Total Maximum Daily Load

Chechessee Creek

Shellfish Fecal Coliform Daily Loads for Stations

18-03, 18-09, 18-10, 18-11, 18-14 in Shellfish Management Area 18

Hydrologic Unit Codes 030502080606 and 030502080607

Prepared for

SCDHEC Bureau of Water

by

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South Carolina Department of Health and Environmental Control

Abstract

The Chechessee Creek watershed is located in Shellfish Management Area 18 in Beaufort and Jasper Counties and is 2.9 mi^2 in area. There are seven shellfish monitoring stations located in Chechessee Creek. Three of these shellfish monitoring stations were included on South Carolina's approved 2010 and draft 2012 303(d) List of Impaired Waters. The area these monitoring stations are located in is classified as restricted for shellfish harvesting due to exceedances of the fecal coliform standard for shellfish harvesting waters. This TMDL document will address the three stations included on the 303(d) list as well as two additional monitoring stations within the area restricted for shellfish harvesting not included on the 303(d) list.

Existing conditions and percent reductions for Chechessee Creek were calculated using cumulative probability distributions. Depending on the station, the percent reduction required to meet the fecal coliform water quality standard ranges from 0% to 31.7%. For SCDOT, existing and future NPDES MS4 permittees, compliance with terms and conditions of its NPDES permit is effective implementation of WLA to the Maximum Extent Practicable (MEP) and demonstrates consistency with the assumptions and requirements of the TMDL. For existing and future NPDES construction and Industrial stormwater permittees, compliance with terms and conditions of its permit is effective implementation of the WLA. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and are eligible for CWA §319 grants.

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

Station	90th %tile of Existing Load (cfu/100ml)	TMDL [1, 2] (cfu/100 ml)	WQ Target (cfu/100 ml)	Margin of Safety (cfu/100ml)	WLA		LA
					Continuous Sources[3] (cfu/100ml)	Non-Continuous [4, 5, 6] Sources (% Reduction)	% Reduction to Meet LA[6]
18-03	20.2	43	40.9	2.1	See Note Below	0%	0%
18-09	59.9	43	40.9	2.1	See Note Below	31.7%	31.7%
18-10	45.0	43	40.9	2.1	See Note Below	9.2%	9.2%
18-11	41.9	43	40.9	2.1	See Note Below	0%	0%
18-14	29.0	43	40.9	2.1	See Note Below	0%	0%

Table Ab-1. TMDLs for Chechessee Creek watershed. Loads are expressed as colony forming (cfu) per 100 ml.

Table Notes:

1. TMDL is expressed as a concentration. If daily average tidal exchange estimates were available, this number could be converted to load in cfu/day by multiplying flow by concentration and a conversion factor.
2. Shellfish WQS = No more than 10% of the samples shall exceed 43cfu/100 ml
3. WLA is expressed as a daily maximum. There are no continuous dischargers at this time. Future continuous discharges are required to meet the prescribed loading for the pollutant of concern. Loadings are developed based upon permitted flow and an allowable permitted maximum concentration of 43/100ml.
4. 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.
5. By implementing the best management practices that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 Permit to address fecal coliform, the SCDOT will comply with this TMDL and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 Permit.
6. Percent reduction applies to existing concentration.

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1.0 Introduction

The Federal Clean Water Act (CWA) directs each state to review the quality of its waters every two years to determine if water quality standards are being met. If it is determined that the water quality is not being met, the states are to list the impaired water bodies under Section 303(d) of the CWA. The area of interest defined in this document includes a portion of Shellfish Management Area 18 (see Figure 1). Shellfish monitoring stations 18-09 and 18-10 are considered impaired for shellfish harvesting due to elevated fecal coliform (FC) bacteria levels. While FC bacteria levels at station 18-11 are currently acceptable, the station is located within a shellfish area defined as restricted for shellfish harvesting. In addition, there are two unimpaired shellfish monitoring stations located within the Chechessee Creek watershed (Sites 18-03 and 18-14) that effectively form the perimeter of an area defined as restricted for shellfish harvesting. This portion of Chechessee Creek is restricted for shellfish harvesting in accordance with Food and Drug Administration (FDA) guidance. Sites 18-09, 18-10, and 18-11 are also included on the List of Impaired Waters in accordance with Section 303(d) of the CWA.

A Total Maximum Daily Load (TMDL) is a written plan and analysis to determine the maximum pollutant load a waterbody can receive and still meet applicable water quality standards. The TMDL process includes estimating pollutant loadings from all sources, linking pollutant sources to their impacts on water quality, allocation of pollutant loads to each source and establishment of control mechanisms to achieve water quality standards (US EPA, 1999). All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES) permitted discharges, a load allocation (LA) for all unregulated nonpoint sources, and an explicit and/or implicit margin of safety (MOS). TMDLs are required to be developed for each waterbody and pollutant combination on the States' 303(d) lists by 40 CFR 130.31(a) (US EPA, 1999). For the purposes of addressing the entire restricted portion of Shellfish Management Area 18, the watershed covered by this TMDL document will include the three impaired locations and extend to the two unimpaired perimeter locations.

1.1 Background

Chechessee Creek is located in the Sea Islands/Coastal Marsh ecoregion of South Carolina within Jasper and Beaufort Counties (Figures 1 and 4). This area of the State is characterized by low slopes, wide intertidal salt marshes with interconnected tidal creeks.

During the last 10 years, some of the coastal counties in South Carolina, including Beaufort and Jasper Counties have experienced rapid growth and population increases. The 2000 US Population Census estimated population of Beaufort County to be 120,937 while 2010 Census estimate is 162,233, an increase of 25.5%. Jasper County population during the same time period increased from 20,678 to 24,777, a 16.5% increase. Compared to the population increase in SC within the same period, which was 13.3%, the percent increase seen in Beaufort County is almost twice that of SC (US Census Bureau). This population growth trend in coastal regions is expected to increase, not just in South Carolina, but also in Georgia and North Carolina as well. The population increase along with development is already impacting coastal resources and watersheds. Impacts of rapid and often loosely managed growth can drastically alter the quality of life of people living in the Southeast (DeVoe and Kleppel, 2006). Fletcher et al. (1998) indicated that one of the most tangible signs of urbanization is the closure of shellfish beds due to contamination which are areas where human activities have degraded the environmental quality.

Landuse along South Carolina's coast is being converted from conifer trees to golf courses and residential communities (Siewicki et al. 2005). Increased urbanization and population growth have led to increased nonpoint source pollution of coastal waters (Mallin et al. 2000). Fecal coliform sources in urban and suburban areas include feces from birds, wildlife, horses, and cats and dogs (Mallin et al 2000b). It has been shown that dog feces have 10^6 fecal coliforms per gram and large portions of are deposited on the landscape and adjacent to impervious surfaces such as sidewalks, roads and parking lots. Other sources of fecal coliform in urban and suburban areas are Sanitary Sewer Overflows (SSOs), stormwater runoff, failing septic tanks, etc. Another component of urban and suburban development is, by increasing human population, wildlife activity moves to the edges of marshes near shellfish harvesting areas (Siewicki et al. 2005).

Studies have shown that proximity of certain land-use practices, such as parking lots, shopping malls, golf course communities, bridges and roads, especially near the estuarine salt marshes adversely affect these systems (Bejarano et al. 2004). Major sources of stormwater runoff in coastal and estuarine areas come from impervious surfaces. Another study, conducted by Mallin et al. (2000b) in southeastern North Carolina correlated the landuse activities with fecal coliform exceedances in nearby estuaries. They concluded that when fecal coliform bacteria are deposited on or near impervious surfaces, bacteria and other pollutants are concentrated and rapidly removed to downstream receiving waters. Several studies have shown that with increased urbanization in coastal areas impervious surfaces also increase resulting in degraded water quality (Mallin et al. 2000b, Siewicki et al, 2005, Schill and Jensen, 2000).

Sources of fecal coliform bacteria are commonly diffuse or nonpoint in nature and may originate from stormwater runoff, failing septic systems, agricultural runoff, leaking sewers, wildlife, pets, birds, etc. Occasionally, the source of the pollutant is a point source, such as wastewater treatment plants, MS4, etc. 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 TMDLs for water bodies not meeting applicable water quality standards. 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 instream 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 included three monitoring stations in Chechessee Creek on South Carolina's approved 2010 and draft 2012 Section 303(d) list for shellfish harvesting due to exceedances of fecal coliform bacteria. Because the sites are impaired, a TMDL must be developed for the pollutant of concern. The goal of this project will be to determine what and where the sources for fecal coliform potentially are, and calculate TMDLs that will meet the applicable water quality standard.

For the purposes of addressing the restricted portion of Chechessee Creek within Shellfish Management Area 18, the watershed covered by this TMDL document will include the three impaired stations and extend to two unimpaired perimeter stations of Shellfish Management Area 18. Shellfish monitoring stations 18-09 and 18-10 are considered impaired for shellfish harvesting due to FC levels exceeding the water quality standard for shellfish harvesting waters. While FC bacteria levels at station 18-11 are currently meeting the water quality standards, the station is restricted for shellfish harvesting. Shellfish control agencies must consider whether to designate

stations with “restricted” classification if the area is affected by either urban or rural sources of nonpoint source pollution which causes water quality to fluctuate either unpredictably or with sufficient frequency (USFDA, 2007). In addition, there are two unimpaired shellfish monitoring stations on either side of the impaired stations located within the Chechessee Creek watershed (Stations 18-03 and 18-14) that effectively form the area defined as “restricted” for shellfish harvesting. Per FDA rules, these unimpaired stations must be identified to either side of an impaired station(s) and restricted classification extended to in order to protect for human health concerns. Therefore, from station 18-03 to station 18-14 and including station 18-11 of Chechessee Creek is restricted for shellfish harvesting in accordance with Food and Drug Administration (FDA) guidance (2007). All five stations covered in this TMDL document are identified on Table 1 and shown on Figures 1, 2 and 4.

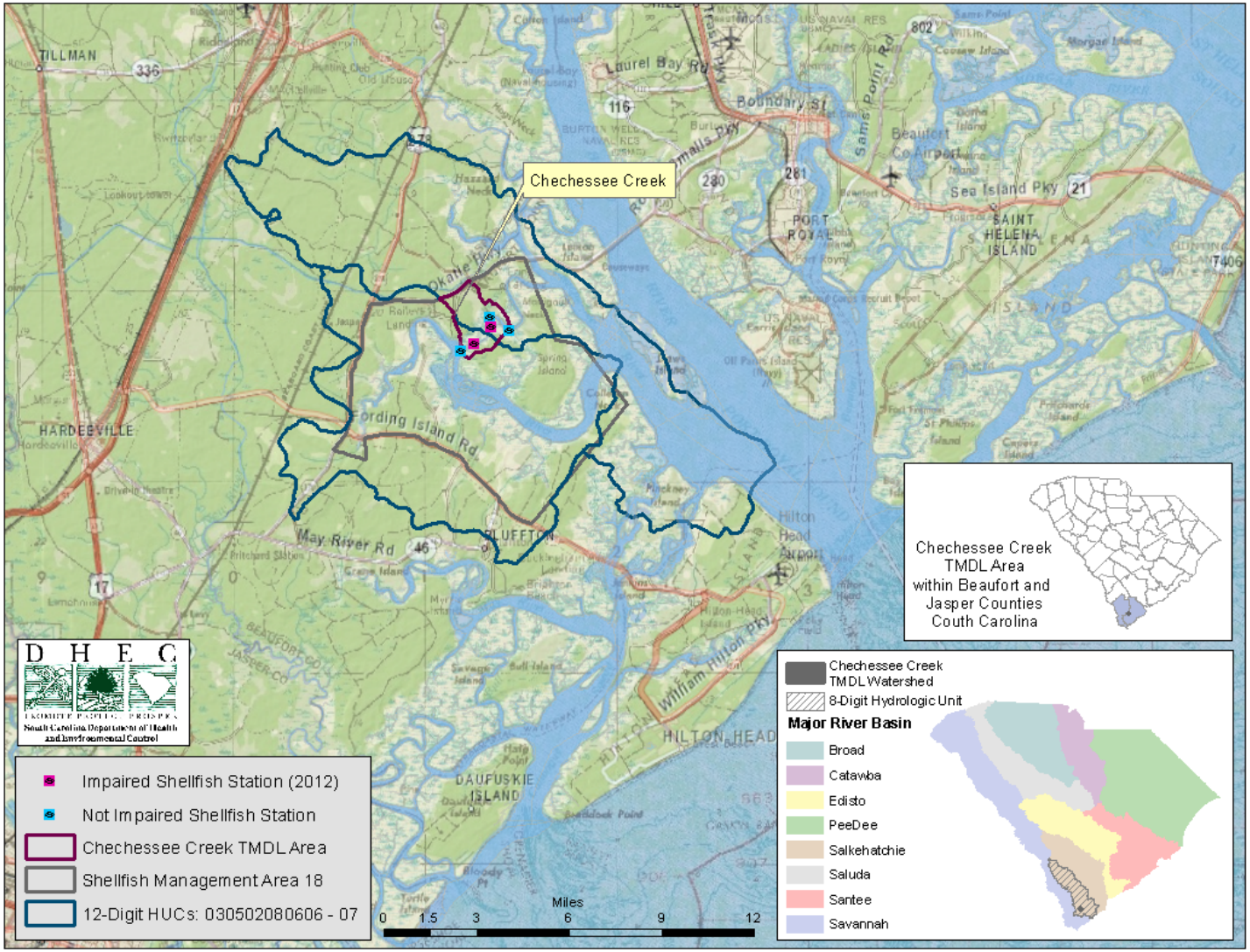

Figure 1. General overview of Chechessee Creek and it's surrounding area within Shellfish Management Area 18, Beaufort and Jasper Counties, South Carolina.

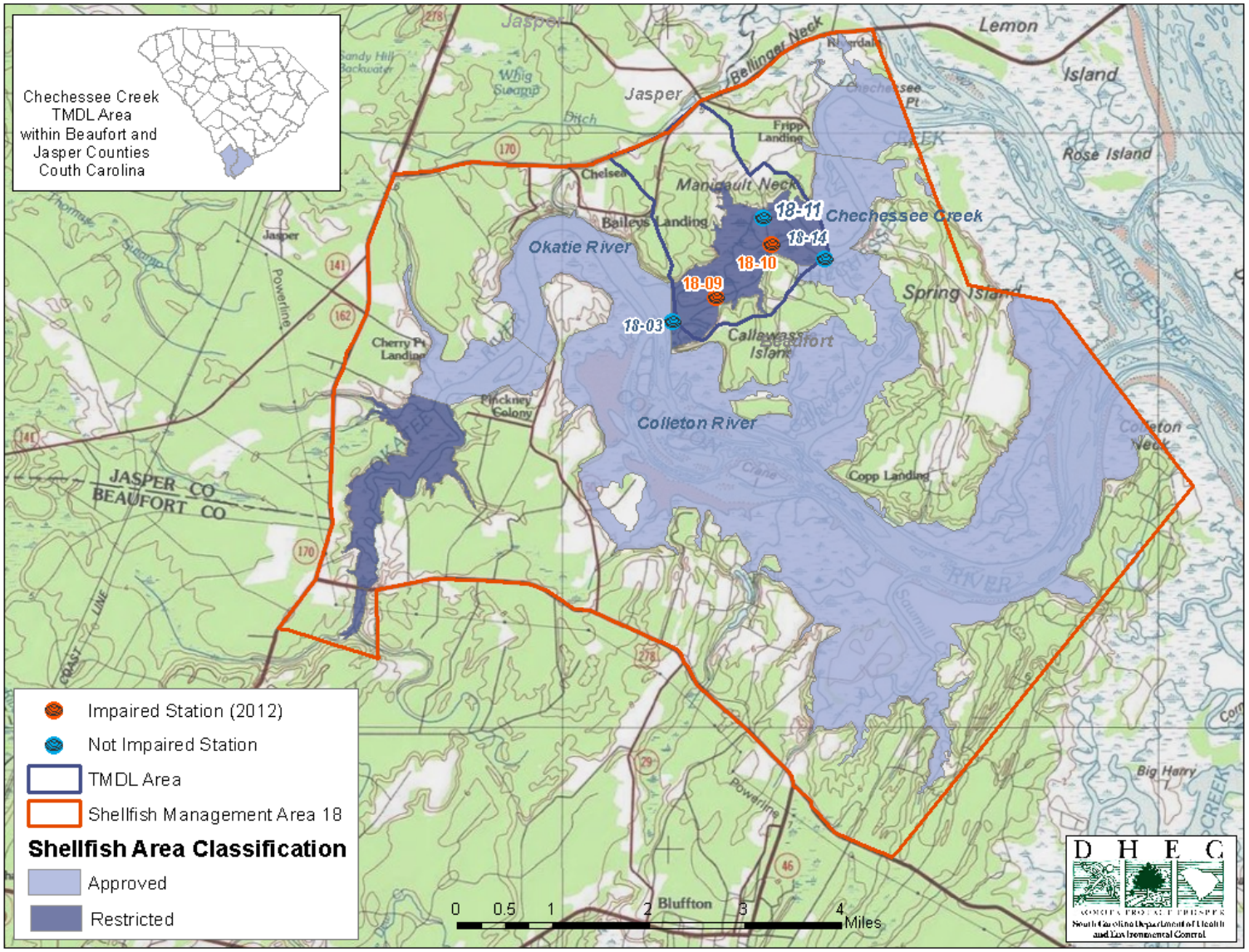

Figure 2. Shellfish Management Area 18 classifications and shellfish monitoring stations within Chechessee Creek TMDL area.

1.2 Watershed Description

The Chechessee Creek watershed is located in Beaufort and Jasper Counties in southern part of South Carolina. The watershed is encompassed within 8-digit hydrologic unit code (HUC) 03050208 which is the Broad River portion of the Salkehatchie river basin, and the 10-digit HUC 0305020806 which includes the Port Royal Sound. The Chechessee Creek watershed in is 12-digit HUCs 030502080606 and 030502080607.

Chechessee Creek, a shallow tidal estuary, is located between the Okatie/Colleton Rivers and the Chechessee River and is between Manigault Neck to the north and Callawassie Island to the south. The Creek has extensive intertidal salt marshes/mudflats, small tidal creeks and barriers effecting the flow (Figure 2). National Oceanic and Atmospheric Administration tidal gage at Callawassie Island Bridge has a mean tidal range of 7.8 ft, and mean tide level of 4.2 ft.

Shellfish Management Area 18 is comprised of Chechessee, Callawassie and Sawmill Creeks, and Colleton and Okatie Rivers and their tributaries. The area's northern boundary runs between the intersection of Highway 170 and US 278 and Chechessee River. The eastern boundary runs along the western shore of the Chechessee River to the mouth of the Colleton River and then to US 278. US 278 define the area's southern boundary. The western boundary runs along Highway 170 and US 278 (SCDHEC, 2011).

SCDHEC and USEPA Region 4 have established seven priority watersheds across South Carolina, and one of these is the HUC 030502080606 which includes a portion of Chechessee Creek (Figure 1). Priority watersheds are areas where USEPA Region 4 and SCDHEC have agreed to target mutual resources for watershed restoration.

Table 1. Shellfish Monitoring Stations on Chechessee Creek

Shellfish Monitoring Stations	Station Description
18-03	Chechessee Creek and Okatie River
18-09	Chechessee Creek first unnamed tributary from Colleton River
18-10	Chechessee Creek second bridge to Callawassie Island
18-11	Chechessee Creek first bridge to Callawassie Island
18-14	Tributary from Spring Island Shrimp Pond

1.3 Landuse and Soils

The National Land Cover Data project (NLCD) 1992 was the first land cover mapping with a national scope. In 2001, the second NLCD was completed and was improved by adding

impervious surface and canopy density and finally, in 2006 the third NLCD was completed using similar methodology as in 2001.

Figure 2. Aerial view of Chechessee Creek and its extensive salt marshes/mud flats. On the right is the mainland and on the left is the Callawassie Island connected with the Callawassie Island Bridge.

A pixel to pixel comparison of the 2001 and 2006 NLCDs with 1992 NLCD is not recommended by EPA due to substantial differences in methodology, accuracy and resolution. Therefore, this document will only address the landuse changes in Chechessee Creek watershed from 2001 to 2006 (US EPA, 2007).

Landuse within Chechessee Creek TMDL area was calculated using both 2001 and 2006 NLCDs for comparison. The results based on landuse characteristics are summarized in Table 2. Based on 2006 NLCD, primary landuse within the TMDL area is wetlands and open water (51.8%) followed by forests (33.6%). Developed landuse is 5.1% of the TMDL watershed.

Predominant soils in Chechessee Creek Watershed are Bohicket and Capers association, Coosaw, Chisolm and Tomotley loamy fine sand, Seabrook fine sand, and Eulonia, Deloss and Wahee fine sandy loam. Majority of the soils within the watershed are either partially hydric or hydric soils, with smaller areas of not hydric soils. Partially hydric and hydric soils may have low infiltration rates, high water table and high runoff potential. Soils that are not hydric have moderate to high infiltration rates and low runoff potential.

Figure 3. Extensive salt marsh of Chechessee Creek with Spartina.

1.4 Water Quality Standard

Chechessee Creek is classified as outstanding water resources (ORW), which is defined in SC Regulation 61-68 (2008) as:

> "Outstanding Resource Waters (ORW) are freshwaters or saltwaters which constitute an outstanding recreational or ecological resource or those freshwaters suitable as a source for drinking water supply purposes with treatment levels specified by the Department."

Chechessee Creek is also shellfish harvesting waters and the fecal coliform standard for the shellfish harvesting waters are guided by the minimum requirements of the National Shellfish Sanitation Program Model Ordinance (US FDA, 2009), which are:

> "Not to exceed an MPN fecal coliform geometric mean of 14/100 ml; nor shall more than 10% of the samples exceed an MPN of 43/100 ml".

Table 2. The Chechessee Creek Landuse based on 2001 NCLD (version 2) and 2006 NLCD

Landuse	**2001 NCLD (v2) Area (acres)**	**% of Area**	**2006 NLCD Area (acres)**	**% of Area**
Open Water	179.7	9.4	195.7	10.3
1Woody Wetlands	187.9	9.9	177.3	9.3
Emergent Herbaceous Wetlands	608.9	31.9	614.3	32.2
Total Wetlands/Open Water	***976.5 acres***	***51.2%***	***987.3 acres***	***51.8%***
Developed, Open Space	93.6	5.0	93.6	5.0
Developed, Low Intensity	2.7	0.1	2.7	0.1
Total Developed	***96.3 acres***	***5.1%***	***96.3 acres***	***5.1%***
Deciduous Forest	14.5	0.8	14.0	0.7
Evergreen Forest	627.2	32.9	577.6	0.3
Mixed Forest	49.8	2.6	49.4	2.6
Total Forested	***691.5 acres***	***36.3%***	***641.0 acres***	***33.6%***
Cultivated Crops	7.8	0.4	7.3	0.4
Total Agricultural	***7.8 acres***	***0.4%***	***7.3 acres***	***0.4%***
Scrub/Shrub	84.7	4.4	133.7	7.0
Grassland/Herbaceous	41.1	2.2	23.8	1.2
Barren Land	8.23	0.4	16.9	0.9
Total Other	***134.0 acres***	***7.0%***	***174.4 acres***	***9.1%***
Total Area (acres)	***1906.1 acres***	***100%***	***1906.1 acres***	***100%***

The National Shellfish Sanitation Program (NSSP) is a tripartite cooperative program involving the Federal government, states and the industry that relies on regulatory controls by the State Shellfish Authority (SSA) to ensure the safety of the molluscan shellfish. This program is recognized by the U. S. Food and Drug Administration (FDA) for safe and sanitary control of growing, processing, and shipping of molluscan shellfish for human consumption. By participating in the National Shellfish Sanitation Program and through membership in the Interstate Shellfish Sanitation Conference, states have agreed to enforce the Model Ordinance which sets the minimally necessary requirements for sanitary control of molluscan shellfish (US FDA, 2009).

1.2 Shellfish Classification of Chechessee Creek TMDL Area

Chechessee Creek between stations 18-03 and 18-14 are classified as restricted for shellfish harvesting. Based on sanitary surveys, "Restricted" is an indication of a moderate degree of pollution or the presence of deleterious or poisonous substances to a degree that may cause the water quality to fluctuate unpredictably or at such a frequency that a "Conditionally Approved" classification is not feasible. Shellfish harvesting in the restricted areas are only allowed for the purpose of relaying or depuration and is allowed only with a permit issued by the Department and under supervision. The suitability of restricted areas for harvesting as described above may be determined through the use of comparison studies of background tissue samples with post-process tissue samples, as well as other process verification techniques deemed appropriate by the Department. Computation of the estimated threshold shall be obtained using the National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology (SCDHEC, 2011).

2.0 Water Quality Assessment

The National Shellfish Sanitation Program (NSSP) allows shellfish growing areas to be classified using either total or fecal coliform, and application of either standard to different water bodies within the state. There are also two sampling strategies for the application of the standards:

a) Adverse pollution control

b) Systematic random sampling (USFDA, 2009).

The SCDHEC Shellfish Program currently utilizes the systematic random sampling (SRS) strategy within Area 18 instead of sampling under adverse pollution control conditions. To insure random sampling, sampling dates are computer generated prior to the beginning of the each quarterly period. Due to shipping requirements and manpower constraints, samples are collected on Mondays, Tuesdays or Wednesdays (SCDHEC, 2011).

In order to comply with NSSP guidelines, a minimum of thirty samples are required to be collected and analyzed from each station during the review period, which is three years. During July 1998, data analysis procedure was updated and formalized.

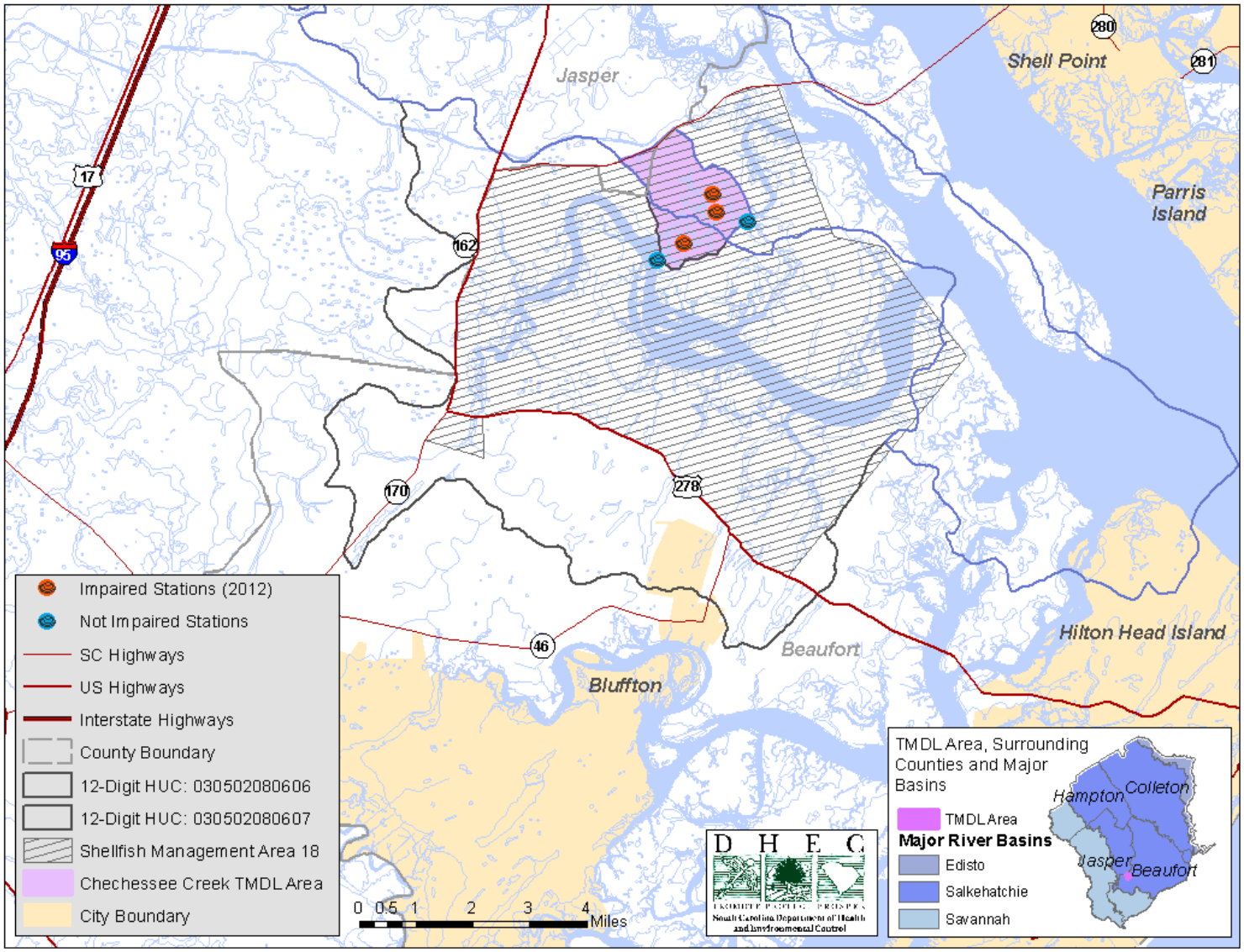

Figure 4. The Chechessee Creek watershed overview.

For classification purposes, samples are collected in accordance with SRS for a 36-month period between January 1st and December 31st. This allows for a maximum of 36 samples per station for a three year period yet provides a six-sample "cushion" (above the NSSP required 30 minimum) for broken samples, lab error, breakdowns, etc. This also allows each annual report to meet the NSSP Triennial Review sampling criteria. All samples collected after September 1, 1986, have been analyzed using the five-tube/three dilution modified A-1 method described by Nuefeld (1985) (SCDHEC, 2011).

In addition to bacteriological samples, surface water temperatures are measured using a hand-held, laboratory-quality calibrated thermometer. Salinities are measured in the laboratory using automatic temperature compensated refractometer. Additional field data collected during samplings are ambient air temperature, wind direction, tidal stage, date and time of sampling. Tidal stages are determined by Nautical Software's *Tides and Currents*, Version 2 (1996) (SCDHEC, 2011).

3.0 Source Assessment

FC bacteria are used by the State of South Carolina as the indicator for pathogens in surface waters. Pathogens, which are usually difficult to detect, cause disease and make full body contact recreation in lakes and streams a risk to public health. Indicators such as FC 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 organisms that may result in sickness.

There are many sources of pathogen pollution in surface waters. These sources may be classified as point and nonpoint sources. Point sources are generally defined as pollutant loads discharged at a specific location from pipes, outfalls, ditches and conveyance channels from either municipal wastewater treatment plants, industrial waste treatment facilities or MS4s. Nonpoint source pollution originates from multiple sources that are unregulated over a relatively large area. Nonpoint sources can be divided in source activities related either to land or water use and include failing septic tanks, improper animal keeping practices, forestry practices, as well as urban and rural runoff. 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.

3.1 Point Sources

3.1.1 Continuous Point Sources

Municipal and private sanitary wastewater treatment facilities may be sources of pathogen or FC bacteria pollution when not meeting limits for FC bacteria. However, if these facilities are discharging wastewater that meets their permit limits, they are not causing or contributing to impairment provided that a daily maximum limit is being met as specified in the TMDL. If any of these facilities are not meeting their permit limits, enforcement actions/mechanisms are in place.

Currently, there are no continuous NPDES-permitted discharges to Chechessee Creek. Future NPDES dischargers in the referenced watershed are required to comply with the load reduction prescribed in the WLA and demonstrate consistency with the assumption and requirements of the TMDL.

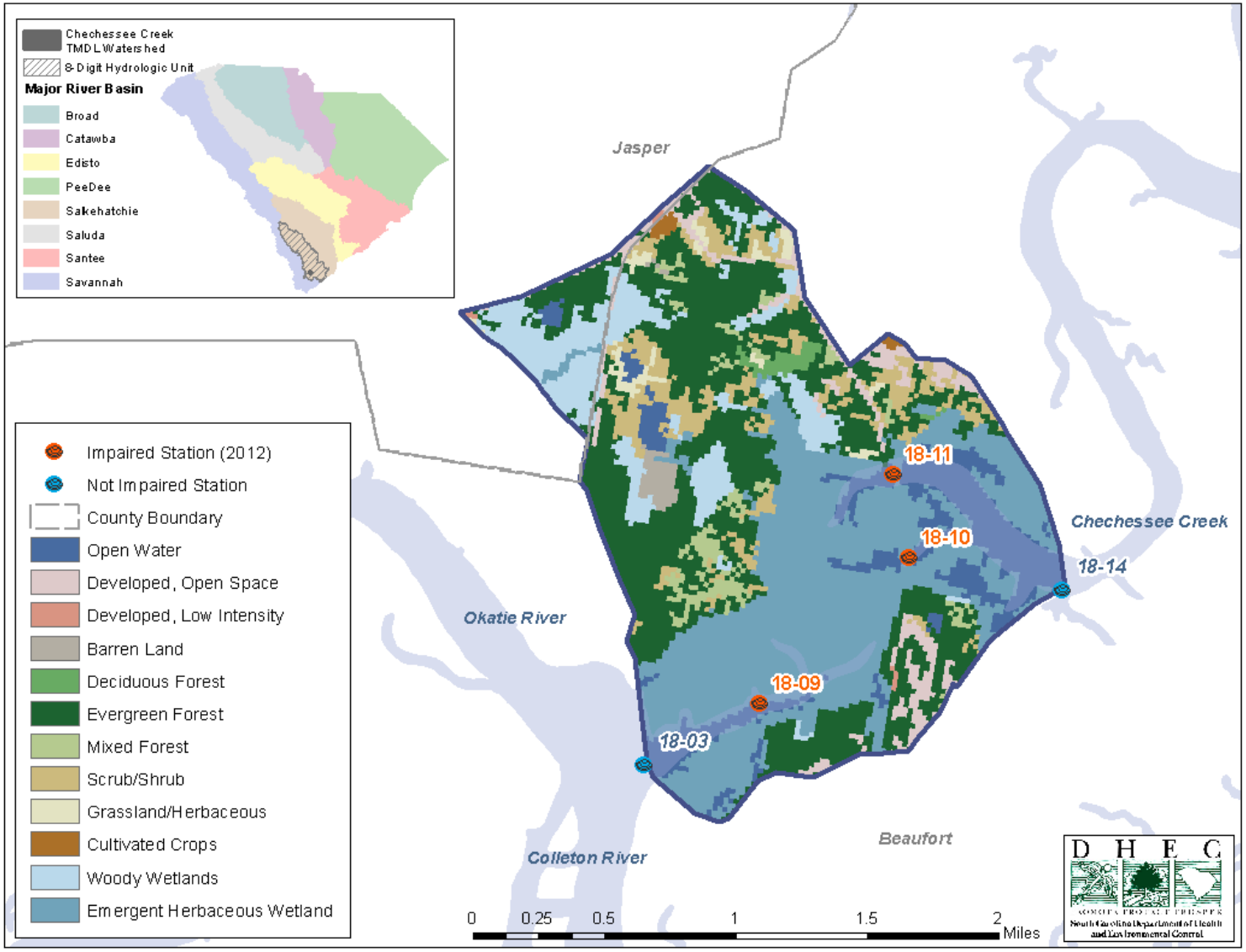

Figure 5. Landuse based on NCLD 2006 within Chechessee Creek TMDL area.

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 61-9 122.26(b)(14) & (15) (2008). All regulated MS4 entities have the potential to contribute FC pollutant loading in the delineated drainage area used in the development of this TMDL.

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

Current Developed land use for Chechessee Creek watershed is 5.1%. Based on current Geographic Information System (GIS) information available at time of TMDL development, there are currently no SCDOT facilities located in the referenced watershed.

Other than SCDOT, there are currently no permitted sanitary sewer or stormwater systems in this watershed. Future permitted sanitary sewer or stormwater systems 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 the 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 are usually covered by the NPDES Storm Water Construction General Permit from the SCDHEC (SCR100000). Where the construction has 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 waste load 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 Chechessee 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.

Sanitary sewer overflows (SSOs) to surface waters have the potential to severely impact water quality. These untreated sanitary discharges result in violations 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. Based on 2010 US Census and data provided by BJW&SA, currently 49% of the households and approximately 41% of the population in Chechessee Creek watershed have sewer service.

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

3.2 Nonpoint Sources

Nonpoint source pollution is likely a major contributing factor impacting water quality in Chechessee Creek watershed. Stormwater runoff may negatively impacts water quality by transporting FC bacteria from land to the receiving waters. Additionally, the Department recognizes that there is likely wildlife, agricultural activities, grazing animals, failing septic tanks and/or other nonpoint source contributors located within this watershed. Nonpoint sources located in unregulated areas are subject to the LA and not the WLA component of the TMDL.

3.2.1 Agricultural Activities

Agricultural activities that involve livestock or animal wastes are potential sources of FC contamination of surface waters. Fecal matter can enter the waterway via runoff from the land or by direct deposition into the stream. Owners/operators of most commercial animal growing operations are required by R. 61-43, Standards for the Permitting of Agricultural Animal Facilities, to obtain permits for the handling, storage, treatment (if necessary) and disposal of the manure, litter and dead animals generated at their facilities (SCDHEC 2002). The requirements of R. 61-43 are designed to protect water quality and there is a reasonable assurance that facilities operating in compliance with this regulation should not contribute to downstream water quality impairments. In addition to the state permit, animal operations that are considered Concentrated Animal Feeding Operations (CAFOs) are also required to have an NPDES Permit if they have a discharge to surface waters. There are currently no permitted CAFOs in South Carolina. Currently, there are no regulated agricultural operations within the TMDL watershed.

3.2.2 Land Application of Industrial, Domestic Sludge or Treated Wastewater

NPDES-permitted industrial and domestic wastewater treatment processes may generate solid waste bi-products, also known 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 (2011), Sections 503, 504, or 505. It is recognized that there may be operating, regulated land application sites located in Chechessee Creek watershed. If properly managed, waste is applied at a rate that ensures pollutants will be incorporated into the soil or plants and pollutants will not enter streams. Land applications sites can be a source of fecal coliform bacteria and stream impairment if not properly managed. Similar to AFO land application sites, the permitted land application sites described in this section are not allowed to directly discharge to Chechessee Creek. Direct discharges from land applications sites to surface waters of the State are illegal and are subject to enforcement actions by the SCDHEC.

Currently there is one NPDES permit for land application of treated wastewater, Callawassie Development ND0062235, located on the Callawassie Island adjacent to Chechessee Creek. Callawassie Development's NPDES permit is a "no discharge" type of permit and are not allowed to discharge to adjacent waters. Therefore this permit should not have the potential to impact the

water quality and as mentioned previously, direct discharges to the surface waters by this type of permit holder is illegal and subject to enforcement.

3.2.3 Urban and Suburban Stormwater Runoff

Portions of Chechessee Creek watershed, such as the Heyward Point (www.heywardpoint.com/), are in the process of being developed. There are also two golf and/or residential developments within the TMDL area. Increased development has the potential to increase runoff into the adjacent waterbody.

Dogs, cats and other domesticated pets are one of many sources of fecal coliform deposited on the urban landscape. There are also "urban" wildlife, such as squirrels, raccoons, pigeons and other birds, all of which contribute to the fecal coliform load.

3.2.4 Failing Septic Systems

On August 8, 2012, 2008 Beaufort Jasper Sewer and Water Authority (BJW&SA) provided SCDHEC with sewer GIS coverages for the TMDL area (Personal communication). Based on this information, there are approximately 127 households with a population of approximately 250 people within Chechessee Creek watershed. Of these 127 households within the TMDL area, an estimated 65 households with an approximate population of 148 people are not served by sewer. Assuming one septic tank per household, there are an estimated 65 septic tanks within Chechessee Creek TMDL area.

Improperly maintained and failing septic tanks can contribute to bacterial contamination of downstream waterbodies (US EPA, 2001). Untreated sewage from failing septic systems may have a potential to enter surface waters in this watershed. 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 effluent from failing septic systems. Figure 5 shows areas within the TMDL area that may not be connected to central sewer system.

3.2.5 Wildlife and Domestic Animals

Wildlife can be a contributor of FC bacteria. Wildlife wastes can be carried into nearby waters by runoff following rainfall and direct deposition. Callawassie Island bordering Chechessee Creek is a private, gated sea island community and a designated Community Wildlife Habitat by the National Wildlife Federation. The community's Callawassie Island Ecology Guide (n.d) lists a resident population of deer, otters, mink, marsh rats, marsh rabbits, raccoons, fox squirrels and bats, as well as alligators, and various birds as wildlife on the island. Callawassie Island manages the deer heard through their annual culling program.

If the population of wildlife is allowed to increase, the water quality in Chechessee Creek may also be negatively impacted by the increase of fecal matter deposited in adjacent areas and washed off during tidal cycles and by precipitation.

Based on the SCDNR's 2008 deer density study, there are 30 to 45 deer per square mile in Chechessee Creek TMDL area (SCDNR, 2008). The study estimated deer density based on suitable habitat such as forests, croplands, and pastures. Yagow (2001) has shown the fecal coliform production by deer can be 347×10^6 cfu/deer/day and 113×10^6 cfu/raccoon/day.

3.2.6 Marinas, Boating Activities and Structures

There are currently no marinas within the TMDL watershed. Marinas are not allowed in shellfish harvesting and ORW waters unless the area is prohibited for the purposes of shellfish harvesting and administratively closed.

There are 3 main types of marine sanitation devices (MSD) that are suitable for different kinds of marine vessels and have varying effluent treatment levels (Table 3). Every vessel with an MSD installed as of January, 30 1980 must be equipped with one of the three types of MSDs (33 USC 1322, 2008). Properly-maintained MSDs should not be causing or contributing to fecal coliform exceedances in Chechessee River. It is prohibited under Federal law to discharge untreated sewer from vessels within navigable waters as stated in Clean Vessel Act.

Table 3. Three main types of MSDs.

Sewage Treatment Device	Vessel Length	Effluent Standard
Type I MSD – flow through with maceration and disinfection	Equal to or less than 65 ft in length	FC count no greater than 1000/100ml and no visible floating solids
Type II MSD- flow through with advanced maceration and disinfection	Greater than 65 ft in length	FC count no greater than 200/100ml and suspended solids no greater than 150 mg/l
Type III MSD – holding tank	Any length	This type of MSD prevents overboard discharge of treated or untreated sewage

There are multiple private docks located in the TMDL watershed. In 2003, National Oceanic and Atmospheric Association's (NOAA) National Centers for Coastal Ocean Science organized a workshop to clarify factual information about the environmental impacts of docks. Documents resulting from this workshop highlight one of the following: The surface areas created especially by longer walkways and dock structures create hard, impervious surfaces for bird fecal mater to concentrate and possibly enter receiving waters through precipitation runoff.

4.0 Cumulative Probability Method

Cumulative probability distributions were used to calculate existing conditions and percent reductions necessary to meet shellfish waters standards for fecal coliform in the Chechessee Creek. For the calculations of the cumulative probability distributions, data from 2000 through 2010 were used for each station.

To create a cumulative probability graphs, water quality measurements are first sorted in ascending order to determine rank and then assigned a probability plotting position using the following function:

$$p(\%) = \frac{100M}{N+1}$$

where, M = rank and N = number of samples (Novotny, 2004).

In this case, the log base 10 of fecal coliform is used. If the data follows a log-normal distribution, the data points on the plot will approximate a straight line (the normal distribution). This straight line is then compared to the water quality standard at the appropriate percentile. For shellfish waters in South Carolina, the TMDL target equates to 43 cfu/100ml minus a 5% margin of safety (40.9 cfu/100ml) at the 90th percentile. If the fit line crosses the 90th percentile reference line above the standard, the site is considered to not meet the standard for single sample maximums. If the line crosses below the standard reference the site does meet the water quality standard. The evaluation is consistent with the NSSP approach under systematic random sampling scheme (which is used in place of adverse sampling). If the data does not meet the single sample standard, a line is drawn parallel to the original normal distribution line that intersects the standard at the 90th percentile point (Appendix A). Drawing the line parallel to the original distribution makes the assumption that the coefficient of variation remains the same for the original data and the desired water quality data (Novotny, 2004). The necessary percent reduction is calculated as the difference between the distributions at the 90th percentile point:

$$\frac{\text{Existing Load - (Standard - MOS)}}{\text{Existing Load}} * 100$$

There are no stations that currently exceed the geometric mean criteria that do not also exceed the single standard sample. Figure 7 shows the cumulative probability graph for station 18-09. The graphs for the remaining stations can be found in Appendix A.

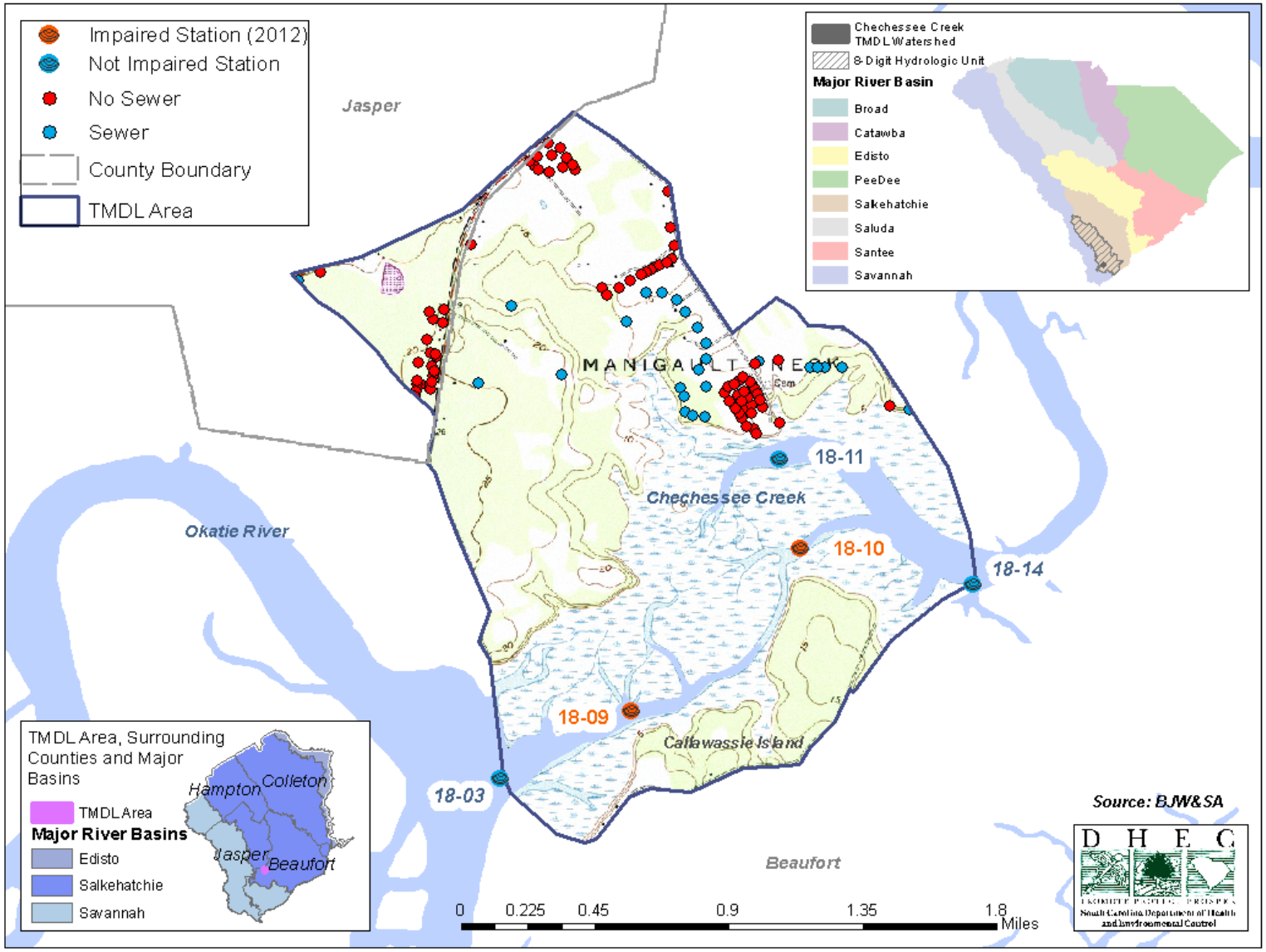

Figure 6. Areas of Chechessee Creek watershed with sewer service and potential on site septic systems.

If sufficient approximations of tidal exchange and flow patterns were available, this method could be extended to calculate the total maximum daily fecal coliform loading in cfu/day for locations within the watershed. Average daily tidal exchange would be multiplied by the water quality standard of 43 cfu/100ml and a conversion factor. This number would represent the maximum daily load for all waters within the delineated watershed, whether impaired or not. There is not sufficient data to calculate the loadings for each station which is a limitation of this method.

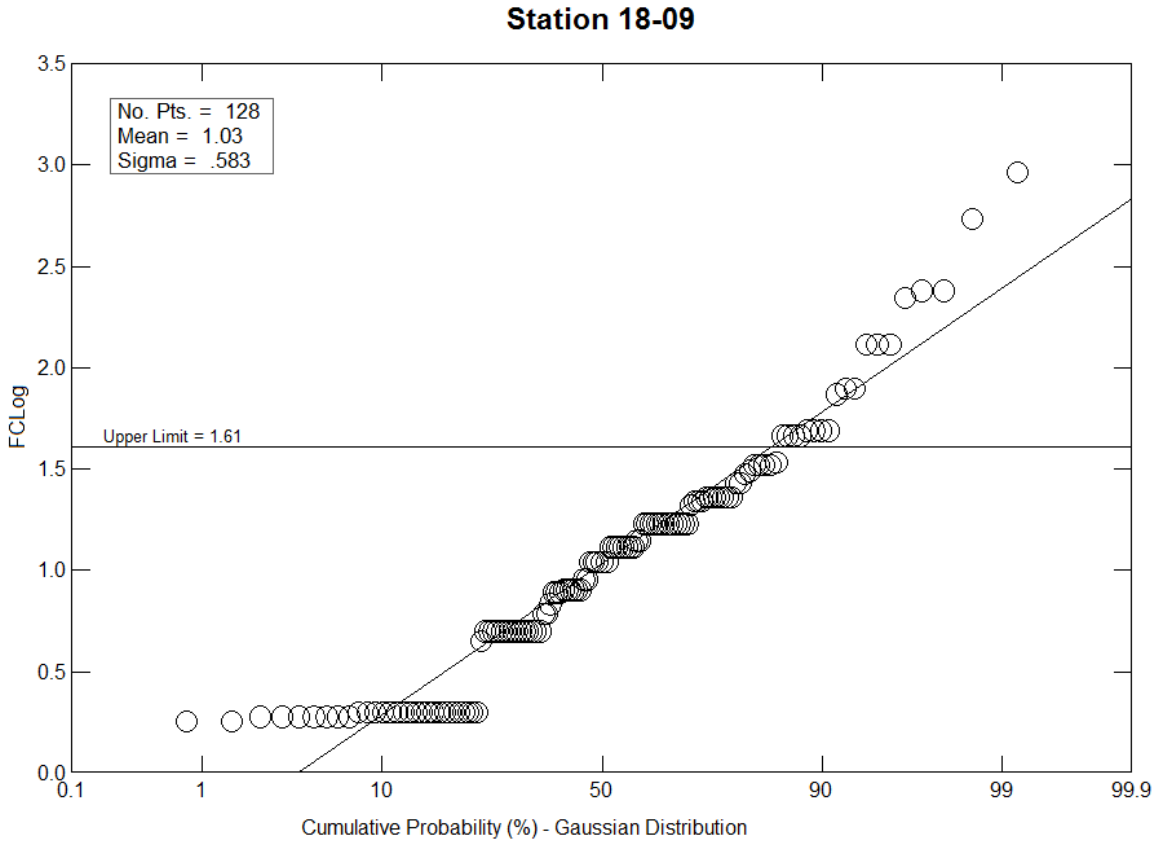

Figure 7. Cumulative probability graph for station 18-09.

5.0 Development of the TMDLs

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

Critical conditions are the "worst-case" environmental conditions for exceedance of water quality standards and which occur at an acceptable frequency (US EPA, 1999). Due to the tidal and complex hydrologic nature of Chechessee Creek, it is unclear what a critical flow would be. By including all data in the calculations, inclusion of the critical condition is implicit. Seasonal variation is also taken into account by including all monitoring data.

5.2 Wasteload Allocation

The WLA is the portion of the TMDL allocated to NPDES-permitted point sources (US EPA, 1999). The wasteload 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 Sanitary Sewer Overflows (SSOs), are illegal and not covered under the WLA of this TMDL.

5.2.1 Continuous Point Sources

The Chechessee Creek is classified as ORW waters and direct dischargers to these waters are not allowable; however facilities with land application permits are allowable, but such operations are not allowed to discharge to waters of the State. Currently there are no direct discharges to Chechessee Creek. Future continuous discharges are required to meet the prescribed loading for the pollutant of concern based on permitted flow and assuming an allowable permitted maximum concentration of 43cfu/100mL.

5.2.2 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 compliance and enforcement mechanisms. All areas defined as "Urbanized Area" by the US Census are required under the NPDES Phase II 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.

SCDOT is currently the only designated MS4 located in the drainage area. Regulated MS4s are subject to the WLA component of this TMDL; however, there may be other unregulated MS4s located in the watershed that are subject to the LA component of this TMDL. At such time that the referenced entities or other future unregulated entities become regulated NPDES MS4 entities and subject to applicable provisions of SC Regulation 61-68, 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. 61-9 122.26(b)(14) & (15) (2008).

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

The percent reductions in this TMDL also apply to the fecal coliform waste load attributable to those areas of the watershed which are covered or will be covered under NPDES MS4 permits.

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

1) An inventory of service boundaries of the MS4 area 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) will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. However, the Department recognizes that the SCDOT is not a traditional MS4 in that it does not possess statutory taxing or enforcement powers. The SCDOT does not regulate land use of zoning, issue building or development permits.

5.3 Load Allocation

The Load Allocation applies to the nonpoint sources of FC bacteria and includes unregulated processes/entities. It is expressed both as a concentration and as a percent. The load allocation is calculated as the difference between the target concentration under the critical condition and the point source WLA. The load allocation for each of the impaired stations in Chechessee Creek is expressed in tables as percent reduction (Table 6). The Department believes that meeting the highest percent reduction or the WQS, whichever is less restrictive, will effectively protect the

shellfish harvesting beds in the referenced watershed for human consumption. Besides SCDOT, there are no other designated or potentially designated MS4s located in the drainage area. There may be other stormwater discharges located in the watershed that are subject to the LA component of this TMDL. At such time that the referenced entities, or other future unregulated entities become regulated NPDES MS4 entities and subject to applicable provisions of SC Regulation 61-68 D, they will be required to meet load reduction 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 SCR 122.26(b)(14) & (15).

5.4 Existing Load

Due to the tidal nature of the system, it is difficult to calculate an existing load for this system. For this reason, existing conditions are given as a concentration. Existing concentration is calculated as the concentration of fecal coliform at the 90^{th} percentile point based on the normal line fit to the monitoring data. Existing loads range from 41.9 cfu/100ml to 59.9 cfu/100ml (Table 4).

5.5 Margin of Safety

A margin of safety (MOS) allows for an accounting of the uncertainty in the relationship between pollutant loads and receiving water quality (US EPA, 1999). Incorporation of a MOS can be done either explicitly within the TMDL calculation or implicitly by using conservative assumptions (US EPA, 1999). This TMDL has an explicit 5% margin of safety, all water quality data is compared to 40.9 cfu/100ml which is the water quality single sample standard of 43 cfu/100ml minus five percent. There is also an unspecified implicit margin of safety in the percent reduction calculations derived from the cumulative probability graphs due to the assumption of independence of the data points (Novotny, 2004).

5.6 Calculation of the TMDL

A TMDL represents the loading capacity (LC) of a waterbody, which is the maximum loading a waterbody can receive without exceeding water quality standards (US EPA, 1999). The TMDL is the sum of the WLA for point sources, the load allocation (LA) for non-point sources and natural background, and a margin of safety (MOS). The TMDL can be represented by the equation (US EPA, 2001):

$$TMDL = LC = WLA + LA + MOS$$

The equation above results in reduction of fecal coliform concentrations ranging from 0.0% to 31.7% in order to consistently meet the instantaneous water quality standard for fecal coliform (Table 4).

Calculated TMDL reductions applicable to each station are shown on Tables 3, 4 and Figure 8. There are no required reductions for station 18-03, 18-11 and 18-14 because existing water quality data demonstrate that the water quality standard is being attained. Each of the three sites meets the relevant water quality standard but are classified as restricted per Shellfish Sanitation Program protocol. Because stations 18-03, 18-11 and 18-14 are not based on documented water quality impairment, a percentage reduction is not needed at this time (0% reduction). Applying the required percent reduction (0%) to each data point in the 2008-2010 dataset also results in the geometric mean criteria being met for all stations (Table 4).

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

Table 4. Geometric mean of data from 2008 through 2010

Station	Geometric Mean Actual Data (2008-2010)	TMDL % Reduction	Geometric Mean with % Reduction Applied
18-03*	5.8	0%	5.8
18-09	11.1	31.7%	7.6
18-10	10.4	9.2%	9.5
18-11**	7.8	0%	7.8
18-14*	6.8	0%	6.8

*Stations form boundary of restricted shellfish harvesting area but do not have elevated fecal coliform bacteria levels and are not considered impaired. Stations will not be assigned further reduction from existing levels.

** While FC bacteria levels at this station are currently acceptable, the station is located within a shellfish area defined as restricted for shellfish harvesting and included on South Carolina's List of Impaired Waters. Because water quality standards are currently attained, station will not be assigned further reduction from existing levels.

Table 5. Components of Chechessee Creek shellfish fecal coliform TMDL

Station	90th %tile of Existing Load (cfu/100ml)	TMDL [1, 2] (cfu/100 ml)	WQ Target (cfu/100 ml)	Margin of Safety (cfu/100ml)	WLA		LA
					Continuous Sources[3] (cfu/100ml)	Non-Continuous [4, 5, 6] Sources (% Reduction)	% Reduction to Meet LA[6]
18-03	20.2	43	40.9	2.1	See Note Below	0%	0%
18-09	59.9	43	40.9	2.1	See Note Below	31.7%	31.7%
18-10	45.0	43	40.9	2.1	See Note Below	9.2%	9.2%
18-11	41.9	43	40.9	2.1	See Note Below	0%	0%
18-14	29.0	43	40.9	2.1	See Note Below	0%	0%

Table Notes:

1. TMDL is expressed as a concentration. If daily average tidal exchange estimates were available, this number could be converted to load in cfu/day by multiplying flow by concentration and a conversion factor.
2. Shellfish WQS = No more than 10% of the samples shall exceed 43cfu/100 ml
3. WLA is expressed as a daily maximum. There are no continuous dischargers at this time. Future continuous discharges are required to meet the prescribed loading for the pollutant of concern. Loadings are developed based upon permitted flow and an allowable permitted maximum concentration of 43/100ml.
4. 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.
5. By implementing the best management practices that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 Permit to address fecal coliform, the SCDOT will comply with this TMDL and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 Permit.
6. Percent reduction applies to existing concentration.

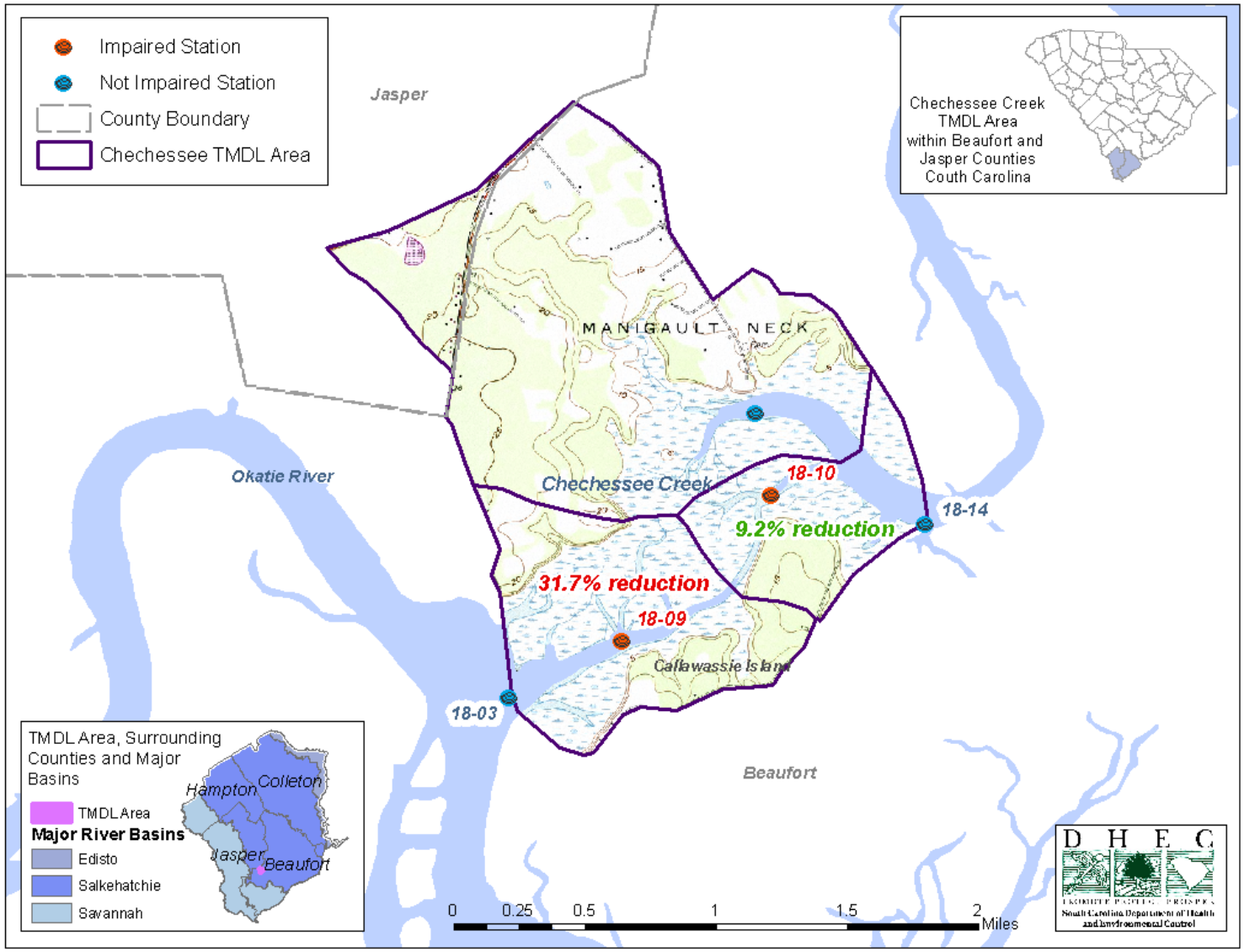

Figure 8. TMDL reductions by each impaired station's drainage area.

6.0 Implementation

The implementation of both point (WLA) and non-point (LA) source components of the TMDL are necessary to bring about the required reductions in FC bacteria loading to Chechessee Creek in order to achieve water quality standards. Using existing authorities and mechanisms, an implementation plan providing information on how point and non point sources of pollution are being abated or may be abated in order to meet water quality standards is provided. Sections 6.1 and 6.2 and their subsections presented below correspond with sections 3.1 and 3.2 and their subsections of the source assessment presented in the TMDL document. As the implementation strategy progresses, DHEC may continue to monitor the effectiveness of implementation measures and evaluate water quality where deemed appropriate.

Point sources are discernible, confined, and discrete conveyances of pollutants to a water body including but not limited to pipes, outfalls, channels, tunnels, conduits, man-made ditches, etc. The Clean Water Act's primary point source control program is the National Pollutant Discharge Elimination System (NPDES). Point sources can be broken down into continuous and non-continuous point sources. Some examples of a continuous point source are wastewater treatment facilities (WWTF) and industrial facilities. Non-continuous point sources are related to stormwater and include municipal separate storm sewer systems (MS4), construction activities, etc. Current and future NPDES discharges in the referenced watershed are required to comply with the load reductions prescribed in the wasteload allocation (WLA).

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

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

Interested parties (local stakeholder groups, universities, local governments, etc.) may be eligible to apply for CWA §319 grants to install BMPs that will implement the LA portion of this TMDL and reduce nonpoint source FC loading to Chechessee Creek. Congress amended the Clean Water Act (CWA) in 1987 to establish the Section 319 Nonpoint Source Management Program. Under Section 319, States receive grant money to support a wide variety of activities including the restoration of impaired waters. TMDL implementation projects are given highest priority for 319 funding. CWA §319 grants are not available for implementation of the WLA component of this TMDL but may be available for the LA component within permitted MS4 jurisdictional

boundaries. Additional resources are provided in Section 7.0 of this TMDL document.. Additional resources are provided in Section 7.0 of this TMDL document.

SC DHEC will work with the agencies in the area to provide nonpoint source education in this watershed and the surrounding watersheds. Local sources for nonpoint source education include Beaufort County Soil and Water Conservation District, Jasper County (serves Beaufort County) Natural Resources Conservation Service, Clemson Extension Service, South Carolina Department of Natural Resources, S.C. Sea Grant Extension Program.

The Department recognizes that **adaptive management/implementation** of these TMDLs might be needed to achieve the water quality standard and we are committed towards targeting the load reductions to improve water quality in Chechessee Creek watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL targets 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 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 are not a substitute for actual NPDES permit conditions.

6.1.1 Continuous Point Sources

Continuous point source WLA reductions are implemented through NPDES permits. The Chechessee Creek is classified as ORW and direct discharges are not permitted. Currently, there are no direct discharges to Chechessee Creek.

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. Discovery and removal of illicit storm drain cross connections is one important element of the storm water NPDES permit. Public nonpoint source pollution education is another. Other permit requirements for implementing WLAs in approved TMDLs will vary across waterbodies, discharges, and pollutant(s) of concern. The allocation within a TMDL can take many different forms – narrative, numeric, specified BMPs – and may be complimented by other special requirements such as monitoring.

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

conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. For SCDOT, exiting and future NPDES MS4 permittees, compliance with terms and conditions of its NPDES permit is effective implementation of the WLA to the MEP. For existing and future NPDES construction and industrial stormwater permittees, compliance with terms and condition of its permit is effective implementation of the WLA. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and are eligible for CWA §319 grants.

The Department 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 websites 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).

During a recent site visit on June 8, 2009, a heavy rain event was observed within Chechessee Creek watershed and runoff from impervious surfaces. Due to the very complex hydrologic nature of Chechessee Creek, it’s classification as ORW, its use as shellfish harvesting waters, it is recommended that measures be taken to minimize the stormwater runoff surrounding Chechessee Creek. Being a saline estuary and input of freshwater as runoff due to precipitation can change the chemistry of Chechessee Creek by causing salinity variances may potentially impact aquatic life. One option is to develop a stormwater collection and reclamation system along major roads with drainage to the receiving waters can be used for none potable purposes. Other options are building wetlands and/or rain gardens for reducing such stormwater runoff. Also, planting vegetative

buffers have been shown to be highly effective for prevention of stormwater runoff. http://www.scdhec.gov/environment/ocrm/pubs/docs/backyard.pdf

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

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

Pollution prevention/good housekeeping is also a key element of stormwater management programs. Generally this requires the MS4 entity to examine and alter their actions to ensure reductions in pollution are occurring. This could also result in a reduction of costs for the MS4 entity. It is recommended that a plan be developed to prevent or reduce pollutant runoff from municipal operations into the storm sewer system and it is encouraged to include employee

training on how to incorporate pollution prevention/good housekeeping techniques. To minimize duplication of effort and conserve resources, the MS4 operator can use training materials that are available from EPA or relevant organizations (USEPA, 2005).

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

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

6.2 Nonpoint Sources

6.2.1 Urban and Suburban Stormwater Runoff

In estuaries, urban runoff is considered the leading cause of impairment. Runoff from urban areas is the results of imperviousness, population and traffic density and all activities connected with urban living (Novotny, 2003). Also, estuaries are saline environments and urban runoff, due to precipitation is fresh water. This fresh water runoff into the estuarine environments causes salinity variances, adversely effecting organisms that are adapted to high salinity. Several studies have shown that salinity fluctuations cause a decrease in biomass of organisms, change in species dominance, reduced growth and survival and other physiological stress. These studies recommend gaining control of salinity fluctuations may help improve estuarine habitats through management of freshwater runoff from urban and suburban environments (Montague & Ley 1993, Mallin et al. 2008). Although there are no required reductions for downstream of station 18-07, it is recommended that measures be taken to reduce nonpoint source runoff in the form of stormwater runoff input to reaches 3, 4, 5 and 6.

Beaufort County has taken steps to reduce the effects of stormwater runoff and these are summarized in Beaufort County Stormwater Management Plan (2006). Based on County's stormwater ordinance, ponds with a positive outfall should be designed so that the post development peak flow rate is less than or equal to peak flow rate for 25-year/24-hour design storms. For ponds with no outfalls (retention and detention ponds), they should be designed to retain 100-year/24-hour design storms. Minimizing surface water runoff directly to the receiving streams may help to improve the water quality in Chechessee Creek.

The Beaufort County Manual for Stormwater Best Management Practices or BC BMP Manual (2008) further requires vegetative strips between wetlands and urban development. In January of 2008, Beaufort County adopted Town of Bluffton's BMPs into the BC BMP Manual and with this

inclusion; the following are required of developers in the County to reduce the amount of post development stormwater runoff:

- Directing of drainage from roofs to adjacent pervious surfaces
- Installing grass swales on lots with appropriate soil types
- Parking lot islands to be sunken rather then raised with curbs
- Commercial parking lots must have at least 50% pervious pavements
- Install disconnected drainage where possible.

The BC BMP Manual also has an overview of structural BMPs that are appropriate for Beaufort County as well as FC removal efficiencies of certain types of BMPs. For further details, please refer to BC BMP Manual (2008).

Subsequent to Beaufort County adopting of the Town of Bluffton's BMPs into the County BMP manual, the Town of Bluffton has more recently adopted the County's stormwater volume control standards. Beaufort County has a number of resources for stormwater volume control measures and other BMPs available. Please visit the following link for additional details: http://www.co.beaufort.sc.us/departments/Engineering-and-Infrastructure/stormwater-management/manuals-and-plans.php.

Potential BMPs for residential, industrial and commercial lots with impervious surfaces for consideration but not limited to are, capturing rain by either using rain barrels (for single family residential units or other small buildings) or a rain water collection system for later use in landscape watering or other none potable uses. Another option would be, when appropriate, constructing rain gardens or wetlands to slow surface water runoff rates from impervious surfaces and to allow for percolation of runoff to recharge ground water. Also, using porous pavements/materials allows runoff due to precipitation percolate hence reducing the runoff rate.

6.2.2 Agricultural Runoff

Agriculture is a complex and large industry with great potential to adversely affect the environment by nonpoint source runoff (Novotny 2003).

Sources of fecal coliform bacteria of nonpoint source origins to the nearby water bodies from agricultural and silvicultural activities are livestock with uncontrolled access to riparian areas, improper manure application, and concentrated or pastured animal operations, etc. Pastureland without proper erosion control measures is over grazed, or when grazing livestock are allowed to approach receiving waters are contributing to nonpoint source pollution. If these are controlled, and with additional BMPs, pollution from these lands can be minimized (Novotny 2003).

There are several agricultural facilities as well as horse barns around Chechessee Creek. During the last site visit on June 8th, horses, cows and a number of dogs were seen on farms on right bank of Chechessee Creek, downstream from US 278 Bridge. Also, during the aerial flight on June 1, 2009, numerous farm animals were seen near Chechessee Creek. Potential sets of BMPs to reduce fecal mater runoff for such facilities may include reviewing the manure application/management systems at these facilities for a better understanding of potential sources for runoff. Installing

vegetative buffers may be helpful for reducing runoff especially in areas that are dominated by hydric soils.

Also, many of the residential communities have horses on their properties. Although these residential areas are not agricultural facilities, they are mentioned in this section. It may be beneficial to review the manure application/management plans of these communities. The runoff from horse fields may be entering the stormwater ponds of these communities and thus concentrated fecal coliform may be unintentionally being released to Chechessee Creek.

Agricultural BMPs can be vegetative, structural or management oriented. When selecting BMPs, it is prudent to keep in mind that nonpoint source related 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.

Fencing livestock (Figure 24) is an effective way for confining the livestock in a certain area where BMPs are deployed; however in certain cases it may not be sufficient for prevention of overland runoff. In the example shown in Figure 25, it may help to deploy additional BMPs such as a vegetative buffer with different growth rates behind the fence of where livestock are kept.

There are several state and federal assistance programs available to agricultural producers, and some of these are described below and electronics links for these programs area available under Section 7 of the TMDL document.

One of the programs that are available through USDA is the Environmental Quality Incentives Program (EQIP). This also is a voluntary conservation program for farmers and ranchers that promote agricultural production and environmental quality as national goals. Eligible participants receive financial and technical help from EQIP to install or implement structural and management related BMPs. Further information is available in Section 7 of this document.

It is recommended that BMPs for all existing agricultural facilities be reviewed for their effectiveness and reduction of runoff.

6.2.3 Failing Septic Systems

Based on the information received from BJW&SA, some of the homes around Chechessee Creek utilizes on site septic systems. Due to the age, lack of maintenance and improper use can cause septic systems to malfunction. Homeowner education about proper maintenance and repairing of their septic systems may help reduce runoff from these treatment systems. Also, encouraging homeowners to have their septic systems inspected and pumped on regular basis is another potential intervention for reducing bacterial runoff/contamination from these systems.

In addition to the resources cited in Section 7 of this document for the implementation of these TMDLs, Clemson Extension has developed a Home-A-Syst handbook that can help urban or rural homeowners reduce sources of NPS pollution from their property. This document guides homeowners through a self-assessment, including information on proper maintenance practices for septic tanks. SCDHEC also employs a nonpoint source educator who can assist with distribution of these tools as well as provide additional BMP information.

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'ts are as follows:

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

Do's:

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

Don'ts:

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

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

6.2.4 Wildlife and Domestic Animals

There are several projects around Chechessee Creek administered by Beaufort County Rural and Critical Land Preservation Program. Some of these properties are zoned for passive recreational purposes. Generally, passive recreation areas are undeveloped spaces and/or environmentally sensitive areas. These areas around Chechessee Creek watershed are important areas for buffering of environmental impacts related to population growth.

In any public places, feeding of or providing food for wild animals including deer, wild ducks, geese, swans and seagulls should be discouraged. By avoiding the feeding of birds, there will be reduced waste accumulating on impervious areas such as on roadsides, walkways, boats, docks and related structures thus helping to avoid these structures from becoming conveyors of fecal matter into the receiving waters due to run-off from precipitation or tides (EPA, 2001).

Maintaining a vegetative buffer around the residential areas will help filter pet waste that may accumulate in gardens and public walkways. For example, in Figure 26 below, a trench is visible

along the fence of a residential unit which flows to a road side ditch. Without any buffers or other BMPs, during rain events, fecal matter may be washed off to the roadside stormwater ditches.

Installation of pet waste collection stations in residential neighborhoods along with dispensing of pet waste bags and bag holders for dog owners are recommended.

There are several other recommendations in Section 7 of this document along with suggestions for public outreach and education.

6.2.5 Marinas, Boating Activities and Structures

Boating related activities have potential to contribute to fecal coliform contamination through potential discharges from installed toilet (MSD) and gray water, and these discharges can contain bacteria. Improperly maintained or malfunctioning MSDs have the potential to leak or discharge untreated sewage. Therefore, it is important to bring attention of boating public to available pumpout facilities near Chechessee Creek. A map of available pumpout facilities can be found at http://www.dnr.sc.gov/marine/vessel/pdf/CoastalBrochureJuly2012.pdf.

Another important factor is outreach and education for boat and dock owners regarding the proper use and maintenance of MSDs, and impact of improper vessel discharges in shellfish harvesting waters. There are pumpout facilities are located on Skull Creek to the west of Hilton Head Island, and on Beaufort River to the northeast of Chechessee Creek (SCDNR, 20012). Marinas are prohibited unless the area is prohibited for shellfish harvesting. Therefore it is prudent to bring awareness to the boating public regarding the locations of available pump out facilities in the nearby vicinity.

Docks can be one of the sources as well as conveyors (as impervious surfaces) for potential fecal coliform contamination. Especially during the boating season, family pets can be also be sources for fecal coliform contamination. Also fishing and shellfishing (such as crabbing) related waste can attract wildlife, especially birds and waste from these types of activities may need to be contained and disposed of properly.

Numerous site visits were conducted during winter months in Chechessee Creek watershed and many types of birds were observed on dock structures (Figure 8). Outreach and education focusing towards private dock owners and boating public may help mitigate some of the sources of fecal coliform. These outreach and education messages can focus on, but not limited to, awareness about impervious surfaces, pet waste collection, responsible fishing and shellfish activities, not providing food for wildlife, etc. Also, installing bird deterrents discourages birds from roosting and depositing feces on hard surfaces and directly into the water (Figure 9).

Figure 9. Birds on dock railings.

Figure 10. Bird deterring plastic coated wires on dock railings.

7.0 Resources

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 Non-Continuous Point Sources

Cities of the Future – Towards Integrated Sustainable Water and Landscape Management (2007). Proceedings of an International Workshop held July 12-14, 2006 in Racine, WI. V. Novotny and P.R. Brown (Eds). IWA Publishing, London, UK. 427pp.

Center for Watershed Protection. Available at: http://www.cwp.org/

Green Highways. Available at: http://www.greenhighways.org/

Interlocking Concrete Pavement Institute. Available at: http://icpi.org/index.cfm

Rain pillows: Rainwater Harvesting from Rooftop Catchments. Available at: http://www.oas.org/usde/publications/Unit/oea59e/ch10.htm

Puget Sound Partnership. Available at: http://www.psp.wa.gov/

DC Greenworks Green Roofs. Available at: http://www.dcgreenworks.org/

Roofscapes, Inc. Taking Green Roofs to the Next Level. Available at: http://www.roofmeadows.com/

Rooftops to Rivers: Green Strategies for Controlling Stormwater and Combined Sewer Overflows. Natural Resources Defense Council. Available at: http://www.nrdc.org/water/pollution/rooftops/contents.asp

Getting In Step Outreach Guide is a program developed by US EPA and is available through Nonpoint Source Outreach Toolbox at: http://www.epa.gov/owow/nps/toolbox/guide.htm

Low Impact Development Center, Inc. Sustainable Design and Water Quality Research. Available at: http://www.lowimpactdevelopment.org/

Featured Products: General Stormwater and Storm Drain Awareness. Available through Nonpoint Source Outreach Toolbox at: http://www.epa.gov/owow/nps/toolbox/generalstormwater.htm

Clemson Extension Storm Drain Stenciling. Available at: http://www.clemson.edu/waterquality/stencil.htm

7.2 General Information for Nonpoint Sources

7.2.1 Pet Waste

Doggie Dooley In-Ground Waste Digester Systems. Available at: http://www.drsfostersmith.com/product/prod_display.cfm?pcatid=570

Pet Care. Available through Nonpoint Source Outreach Toolbox at: http://www.epa.gov/owow/nps/toolbox/petcare.htm

7.2.2 Wildlife

http://www.epa.gov/nps/mmsp/section4.11.pdf

Bird Deterrents:

http://www.boatliftanddock.com/p-325-19-dori-polereg-dock-bird-deterrent.aspx

http://www.hotfoot.com/spring-pd.html

http://www.birdbusters.com/bird_control_products.html

7.2.3 Septic Systems

Septic System Care. Available through Nonpoint Source Outreach Toolbox at: http://www.epa.gov/owow/nps/toolbox/septic.htm

Clemson Extension Home*A*Syst. Available at: http://www.clemson.edu/waterquality/homasys.htm

7.2.4 Agriculture

Animal Feeding Operations – Best Management Practices (BMPs). Available at: http://www.epa.gov/agriculture/anafobmp.html/

Agricultural Management Assistance. Available at: http://www.nrcs.usda.gov/Programs/AMA/

Environmental Quality Incentives Program. Available at: http://www.nrcs.usda.gov/programs/eqip/

7.3 Restoration

South Carolina Oyster Restoration and Enhancement (SCORE). SCORE is a community based restoration program geared towards oyster habitat restoration and monitoring program of the SCDNR. Contact Nancy Hadley or Michael Hodges with SCDNR. More information can be found at: http://score.dnr.sc.gov/

A Practitioners Guide to the Design and Monitoring of Shellfish Restoration Projects. Available at: http://www.nmfs.noaa.gov/habitat/restoration/publications/TNCNOAAshellfish_hotlinks_final.pdf

The Nature Conservancy, the Marine Initiative: Shellfish Conservation and Restoration. Available at: http://www.nature.org/initiatives/marine/files/shellfish_fs_05.pdf

Shellfish Reefs at Risk: Recommendations for Conservation, Restoration and Management. Available at: http://www.nature.org/initiatives/marine/shellfish/help/

7.4 Outreach and Education

Nonpoint Source Runoff Pollution SCDHEC http://www.scdhec.gov/environment/water/npspage.htm

Stormwater drain tagging

Scoop the Poop campaign

Buffers: http://www.scdhec.gov/environment/ocrm/pubs/docs/backyard.pdf

Docks: http://www.scdhec.gov/environment/ocrm/pubs/docs/Dock_Building.pdf

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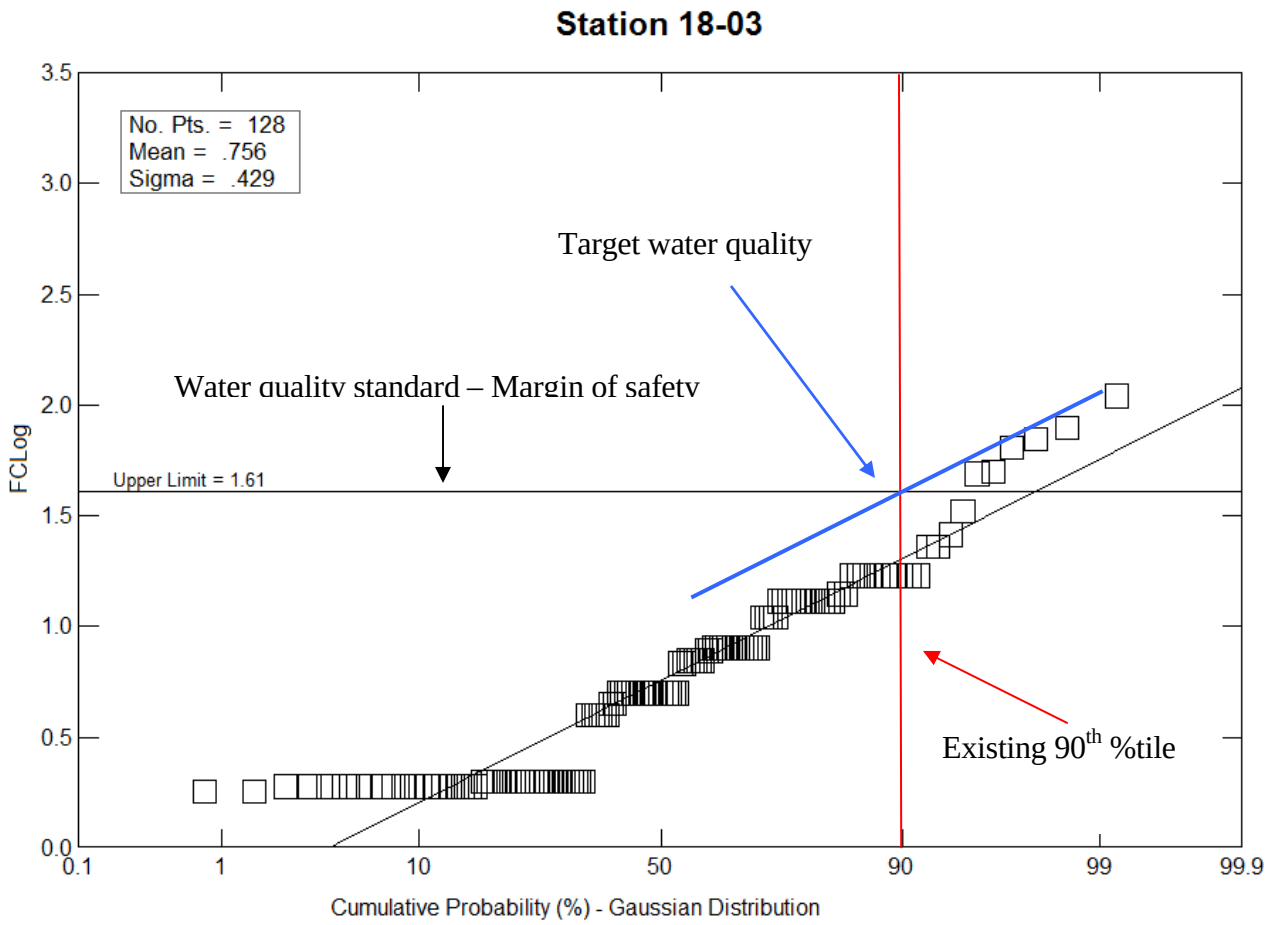
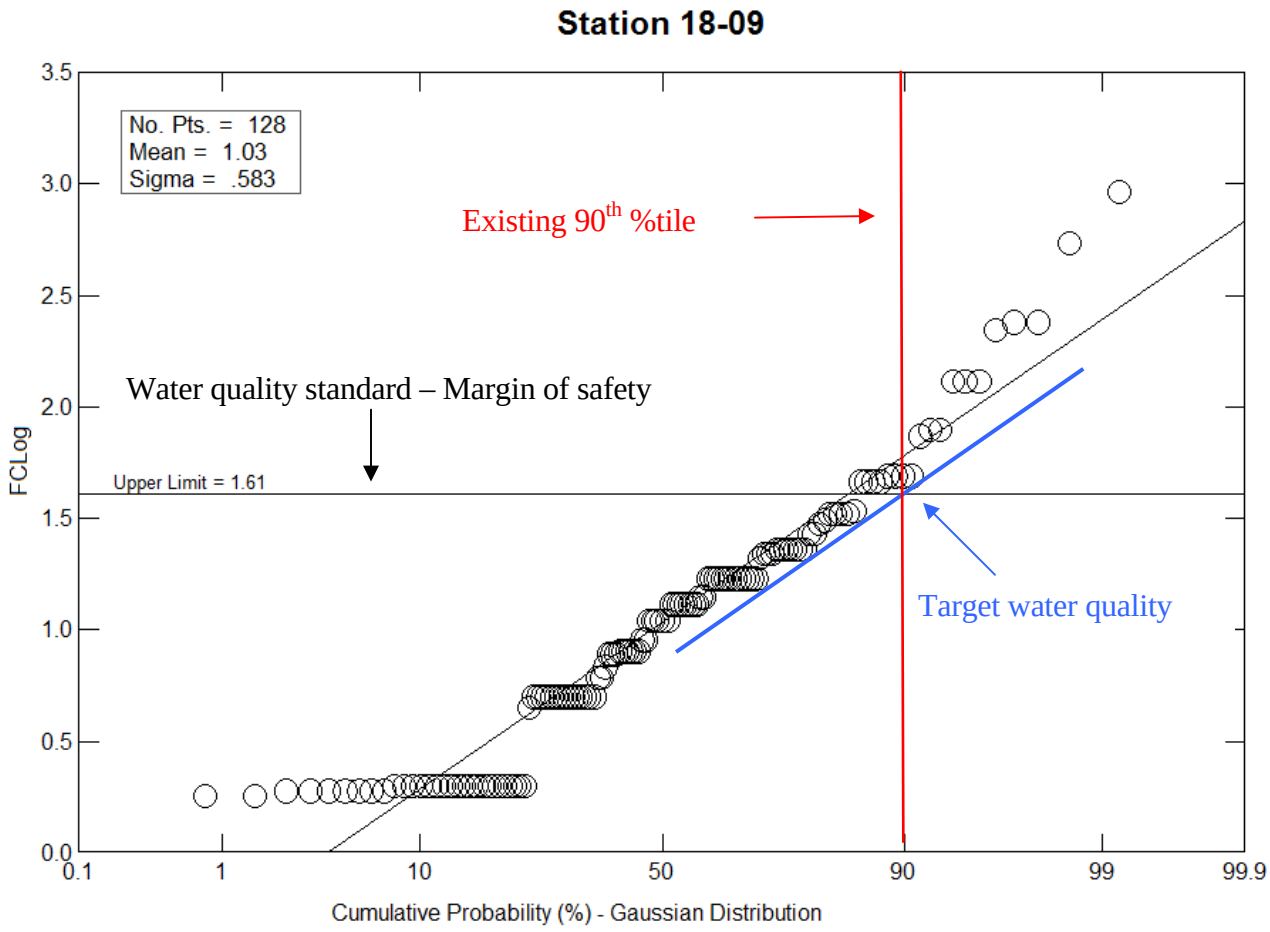
Appendix A

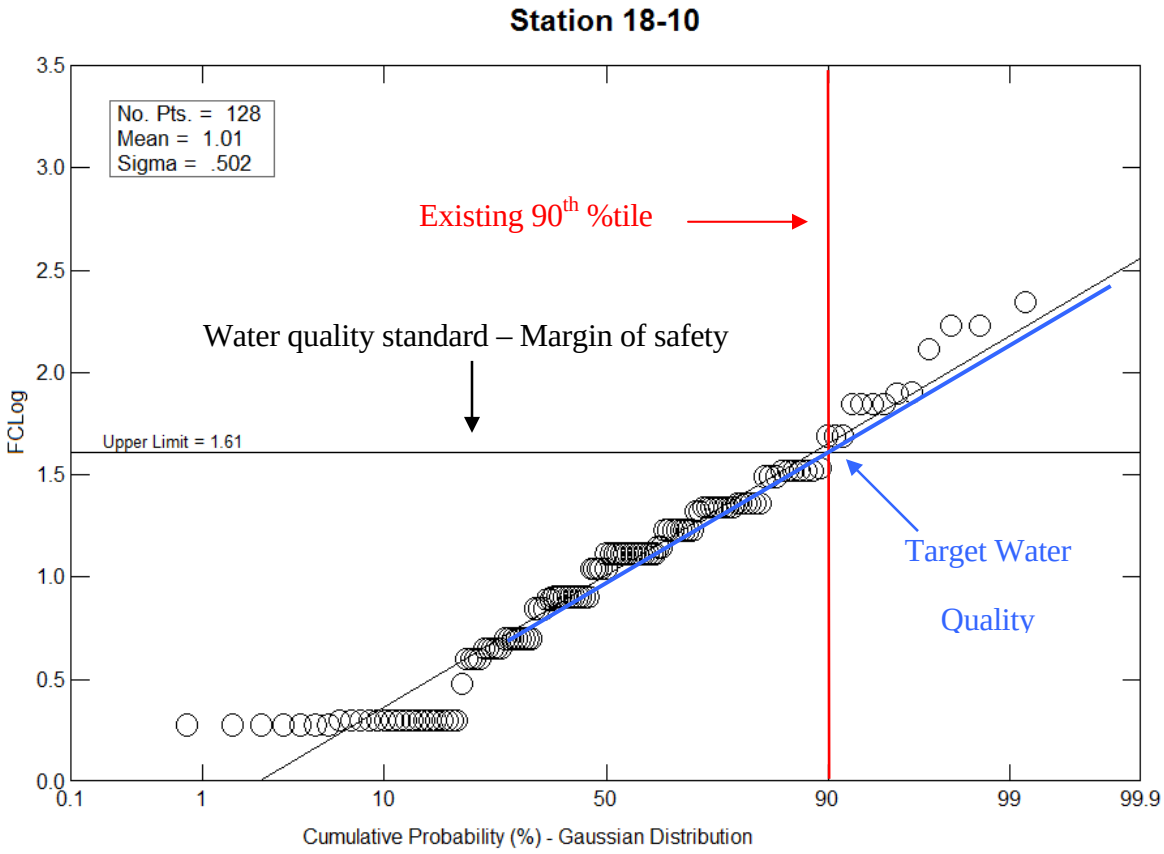
Cumulative Probability Graphs



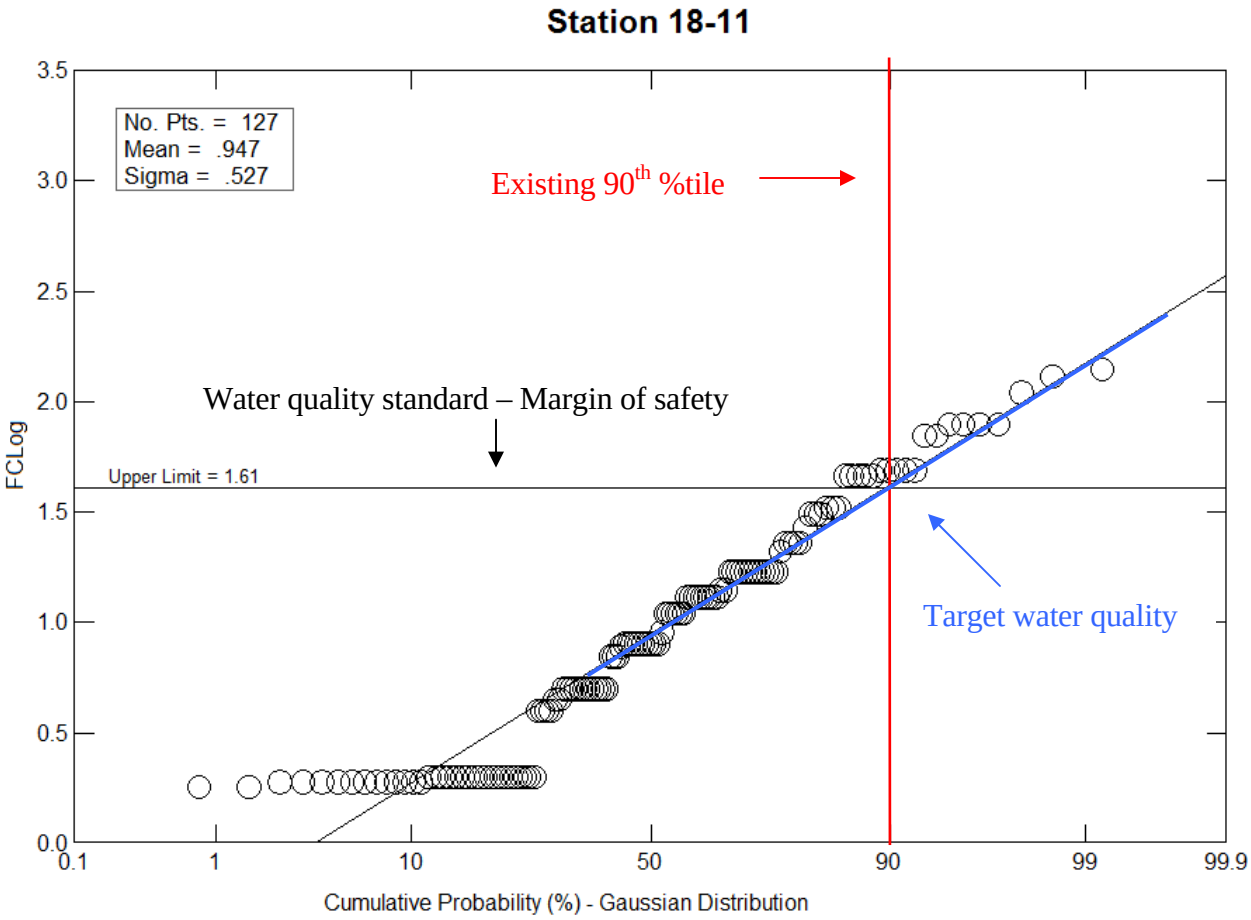
Station 18-03 Cumulative probability graph



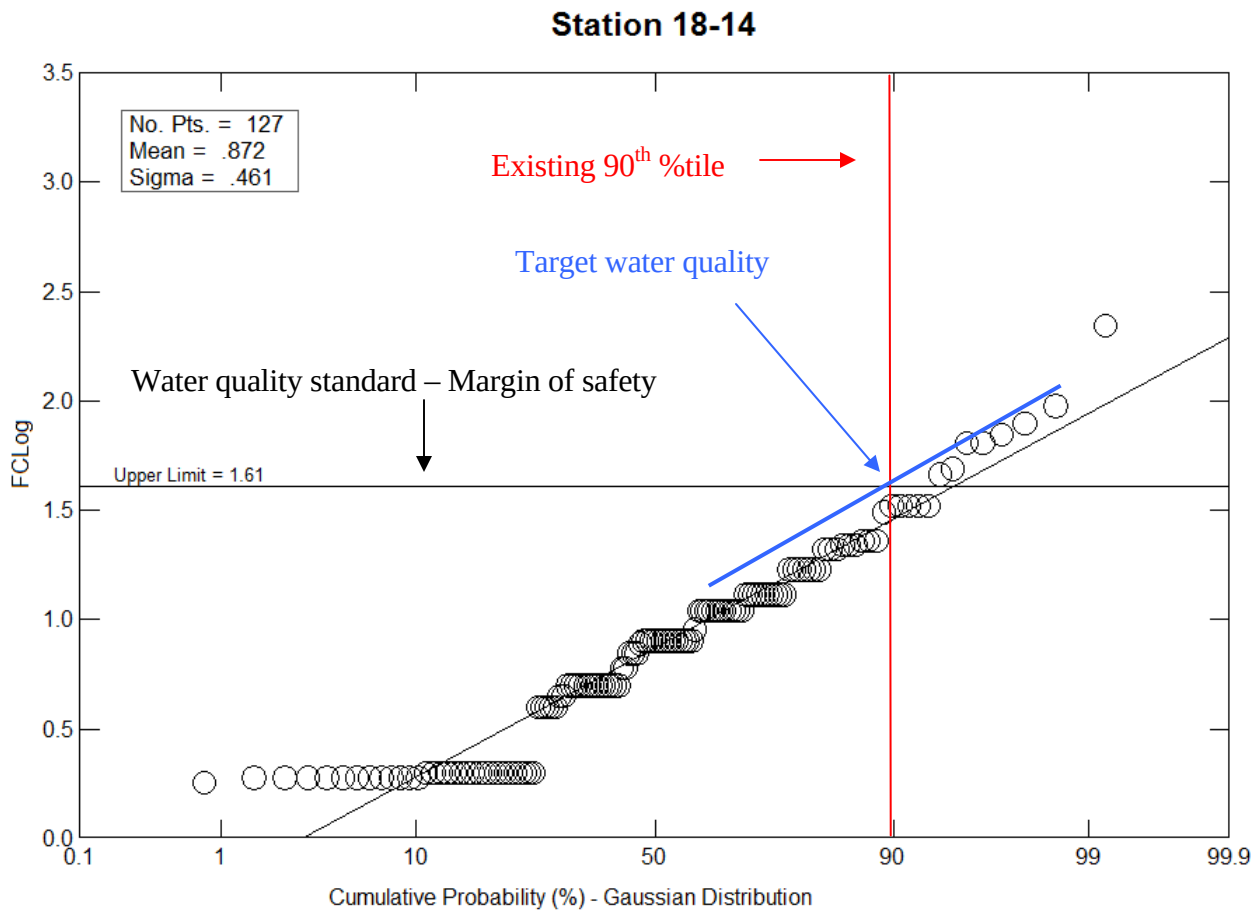
Station 18-09 Cumulative probability graph.



Station 18-10 Cumulative probability graph.



Station 18-11 Cumulative probability graph.



Station 18-14 Cumulative probability graph.

Appendix B

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 (a.k.a. stacking sheds)
  - Strip cropping
  - Prescribed grazing
  - Critical Area Planting
  - Runoff Management System
  - Waste Management System
  - Solids Separation Basin
  - Riparian Buffers

Appendix C

Shellfish Monitoring Data

Station	Date	FC/MPN	FC Log10
18-03	1/18/2000	2	0.30103
18-03	2/7/2000	2	0.30103
18-03	3/20/2000	2	0.30103
18-03	4/24/2000	2	0.30103
18-03	5/22/2000	5	0.69897
18-03	6/14/2000	7	0.845098
18-03	7/11/2000	2	0.30103
18-03	8/7/2000	4	0.60206
18-03	9/5/2000	2	0.30103
18-03	10/9/2000	4	0.60206
18-03	11/14/2000	2	0.30103
18-03	12/18/2000	2	0.30103
18-03	1/23/2001	1.9	0.278754
18-03	2/21/2001	5	0.69897
18-03	3/6/2001	8	0.90309
18-03	4/3/2001	5	0.69897
18-03	5/8/2001	2	0.30103
18-03	6/26/2001	1.9	0.278754
18-03	7/25/2001	1.9	0.278754
18-03	8/6/2001	1.9	0.278754
18-03	9/11/2001	1.9	0.278754
18-03	10/17/2001	4	0.60206
18-03	11/12/2001	7	0.845098
18-03	12/4/2001	2	0.30103
18-03	1/22/2002	1.9	0.278754
18-03	2/13/2002	2	0.30103
18-03	3/11/2002	2	0.30103
18-03	4/1/2002	8	0.90309
18-03	5/7/2002	2	0.30103
18-03	6/17/2002	17	1.230449
18-03	7/9/2002	2	0.30103
18-03	8/12/2002	5	0.69897
18-03	9/16/2002	23	1.361728
18-03	10/14/2002	1.9	0.278754
18-03	11/14/2002	79	1.897627
18-03	12/3/2002	1.9	0.278754
18-03	1/13/2003	14	1.146128
18-03	2/3/2003	1.9	0.278754
18-03	3/19/2003	7	0.845098
18-03	4/14/2003	5	0.69897
18-03	5/13/2003	13	1.113943
18-03	6/4/2003	14	1.146128
18-03	7/16/2003	2	0.30103

18-03	8/19/2003	2	0.30103
18-03	9/8/2003	5	0.69897
18-03	10/13/2003	8	0.90309
18-03	11/3/2003	13	1.113943
18-03	12/15/2003	17	1.230449
18-03	1/30/2004	8	0.90309
18-03	2/23/2004	5	0.69897
18-03	3/2/2004	5	0.69897
18-03	4/5/2004	8	0.90309
18-03	5/12/2004	13	1.113943
18-03	6/8/2004	11	1.041393
18-03	7/12/2004	1.9	0.278754
18-03	8/17/2004	11	1.041393
18-03	9/14/2004	8	0.90309
18-03	10/11/2004	1.9	0.278754
18-03	11/3/2004	8	0.90309
18-03	12/15/2004	13	1.113943
18-03	1/11/2005	33	1.518514
18-03	2/1/2005	5	0.69897
18-03	3/14/2005	17	1.230449
18-03	4/6/2005	2	0.30103
18-03	5/11/2005	13	1.113943
18-03	6/15/2005	110	2.041393
18-03	7/11/2005	13	1.113943
18-03	8/10/2005	70	1.845098
18-03	9/21/2005	5	0.69897
18-03	10/19/2005	1.9	0.278754
18-03	11/8/2005	11	1.041393
18-03	12/12/2005	8	0.90309
18-03	1/23/2006	23	1.361728
18-03	2/15/2006	2	0.30103
18-03	3/14/2006	13	1.113943
18-03	4/18/2006	17	1.230449
18-03	5/1/2006	8	0.90309
18-03	6/19/2006	64	1.80618
18-03	7/25/2006	5	0.69897
18-03	8/15/2006	13	1.113943
18-03	9/6/2006	50	1.69897
18-03	10/17/2006	13	1.113943
18-03	11/28/2006	8	0.90309
18-03	12/14/2006	7	0.845098
18-03	1/16/2007	26	1.414973
18-03	2/20/2007	5	0.69897
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18-03	5/1/2007	4	0.60206

18-03	7/9/2007	2	0.30103
18-03	8/20/2007	1.9	0.278754
18-03	9/5/2007	5	0.69897
18-03	10/16/2007	5	0.69897
18-03	11/13/2007	1.9	0.278754
18-03	12/4/2007	8	0.90309
18-03	1/2/2008	49	1.690196
18-03	2/25/2008	11	1.041393
18-03	3/18/2008	5	0.69897
18-03	4/15/2008	17	1.230449
18-03	6/25/2008	17	1.230449
18-03	7/15/2008	2	0.30103
18-03	8/13/2008	13	1.113943
18-03	9/16/2008	4	0.60206
18-03	10/8/2008	17	1.230449
18-03	11/6/2008	7	0.845098
18-03	12/17/2008	5	0.69897
18-03	1/14/2009	5	0.69897
18-03	2/2/2009	1.9	0.278754
18-03	3/17/2009	17	1.230449
18-03	4/21/2009	17	1.230449
18-03	5/5/2009	13	1.113943
18-03	6/17/2009	2	0.30103
18-03	7/7/2009	1.9	0.278754
18-03	8/19/2009	1.8	0.255273
18-03	9/15/2009	4	0.60206
18-03	10/20/2009	1.9	0.278754
18-03	11/4/2009	6.8	0.832509
18-03	1/12/2010	1.9	0.278754
18-03	3/9/2010	7.8	0.892095
18-03	4/21/2010	13	1.113943
18-03	5/24/2010	17	1.230449
18-03	6/22/2010	6.8	0.832509
18-03	7/12/2010	2	0.30103
18-03	8/4/2010	1.8	0.255273
18-03	9/20/2010	2	0.30103
18-03	10/12/2010	7.8	0.892095
18-03	11/22/2010	4.5	0.653213
18-03	12/6/2010	4.5	0.653213
18-09	1/18/2000	11	1.041393
18-09	2/7/2000	1.9	0.278754
18-09	3/20/2000	8	0.90309
18-09	4/24/2000	2	0.30103
18-09	5/22/2000	49	1.690196
18-09	6/14/2000	17	1.230449
18-09	7/11/2000	13	1.113943

18-09	8/7/2000	2	0.30103
18-09	9/5/2000	2	0.30103
18-09	10/9/2000	2	0.30103
18-09	11/14/2000	13	1.113943
18-09	12/18/2000	1.9	0.278754
18-09	1/23/2001	5	0.69897
18-09	2/21/2001	5	0.69897
18-09	3/6/2001	5	0.69897
18-09	4/3/2001	11	1.041393
18-09	5/8/2001	17	1.230449
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18-09	7/25/2001	11	1.041393
18-09	8/6/2001	2	0.30103
18-09	9/11/2001	2	0.30103
18-09	10/17/2001	2	0.30103
18-09	11/12/2001	2	0.30103
18-09	12/4/2001	1.9	0.278754
18-09	1/22/2002	1.9	0.278754
18-09	2/13/2002	2	0.30103
18-09	3/11/2002	5	0.69897
18-09	4/1/2002	23	1.361728
18-09	5/7/2002	5	0.69897
18-09	6/17/2002	17	1.230449
18-09	7/9/2002	2	0.30103
18-09	8/12/2002	8	0.90309
18-09	9/16/2002	23	1.361728
18-09	10/14/2002	8	0.90309
18-09	11/14/2002	540	2.732394
18-09	12/3/2002	2	0.30103
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18-09	2/3/2003	1.9	0.278754
18-09	3/19/2003	5	0.69897
18-09	4/14/2003	9	0.954243
18-09	5/13/2003	8	0.90309
18-09	6/4/2003	130	2.113943
18-09	7/16/2003	5	0.69897
18-09	8/19/2003	46	1.662758
18-09	9/8/2003	13	1.113943
18-09	10/13/2003	22	1.342423
18-09	11/3/2003	22	1.342423
18-09	12/15/2003	79	1.897627
18-09	1/30/2004	1.9	0.278754
18-09	2/23/2004	2	0.30103
18-09	3/2/2004	240	2.380211
18-09	4/5/2004	13	1.113943
18-09	5/12/2004	130	2.113943

18-09	6/8/2004	31	1.491362
18-09	7/12/2004	8	0.90309
18-09	8/17/2004	17	1.230449
18-09	9/14/2004	8	0.90309
18-09	10/11/2004	2	0.30103
18-09	11/3/2004	33	1.518514
18-09	12/15/2004	2	0.30103
18-09	1/11/2005	17	1.230449
18-09	2/1/2005	2	0.30103
18-09	3/14/2005	5	0.69897
18-09	4/6/2005	23	1.361728
18-09	5/11/2005	13	1.113943
18-09	6/15/2005	240	2.380211
18-09	7/11/2005	5	0.69897
18-09	8/10/2005	46	1.662758
18-09	9/21/2005	5	0.69897
18-09	10/19/2005	23	1.361728
18-09	11/8/2005	33	1.518514
18-09	12/12/2005	49	1.690196
18-09	1/23/2006	5	0.69897
18-09	2/15/2006	13	1.113943
18-09	3/14/2006	9	0.954243
18-09	4/18/2006	17	1.230449
18-09	5/1/2006	23	1.361728
18-09	6/19/2006	33	1.518514
18-09	7/25/2006	17	1.230449
18-09	8/15/2006	11	1.041393
18-09	9/6/2006	30	1.477121
18-09	10/17/2006	130	2.113943
18-09	11/28/2006	2	0.30103
18-09	12/14/2006	27	1.431364
18-09	1/16/2007	920	2.963788
18-09	2/20/2007	2	0.30103
18-09	3/12/2007	79	1.897627
18-09	4/19/2007	17	1.230449
18-09	5/1/2007	2	0.30103
18-09	7/9/2007	23	1.361728
18-09	8/20/2007	49	1.690196
18-09	9/5/2007	22	1.342423
18-09	10/16/2007	27	1.431364
18-09	11/13/2007	5	0.69897
18-09	12/4/2007	17	1.230449
18-09	1/2/2008	5	0.69897
18-09	2/25/2008	11	1.041393
18-09	3/18/2008	33	1.518514
18-09	4/15/2008	21	1.322219

18-09	6/25/2008	46	1.662758
18-09	7/15/2008	1.9	0.278754
18-09	8/13/2008	46	1.662758
18-09	9/16/2008	5	0.69897
18-09	10/8/2008	17	1.230449
18-09	11/6/2008	17	1.230449
18-09	12/17/2008	14	1.146128
18-09	1/14/2009	5	0.69897
18-09	2/2/2009	14	1.146128
18-09	3/17/2009	74	1.869232
18-09	4/21/2009	34	1.531479
18-09	5/5/2009	7.8	0.892095
18-09	6/17/2009	7.8	0.892095
18-09	7/7/2009	4.5	0.653213
18-09	8/19/2009	7.8	0.892095
18-09	9/15/2009	6.1	0.78533
18-09	10/20/2009	17	1.230449
18-09	11/4/2009	11	1.041393
18-09	1/12/2010	2	0.30103
18-09	3/9/2010	220	2.342423
18-09	4/21/2010	49	1.690196
18-09	5/24/2010	13	1.113943
18-09	6/22/2010	6.8	0.832509
18-09	7/12/2010	6.1	0.78533
18-09	8/4/2010	13	1.113943
18-09	9/20/2010	1.8	0.255273
18-09	10/12/2010	23	1.361728
18-09	11/22/2010	1.8	0.255273
18-09	12/6/2010	2	0.30103
18-10	1/18/2000	8	0.90309
18-10	2/7/2000	1.9	0.278754
18-10	3/20/2000	23	1.361728
18-10	4/24/2000	13	1.113943
18-10	5/22/2000	17	1.230449
18-10	6/14/2000	1.9	0.278754
18-10	7/11/2000	2	0.30103
18-10	8/7/2000	7	0.845098
18-10	9/5/2000	22	1.342423
18-10	10/9/2000	2	0.30103
18-10	11/14/2000	2	0.30103
18-10	12/18/2000	2	0.30103
18-10	1/23/2001	4	0.60206
18-10	2/21/2001	4	0.60206
18-10	3/6/2001	4	0.60206
18-10	4/3/2001	13	1.113943
18-10	5/8/2001	23	1.361728

18-10	6/26/2001	220	2.342423
18-10	7/25/2001	2	0.30103
18-10	8/6/2001	2	0.30103
18-10	9/11/2001	11	1.041393
18-10	10/17/2001	2	0.30103
18-10	11/12/2001	1.9	0.278754
18-10	12/4/2001	1.9	0.278754
18-10	1/22/2002	2	0.30103
18-10	2/13/2002	2	0.30103
18-10	3/11/2002	2	0.30103
18-10	4/1/2002	130	2.113943
18-10	5/7/2002	70	1.845098
18-10	6/17/2002	23	1.361728
18-10	7/9/2002	2	0.30103
18-10	8/12/2002	13	1.113943
18-10	9/16/2002	17	1.230449
18-10	10/14/2002	8	0.90309
18-10	11/14/2002	49	1.690196
18-10	12/3/2002	1.9	0.278754
18-10	1/13/2003	14	1.146128
18-10	2/3/2003	2	0.30103
18-10	3/19/2003	5	0.69897
18-10	4/14/2003	8	0.90309
18-10	5/13/2003	8	0.90309
18-10	6/4/2003	70	1.845098
18-10	7/16/2003	33	1.518514
18-10	8/19/2003	13	1.113943
18-10	9/8/2003	17	1.230449
18-10	10/13/2003	23	1.361728
18-10	11/3/2003	13	1.113943
18-10	12/15/2003	33	1.518514
18-10	1/30/2004	2	0.30103
18-10	2/23/2004	8	0.90309
18-10	3/2/2004	13	1.113943
18-10	4/5/2004	22	1.342423
18-10	5/12/2004	22	1.342423
18-10	6/8/2004	8	0.90309
18-10	7/12/2004	11	1.041393
18-10	8/17/2004	11	1.041393
18-10	9/14/2004	13	1.113943
18-10	10/11/2004	5	0.69897
18-10	11/3/2004	23	1.361728
18-10	12/15/2004	1.9	0.278754
18-10	1/11/2005	17	1.230449
18-10	2/1/2005	7	0.845098
18-10	3/14/2005	8	0.90309

18-10	4/6/2005	5	0.69897
18-10	5/11/2005	17	1.230449
18-10	6/15/2005	170	2.230449
18-10	7/11/2005	5	0.69897
18-10	8/10/2005	70	1.845098
18-10	9/21/2005	8	0.90309
18-10	10/19/2005	13	1.113943
18-10	11/8/2005	33	1.518514
18-10	12/12/2005	5	0.69897
18-10	1/23/2006	49	1.690196
18-10	2/15/2006	2	0.30103
18-10	3/14/2006	13	1.113943
18-10	4/18/2006	13	1.113943
18-10	5/1/2006	79	1.897627
18-10	6/19/2006	22	1.342423
18-10	7/25/2006	8	0.90309
18-10	8/15/2006	33	1.518514
18-10	9/6/2006	80	1.90309
18-10	10/17/2006	33	1.518514
18-10	11/28/2006	17	1.230449
18-10	12/14/2006	11	1.041393
18-10	1/16/2007	33	1.518514
18-10	2/20/2007	5	0.69897
18-10	3/12/2007	22	1.342423
18-10	4/19/2007	7	0.845098
18-10	5/1/2007	8	0.90309
18-10	7/9/2007	21	1.322219
18-10	8/20/2007	22	1.342423
18-10	9/5/2007	5	0.69897
18-10	10/16/2007	17	1.230449
18-10	11/13/2007	5	0.69897
18-10	12/4/2007	11	1.041393
18-10	1/2/2008	70	1.845098
18-10	2/25/2008	17	1.230449
18-10	3/18/2008	21	1.322219
18-10	4/15/2008	170	2.230449
18-10	6/25/2008	13	1.113943
18-10	7/15/2008	8	0.90309
18-10	8/13/2008	31	1.491362
18-10	9/16/2008	14	1.146128
18-10	10/8/2008	31	1.491362
18-10	11/6/2008	23	1.361728
18-10	12/17/2008	1.9	0.278754
18-10	1/14/2009	13	1.113943
18-10	2/2/2009	2	0.30103
18-10	3/17/2009	31	1.491362

18-10	4/21/2009	34	1.531479
18-10	5/5/2009	22	1.342423
18-10	6/17/2009	7.8	0.892095
18-10	7/7/2009	2	0.30103
18-10	8/19/2009	4.5	0.653213
18-10	9/15/2009	4.5	0.653213
18-10	10/20/2009	13	1.113943
18-10	11/4/2009	2	0.30103
18-10	1/12/2010	4.5	0.653213
18-10	3/9/2010	7.8	0.892095
18-10	4/21/2010	22	1.342423
18-10	5/24/2010	49	1.690196
18-10	6/22/2010	4.5	0.653213
18-10	7/12/2010	4	0.60206
18-10	8/4/2010	4.5	0.653213
18-10	9/20/2010	13	1.113943
18-10	10/12/2010	13	1.113943
18-10	11/22/2010	2	0.30103
18-10	12/6/2010	3	0.477121
18-11	1/18/2000	1.9	0.278754
18-11	2/7/2000	1.9	0.278754
18-11	3/20/2000	2	0.30103
18-11	4/24/2000	7	0.845098
18-11	5/22/2000	11	1.041393
18-11	6/14/2000	2	0.30103
18-11	7/11/2000	2	0.30103
18-11	8/7/2000	70	1.845098
18-11	9/5/2000	46	1.662758
18-11	10/9/2000	5	0.69897
18-11	11/14/2000	5	0.69897
18-11	12/18/2000	2	0.30103
18-11	1/23/2001	5	0.69897
18-11	2/21/2001	1.9	0.278754
18-11	3/6/2001	1.9	0.278754
18-11	4/3/2001	2	0.30103
18-11	5/8/2001	11	1.041393
18-11	6/26/2001	79	1.897627
18-11	7/25/2001	23	1.361728
18-11	8/6/2001	1.9	0.278754
18-11	9/11/2001	17	1.230449
18-11	11/12/2001	5	0.69897
18-11	12/4/2001	2	0.30103
18-11	1/22/2002	1.9	0.278754
18-11	2/13/2002	1.9	0.278754
18-11	3/11/2002	2	0.30103
18-11	4/1/2002	17	1.230449

18-11	5/7/2002	1.9	0.278754
18-11	6/17/2002	2	0.30103
18-11	7/9/2002	2	0.30103
18-11	8/12/2002	13	1.113943
18-11	9/16/2002	13	1.113943
18-11	10/14/2002	8	0.90309
18-11	11/14/2002	130	2.113943
18-11	12/3/2002	1.9	0.278754
18-11	1/13/2003	2	0.30103
18-11	2/3/2003	8	0.90309
18-11	3/19/2003	11	1.041393
18-11	4/14/2003	1.9	0.278754
18-11	5/13/2003	5	0.69897
18-11	6/4/2003	79	1.897627
18-11	7/16/2003	5	0.69897
18-11	8/19/2003	49	1.690196
18-11	9/8/2003	31	1.491362
18-11	10/13/2003	17	1.230449
18-11	11/3/2003	11	1.041393
18-11	12/15/2003	13	1.113943
18-11	1/30/2004	1.9	0.278754
18-11	2/23/2004	8	0.90309
18-11	3/2/2004	33	1.518514
18-11	4/5/2004	33	1.518514
18-11	5/12/2004	33	1.518514
18-11	6/8/2004	79	1.897627
18-11	7/12/2004	31	1.491362
18-11	8/17/2004	2	0.30103
18-11	9/14/2004	8	0.90309
18-11	10/11/2004	8	0.90309
18-11	11/3/2004	46	1.662758
18-11	12/15/2004	5	0.69897
18-11	1/11/2005	14	1.146128
18-11	2/1/2005	5	0.69897
18-11	3/14/2005	5	0.69897
18-11	4/6/2005	2	0.30103
18-11	5/11/2005	17	1.230449
18-11	6/15/2005	49	1.690196
18-11	7/11/2005	5	0.69897
18-11	8/10/2005	49	1.690196
18-11	9/21/2005	17	1.230449
18-11	10/19/2005	13	1.113943
18-11	11/8/2005	140	2.146128
18-11	12/12/2005	17	1.230449
18-11	1/23/2006	21	1.322219
18-11	2/15/2006	5	0.69897

18-11	3/14/2006	17	1.230449
18-11	4/18/2006	46	1.662758
18-11	5/1/2006	27	1.431364
18-11	6/19/2006	13	1.113943
18-11	7/25/2006	2	0.30103
18-11	8/15/2006	17	1.230449
18-11	9/6/2006	79	1.897627
18-11	10/17/2006	17	1.230449
18-11	11/28/2006	14	1.146128
18-11	12/14/2006	23	1.361728
18-11	1/16/2007	13	1.113943
18-11	2/20/2007	2	0.30103
18-11	3/12/2007	17	1.230449
18-11	4/19/2007	9	0.954243
18-11	5/1/2007	2	0.30103
18-11	7/9/2007	4	0.60206
18-11	8/20/2007	23	1.361728
18-11	9/5/2007	7	0.845098
18-11	10/16/2007	17	1.230449
18-11	11/13/2007	8	0.90309
18-11	12/4/2007	70	1.845098
18-11	1/2/2008	13	1.113943
18-11	2/25/2008	49	1.690196
18-11	3/18/2008	46	1.662758
18-11	4/15/2008	8	0.90309
18-11	6/25/2008	8	0.90309
18-11	7/15/2008	8	0.90309
18-11	8/13/2008	11	1.041393
18-11	9/16/2008	5	0.69897
18-11	10/8/2008	23	1.361728
18-11	11/6/2008	49	1.690196
18-11	12/17/2008	2	0.30103
18-11	1/14/2009	13	1.113943
18-11	2/2/2009	8	0.90309
18-11	3/17/2009	31	1.491362
18-11	4/21/2009	7	0.845098
18-11	5/5/2009	13	1.113943
18-11	6/17/2009	46	1.662758
18-11	7/7/2009	2	0.30103
18-11	8/19/2009	4	0.60206
18-11	9/15/2009	4.5	0.653213
18-11	10/20/2009	4	0.60206
18-11	11/4/2009	7.8	0.892095
18-11	1/12/2010	1.9	0.278754
18-11	3/9/2010	11	1.041393
18-11	4/21/2010	17	1.230449

18-11	5/24/2010	110	2.041393
18-11	6/22/2010	2	0.30103
18-11	7/12/2010	4.5	0.653213
18-11	8/4/2010	1.8	0.255273
18-11	9/20/2010	2	0.30103
18-11	10/12/2010	4	0.60206
18-11	11/22/2010	2	0.30103
18-11	12/6/2010	1.8	0.255273
18-14	1/18/2000	2	0.30103
18-14	2/7/2000	1.9	0.278754
18-14	3/20/2000	5	0.69897
18-14	4/24/2000	23	1.361728
18-14	5/22/2000	33	1.518514
18-14	6/14/2000	2	0.30103
18-14	7/11/2000	2	0.30103
18-14	8/7/2000	8	0.90309
18-14	9/5/2000	8	0.90309
18-14	10/9/2000	2	0.30103
18-14	11/14/2000	5	0.69897
18-14	12/18/2000	5	0.69897
18-14	1/23/2001	5	0.69897
18-14	2/21/2001	1.9	0.278754
18-14	3/6/2001	4	0.60206
18-14	4/3/2001	13	1.113943
18-14	5/8/2001	8	0.90309
18-14	6/26/2001	4	0.60206
18-14	7/25/2001	2	0.30103
18-14	8/6/2001	1.9	0.278754
18-14	9/11/2001	33	1.518514
18-14	11/12/2001	1.9	0.278754
18-14	12/5/2001	11	1.041393
18-14	1/22/2002	2	0.30103
18-14	2/13/2002	1.9	0.278754
18-14	3/11/2002	2	0.30103
18-14	4/1/2002	17	1.230449
18-14	5/7/2002	17	1.230449
18-14	6/17/2002	13	1.113943
18-14	7/9/2002	1.9	0.278754
18-14	8/12/2002	1.9	0.278754
18-14	9/16/2002	5	0.69897
18-14	10/14/2002	13	1.113943
18-14	11/14/2002	49	1.690196
18-14	12/3/2002	1.9	0.278754
18-14	1/13/2003	11	1.041393
18-14	2/3/2003	1.9	0.278754
18-14	3/19/2003	5	0.69897

18-14	4/14/2003	2	0.30103
18-14	5/13/2003	8	0.90309
18-14	6/4/2003	33	1.518514
18-14	7/16/2003	22	1.342423
18-14	8/19/2003	21	1.322219
18-14	9/8/2003	2	0.30103
18-14	10/13/2003	22	1.342423
18-14	11/3/2003	11	1.041393
18-14	12/15/2003	17	1.230449
18-14	1/30/2004	2	0.30103
18-14	2/23/2004	5	0.69897
18-14	3/2/2004	46	1.662758
18-14	4/5/2004	13	1.113943
18-14	5/12/2004	95	1.977724
18-14	6/8/2004	11	1.041393
18-14	7/12/2004	13	1.113943
18-14	8/17/2004	8	0.90309
18-14	9/14/2004	4	0.60206
18-14	10/11/2004	2	0.30103
18-14	11/3/2004	21	1.322219
18-14	12/15/2004	2	0.30103
18-14	1/11/2005	13	1.113943
18-14	2/1/2005	1.9	0.278754
18-14	3/14/2005	5	0.69897
18-14	4/6/2005	11	1.041393
18-14	5/11/2005	23	1.361728
18-14	6/15/2005	79	1.897627
18-14	7/11/2005	5	0.69897
18-14	8/10/2005	17	1.230449
18-14	9/21/2005	23	1.361728
18-14	10/19/2005	8	0.90309
18-14	11/8/2005	17	1.230449
18-14	12/12/2005	11	1.041393
18-14	1/23/2006	21	1.322219
18-14	2/15/2006	5	0.69897
18-14	3/14/2006	6	0.778151
18-14	4/18/2006	8	0.90309
18-14	5/1/2006	13	1.113943
18-14	6/19/2006	5	0.69897
18-14	7/25/2006	7	0.845098
18-14	8/15/2006	11	1.041393
18-14	9/6/2006	220	2.342423
18-14	10/17/2006	31	1.491362
18-14	11/28/2006	5	0.69897
18-14	12/14/2006	33	1.518514

18-14	1/16/2007	64	1.80618
18-14	2/20/2007	5	0.69897
18-14	3/12/2007	8	0.90309
18-14	4/19/2007	6	0.778151
18-14	5/1/2007	1.9	0.278754
18-14	7/9/2007	13	1.113943
18-14	8/20/2007	4	0.60206
18-14	9/5/2007	8	0.90309
18-14	10/16/2007	8	0.90309
18-14	11/13/2007	4	0.60206
18-14	12/4/2007	8	0.90309
18-14	1/2/2008	8	0.90309
18-14	2/25/2008	17	1.230449
18-14	3/18/2008	8	0.90309
18-14	4/15/2008	7	0.845098
18-14	6/25/2008	2	0.30103
18-14	7/15/2008	7	0.845098
18-14	8/13/2008	2	0.30103
18-14	9/16/2008	2	0.30103
18-14	10/8/2008	5	0.69897
18-14	11/6/2008	17	1.230449
18-14	12/17/2008	9	0.954243
18-14	1/14/2009	11	1.041393
18-14	2/2/2009	11	1.041393
18-14	3/17/2009	33	1.518514
18-14	4/21/2009	8	0.90309
18-14	5/5/2009	11	1.041393
18-14	6/17/2009	22	1.342423
18-14	7/7/2009	7.8	0.892095
18-14	8/19/2009	4.5	0.653213
18-14	9/15/2009	1.9	0.278754
18-14	10/20/2009	4.5	0.653213
18-14	11/4/2009	2	0.30103
18-14	1/12/2010	2	0.30103
18-14	3/9/2010	70	1.845098
18-14	4/21/2010	64	1.80618
18-14	5/24/2010	11	1.041393
18-14	6/22/2010	2	0.30103
18-14	7/12/2010	13	1.113943
18-14	8/4/2010	13	1.113943
18-14	9/20/2010	2	0.30103
18-14	10/12/2010	11	1.041393
18-14	11/22/2010	2	0.30103
18-14	12/6/2010	1.8	0.255273

Appendix D

Site Visit Photographs

Figure D1. Chechessee Creek, shellfish monitoring station 18-14 (white dot), Callawassie and Spring Islands.

Figure D2. Dominant Landuse in Chechessee Creek watershed is forests.

Figure D3. Altamaha Town Heritage Preserve is located on Heyward Point in the western portion of Chechessee Creek watershed.

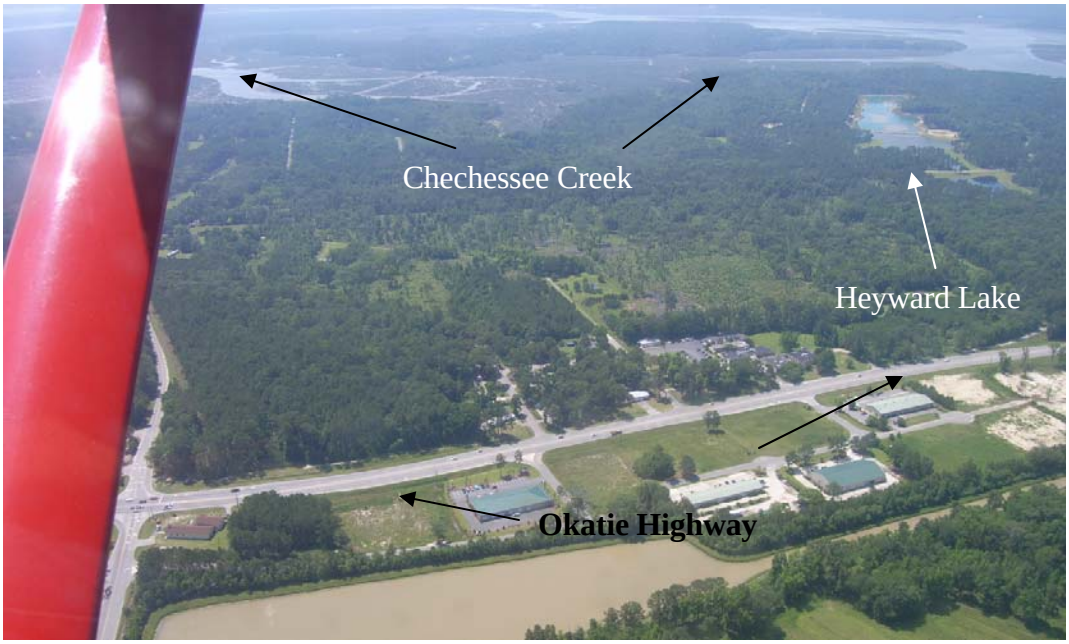


Figure D4. Aerial view of Chechessee Creek, Okatie Highway and Heyward Lake.

Responsiveness Summary

Chechessee Creek SFH FC TMDL Document

Comments were received from the following:

Beaufort County Stormwater Utility and Stormwater Utility Board

South Carolina Department of Natural Resources

The following comments were submitted by Dan Ahern, Stormwater Manager, Beaufort County.

Comment 1:

"I am submitting comments on the draft TMDL and requesting that it not be issued without significant revisions and consideration of additional monitoring to better determine natural background and other sources. There are also concerns about the conflicts with schedules in draft 2012 303d list and local notification procedures that will be address separately. We want to utilize TMDLs to assist in the County's watershed restoration efforts to return waters to their designated water uses but feel that local watershed priority should be taken into consideration when conducting TMDLs."

Response 1:

As noted in an email dated September 25, 2012 from Banu Varlik (Chechessee Creek TMDL Project Manager, DHEC) to Dan Ahern (Stormwater Manager, Beaufort County), Chechessee Creek TMDLs had been planned as a follow-up to development of the Okatie River shellfish harvesting (SFH) FC TMDLs since the commencement of the Okatie River shellfish FC TMDLs in 2008. Please refer to "List of Impaired Waters" section on page 9 of the final 2010 303(d) List, for further explanation regarding TMDL target dates. Target dates are subject to change as deemed appropriate by South Carolina Department of Health and Environmental Control (the Department or DHEC). Please also note that the draft 2012 303(d) has not yet been approved by EPA.

Comment 2:

"I apologize for disjointed nature of comments but we did not have much time to review the draft document due to the late notification on its availability."

Response 2:

An email was sent out to the statewide TMDL stakeholder email list on September 12, 2012 announcing the notice of availability of the Draft Chechessee Creek TMDL document. The document was available for public comment from September 13, 2012 - October 15, 2012 (33 days total). The same notice of availability was published in The

Island Packet/Beaufort Gazette on September 13, 2012. This meets the public notice requirements established for TMDLs in SC Regulation 61-110.

As previously conveyed via e-mail dated September 25, 2012, the statewide TMDL email recipient list included several Beaufort County representatives, including the Public Works Department. On September 18, Dan Ahern, sent an email to Matt Carswell and Banu Varlik (DHEC) indicating the public notice published in the local newspapers was brought to his attention by Reed Armstrong of Coastal Conservation League. The public comment period remained open through 5:00 pm October 15, 2012, and written comments were accepted as long as they were post marked by the indicated date and time. DHEC received Beaufort County's comments, on October 10, 2012, within the advertised public comment period.

Comment 3:

Data

"DHEC shellfish monitoring data appears to indicate that station 18-10 should be meeting standards and not require reduction and station 18-11 is not meeting standards and should have a reduction. This is opposite of what is said in the TMDL."

Response 3:

Based on 2011 Annual Update for Shellfish Management Area 18, stations 18-09 and 18-10 have restricted water quality and restricted classification for shellfish use. Based on the same report, station 18-11 has approved water quality but is restricted for shellfish use. The classifications of shellfish waters are based on National Shellfish Sanitation Program (NSSP) Guide for the Control of Molluscan Shellfish that is used by US Food and Drug Administration (FDA) to evaluate station shellfish sanitation programs.

The 2011 Annual Update for Shellfish Management Area 18 included an assessment of 2008-2010 data, consistent with established FDA protocol. For calculations of the TMDLs, a time-frame of 2000-2010 data was used in order to include a more robust data set. In both the 2011 Annual Update for Shellfish Management Area 18 and draft TMDL document, it was determined that sites 18-09 and 18-10 did not meet the SFH water quality standard for FC bacteria and TMDL reductions were required for these sites. Because assessments of data (2008-2010 and 2000-2010 time-frames) demonstrated that the SFH water quality standard for FC bacteria was being met for station 18-11, no SFH FC bacteria reduction was necessary for this site, as it is indicated in the draft Chechessee Creek TMDL document.

Comment 4:

"Not sure why area below station (either 18-10 or 18-11 –see comment above) is restricted as it is meeting the standards."

Response 4:

See Response 3.

As previously indicated station 18-10 is considered restricted due to water quality and has a restricted classification for shellfish harvesting. Station 18-10 is not meeting the water quality standard and requires a 9.2% reduction for SFH FC bacteria. While Station 18-11 is currently meeting the SFH water quality standard for FC bacteria, the site is assigned a restricted classification for shellfish harvesting per FDA regulations. For the purposes of drafting the TMDL document, station 18-11 is not assigned a percent reduction for SFH FC bacteria.

Comment 5:

"Consideration should be given to site or sampling below confluence of 18-10 and 18-11 to determine if it meets standards which could remove use restrictions."

Response 5:

The comment is noted and the request is being forwarded to the shellfish sanitation program for consideration. Establishment of additional shellfish monitoring sites is based on protocol established by the shellfish sanitation program and is outside the scope of the draft TMDL document.

Comment 6:

"Additional data should be developed to determine if nonpoint sources, background or large open water bird population is source of impairment. The Stormwater Utility and Low Country Institute would be willing partner in this effort."

Response 6:

Available data from 2000-2010 were used to develop aggregate percent reductions for these TMDLs as necessary to meet the FC bacteria standard for shellfish waters. Both the WLA and LA percent reductions are equivalent and based upon aggregate loadings used to establish the existing condition instream. TMDLs may be revised if additional information becomes available and if deemed appropriate by the Department.

Comment 7:

TMDL

"Expressing TMDL as a concentration does not allow for management of loads from nonpoint sources and could lead to solutions that could adversely affect the marine resources. Also reduction percentages could be met without any reduction of load to the receiving waters. Beaufort County routinely measures low concentration discharges from stormwater discharges and orders of magnitude increases of concentration as these

discharges leave forested wetland ditches. Reducing the concentration from the stormwater discharges in these situations will not decrease the loads. (page 21)"

Response 7:

Chechessee Creek is a tidally complex waterbody. Calculation of the net flow out of the system by the Department would be resource intensive. Therefore, after consulting with US Environmental Protection Agency (EPA) Region 4, percent reductions as an end point for these Total Maximum Daily Load (TMDLs) were used instead of load reductions for the calculation of the TMDLs. This approach is consistent with that of other EPA-approved SFH FC TMDLs in SC such as the Okatie River, Jeremy Inlet/Scott Creek and the Toogoodoo Rivers. Furthermore, there are EPA approved TMDLs utilizing percent reductions as end points that have been implemented successfully, such as the "Lynnhaven Bay, Broad Bay and Linkhorn Bay Watersheds TMDL Report for Shellfish Areas Listed Due to Bacteria Contamination", available electronically at: http://www.deq.virginia.gov/portals/0/DEQ/Water/TMDL/apptmdls/shellfish/lynnfc.pdf

Regardless of loading versus the prescribed percent reductions, the endpoint is insuring that the SFH water quality standard for FC bacteria is being met. In order to meet the standard and designated use, the Department recognizes the prescribed percent reductions must be met from all sources covered under the WLA or LA of the TMDLs. It is also recognized that reductions covered under the LA are voluntary and targeting these reductions may be a challenge during implementation of these TMDLs.

Comment 8:

"TMDL includes two separate hydrologic units (HUCs) and should be considered separately, especially since one of the hydrologic units also contains addition aquatic life violations downstream. Only shellfish station 18-09 is in one of the priority watersheds that SC and EPA Region 4 agreed to target."

Response 8:

The TMDL area includes two 12-digit HUCs, however these 12-digit HUCs are within the same 10-digit HUC. Also, it is not out of the ordinary to use multiple 12-digit HUCs to calculate TMDLs or even larger areas represented by 10-digit HUCs. As previously explained in September 25, 2012 email to Dan Ahern, due to the topography in areas such as the Low Country and the presence of connecting creeks like Chechessee, HUCs are not always useful in determining watershed boundaries. Instead, we rely on shellfish management area boundaries when developing shellfish FC TMDLs. Because shellfish FC-impaired stations are within the same management area and are hydrologically connected, it is appropriate to calculate TMDLs for the same waterbody. Priority watersheds are determined based on several criteria such as local interest in water quality improvements; however, TMDLs must also be developed in non-priority watersheds where impaired locations exist. Chechessee Creek shellfish FC TMDL were planned to be calculated by 2010, however due resource constrains, were delay until 2012.

The Chechessee River is currently not impaired for SFH FC bacteria and shellfish area 17 (Chechessee River) is approved for shellfish harvesting. A dissolved oxygen (DO) TMDL may be developed in the future to address the aquatic life impairment but this will be a separate effort from the targeted SFH FC bacteria TMDL effort in Area 18.

Comment 9:

"The TMDL does not make any estimate of the natural background loading. This is especially important in a watershed that has only 5.1% impervious cover. Requiring reduction in loads that does not acknowledge background, places unattainable reduction burden on nonpoint sources. It is our understanding that these impairments have been in place for a long time and may date to initial construction of a causeway in 1970's? that impacted tidal flow."

Response 9:

See Response 7.

It is not possible to estimate the "natural background" loading of FC with limited data and limited resources. Regardless of loading versus the prescribed percent reductions, the endpoint is insuring that the SFH water quality standard for FC bacteria is being met. Reductions from all sources, whether considered "natural background" or other, must be achieved in order for the SFH water quality standard for FC bacteria to be met. It is also recognized that reductions covered under the LA are voluntary and targeting these reductions may be a challenge during implementation of these TMDLs.

Please note that an estimate of impervious cover is not provided in the TMDL document. Instead, the 5.1% estimate represents the "developed" landuse in the watershed.

Comment 10:

"TMDL does not acknowledge impacts of runoff volume and the documented impacts of fecal load increases from low concentration discharges. SCDOT Permit to address fecal coliform may not allow for load reductions caused by road runoff volume. See local study documenting impacts of low concentration discharges in published articles on Utility's website. http://www.bcgov.net/departments/Engineering-and-Infrastructure/stormwater-management/manuals-and-plans.php"

Response 10:

See Response 7.

In order to meet the standard and designated use, the Department recognizes the prescribed percent reductions must be met from all sources covered under the WLA or LA of the TMDLs. This includes all discharges exceeding the SFH water quality standard for FC bacteria. If the SFH water quality standard is being met at the point of outfall, then the discharge is not causing or contributing to the impairment of concern, regardless of the loading contribution.

SCDOT is subject to the percent reductions prescribed in this draft TMDL document. Note that 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.

Comment 11:

"How are causeway road structures considered in analysis? Are they background or potential sources or causes? How would they be addressed?"

Response 11:

The draft TMDL document acknowledges that certain landuse practices, including bridges and roads, may adversely impact systems such as the Chechessee Creek (see Page 3 of document). The document also offers some implementation suggestions regarding roads and bridges (page 28 of document).

The developed landuse in the TMDL area is 5.1% and there is a limited number of SCDOT owned and operated roads in the watershed. Roads may not be sources or causes of impairment, however, roads can be conveyances of various pollutants.

Due to the presence of their roads, SCDOT is subject to the percent reductions prescribed in this draft TMDL document. Note that 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.

There may also be other roads present in the watershed that are not owned/operated by the SCDOT. Such roads are not currently subject to an MS4 permit and are subject to the LA component of the TMDL.

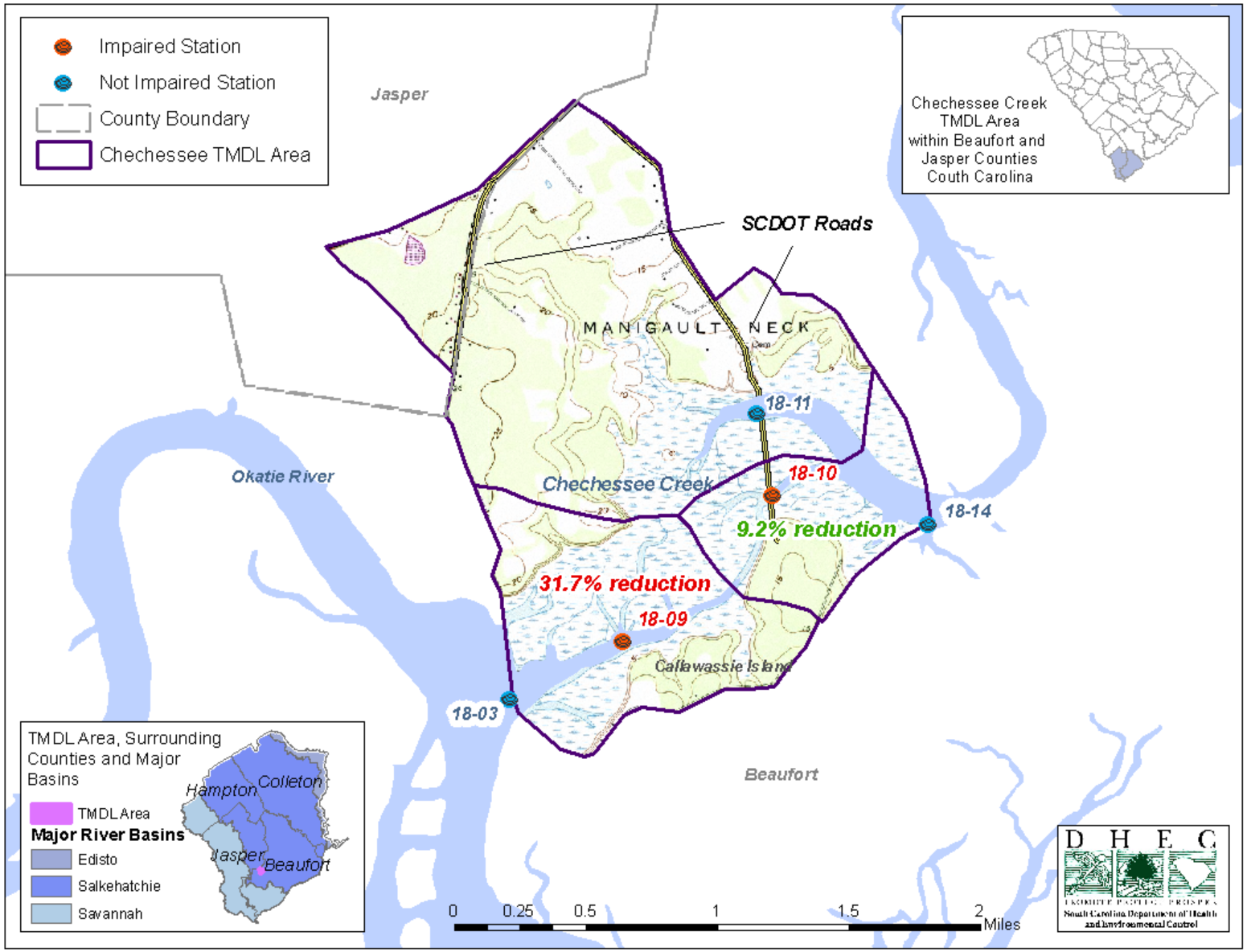
Reductions from all sources, including the aforementioned, may be necessary for the SFH FC bacteria standard to be met.

Comment 12:

There should be a map of the SCDOT roads that are owned and operated in the watershed so that they can be seen in relationship to the impaired stations.

Response 12:

Below is a map showing the two roads currently owned and operated by SCDOT.


Impaired Station
Not Impaired Station
County Boundary
Chechessee TMDL Area
Jasper
Chechessee Creek TMDL Area within Beaufort and Jasper Counties Couth Carolina
SCDOT Roads
MANIGAULT NECK
18-11
18-10
18-14
9.2% reduction
31.7% reduction
18-09
18-03
Okatie River
Chechessee Creek
Callawassie Island
Beaufort
TMDL Area, Surrounding Counties and Major Basins
TMDL Area
Major River Basins
Edisto
Salkehatchie
Savannah
Hampton
Colleton
Jasper
Beaufort
0
0.25
0.5
1
1.5
2
Miles
D H E C
South Carolina Department of Health and Environmental Control

Comment 13:

Page 28 of draft TMDL mentions observation of runoff from impervious surfaces and consideration of collection of stormwater runoff from the major roads. Can this be included in SCDOT permit and what level of collection/treatment is recommended? County now has volume controls that are representative of 10% equivalent impervious cover (EIC). The watershed is now reported to be 5.1 percent impervious cover and future development could add some additional runoff volume. TMDL should have identified the sub watersheds that appeared to have high runoff during reported event.

Response 13:

Individual MS4 permits are not issued or revised by the TMDL staff. For questions regarding SCDOT's NPDES MS4 permit requirements as related to TMDLs, please contact Arturo Ovalles at 803-898-4178 by email at ovallear@dhec.sc.gov.

The 5.1% represents "developed" landuse in the TMDL watershed based on NLCD 2006 and should not be confused with 'impervious" surfaces. Beaufort County's progressive efforts in stormwater runoff reduction have been recognized on numerous occasions. The Department does not enforce local municipalities' regulations.

Comment 14:

"While there is no continuous NPDES-permitted discharges to Chechessee Creek there is a sewer system with no discharge permits. This area (Callawassee) also has non-continuous point sources included in their drainage system. Will these be controlled under their current NPDES permit? Do not see how a potentially designated MS4 can be responsible to the LA for this TMDL when they have no control over existing loads. (page 13)"

Response 14:

The TMDL document acknowledges the presence of the no discharge NPDES permittee, the Callawassie Development. The Callawassie Development's NPDES permit is a no discharge (ND) type of permit which does not allow discharge to waters of the State. Such discharges are illegal and subject to compliance and enforcement mechanisms. For additional ND permitting related questions, please contact Mike Montebello at 803-898-4228 or by email at montebmj@dhec.sc.gov.

Because the referenced site is not allowed to discharge directly to surface waters of the State, modifications to an existing land application permit for industrial and domestic wastewater facilities covered under SC Regulation 61-9, Sections 503, 504, or 505 are not within the scope of these TMDLs.

Beaufort County is currently a non-regulated MS4 and subject to the voluntary LA component of the TMDL. From the State and Federal perspective, Beaufort County's progressive stormwater control measures are considered voluntary although the County's local ordinances may be mandatory. The Department recognizes Beaufort County's efforts and is supportive of these voluntary measures.

At such time that Beaufort County is covered under a MS4 permit, the County will becomes subject to the WLA component of the TMDL. The TMDL document acknowledges that there may be activities within their MS4 jurisdictional area that they have no control and are covered under the LA component of the TMDL. The regulated MS4 is only responsible for addressing the WLA reduction in accordance with their MS4 permit.

Comment 15:

"Not all hydric soils have low infiltration rates and we have many sandy hydric soils in county with high infiltration rates especially when ground water levels are low. (page 7) There is also class D soils that are not hydric and have low infiltration but they may not exist in watershed."

Response 15:

The comment is noted.

On Page 7, paragraph 4, sentence 3 has been changed "Partially hydric and hydric soils **may** have low infiltration rates, high water table and high runoff potential."

Comment 16:

"No explanation for increase in open water between 2001 and 2006 (1% or 16 acres). It would seem to be a significant change especially since developed area remained the same (Table 2)."

Response 16:

For a more detailed explanation regarding landuse changes from NLCD 2001 to 2006, please refer to http://www.mrlc.gov/.

Please refer to Table 2 in the draft document for comparison of changes in categories of landuses from NLCD 2001 to 2006. While one category of landuse may decrease, another category will increase within the same delineated area but the total of the delineated area will remain the same. Landuse based on NLCD 2001 was included in the Draft TMDL document for informational purposes. The estimated 16 acre increase in the open water category does not change the outcome of the TMDLs**.**

Comment 17:

TMDL should recognize wetlands discharges as a nonpoint source contributor in the watershed. (page 14) This has been proven to be a major source of FC load in other Beaufort County watersheds.

Response 17:

The Department recognizes that wetlands may be a source of FC bacteria within the watershed as wetlands provide habitat to water fowl, aquatic mammals and other warm-blooded animals. Section 3.2.5 of the draft document addresses potential non-point source contributions by wildlife.

Comment 18:

"The no discharge permit for Callawassee could have impact on water quality by taking up storage space for irrigation that could require stormwater runoff to increase. (page 14-15)"

Response 18:

See Response 14.

The comment is noted.

Comment 19:

"While recognizing that determining existing load is difficult (page 22), it will be even more difficult to implement controls to reduce loads with the TMDL concentration reductions only. Having load reduction goals that are a function of volume and concentration will allow the addressing of the additional impact of that volume on the natural drainage system."

Response 19:

See Responses 7, 9.

Comment 20:

"While we appreciate the recognition that freshwater runoff can change the chemistry of tidal creeks and cause salinity variations (page 28) it is of concern in that this watershed is presently below (5.1%) our goal volume controls of 10% EIC. Is this saying that Beaufort County's volume controls (Federal standards of control to 95percentile event) is not adequate?"

Response 20:

Please note that Section 6.0 Implementation Strategies is provided for information purposes only and all language is not subject to a formal approval action by USEPA Region 4. Instead, the language is provided as more general guidance and an acknowledgement of the efforts of Beaufort County, other local entities and provides additional resources for consideration.

Page 28 does not mention fresh water input but section 6.2.1 on page 29 makes a general comment regarding the impact fresh water can make in a saline environment.

As previously mentioned, please note that an estimate of impervious cover is not provided in the TMDL document. Instead, the 5.1% estimate represents the "developed" landuse in the watershed.

Beaufort County is currently a non-regulated MS4 and subject to the voluntary LA component of the TMDL. From the State and Federal perspective, Beaufort County's progressive stormwater control measures are considered voluntary although the County's local ordinances may be mandatory. The Department is recognizes Beaufort County's efforts and is supportive of these voluntary measures as the County has one of the most proactive stormwater management programs in the State.

Comment 21:

"How would the suggested collection and reclamation system (page 28) along major roads be incorporated into the current SCDOT MS4 permit?"

Response 21:

See Response 13.

See Response 20, paragraph one.

Individual MS4 permit requirements are outside the scope of this draft TMDL document.

Comment 22:

"It appears that under section 6.2 (page 30) that wording is reflective of am earlier TMDL and needs to be updated. The references to Beaufort County adopting Town of Bluffton's BMP are outdated. This was done in the earlier 2009 BMP manual and now the Town of Bluffton has adopted the County's volume standards and the situation is reversed. The latest BMP revision is 2012 that incorporates runoff volume control up to the 95 percentile event. Also the BC Stormwater Management Plan was dated 2006 not 2008 as listed in TMDL. The TMDL should also mention the 2010 County ordinance changes that require runoff volume control on residential lots not handling volume on a developmental level. (page 31)"

Response 22:

See Response 20, paragraph one.

The referenced language was taken from the Okatie River TMDL document and since the Okatie River and Chechessee Creek are part of the same system and both are in Shellfish Management Area 18, the Department believes it is appropriate to use similar language in the Draft Chechessee Creek TMDL document. The manual referred to in the Draft TMDL document was incorrectly cited as The Beaufort County Stormwater Management Plan. Where appropriate, Section 6.0 of the draft TMDL document now refers to the Beaufort County Manual for Stormwater Best Management Practices or BC BMP Manual (2008).

The comment regarding the Town of Bluffton adapting the County ordinances is noted. In addition, the following language has been added as a sentence to 6.2.1: "Subsequent to Beaufort County adopting of the Town of Bluffton's BMPs into the BC BMP manual, the Town of Bluffton has more recently adopted the County's stormwater volume control standards."

Comment 23:

"Recommend that DHEC utilize and reference the number of published articles on volume controls available on the county website."

Response 23:

The comment is noted. The following has been added as a resource in Section 6.2.1: "Beaufort County has a number of resources for stormwater volume control measures and other BMPs available. Please visit the following link for additional details: http://www.co.beaufort.sc.us/departments/Engineering-and-Infrastructure/stormwater-management/manuals-and-plans.php."

Comment 24:

Requests

"Delay TMDL issuance until watershed becomes priority for restoration or at least until additional monitoring can be done to determine the breakdown between background and nonpoint sources. Addressing TMDL now could lead to removal of limited resources from priority watershed restoration projects."

Response 24:

See Response 7.

Calculation of the TMDL takes into account all the sources that may be contributing to the FC impairment.

Following approval of the TMDL by EPA, the document becomes effective for implementation. At this point, the Department does not have a reason to delay the forwarding of the Draft Chechessee Creek TMDL document to EPA for final approval. A portion of the Chechessee Creek is located in a USEPA priority watershed; however, the absence of an EPA priority watershed does not preclude areas from eligibility for CWA Section 319 funding.

Beaufort County and other local stakeholders have benefited from financial assistance in terms of CWA Section 319 funding for implementation of the May River Watershed Based Plan and the Okatie River TMDL in Beaufort County as well as technical assistant provided by various individuals from DHEC including Region 8 offices and main office in Columbia.

Because the potential sources contributing the impairment in Chechessee Creek shellfish FC impairment are all considered nonpoint sources, such as wildlife, improperly functioning septic tanks, improper disposal of waste from boats, the implementation of the TMDLs are voluntary and should not cause the County any additional financial burden.

Comment 25:

"If a TMDL is to be issued now it should only for the section in SCDHEC/EPA priority watershed (station 18-09). The Chechessee HUC violations should be addressed on a watershed basis with all the violations in the watershed."

Response 25:

See Responses 8 and 24.

Comment 26:

"TMDL should identify non point loads that must be reduced. Background loadings must be determined and estimated. If the background loadings are such that standards cannot be met that a use attainability study should be conducted to avoid unattainable requirements."

Response 26:

See Responses 7 and 9.

Calculation of the TMDL takes into account all the sources that may be contributing to the FC impairment.

Both the WLA and LA percent reductions are equivalent and based upon aggregate loadings used to establish the existing condition instream. TMDLs may be revised if additional information becomes available and if deemed appropriate by the Department.

Beaufort County is currently a non-regulated MS4 and subject to the voluntary LA component of the TMDL. From the State and Federal perspective, Beaufort County's progressive stormwater control measures are considered voluntary although the County's local ordinances may be mandatory. The Department is supportive of Beaufort County's efforts.

Under 40 CFR 131.10(g), use attainability analyses (UAA) are a tool available for states to determine if a designated use should be removed, not to determine if the water quality standard is unattainable. In the case of the Chechessee Creek, the shellfish harvesting designated use is also an existing use regulated by the shellfish sanitation program. A UAA can not remove an existing use as defined in 40 CFR 131.3. Because the use currently exists and the waters are also classified as outstanding resources waters (ORW), Chechessee Creek is not a candidate for removal of the shellfish harvesting use nor a candidate waterbody for a change of water quality standards.

Comment 27:

"Stations 18-10 and 18-11 are in the Chechessee River HUC that has aquatic life violations and consideration should be given to an impervious cover TMDL. County's controls are based on Equivalent Impervious Cover (EIC) goals. FC goal is 5% and an aquatic life impervious cover TMDL would allow for better management of reductions. We do not understand why impervious cover TMDLs are limited to 10% or more impervious cover."

Response 27:

Stations 18-10 and 18-11 are located in the Chechessee Creek and not the Chechessee River; however, they do share the same HUC based on published USGS information.

There are two random water quality monitoring stations in the Chechessee River that are included on the approved 2010 and draft 2012 303(d) lists due to depressed DO levels. As previously noted, Hydrologic Unit Codes may not necessarily define the boundaries of an actual watershed. In the case of addressing the Chechessee River DO impairments, the Department believes this should be a separate TMDL effort as the approach taken to address the impairments will differ from that of SFH FC bacteria impairments in the Chechessee Creek. The Department relies on shellfish management area boundaries when developing shellfish FC TMDLs and may rely on a different set of boundaries to develop other TMDLs.

The Department is unclear what is meant by "FC goal is 5% and an aquatic life impervious cover TMDL would allow for better management of reductions". As previously explained in an email from Banu Varlik to Dan Ahern on September 25, 2012, the Department believes it is inappropriate to calculate TMDLs based on impervious surfaces for the Chechessee Creek watershed. Currently, the "developed" landuse in the Chechessee Creek watershed is approximately 5.1% which is much lower then the literature-based threshold of 10% for impervious area related TMDLs. "Developed" landuse does not equate to impervious surface. The actual impervious surface in the Chechessee Creek TMDL area is much less than 5.1% of the "developed" landuse.

The "developed" landuse in the Chechessee River is less than 3% so an impervious cover based TMDL is also inappropriate for this waterbody. In an email from Dan Ahern to Matt Carswell on September 19, Mr. Ahern included a link to an EPA website which gave examples of two impervious cover TMDLs: Barberry Creek, Maine and Eagleville Brook, Connecticut. At the time of the TMDL calculations, Barberry Creek had 23% impervious cover. Eagleville Brook watershed was divided into three sub watersheds and two of these had impervious covers of 14% and 27% and the TMDL targets were 12% impervious cover for both sub watersheds with above 12% impervious cover. These TMDL efforts both demonstrated existing conditions called for a reduction of imperious cover as they exceeded the literature-based threshold of 10% . The Chechessee River does not exceed this threshold and the watershed currently has well below 10% impervious cover.

Comment 28:

"As part of the County Council's top priority agenda goal, the Council approved a Watershed Restoration plan in January 2012 and consideration should be given to County's priority watershed restoration programs in Battery Creek; Headwaters of Okatie River and May River."

Response 28:

The Okatie River, including its headwaters, is currently covered under EPA-approved shellfish FC TMDLs and $392,018 of CWA Section 319 funds has been awarded to local entities, including Beaufort County, for the implementation of the TMDLs.

The May River Watershed Based Plan has also been awarded CWA Section 319 funds amounting to $483,500 and is currently in the second phase of implementation. Clearly, DHEC has been working with Beaufort County to improve the water quality in the local area.

The Department acknowledges the impairment in Battery Creek and in the future may develop a TMDL to address the impairment.

The following comments were submitted by Priscilla Wendt, Office of Environmental Programs, SCDNR:

Comment 1:

"The TMDL document states that the Callawassie Development's NPDES permit is a "No Discharge" permit, which prohibits the direct discharge of wastewater to adjacent surface waters and, therefore, *"should not have the potential to impact the water quality"* of Chechessee Creek. Considering the fact that two of the three impaired stations are adjacent to Callawassie Island, the possibility that the land application of treated wastewater is unintentionally contributing to the elevated fecal coliform levels in Chechessee Creek should be further investigated and discussed in the TMDL document."

Response 1:

The Department acknowledges that land application sites that are not operating in accordance with their NPDES "no discharge" permit may be a potential source of FC bacteria impairment in the referenced waterbody.

The Callawassie Development's NPDES permit is a no discharge (ND) type of permit and are not allowed to discharge to waters of the State. Such discharges are illegal and subject to compliance and enforcement mechanisms. For additional ND permitting related questions, please contact Mike Montebello at 803-898-4228 or by email at montebmj@dhec.sc.gov.

Because the referenced site is not allowed to discharge directly to surface waters of the State, modifications to an existing land application permit for industrial and domestic

wastewater facilities covered under SC Regulation 61-9, Sections 503, 504, or 505 are not within the scope of these TMDLs.

Comment 2:

"In addition, the TMDL document states that *"properly-maintained MSDs should not be causing or contributing to fecal coliform exceedances"* in Chechessee Creek; however, the effluent standards for Type I and Type II MSDs include limits for fecal coliform counts of 1000/100 ml and 200/100 ml, respectively. These concentrations are substantially higher than the water quality standard for SFH waters (maximum of 43/100 ml), suggesting that even properly-maintained MSDs could be contributing to the elevated fecal coliform levels in Chechessee Creek."

Response 2:

While it is prohibited under Federal law to discharge untreated sewage from vessels within navigable waters as stated in Clean Vessel Act, the Department acknowledges that treated or untreated wastes from marine sanitation devices (MSD) that exceeds the SFH WQS may be a potential source of FC bacteria impairment in the referenced waterbody. It is recognized that reductions covered under the LA are voluntary and targeting these reductions may be a challenge during implementation of these TMDLs.

Waterbodies can be designated as NDZs from marine vessels however; establishment of NDZ is beyond the scope of this TMDL. For more information, please refer to S.C. Regulations 61-68 and 61-69 for further information, which are available electronically at:

http://www.scdhec.gov/environment/water/regs/r61-68.pdf

Comment 2:

"The TMDL document lists several options for addressing nonpoint sources of pollution; however, most of these implementation strategies would be voluntary and rely primarily on education and outreach. One regulatory strategy that is not discussed in the document is the possibility of designating Chechessee Creek as a No Discharge Zone (NDZ), which would prohibit any discharge of sewage from MSDs into Chechessee Creek and its tributaries. The status of Chechessee Creek as an ORW waterbody that is impaired due to high fecal coliform levels would seem to warrant its designation as a NDZ. This should be discussed as a possible implementation strategy in the TMDL document."

Response 3:

See Response 2.

Comment 4:

"Overall, the SCDNR commends DHEC for developing a protective TMDL for fecal coliform in Chechessee Creek and supports all reasonable efforts to improve and sustain water quality to the greatest extent possible, particularly in SFH and ORW waters.

Successful implementation of the proposed TMDL should result in a substantial improvement in water quality in this watershed, and effectively protect its shellfish harvesting beds for human consumption. The SCDNR welcomes the opportunity to work with DHEC, as well as other public and private entities, in implementing the proposed TMDL to achieve water quality standards."

Response 4:

The Department appreciates SCDNR's support of Chechessee Creek TMDLs.

Amendments:

The following amendments were made to the draft Chechessee Creek TMDL document following the public comment period.

Amendment 1 Location: Page 22, paragraph 1.

The following has been added to Section 5.3 Load Allocation:

Besides SCDOT, there are no **other** designated or potentially designated MS4s located in the drainage area.