed to safeguard other water quality parameters."

Response 5:
The referenced sentence refers to the fact that SCDOT has no rest areas, maintenance facilities, etc., which could have the potential to contribute to a fecal coliform impairment. There is a network of SCDOT owned and operated roads within the Black Creek watershed. SCDOT is subject to the wasteload allocations (WLAs) prescribed in the document by impaired site. For SCDOT, compliance with terms and conditions of its NPDES MS4 permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP). 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.

Comment 6:
"While NPDES dischargers have certainly done their part over the years to improve their effluent, it appears that the wastewater treatment facilities in the Black Creek watershed still have some room for improvement. The TMDL reports that between 1998 and 2008, more than 10.2 million gallons of untreated sewage were released - based on 304 reported releases. That is a substantial volume of sewage and number of releases. It would appear this is a great starting point for addressing fecal coliform levels in Black Creek. The TMDL suggests that those 10.2 million gallons did not reach waters of the State. TMDL at p. 14. It would seem that the assumption should be that those releases did flow to waters of the state unless documented to the contrary. Were these overflows captured and reprocessed in a WWTP? How many enforcement actions has DHEC brought against the entities responsible for the releasing systems?"

Response 6:
The TMDL document does not imply whether the reported SSOs have or have not reached the state waters, but informs that it is not known if any of the reported SSOs have entered the state waters.

Sanitary sewer overflows (SSOs) are not provided a TMDL WLA or LA in this document because these releases are illegal and are subject to compliance and enforcement actions by the Department.

For additional information general information regarding SSOs statewide go to the following link: http://www.scdhec.gov/environment/water/wpc_sso.htm

For, more specific information regarding SSO frequency in the Black Creek Watershed, and the status of enforcement actions with respect to SSOs, please submit a request through the Department's Freedom of Information (FOI) Office.

Comment 7:
"Table 5 is incorrect in at least one respect. The Egg & I Farm is not located in the Black Creek Watershed. It is located in the Lynches River watershed (03040202-05) between Highway 401 and I-20."

Response 7:
Table 5 is correct: Based on the Department's records, the Egg & I (now known as ISE) Farm has 3 tracts of land within the Black Creek watershed which are manure utilization areas (MUA) located north-north-west of Darlington County Airport. While a facility may be located outside of the Black Creek Watershed, these agricultural facilities may have MUAs located at more than one tract of land and not directly adjacent to facility operations.

Comment 8:
"Although a minor point, I want to call to your attention several typographical errors: page 6, second paragraph, second line; page 11, first paragraph, third line; page 14, second full paragraph, first line; page 14, fourth full paragraph, line one; and page 27, first paragraph, third line."

Response 8:
Revisions to the draft TMDL document were made where appropriate and deemed necessary by the Department

Mr. Ben Williamson

Comment 1:
"The title page should not only list the HUCs by number, but should also give the name of the stream that drains each HUC, so that laymen can recognize the areas under discussion and maybe add to the body of knowledge about Black Creek and its tributaries."

Response 1:
Hydrologic unit codes (HUCs) are a series of numbers that include drainage area from numerous streams. It would not be practical to identify all contributing streams in a particular HUC drainage area in the document. Instead, there are occasions were the station locations have been identified throughout the draft document. There are also maps of the HUC drainage areas provided in the document.

While HUCs may not be familiar terminology to the public at large, these are widely accepted in the scientific community (including SCDHEC and USEPA) as published drainage areas.

Comment 2:
"The document needs an Introduction that really does introduce the reader to the TMDL program / process: telling first what the letters 'TMDL' stand for, then what the purposes and goals and objectives for the program are, and how the sponsors (or promoters) of the program expect the program to work (to fulfill the purposes). It should explain when in the process the TMDL program is enacted / adopted / established / made official. And it should tell in general terms how the TMDL program is to be maintained over the years."

Response 2:
The Department believes that the draft TMDL document satisfies Clean Water Act (CWA) requirements in the present form. However, it is a goal of the Department to convey information in a format that, not only satisfies CWA requirements but is also provides a roadmap for identifying potential sources of impairment, establishing TMDL(s), and provide implementation guidance to meet required reductions to achieve TMDLs. The Department believes that the Introduction has provided sufficient overview of the concern and why the TMDL document has been developed.

The letters "TMDL" have been defined as Total Maximum Daily Load in the Introduction for the benefit of the reader.

Draft TMDL documents, such as TMDLs for the Black Creek and tributaries, are made available for a 30-day public comment period followed by development of responses to comments received. Changes to the TMDL document may occur after the public comment period has ended and if the Department believes necessary, based on comments received. Once necessary revisions to the document have been completed, a Notice of Department Decision (NODD) is issued for a period of 15 days. The NODD period allows an opportunity for an appeal of a DHEC decision to forward the document to USEPA for final approval. Appeals are filed with the DHEC Clerk of the Board. If an appeal is received, then the DHEC Board will decide whether to hear the appeal at their next scheduled monthly meeting. If no appeals are filed, then the Department will forward the draft document to USEPA for final approval. Once USEPA approves the document (typically within 30 days from submittal) then the TMDL(s) are considered final. Once final, TMDLs never expire but may be revised at the discrepancy of the Department.

TMDLs convey no additional regulatory authority to the Department. Instead, the wasteload allocation (WLA) component of a TMDL is implemented through existing permitting mechanisms (i.e. wastewater treatment plants or regulated stormwater). Implementation of the load allocation (LA) is voluntary.

Comment 3:
"The document needs a glossary, not only for all the acronyms, but also for words and expressions that may not be familiar to laymen. (For example, notations like "12.3E+05" need to be explained in lay terms; "exceedance" can probably be figured

out, but why use “excursion”, which has other, ordinary meanings, and apparently here is the same as “exceedance”; alternate expressions of commonly used units of measure would also be helpful, like giving flow in cfs & mgd and loads in cfu & whatever units permits are written in; and so on throughout the document, making the document more intelligible and interesting to lay readers.)”

Response 3:
The Department believes that the draft TMDL document satisfies Clean Water Act (CWA) requirements in the present form. Scientific notation as well as other terms, such as MGD and cfs have been explained in prior communications with the commenter.

Comment 4:
“The document needs clear maps of all SCDHEC sampling stations (active and inactive), all animal feeding operations, all tributaries, etc., shown on maps with road names/numbers, community names, stream names, & GPS coordinates - on a scale large enough for readers to locate their own places of interest in relation to the subject of the map.”

Response 4:
The Department has provided multiple maps in the document in order to help orient the reader to locations and relevant features. The appropriate level of detail for inclusion within any TMDL document can be challenging for the TMDL developer given constraints such as the size of the watershed, size of map scale, paper size, feature/landmark size, and legend. As the number of elements included in a map increases, the ability to discern the information on the map decreases. The Department has attempted to include the most practical combination of features, labels and legends for the purposes of drafting this document. When too many of the aforementioned features are included on a map, it becomes difficult for the reader to discern the information presented.

Comment 5:
“All photographs should have GPS coordinates, direction of the view (northeast, downstream, etc.) so that anyone can find the location of the subject of the photographs; and all photographs should be dated.”

Response 5:
The Department has included the most relevant descriptive information about photographs in the draft document.

Comment 6:
“All stormwater outfalls, ditches, and drainages within the cities of Hartsville, Darlington, and Quinby should be identified (with the help of municipal employees and other interested persons), and located on maps showing GPS coordinates and street addresses.”

Response 6:
It is not the responsibility of the Department to provide this information. Please contact the MS4 permit holder directly for that information.

Comment 7:
"All permits of all kinds (including No Discharge) should be listed and the location of their outfall and/or operation shown on maps, giving GPS coordinates, road names, tributaries, etc. for each."

Response 7:
No Discharge (ND) permits are not allowed discharges to waters of the State and, therefore, there are no regulated outfalls on record associated with these permitted operations. Most of these facilities land apply wastes to designated tracts of land and are required to comply with SC R. 61-43. Discharges under ND permits to waters of the State are illegal and subject to enforcement mechanisms.

The TMDL document includes the names of regulated animal feeding operations (AFOs) , AFO permit ID, as well as the type of operation covered under an active ND permit. The Department believes that this is sufficient information to indicate the presence of these facilities within the watershed.

For additional information regarding AFOs statewide (including maps), please go to the following link: http://www.scdhec.gov/environment/water/agpermitting.htm

Additional information regarding AFOs located in the Black Creek Watershed is available to the public at any time through submittal of a written request to the Department's Freedom of Information (FOI) Office.

Comment 8:
"All potential or suspect sites or operations (like junkyards, golf courses, hog pens, dilapidated or abandoned housing units near ditches or streams, poultry houses, etc.) should be listed, and locations given."

Response 8:
The Department acknowledges that runoff from some of these sites may contain fecal coliform bacteria in excess of the water quality standard. The document includes a source assessment that includes broad categories as well as targeting known sources appropriate for the data available at the time of TMDL development. The commenter is suggesting a level of specificity that is not possible for developing a draft TMDL document.. It is doubtful that the level of data suggested has been inventoried in a database that is readily available. It should also be noted that inclusion of any of the aforementioned would not affect the TMDL, WLA or LA targets provided in the TMDL document.

Comment 9:

"Desirable locations for sampling / monitoring stations where none now exist should be proposed, and landowners should be encouraged to make access to these locations easy."

Response 9:
Budget reductions implemented by the Department have impacted the water quality monitoring program. There have been both reductions in sampling frequency and an overall reduction in the number of locations sampled statewide. This has resulted in no sampling at station PD-141 since 2008. There was one sample collected from PD-137 in 2009 and 36 samples were collected from PD-258 in 2009.

Sites RS-01023, RS-03507, and RS-06027 were sampled as a "random" or "probability-based" component of the statewide ambient monitoring strategy. The goal of "random" or "probability-based" monitoring is to sample a location once/month for one year only. There are no plans to revisit these locations after one year and there may be additional "random" locations in the future.

Site PD-078 is considered a base or integrator site according to the statewide ambient monitoring strategy. The term essentially means that the site will continue to be sampled once/every other month and every year.

Based on the above and with the exception of the potential for additional "random" monitoring locations, the Department has no plans to establish additional monitoring sites in the Black Creek Watershed.

The Department encourages local groups interested in conducting additional ambient monitoring in the watershed. Depending on the intent of data collection efforts, established protocol should be followed. The Department has developed guidance regarding the topic entitled *Outside Data and Quality Assurance Requirements.* See the following link for additional details: http://www.scdhec.gov/environment/water/docs/fw_agency.pdf

Comment 10:
"The status of station PD-078 needs to be clarified. As I read the document, it does not fit the definition of an impaired point, having been sampled in four, not five, years."

Response 10:
At the time or the TMDL development, PD-078 was included on the 2010 303(d) list as impaired for fecal coliform. The Department's 303(d) listing methodology, which is approved by the USEPA, allows for no greater that 10% exceedances of the 400 cfu/100 ml standard. Based on all available water quality data assessed for development of the 2010 303(d) list, site PD-078 were considered impaired due to fecal coliform bacteria.

All available DHEC data collected during the 2004-2008 time-frame were used for development of the 2010 303(d) list. Attainment status for PD-078 was based on data collected in 2004-2007. There were no data collected at this site during 2008. Attainment

status is not limited to assessment of a minimum of five-years of data, only all available data collected during the relevant time-frame.

After the draft TMDL document had been placed on a 30-day public comment period, data from the 2006-2010 time period were assessed for development of the 2012 303(d) list. Assessment results demonstrated that PD-078 (Black Creek) is no longer impaired for FC bacteria. All other sites described in the draft TMDL document remain impaired for FC bacteria. In the interest of addressing commenters' concern regarding the inclusion of more recent data in evaluating the impairment status, all available 2009-2011 data were also included in the load duration curves, where available. For site PD-078, a TMDL was developed but the TMDL did not demonstrate a reduction was necessary on the mainstem Black Creek. In effect, there is additional assimilative capacity for FC bacteria at that location. All other sites remain impaired for FC and continue to require a reduction in order to meet the TMDLs described in the draft document. Table Ab-1, Table 9, Table 10 and, where applicable, load-duration curves illustrated in Figure 4 and Appendix A were updated in the document.

Comment 11:
"The location and description of station PD-141 need improving. At one place it is called a 'tilefield'; at another, a 60" tile. In one table it is listed as 'Swift Creek'. Is it a storm drain ? What is its drainage area ? The location of the station as shown in the land use summary map, page 51, appears not to be the same as shown in photos, page 75. This station, also, was sampled in only four years, according to the table in Appendix E."

Response 11:
Table 1 in the draft TMDL document is the description of the station location as it appears in the Department's monitoring strategy. The term "tilefield" is not used anywhere else in the document. Due to space limitations, a shorter description may have been used elsewhere in the document after its description on Table 1. Tables 1, 3, 6, and 8 now include "(tributary to Swift Creek)" as part of the site description for PD-141.

The individual drainage area for all sites, including PD-141, is included in Appendix C of the TMDL document.

Appendix C landuse summary maps include the entire drainage area contributing to site PD-141. Appendix G of the revised document (formerly Appendix E) includes photographs that represent a "snapshot" of the location in question. Figure G-10 of the revised document is a photograph taken just upstream of site PD-141; this is same location identified by the "PD-141" label in Appendix C.

Comment 12:
"Of the 7 stations shown in the table in Appendix E 4 were sampled during four years; 3 stations (the random ones) were sampled in only one year. An explanation is needed

to show how this relates to the standard for 'impaired' designation (i.e., more than 10% of the samples exceeding 400cfu/100ml over 5 years - page 10)."

Response 12:
South Carolina has an extensive network of water quality monitoring stations and the Clean Water Act does not specify how many stations or a minimum sample size are required for a waterbody. Nor is there a minimum sampling requirement for the development of the 303(d) list or TMDLs.

With respect to sampling frequency for each impaired site, please see Response 9.

For further details on the State of South Carolina Monitoring Strategy, please go to: http://www.scdhec.gov/environment/water/docs/strategy.pdf

The Department's 303(d) listing methodology, which is approved by the USEPA, allows for no greater that 10% exceedances of the 400 cfu/100 ml standard. Based on the available water quality data assessed for development of the 2010 303(d) list, one station on the main stem of the Black Creek and six stations on its tributaries are considered impaired due to fecal coliform bacteria.

All available DHEC data collected during the 2004-2008 time-frame were used for development of the 303(d) list. Attainment status is not limited to assessment of a minimum of five-years of data, only all available data collected during the relevant time-frame.

After the draft TMDL document had been placed on a 30-day public comment period, data from the 2006-2010 time period were assessed for development of the 2012 303(d) list. Assessment results demonstrated that PD-078 (Black Creek) is no longer impaired for FC bacteria. All other sites described in the draft TMDL document remain impaired for FC bacteria. In the interest of addressing commenters' concern regarding the inclusion of more recent data in evaluating the impairment status, all available 2009-2011 data were also included in the load duration curves, where available. For site PD-078, a TMDL was developed but the TMDL did not demonstrate a reduction was necessary on the mainstem Black Creek. In effect, there is additional assimilative capacity for FC bacteria at that location. All other sites remain impaired for FC and continue to require a reduction in order to meet the TMDLs described in the draft document. Table Ab-1, Table 9, Table 10 and, where applicable, load-duration curves illustrated in Figure 4 and Appendix A were updated in the document.

Comment 13:
"Also needed is an explanation of the meaning of samples taken from stations on ephemeral streams, especially when there was no flow (as in the caption for Fig E-5, date unknown). Should the Fecal Coliform count in a sample from a stagnant pool in a non-flowing ephemeral stream carry as much weight as a sample from a flowing stream ?"

Response 13:
Figure G-5 (formerly Figure E-5) was taken at station RS-06027, a “random” or “probability-based” monitoring site. As previously described in Response 9, one component of DHEC’s ambient monitoring strategy is to collect samples once/month for one year at sites statewide.

One goal of “random” or “probability-based” monitoring is to get a broad snapshot of statewide scale condition of the State’s water resources by assessing the data collected from these sites. ”Random” sites can be categorized as stream, lake or estuarine sites. For the purposes of statewide probabilistic reporting on stream resources, a site selection criterion of “perennial” stream is included, using the stream classifications identified in USEPA's National Hydrography Dataset (NHD). If a natural event impacts wide areas of the State in any given year (e.g. hurricanes, drought, etc.) its impact, and the extent of that impact, should be included and reflected in the resulting data collected at the “probability-based” sites.

Based on USEPA’s NHD, site RS-06027 is considered “perennial” and not “ephemeral”.

The Department includes only discreet sampling locations or points during development of the 303(d) list of impaired waters. The Department evaluates data collected from all points equally for listing and subsequent TMDL development.

On the day sites are scheduled to be sampled, there may be stagnant pools of water or no water in the waterway at all. According to DHEC standard operating procedure, a sample will not be collected by field personnel on that day.

Comment 14:
“Where in the process of determining the waste load assimilative capacity of a water body are the flow data (as on page 65) used ? A sample calculation for 1 or 2 stations would be helpful (probably in an appendix).”

Response 14:
In order to assist the commenter, the following example calculations from Appendix F are being provided:

TMDL Critical Condition is Moist Conditions (10%-40% Flows) for site PD-078. The TMDL is **= 4.77E+12 cfu/day** or = 4,770,000,000,000 colony forming units (CFU)/day.

The TMDL for PD-078 is based on the moist conditions midpoint flow (10%-40% Flows) for site PD-078 = **487.8 CFS.**

And

With a Conversion factor of 2.4465758.4 and assuming the TMDL target concentration is the water quality standard for FC bacteria (**400cfu/100 ml**).

From values above:
400 cfu/100 ml* 2.4465758.4 * 487.5 CFS = 4.77E+12 or 4,770,000,000,000 CFU/100 ml.

The same calculation would be repeated for all stations and hydrologic categories. The same equation may be used to determine existing load except the load is determined by substituting the 90th %tile FC Concentration (cfu/100 ml) with the water quality standard target of 400 cfu/100 ml.

Comment 15:
"Section 4, Load duration curve method, is very, very confusing to me; and judging from the answers to various questions that I have heard or read, I don't seem to be the only one."

Response 15:
The comment is noted by the Department. It can be challenging to convey technical information and calculations in a document for review by the public at large. This is a technical document which certain requirements such as the methodology used for calculations needs to be explain in a technical writing format. The TMDL approach, TMDL calculations and subsequent document are similar to that of other fecal coliform bacteria TMDL documents in South Carolina and Nationally. USEPA is ultimately the approval authority for these TMDLs.

Comment 16:
"Furthermore, the load duration method, as presented, seems to be of very little value in estimating the maximum daily load that a waterbody can assimilate. I suggest that if no one can write this section so that laymen can understand both the process and the value of the load duration method, this section be made an appendix; and links to USEPA's publication on load duration be furnished."

Response 16:
See Response 15. Also, the link to the EPA publication for load duration curves were furnished to the commenter in an email dated September 15, 2011 in response to their questions.

Comment 17:
"Considering the importance of flow to assimilative capacity of streams and their tributaries, as well as to the development of load duration curves, I do not understand how reliance upon a USGS recording station 30 miles from an ephemeral stream can yield a valid indication of flow in that tributary.**"**

Response 17:
It is standard practice to use the best available USGS gauge for TMDL calculations. Gauge selection can be a difficult task and is dependent upon but not limited to location of the established gauge in proximity to the TMDL site, watershed size, size of waterbody, ecoregion, and period of record. It should also be noted that there have

been many USGS flow gauges discontinued in recent years due to resource limitations. The Department believes that the gauge selection was appropriate for developing these TMDLs.

Comment 18:
"If fecal coliform loads from all permitted sources, including those with No Discharge permits, and from application of livestock waste to fields are not a part of the TMDL program/process, what do Notes 2 and 4 below Table 9 mean ? And what is the likelihood of achieving the % Reduction shown in that table if those potential sources are not part of the TMDL program / process ?.**"**

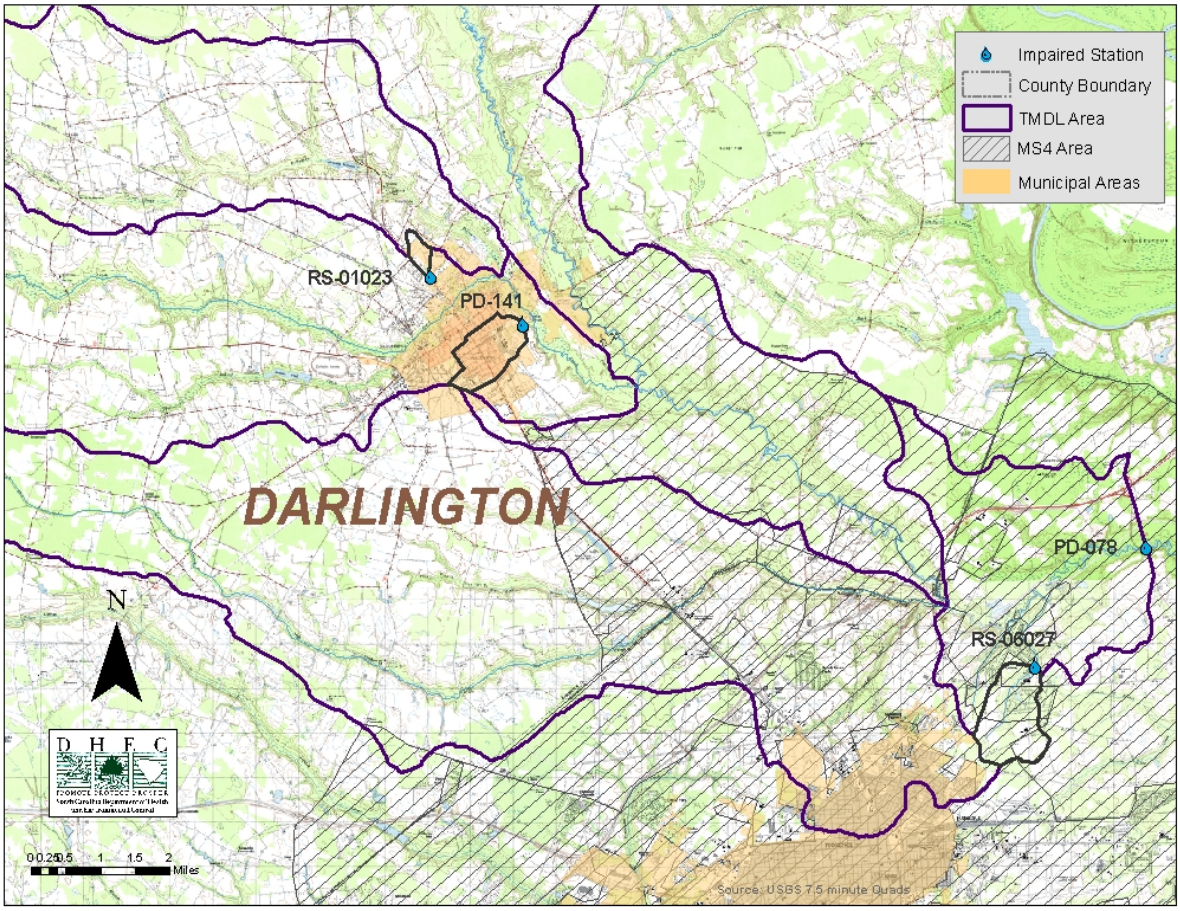
Response 18:
NPDES permitted point sources with "No Discharge" permits are not allowed to discharge to surface waters. The Department has no regulatory authority of enforcement for agricultural facilities not requiring permits. The permitted agricultural facilities are nonpoint sources covered under the "Load Allocation" in Table 9. Approval of a TMDL by USEPA does not give the Department additional authority, which is the reason we rely on local stakeholders, citizen groups and government entities to implement best management practices.

Footnote 2 is applicable only to MS4s, construction and industrial stormwater discharges covered under permits. These sources are covered under the wasteload allocation (WLA) component of the TMDL Footnote 4 means the existing load in the stream needs to be reduced by the percentage shown and by the corresponding impaired station.

A TMDL is only achieved if all WLA and LA reduction targets are met once implemented. The WLA will be targeted through existing NPDES permitting mechanisms. The LA will be targeted through voluntary measures. After a TMDL is approved by USEPA, there may be funds available for voluntary implementation of the LA of BMPs may be implemented in an impaired watershed. Through the implementation of these voluntary BMPs, the Department has seen water quality improvement in previously impaired watershed where the water quality is currently being met.

Comment 19:
"If all of Darlington County is an MS4, and if Section 319 funds are not available within MS4s, what funds, if any, are available to help with the impaired stations, 5 of which are in Darlington County ? (The other 2 are in the Quinby MS4.) Table 10."

Response 19:
Only portions of Darlington County are currently covered under MS4 permit coverage. The following map is being included in the Responsiveness Summary for benefit of the commenter:



For additional information regarding the Darlington County MS4 permit, please contact Mr. Arturo Ovalles, SCDHEC Stormwater Permitting, at (803) 898-4178 or e-mail at ovallear@dhec.sc.gov.

Comment 20:
"Table 7 is titled 'Average Monthly Permitted Flow …' This is the first reference that I have seen to a **monthly** flow. The units given are million gallons / ***day*** and # / ***day ,*** not per month. This average would be the average of how many months ? The *footnote is also puzzling."

Response 20:
Average monthly permitted flows in Table 7 is for the NPDES permitted discharges listed. Average monthly flow of a discharger is determined by averaging the ***daily*** flows for a month and the units are in multiples of gallons per day, 10,000 gallons per day, one million gallon per day. The same logic also is applicable to the wasteload allocations, which in this case are # (pounds) per day.

The footnote **"*** No impaired stations below this NPDES permitted facility." is included to inform the reader that no WLA has been provided for the Pageland/Southeast WWTP because the facility is not located within the TMDL area defined in the draft TMDL document (see Figures 5a and 5b).

Comment 21:
"Station PD-021 is included in Appendix G. Why ?"

Response 21:
The load/duration curve for site PD-021 has been removed from Appendix A of the draft TMDL document.

Comment 22:
"The sampling data for station PD-258 are from 1999 to 2008, 2008 being the worst year. The photo E-15 looks very recent. Now that that area has been radically changed, is PD-258 still a problem ?"

Response 22:
All available DHEC data collected during the 2004-2008 time-frame were used for development of the 2010 303(d) list. Attainment status is not limited to assessment of a minimum of five-years of data, only all available data collected during the relevant time-frame.

After the draft TMDL document had been placed on a 30-day public comment period, data from the 2006-2010 time period were assessed for development of the 2012 303(d) list. There were 36 additional samples collected from PD-258 in 2009; those data were included with all other available data from 2006-2010 time-frame for assessment purposes. Site PD-258 continues to be impaired for FC bacteria and a TMDL has been developed for this site.

See Response 9 for additional details.

Comment 23:
"Station PD-025, not elsewhere discussed, is also included in Appendix G. Why ?"

Response 23:
The load/duration curve for site PD-025 has been removed from Appendix A of the draft TMDL document.

Comment 24:
"It seems to me that before a lot of citizens' and SCDHEC staff's time is spent on the problems identified in this document, a broad look at the health of Black Creek and its major tributaries would be smart. The station RS-01023 was sampled 8 times in 2001; 2 samples exceeded 400 #/100ml [cfu/100ml, I assume]. The station RS-03507 was sampled 12 times, once each month in 2003; 2 samples exceeded 400 #/100ml. SCDHEC has more recent sampling data from many other stations. There are studies

related to stream health that have been conducted on Black Creek. SCDHEC permittees (including No Discharge) submit discharge monitoring reports. Data from these and other sources should be a part of the TMDL program and of this document, so that scientists and laymen alike can assess the health of Black Creek, and spend their resources where problems are now (not just where they were a decade ago)."

Response 24:
Please see Responses 9, 10 and 12 with respect to water quality monitoring in the Black Creek Watershed.

No Discharge (ND) permits are not allowed discharges to waters of the State and, therefore, there are no regulated outfalls on record associated with the permitted operations. Most of these facility land apply wastes to designated tracts of land and are required to comply with SC R. 61-43. Discharges under ND permits to water of the State are illegal and subject to enforcement mechanisms. Due to the aforementioned, ND permits are not provided a WLA or LA for the purposes of developing these TMDLs.

Most ND facilities are not required to collect ambient water quality monitoring data and, since there are no outfalls to monitor, sampling data are mostly nonexistent.

Daily monitor and report (DMR) data were reviewed for the four NPDES sanitary wastewater point source facilities listed in Table 4. Comments are provided in Section 3.1.1 of the draft document regarding facility compliance with respect to fecal coliform bacteria.

Comment 25:
"It is not clear to me what happens when the TMDL program is adopted. When will NPDES and other permits be amended to conform to the % Reductions required by the TMDL program ? Will municipalities be responsible for fecal coliform pollution from their storm drains / runoff ? Will private landowners be responsible for fecal coliform pollution coming from their land ?"

Response 25:

Once these TMDL are finalized and approved by USEPA, all regulated point sources (including both continuous, as described in Section 3.1.1. and non-continuous, as described in Section 3.1.2 will be required to comply with the WLA component of the TMDL.

As previously described, continuous point source (i.e. wastewater facilities) **are** currently and **will continue** to be required to meet the water quality standard for fecal coliform at the end of pipe. In effect, the TMDL document will not result in **more restrictive** permit requirements for these facilities because the facilities are currently required to meet the WLA targets established in the TMDL document.

Regulated non-continuous stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permits will be required to address fecal coliform load reductions through NPDES stormwater permit. Compliance with terms and conditions with their NPDEs permit will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL.

Implementation of the LA component of the TMDL is voluntary. Private land owners may voluntarily participate and implement BMPs to reducing fecal coliform loadings (non-point source pollution from their lands.

As mentioned before, approval of a TMDL document does not give the Department additional regulatory authority.

Comment 26:
"There is little discusson in this document about citizens' involvement in the TMDL program. Black Creek is probably unique in S.C. for having such a history of citizen support. The Black Creek Protective Association was chartered in 1941 (making it one of the oldest environmental organisations in S.C.) and is still alive. The Black Creek Land Trust was formed about 1980 (making it one of the oldest land trusts in S.C.), and is quite active. Section 6, Implementation, page 27, says ' South Carolina has several tools available for implementing the non-point source component of this TMDL. ' The next sentence begins, 'Another key component....' Something seems to be missing from the text. [Maybe that was 'Citizen Participation'.] The last two paragraphs of page 28 are especially relevant; they should be emphasized. And any land use maps should show conservation easements on land in the Black Creek watershed."

Response 26:
To avoid confusion to the reader, "Another key component…" has been changed to "A key component…". There was nothing missing from the original text.

Landuse maps are included in the draft TMDL document to summarize the different physical characteristics of the TMDL watersheds. The landuse data represented was generated from the nationally available 2001 National Land Use Data Cover (NLCD). The categories in NLCD do not differentiate between lands donated by local entities, persons, or conservation easements, etc. NLCD categorizes landuses under certain descriptions to make it uniform and comparable throughout the USA, which allows analysis of physical characteristics. Inclusion of conservation easements would be unnecessary for the intended purpose of the landuse maps.

The Department recognizes efforts of both the Black Creek Land Trust and Pee Dee Land Trusts for advocating conservation in the Black Creek Watershed and establishing easements for protecting the watershed. These efforts support the common goal of water quality improvements by the Department and local stakeholders in the watershed.

Comment 27:
"The last - and probably most important - shortcoming that I want to

comment on is lack of emphasis on water quality monitoring and dissemination of timely, relevant information. This document - and maybe the TMDL program in S.C. - is so narrowly focused, in this case on fecal coliform only, the overall health of the Black Creek watershed in the past, now, and in the future seems to be neglected. The diligent surveillance of Black Creek and its tributaries, together with the dissemination (or at least the easy availability) of timely, relevant information should be the highest priority of all efforts to improve the water quality of Black Creek."

Response 27:
All DHEC ambient water quality data is collected in accordance with the Department's Quality Assurance Management Plan (QAMP). Sample collection results become final after data has been reviewed for acceptable QA/QC standards. The evaluation process can take up to one year before data is released to the public as final.

Provisional water quality data are available to the public at any time through submittal of a written request to the Department's Freedom of Information (FOI) Office.

Note that the Department only assesses water quality data once every two years for the purposes of determining and reporting attainment status. The two-year time-frame is consistent with Clean Water Act (CWA) reporting requirements and is appropriate given available resources. Impairment status of a waterbody is determined every two years after all relevant data are considered final.

TMDL Document Amendments

The Department has made some additional amendments to the Black Creek TMDL Document. Additional language was added in order to clarify certain aspects of the document and was not added as the direct result of a comment received during the advertised public comment period. Changes are reflected in the most recent version of the referenced TMDL document.

Amendment 1:
Abstract, Page 2, Paragraph, 2: "Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. For SCDOT, compliance with terms and conditions of its NPDES MS4 permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP). "

Amendment 2:
Section 1.1, Page 6, Paragraph 3: "Note that all impaired locations at the time of TMDL development are located below Lake Robinson and Lake Prestwood."

Amendment 3:
Section 1.2, Page 5, Additional Paragraph: "Lake Robinson and Lake Prestwood are centrally located in the watershed. There are currently no impaired sites located

upstream of the impoundments (all impaired locations are below Lake Prestwood). Finally, it is believed that fecal coliform bacteria loadings to the lakes would have minimal influence below Lake Prestwood. Because of these three reasons, this document will emphasize fecal coliform bacteria reductions necessary below Lake Prestwood in order for impaired sites to achieve the water quality standard for the pollutant of concern."

Amendment 4:
Section 2.0, Page 9, Paragraph 3, the paragraph has been revised to include the following: "At the time of initial TMDL development, there were seven locations that were considered impaired due to fecal coliform WQS exceedances. Those sites were included on the approved 2010 §303(d) list. However, based on an assessment of more recent data, it has been determined that one of these sites is currently meeting the water quality standard for fecal coliform bacteria. PD-078 will be removed or "delisted" from the §303(d) list for fecal coliform bacteria in 2012. Due to the expected change in impairment status once the 2012 §303(d) list is finalized, the Department believes it is appropriate to present a data summary that includes more recent data, where available, at the time of completing these TMDLs."

Table 3 and Figure 3, Page 10 were also revised to include 2009-2011 fecal coliform and precipitation data, where available.

Amendment 5:

Section 3.1.1, Page 12: "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."

Amendment 6:

Section 4.0, Page 24, the following sentence has been revised: "Flow data for an 8 year period (2004-2011) was used to establish flow duration curves."

Figure 4, Page 27 has also been revised to include include 2009-2011 fecal coliform and flow data, where available.

Amendment 7:

Section 5.2, Page 224, a second paragraph has been included: "At the time of initial TMDL development, there were seven locations in the TMDL watershed considered impaired due to fecal coliform. These sites were included on the approved 2010 §303(d) list. However, based on an assessment of more recent data, it has been determined that one of these sites is currently meeting the water quality standard for fecal coliform bacteria. PD-078 will be removed or "delisted" from the §303(d) list for fecal coliform bacteria in 2012. Due to the expected change in impairment status once the 2012

§303(d) list is finalized, the Department believes it is appropriate to indicate that no fecal coliform bacteria reduction will be necessary for PD-078”

Amendment 8:

Section 5.7, Page 29, Table 9: “Table 9. TMDL Components for the Fecal Coliform Impaired Segments in the Black Creek Watershed, below Lake Prestwood. Loads are expressed as colony forming units (cfu) per day.”

Amendment 9:

Abstract, Page 3, and Table 9, Page 32, and Table 10, Page 33: The following footnote has been added: “5. Contingent upon approval by USEPA, PD-078 will not be included on the 2012 303(d) list. As long as ambient conditions remain the same no reduction is needed”.