Total Maximum Daily Load
Wando River Shellfish Fecal Coliform Daily Loads for Stations 09B-02, 09B-04, 09B-05, 09B-06, 09B-07, 09B-09, 09B-10, 09B-11, 09B-12, 09B-18, and 09B-21 in Shellfish Management Area 09B Hydrologic Unit Codes 030502010401 and 030502010402

Prepared for

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by

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Abstract

The Wando River watershed is located in Shellfish Management Area 09B in Berkeley and Charleston Counties and is 74.2 mi^2 in area. There are 18 shellfish monitoring stations located in 12-digit HUCs 030502010401 and 030502010402. Nine of these shellfish monitoring stations have been included on South Carolina's EPA approved 2014 303(d) List of Impaired Waters (SC DHEC, 2014). 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 nine stations included on the EPA approved 2014 303(d) List of Impaired Waters as well as two additional monitoring stations within the areas restricted for shellfish harvesting not included on the 303(d) list.

Existing conditions and percent reductions for the Wando River TMDLs 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 83.8%. For SCDOT, existing and future NPDES MS4 permittees, compliance with terms and conditions of their 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 Wando River watershed. As additional data and/or information become available, it may become necessary to revise and/or modify these TMDL targets accordingly.

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

Station	90th %tile of Existing Load (cfu/100ml)	TMDL [1, 2] (cfu/100ml)	WQ Target (cfu/100ml)	Margin of Safety (cfu/ 100ml)	WLA			LA
					Continuous Sources[3] (cfu/100ml)	Non-Continuous [4, 7] Sources (% Reduction)	Non-Continuous SCDOT [7] (% Reduction)	% Reduction to Meet LA [7]
09B-02	29.1	43	40.9	2.1	See Note Below	0%	0%[5]	0%
09B-04	139.2	43	40.9	2.1	See Note Below	70.6%	70.6%[6]	70.6%
09B-05	92.3	43	40.9	2.1	See Note Below	55.7%	0%[5]	55.7%
09B-06	138.5	43	40.9	2.1	See Note Below	70.5%	0%[5]	70.5%
09B-07	121.7	43	40.9	2.1	See Note Below	66.4%	66.4%[6]	66.4%
09B-09	252.5	43	40.9	2.1	See Note Below	83.8%	0%[5]	83.8%
09B-10	133.1	43	40.9	2.1	See Note Below	69.3%	0%[5]	69.3%
09B-11	40.1	43	40.9	2.1	See Note Below	0%	0%[5]	0%
09B-12	84.6	43	40.9	2.1	See Note Below	51.7%	0%[5]	51.7%
09B-18	69.5	43	40.9	2.1	See Note Below	41.2%	41.2%[6]	41.2%
09B-21	41.3	43	40.9	2.1	See Note Below	0.88%	0.88%[6]	0.88%

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 = Samples shall not 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. As long as the conditions within the SCDOT MS4 area remain the same the Department deems the current contributions from SCDOT negligible and no reduction of FC bacteria is necessary. SCDOT must continue to comply with the provisions of its approved NPDES stormwater permit.
6. 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 these TMDLs and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 permit.
7. Percent reduction applies to existing concentration.

Table of Contents

Figures

Tables

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 §303(d) of the CWA. The area of interest defined in this document includes portions of Shellfish Management Area 09B in the Wando River watershed (Figure 3). Shellfish monitoring stations 09B-04, 09B-05, 09B-06, 09B-07, 09B-09, 09B-10, 09B-12, 09B-18 and 09B-21 are considered impaired for shellfish harvesting due to elevated fecal coliform (FC) bacteria levels. These nine locations have been included on the 2014 303(d) list of impaired waters. In addition, there are two unimpaired shellfish monitoring stations located within this portion of the watershed, stations 09B-02 and 09B-11 which effectively form the perimeter of the areas defined as restricted for shellfish harvesting. Based on information available at the time of initial draft of this document in August 2014, the Wando River was restricted for shellfish harvesting upstream of stations 09B-02, 09B-11 and 09B-18 in accordance with Food and Drug Administration (FDA) guidance.

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. 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 130.7. 2001. This TMDL document will address the areas of the Wando River mentioned above, which are restricted for shellfish harvesting, and will include the nine impaired and two unimpaired stations.

1.1 Background

Wando River is located in the Sea Islands/Coastal Marsh and Carolina Flatwoods ecoregions of South Carolina within Berkeley and Charleston Counties. Generally, Sea Islands/Coastal Marsh ecoregions have the lowest elevations in South Carolina, and Carolina Flatwoods ecoregions show very little relief with wider upland areas. In some areas there are abundant Carolina bays, pocosins and endemic biota (Griffith, et al., 2002).

Between 2000 and 2010, some of the coastal counties in South Carolina, including Berkeley and Charleston Counties have experienced rapid growth and population increases. From 2000 US Population Census to 2010 Census, Berkeley County's population increased by 24.7% to 177,843. During the same period, Charleston County's population increased by 13% to 350,209 and total population for South Carolina increased by 15.3% to 4,625,384 (US Census Bureau, n.d.). 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 & 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.

Table 1. Shellfish monitoring stations and descriptions included in the Wando River FC TMDL document.

Shellfish Monitoring Stations	Station Descriptions
09B-02	Wando River at Horlbeck Creek
09B-04	Wando River at Deep Creek
09B-05	Wando River at Big Paradise Island
09B-06	Wando River at Paradise Island Boat Landing
09B-07	Boone Hall Creek at County Recreation Area
09B-09	Deep Creek – 1 mile from confluence with the Wando River
09B-10	Wando River at Alston Creek confluence
09B-11	Wando River at Guerin Creek
09B-12	Guerin Creek at Old House Creek
09B-18	Wando River at Rat Hall Creek
09B-21	Horlbeck Creek at the power line crossing

Increased urbanization and population growth have led to increased nonpoint source pollution of coastal waters (Mallin, et al., 2000a). Fecal coliform sources in urban and suburban areas include feces from birds, wildlife, horses, and cats and dogs (Mallin, et al., 2000b). 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 & 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 *Water Quality Planning and Management* Regulations (40 CFR 130.7. 2001) require states to develop TMDLs for water bodies that are not meeting designated uses under technology-based pollution controls. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and in stream water quality conditions so that states can establish water quality-based controls to reduce pollution and restore and maintain the quality of water resources (US EPA, 1991).

The State of South Carolina has included nine monitoring stations in the Wando River on South Carolina's EPA approved 2014 §303(d) List of Impaired Waters (SC DHEC, 2014) 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 portions of the Wando River, the watersheds covered by this TMDL document will include the nine impaired stations within Shellfish Management Area 09B. Shellfish monitoring stations 09B-04, 09B-05, 09B-06, 09B-07, 09B-09, 09B-10, 09B-12, 09B-18 and 09B-21 are considered impaired for shellfish harvesting due to FC levels exceeding the water quality standard for shellfish harvesting waters. These nine locations have been included on the 2014 303(d) list of impaired waters. 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 (US FDA, 2011 Revision). In addition, there are two unimpaired shellfish monitoring stations, 09B-02 and 09B-11, downstream from the impaired stations located within the Wando River watershed that effectively form the boundary of areas defined as "restricted" for shellfish harvesting. Per US Food and Drug Administration (FDA) rules, these unimpaired stations must be identified to either side or downstream from an impaired station(s) and restricted classification extended to in order to protect for human health concerns. Therefore, stations 09B-04, 09B-05, 09B-06, 09B-09, 09B-10, and 09B-12 to station 09B-11, stations 09B-07 and 09B-21 to 09B-02, and between stations 09B-15 and 09B-24 including 09B-18 and its drainage area of the Wando River are restricted for shellfish harvesting in accordance with FDA guidance (US FDA, 2011 Revision). All 11 stations covered in this TMDL document are identified on Table 1, and shown on Figure 3 and Figure 4.

1.2 Watershed Description

The Wando River watershed is located in Berkeley and Charleston Counties in coastal South Carolina. The watershed is encompassed within 8-digit hydrologic unit code (HUC) 03050201 which is the Cooper River portion of the larger Santee River basin, and the 10-digit HUC 03050200104 which includes the Wando River from its headwaters to its confluence with the Cooper

River near Charleston, SC. The TMDL areas are included within two 12-digit HUCs 030502010401 and 030502010402.

The Wando River is a tidal slough situated to the northeast of Charleston Harbor, SC. The river is approximately half a mile wide at its mouth with its confluence with the Cooper River and tapers to a narrow tidal creek near Ward Bridge, 21 miles upstream. In the less developed portions, this salt water system has extensive *Spartina alterniflora* marshes on its banks (Figure 1). Mean tidal range near the confluence with the Cooper River and around Big Paradise Island are 5.44 and 6.54 ft., respectively (Conrads & Smith, 1996).

Shellfish Management Area 09B is comprised of the entire Wando River from its headwaters to its confluence with the Cooper River. The TMDL area includes headwaters of the Wando River in the Francis Marion National Forest and various tributaries such as Horlbeck, Rathall and Guerin Creeks.

Figure 1. Extensive *Spartina alterniflora* marshes on the banks of the Wando River. Location is at station 09B-09.

Headwaters of the Wando River are within the Francis Marion National Forest which is located upstream of station 09B-06. Stations 09B-04, 09B-05, 09B-06, 09B-09, 09B-10, 09B-11 and 09B-12 located in the upper portion of the Wando River comprise a large portion of the TMDL watershed. The Francis Marion forest consists primarily of longleaf and loblolly pines, followed by open pine savannahs and bald-cypress-tupelo gum swamps. To a lesser degree bottomland hardwood forest, shrub/scrub (pocosins), southern mixed hardwood forests and deciduous woods are also found (National Audubon Society, 2013).

Figure 2. Station 09B-07. Photograph on the right shows the Palmetto Islands County Park fishing pier. The photograph on the left shows the marsh beyond which is the Boone Hall Plantation.

Stations 09B-07, 09B-21 (Figure 2) and 09B-02, are located in Horlbeck Creek. Developed areas in the 09B-07 and 09B-21 watersheds are 48.5% and 40% of total area, respectively, including residential communities, private docks, and golf courses. The watershed also includes the Palmetto Islands County Park, and Boone Hall Plantation and Gardens.

Station 09B-18 is located on the Rathall Creek. Developed area in this watershed is 55% of the total area with residential areas, a recreational center, Highway 526, and is adjacent to Port of Charleston Wando Welsh.

1.3 Landuse

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 followed by 2006 NLCD. Recently, 2011 NLCD was completed and published using similar methodology as in 2001.

Landuse within the Wando River TMDL area was calculated using 2001, 2006 and 2011 NLCD. The results based on landuse characteristics are summarized on Table 2. Figure 6 shows the NLCD 2011 landuse within the Wando River watershed. Based on 2011 NLCD, primary landuse within the TMDL area is woody and emergent herbaceous wetlands and open water (52%) followed by forests (25.54%). Total developed landuse within the TMDL watershed is 13.2%. Individual landuses of stations included in this TMDL document are summarized in Appendix B.

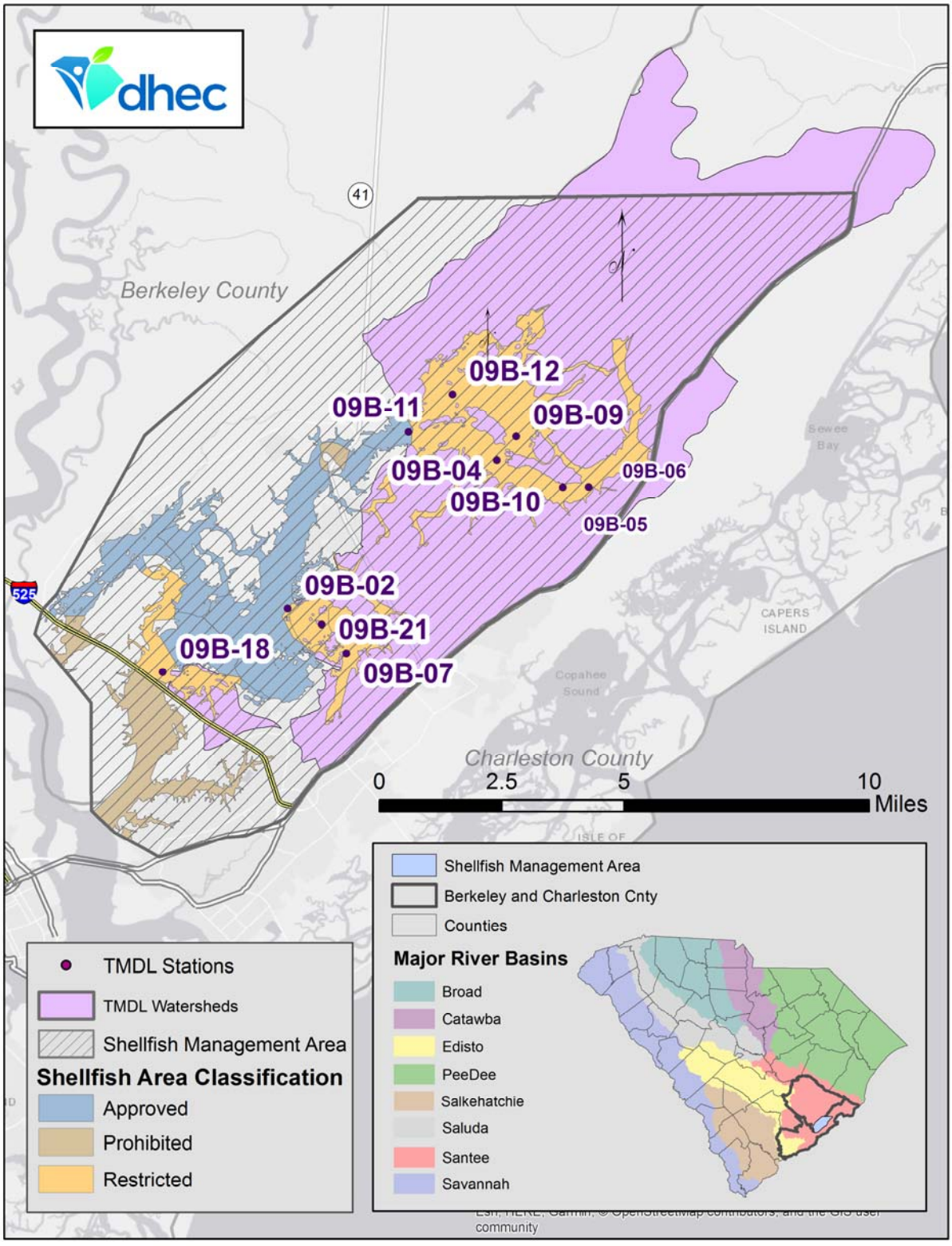

Figure 3. General overview of the Wando River TMDL area and Shellfish Management Area 09B, Berkeley and Charleston Counties, South Carolina.

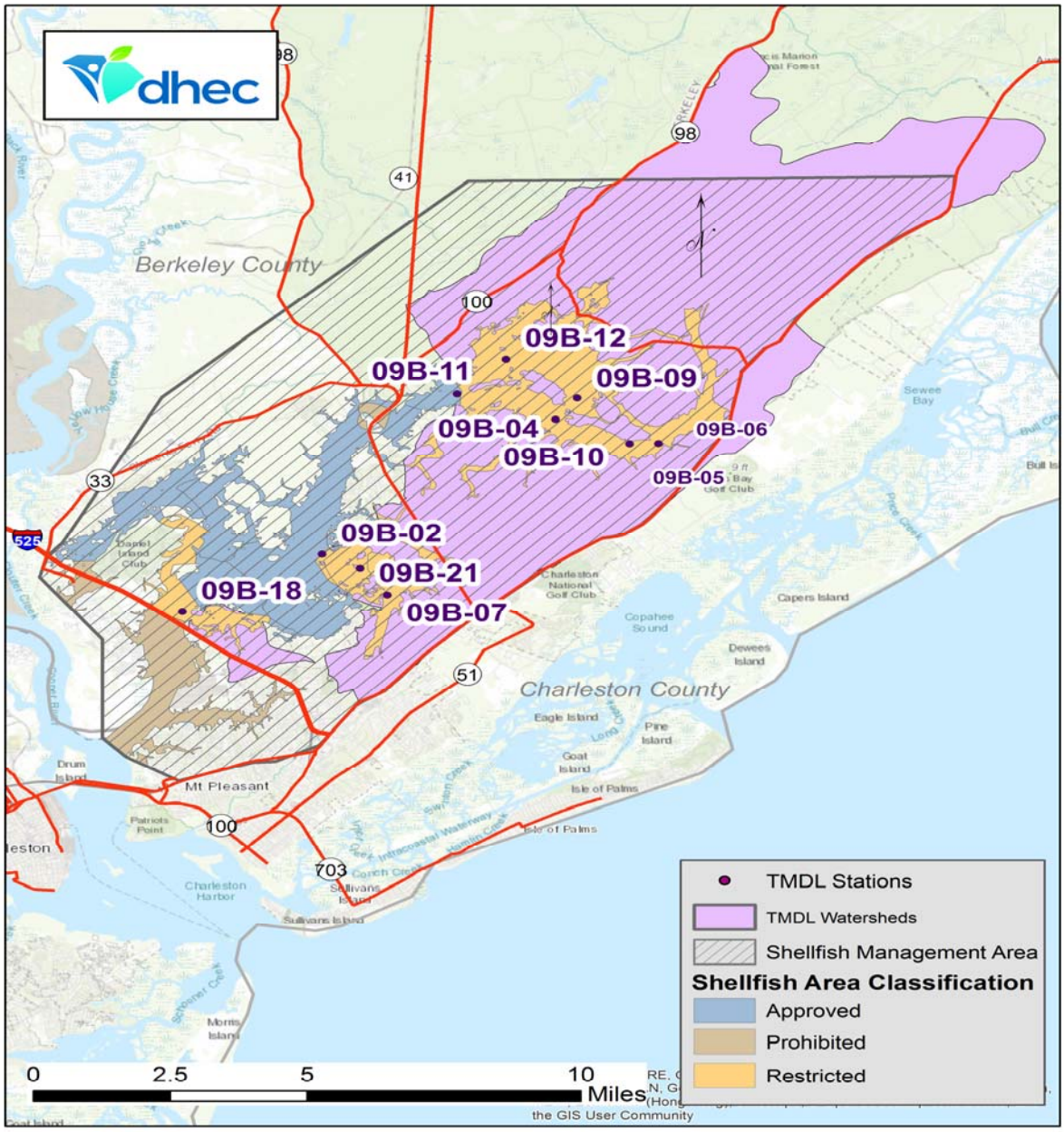

Figure 4. Shellfish Management Area 09B classifications and shellfish monitoring stations within the Wando River TMDL areas.

1.4 Water Quality Standard

The portions of the Wando River relevant to these TMDLs and this document are classified as Shellfish Harvesting Waters (SFH) in SC Regulation 61-69 (SC DHEC, 2014b). SFH waters are defined in SC Regulation 61-68 (2014a) as:

> "Shellfish Harvesting Waters (SFH) are tidal saltwaters protected for shellfish harvesting and uses listed in Class SA and Class SB. Suitable for primary and secondary contact recreation, crabbing, and fishing. Also suitable for the survival and propagation of a balanced indigenous aquatic community of marine fauna and flora."

Fecal coliform standard for the shellfish harvesting waters are guided by the minimum requirements of the National Shellfish Sanitation Program Model Ordinance (US FDA, 2011 Revision). Fecal coliform standard for Shellfish Harvesting Waters are (SCDHEC, 2014a):

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

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.

Figure 5. Vicinity of station 09B-4.

Table 2. The Wando River TMDL watersheds landuses based on 2001, 2006 and 2011 NLCD.

Landuse	2001 NLCD Area (mi2)	2006 NLCD Area (mi2)	2011 NLCD Area (mi2)	% of Total Area (2011 NLCD)	% Change from 2001 to 2011 NLCD
Open Water	2.3	2.4	2.33		
Woody Wetlands	23.4	23.0	27.99		
Emergent Herbaceous Wetlands	10.6	10.6	10.62		
Total Wetlands/Open Water	***36.3***	***36.0***	***40.93***	***55.16***	***12.75***
Developed, Open Space	5.0	5.5	5.41		
Developed, Low Intensity	2.9	3.5	3.60		
Developed, Medium Intensity	0.4	0.7	0.72		
Developed, High Intensity	0.0	0.04	0.08		
Total Developed	***8.3***	***9.68***	***9.81***	***13.22***	***18.19***
Deciduous Forest	0.1	0.12	0.11		
Evergreen Forest	24.5	23.31	18.45		
Mixed Forest	0.6	0.54	0.39		
Total Forested	***25.2***	***23.97***	***18.95***	***25.53***	***-24.8***
Pasture/Hay	0.80	0.8	0.80		
Cultivated Crops	0.3	0.22	0.27		
Total Agricultural	***1.1***	***1.0***	***1.07***	***1.44***	***-2.72***
Scrub/Shrub	2.5	2.64	2.51		
Grassland/Herbaceous	0.8	0.83	0.8		
Barren Land	N/A	0.07	0.12		
Total Other	***3.3***	***3.54***	***3.43***	***4.62***	***3.94***
Total Area (mi2)	***74.2***	***74.2***	***74.2***	***100***	

1.5 Shellfish Classification of the Wando River TMDL Area

Based on the 2014 303(d) list of impaired waters (the most recent EPA-approved list finalized May 27, 2015), and consistent with Shellfish Management Area 09B 2013 Annual Update (data January 1, 2010 through December 31, 2012), the Wando River from its headwater to station 09B-11 and including station 09B-09 in Deep Creek and station 09B-12 in Guerin Creek, Horlbeck and Rat Hall Creeks from their headwaters to stations 09B-02 and 09B-18, respectively, are impaired for exceeding the WQS for shellfish harvesting waters. These areas are also 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 (SC DHEC, 2013).

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 (US FDA, 2011 Revision).

The SCDHEC Shellfish Program currently utilizes the systematic random sampling (SRS) strategy within Area 09B instead of sampling under adverse pollution control conditions. To ensure 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 (SC DHEC, 2013).

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.

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 (SC DHEC, 2013).

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 (SC DHEC, 2013).

3.0 Source Assessment

Pathogens, which are usually difficult to detect, cause disease and make full body contact recreation in lakes, 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 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 the Wando River with a FC bacteria effluent limit on their NPDES permit. The existing three permits are general permits; two are for mining related operations, and the third for a car wash. These three permitted discharges are not expected to contain FC bacteria. Future NPDES dischargers in the referenced watersheds are required to comply with the load reduction prescribed in the WLA and demonstrate consistency with the assumptions and requirements of the TMDL.

3.1.2 Non-Continuous Point Sources

Non-continuous point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permits numbered SCS and SCR and/or regulated under *South Carolina Water Pollution Control Permits*: R.61-9, §122.26(b)(4),(7),(14) - (21) (SC DHEC, 2011). All regulated MS4 entities have the potential to contribute to FC pollutant loading in the delineated drainage area used in the development of this TMDL.

The South Carolina Department of Transportation (SCDOT) is a designated MS4 within the Wando River watershed. The SCDOT operates under NPDES MS4 Permit SCS040001 and owns and operates roads within the watershed. However, the Department recognizes that SCDOT is not a traditional MS4 in that it does not possess statutory taxing or enforcement powers. SCDOT does not regulate landuse or zoning, issue building or development permits.

Individual landuses for 11 stations included in this TMDL document were calculated utilizing 2011 NLCD and a Geographic Information System (GIS) tool and are summarized in Appendix B by each landuse category. Total developed landuse of these 11 stations ranges between 0% - 55% of their total drainage area. Based on current GIS information available at the time of TMDL development, there are no SCDOT facilities located within these referenced watersheds.

Other than SCDOT, there are two additional NPDES-permitted stormwater systems located in these watersheds. The Town of Mount Pleasant operates under NPDES MS4 Permit SCR031906 and Charleston County operates under NPDES MS4 Permit SCR031902. In watersheds where the applicable water quality standard is not being attained (impaired), existing and 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 TMDLs. If a TMDL site attains the applicable water quality standard in the future (not impaired), then regulated MS4s within that TMDL watershed are not subject to a WLA reduction. Urbanized areas based on 2010 census within the Wando River TMDL watersheds are shown on Figure 7.

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 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 or other unregulated MS4 communities located in these watersheds may have the potential to contribute FC bacteria in stormwater runoff. These unregulated entities are subject to the LA for the purposes of these TMDLs.

Sanitary sewer overflows 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. Parts of the Wando River TMDL area are serviced by a community collection system and the remainder utilizes onsite septic systems.

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 Maximum

Extent Practicable (MEP) definition is met, even where the numeric percent reduction may not be achieved in the interim.

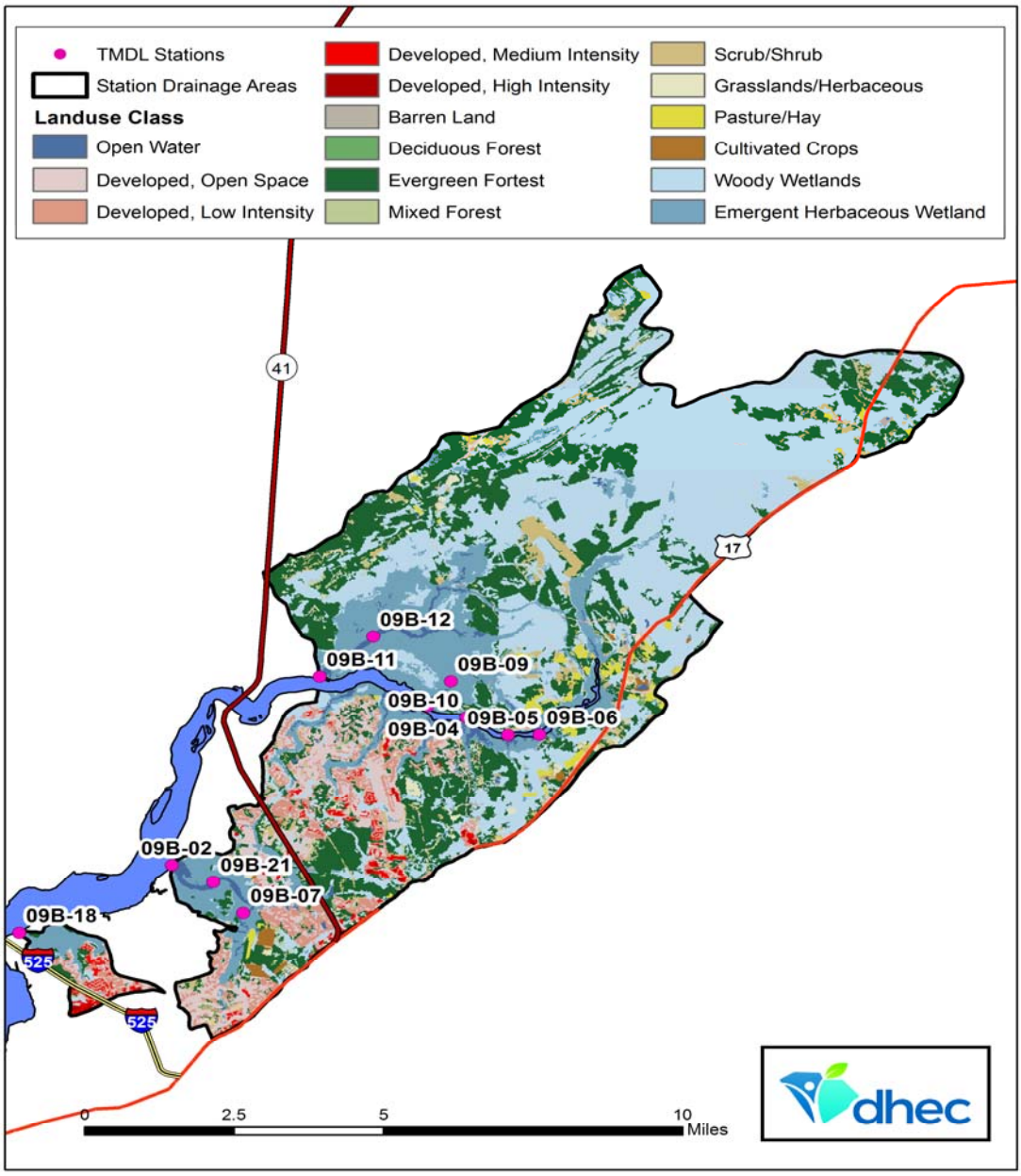

Figure 6. Landuse within the Wando River TMDL areas based on NLCD 2011.

3.2 Nonpoint Sources

Nonpoint source pollution is defined as pollution that is not released through pipes but rather originates from multiple sources over a relatively large area. Nonpoint sources can be divided into

source activities related either to land or water use including failing septic tanks, improper animal-keeping practices, agriculture, forestry practices, wildlife and urban and rural runoff.

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

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

Currently there are no NPDES permitted facilities with a land application permit of treated wastewater within the Wando River watershed.

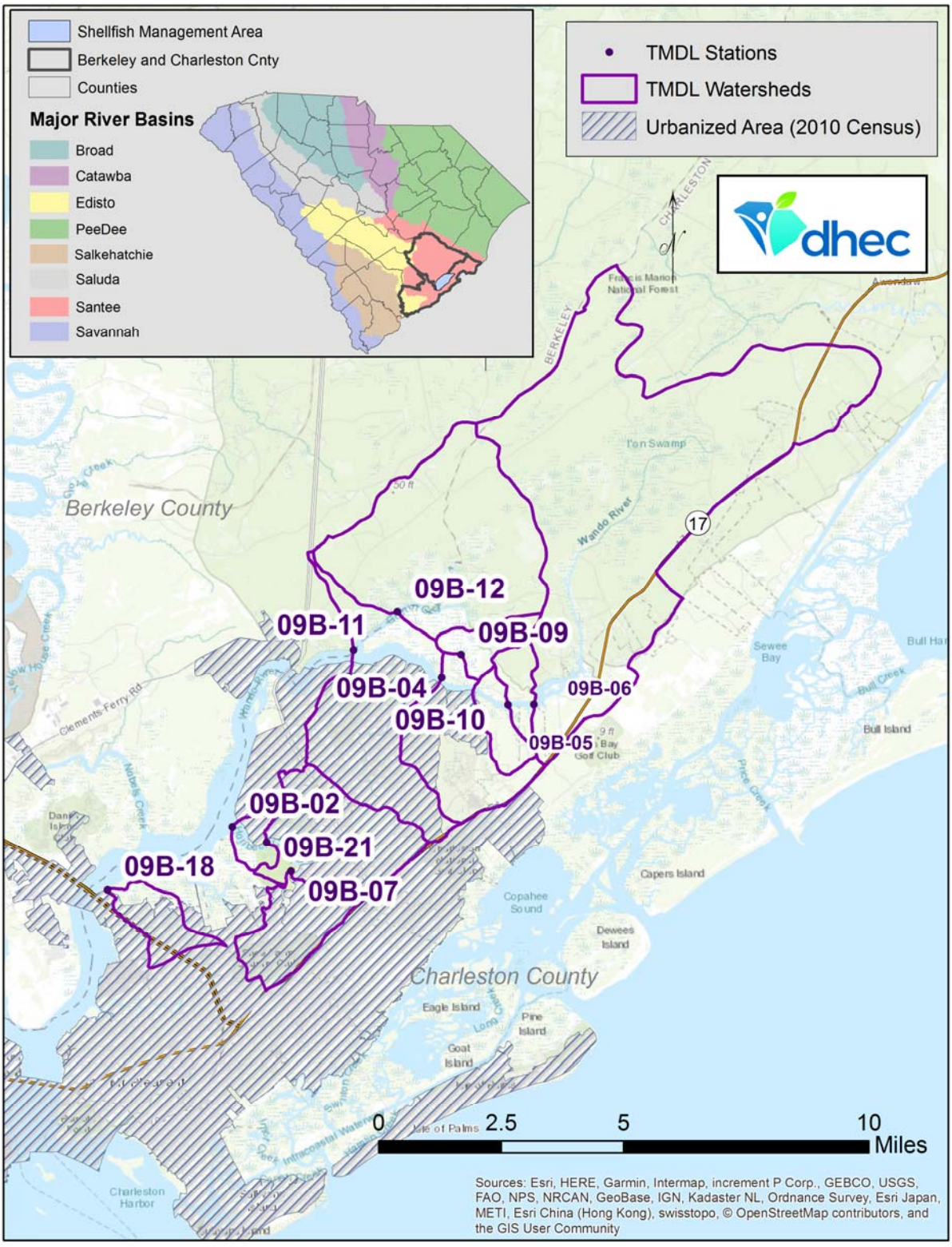

Figure 7. Urbanized areas based on 2010 census within the Wando River TMDL areas

3.2.3 Urban and Suburban Stormwater Runoff

There are 'urban' wildlife such as resident waterfowl, squirrels, rodents, raccoons, pigeons, and other birds, all of which can contribute to the FC load. Urban runoff is considered to be negligible within the headwaters, i.e. upstream of station 09B-06 portion of the TMDL watershed (Conrads & Smith, 1996); however, there may be urban runoff contributing in more developed portions of the watershed.

Other contributors to the FC loading to streams, estuaries and lakes are household cats and dogs as well as other domesticated animals such as horses (Figure 9) chickens, pigs and others (Figure 8). One study found cat feces can contain between $3.3x10^4$ to $4.1x10^7$ CFU/g (wet), and dog feces between $8.4x10^6$ to $1.2x10^8$ CFU/g (wet) of fecal coliform (Cox, et al., 2005). U.S. Pet Ownership Statistics show 36.5% of households own dogs and 30.4% own cats (American Veterinary Medical Association, 2014). Based on the 2010 US Population Census, there are approximately 6141 dogs and 6709 cats by an estimated 10760 households within the Wando River TMDL watersheds. American Veterinary Medical Association Pet Ownership Calculator is available at: https://www.avma.org/KB/Resources/Statistics/Pages/US-pet-ownership-calculator.aspx

Table 3. Estimated number of dogs and cats per station within the Wando River TMDL area (American Veterinary Medical Association, 2014).

TMDL Station	Population ∞	Number of Houses ∞	Number of Dogs†	Number of Cats†
09B-02	205	69	46	50
09B-04	2,831	1,086	636	695
09B-05	72	15	16	18
09B-06	864	347	194	212
09B-07	4,555	2,097	1,023	1,118
09B-09	4	2	1	1
09B-10	62	26	14	15
09B-11	7,478	2,853	1,680	1,835
09B-12	64	30	14	16
09B-18	2,915	1,091	655	715
09B-21	6,783	2,467	1,524	1,664
Total	***27,340***	***10,760***	***6,141***	***6,709***

∞ Estimates based on 2010 us population census.

† Number of pets per watershed was calculated utilizing American Veterinary Medical Association statistics (2014).

Similar to regulated MS4s, potentially designated MS4 entities as listed in FR 64, Appendix 7 (Federal Register, n.d.) or other unregulated MS4 communities located in the Wando River watershed may have the potential to contribute FC bacteria in stormwater runoff.

3.2.4 Failing Septic Systems

Improperly maintained and failing septic tanks can contribute to bacterial contamination of downstream waterbodies. 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 8. A resident with tropical bird breeding facility adjacent to the Wando River.

3.2.5 Wildlife

Resident, migrant and seasonal wildlife' wastes that are carried into nearby streams by runoff following rainfall or deposited directly in or adjacent to streams may be a significant source of fecal coliform in the Wando River watershed.

As mentioned above, Francis Marion Forest occupies a portion of the TMDL area. The forest fauna has approximately 48 species of mammals including wild boar/feral pig, black bear, otter, beaver, coyote, bobcat, raccoon and deer, as well as 250 species of birds, 43 species of amphibians and 58 species of reptiles. The forest is also designated as an "Important Bird Area" by the National Audubon Society and the American Bird Conservancy. Located on the Atlantic flyway, Francis Marion Forest is used by birds for spring and fall migrations and also serves as essential breeding habitat (US DA, n.d.).

Table 4. Estimated populations of horses, sheep and some of the wildlife within the TMDL watershed.

Station	Deer [2]	Raccoons [3]	Wild turkey [4]	Wild boar/feral pig [5]
09B-02	12	2528	12	
09B-04	71	15,168	71	71
09B-05	17	3,584	17	17
09B-06	467	99,616	467	467
09B-07	71	15,136	71	
09B-09	20	4,160	20	20
09B-10	20	4,224	20	20
09B-11	249	26,592	125	125
09B-12	379	40,448	190	190
09B-18	26	5,632		
09B-21	82	17,536	82	

Data Sources:

1. SC DNR 2013 Deer Density Map (SC DNR, 2013)
2. SC DNR Wildlife Management Guide for Raccoons (SC DNR, (n.d.))
3. SC DNR 2010 Wild Turkey Distribution Map (SC DNR, 2010)
4. 2013 Wild Boar Map (Dr. J. Corn, personal communication, April 7, 2014)

SCDNR's 2008 deer density study indicate there are approximately 15 to 45 deer per square mile in the Wando River TMDL area (SC DNR, 2013). The study estimated deer density based on suitable habitat such as forests, croplands, and pastures. Data compiled by Yagow (2001) show the fecal coliform production can be 347 x 10^6 cfu/deer/day, 113 x 10^6 cfu/raccoon/day, and 4,853 x 10^6 cfu/duck/day.

The majority of the drainage area for station 09B-06 is rural and a large portion of it is within the Francis Marion National Forest. As mentioned above, there is a variety of wildlife within the forest. However, there is negligible amount of freshwater input from the forest to the headwaters of the

Wando River (Conrads & Smith, 1996) under dry conditions; it is highly unlikely there would be any fecal coliform input from the Francis Marion National Forest into the Wando River. Also, forest canopy intercepts most of the precipitation and since forest floor is highly pervious, it is not likely there would be significant amounts of fecal coliform with runoff reaching the Wando River and impacting the bacteria levels.

During two field reconnaissance trips, DHEC District personnel indicated the presence of large populations of raccoons and feral pigs within the TMDL watersheds. As shown in Figure 10, (Dr. Joseph Corn personal communication, April 7, 2014), feral pigs are known to exist within certain portions of the Wando River watershed. Both raccoons and feral pigs spend time near water's edge on tidal flats and both may be major contributors to fecal coliform exceedances.

Figure 9. There are numerous equestrian facilities as well as residential communities with access to the Wando River.

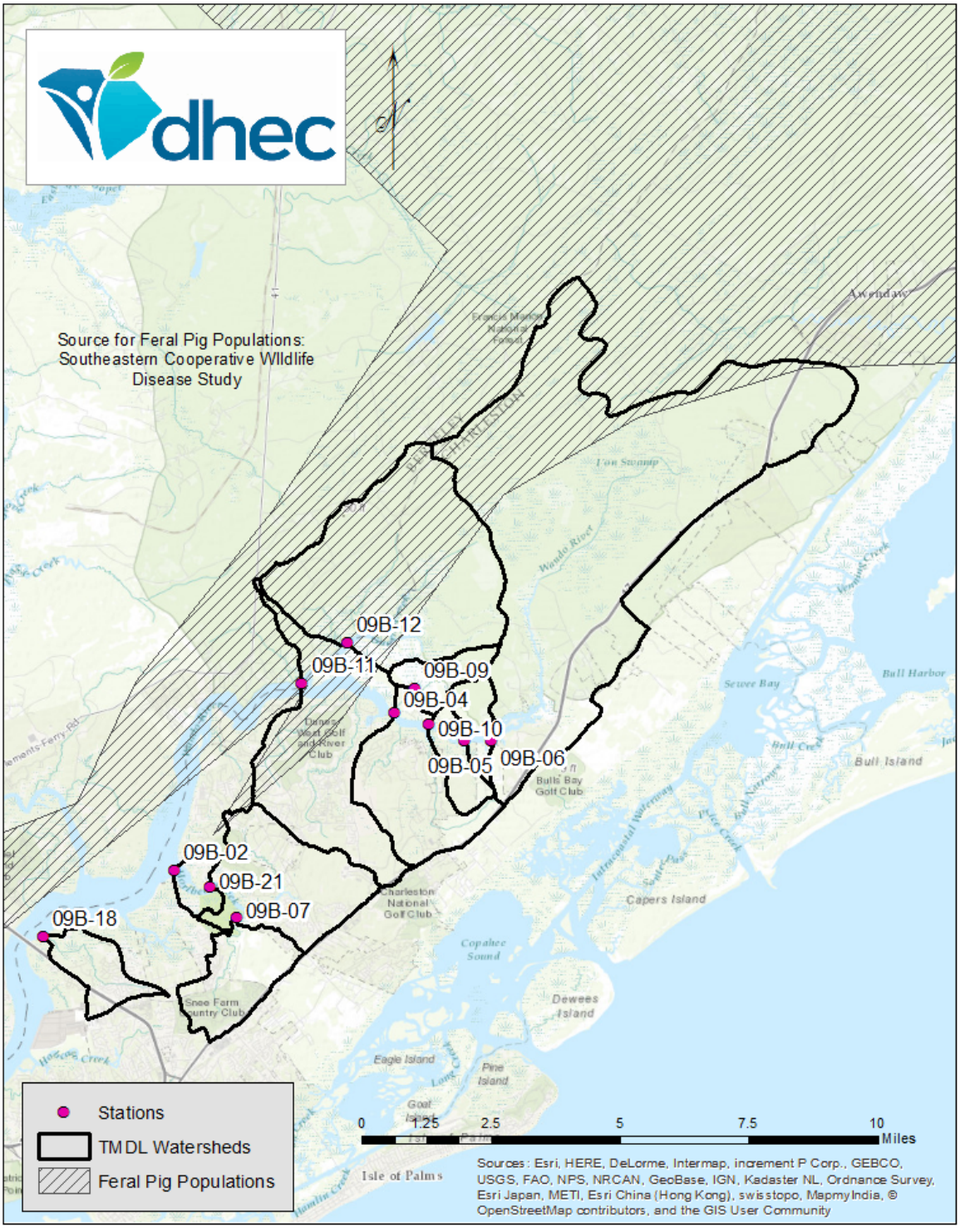

Figure 10. Approximate distribution of feral pigs within the Wando River TMDL watersheds (Dr. Joseph Corn personal communication, April 7, 2014).

3.2.6 Marinas, Boating Activities and Structures

There are currently no marinas within the TMDL watersheds however there are numerous private docks along the Wando River and its tributaries. 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 5). 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 the Wando River. It is prohibited under Federal law to discharge untreated sewer from vessels within navigable waters as stated in Clean Vessel Act.

During 2007, US EPA performance tested two US Coast Guard certified, Type I MSDs for effectiveness in reducing FC and visible floating solids (VFS) from their discharge. Units used in the performance tests were Electro Scan Model EST 12 and Thermopure-2 Model TP-210. Both units utilized maceration for reduction of VFS. Electro Scan uses chlorine generated from salt water, while Thermopure utilizes low level heat for bacteria elimination/sterilization.

Effluent treated by Electro Scan had fecal coliform ranges from nondetect to >1600 MPN/100ml, with a mean concentration of 82 MPN/100ml. Effluent treated by Thermopure had fecal coliform ranges from nondetect to >3,000,000 MPN/100ml with a mean of 380,000 MPN/100ml. EPA concluded that Thermopure model used in the testing showed poor performance (US EPA, January 2010).

Table 5. Types of Marine Sanitation Devices.

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 numerous 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 matter 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 Wando River TMDL watersheds. For the calculations of the cumulative probability distributions for all stations except for 09B-06, 09B-10 and 09B-21 data from 2000 through 2012 were used. Stations 09B-06 and 09B-10 have been discontinued since end of 2006 therefore only data from 2000 to 2006 were used for calculating percent reductions for these two stations. Station 09B-21 was has been active since 2007 and cumulative probability distributions were calculated using data from 2007 to 2012.

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 do 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. 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 11 shows the cumulative probability graph for station 09B-04. The graphs for the remaining stations can be found in Appendix A.

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 are not sufficient data to calculate the loadings for each station which is a limitation of this method.

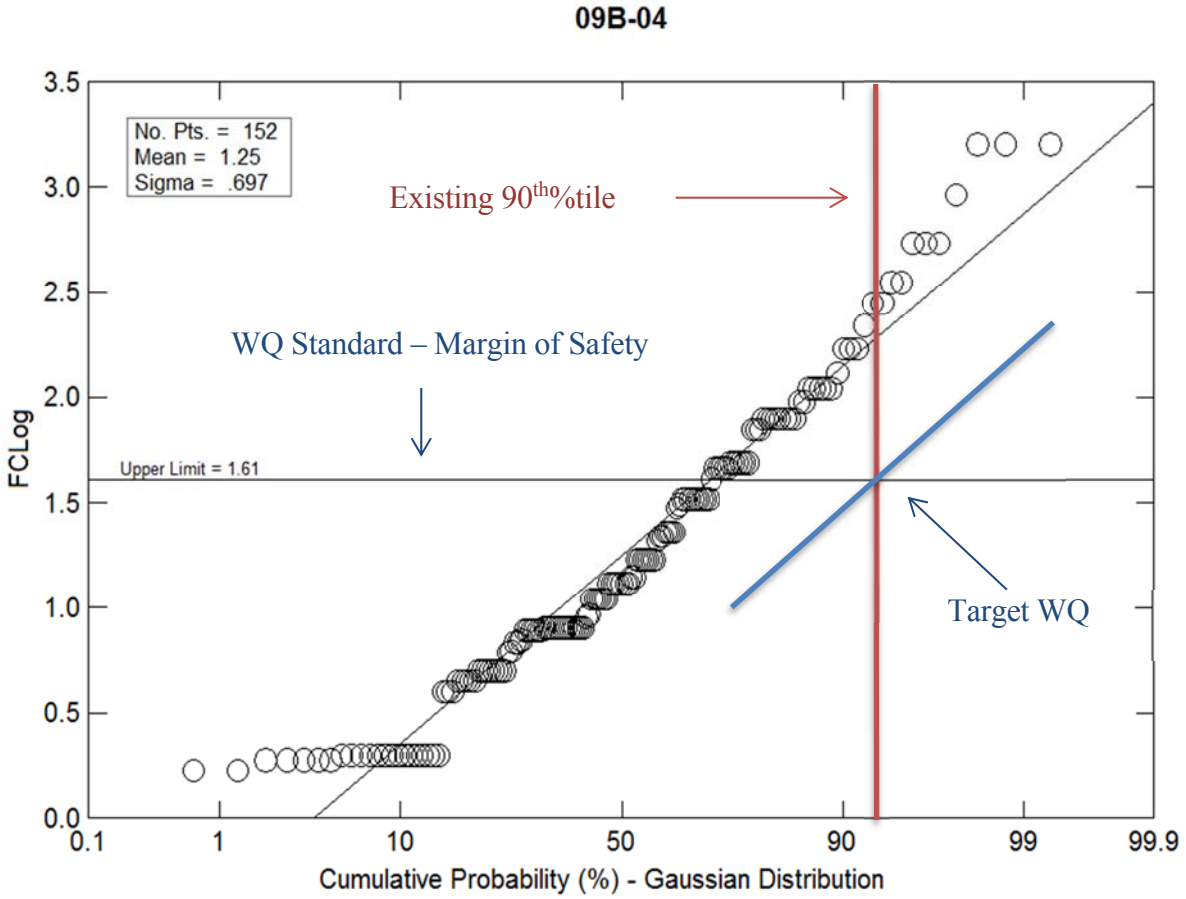

Figure 11. Cumulative probability graph for station 09B-04.

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 the Wando River, 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 SSOs, are illegal and not covered under the WLA of this TMDL.

5.2.1 Continuous Point Sources

The Wando River is classified as SFH waters and direct discharges 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 continuous NPDES-permitted discharges to the affected TMDL watersheds with a FC bacteria effluent limit on their NPDES permit. 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 and SCR and/or regulated under South Carolina Water Pollution Control Permits: R61-9, §122.26(b)(4),(7),(14)-(21) (SC DHEC, 2011). 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. Based on the 2010 US Census, at the time of the TMDL development, a portion of the Wando River watershed was classified as urbanized area.

Charleston County, SCDOT and Town of Mount Pleasant are the designated MS4s located in the TMDL areas (Figure 7). In watersheds where the applicable water quality standard is not being attained (impaired), existing and 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 TMDLs. If a TMDL site attains the applicable water quality standard in the future (not impaired), then regulated MS4s within that TMDL watershed are not subject to a WLA reduction.

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 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, where applicable. This also applies to future discharges associated with industrial and construction activities that will be subject to R61-9, §122.26(b)(4),(7),(14)-(21) (SC DHEC, 2011).

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 which includes unregulated processes/entities and is expressed both as a load and as a percent reduction. 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 the Wando River 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 other regulated MS4s that may be located in at least one of the TMDL drainage areas: Charleston County, and the Town of Mount Pleasant. In watersheds where the applicable water quality standard is not being attained (impaired), regulated MS4s are subject to the WLA component of these TMDLs. There may also be other unregulated stormwater discharges located in the watershed that are subject to the LA component of these TMDLs.

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 R61-9 §122.26(b)(4),(7),(14) - (21) (SC DHEC, 2011).

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 29.1 cfu/100ml to 252.5 cfu/100ml (Table 6).

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 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 83.8% in order to consistently meet the instantaneous water quality standard for fecal coliform (Table 6).

Calculated TMDL reductions applicable to each station are shown on Table 6. There are no required reductions for station 09B-02 and 09B-11 because existing water quality data demonstrate that the

water quality standard is being attained. Both sites meet the relevant water quality standard but are classified as "restricted" per Shellfish Sanitation Program protocol however; a percentage reduction is not needed at this time (0% reduction). Only the instantaneous water quality criterion was targeted because there is insufficient data to evaluate against the 30-day geometric mean.

Based on the information available at this time, the portions of the watersheds 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.

5.7 Statistical Trend Analysis

As with most water quality data, fecal coliform data is non-normal requiring the use of non-parametric statistical methods for analysis. Mann-Kendall test calculates the Kendall's tau correlation coefficient and its significance for any pair of X, Y data. Mann-Kendall test is widely used to detect monotonic (changes in a consistent direction) trends in water quality data where there can be missing values, results can be right or left censored (less than, more than), and when data distribution is non-normal.

Trend analyses were performed on fecal coliform data utilizing a DOS based computer program, Kendall.exe, developed by United States Geological Survey (USGS) (Helsel, et al., 2006). Data for each station was analyzed using the TMDL periods, where X is date and Y is the fecal coliform data. Output files from the Kendall.exe and plots of fecal coliform time series and trend line are shown in Appendix D.

Overall, the trend analysis showed little change in fecal coliform levels over time in the TMDL areas. One station, 09B-07, showed statistically significant decreasing trend over the TMDL period, 2000-2012. However, the slopes of the trend line is weak and high bacteria readings have not decreased over time, so it is not clear if real improvement has occurred or just natural variability.

Table 6. Components of the Wando River shellfish fecal coliform TMDLs

Station	90th %tile of Existing Load (cfu/100ml)	TMDL [1, 2] (cfu/100ml)	WQ Target (cfu/100ml)	Margin of Safety (cfu/ 100ml)	WLA			LA
					Continuous Sources[3] (cfu/100ml)	Non-Continuous [4, 7] Sources (% Reduction)	Non-Continuous SCDOT [7] (% Reduction)	% Reduction to Meet LA [7]
09B-02	29.1	43	40.9	2.1	See Note Below	0%	0%[5]	0%
09B-04	139.2	43	40.9	2.1	See Note Below	70.6%	70.6%[6]	70.6%
09B-05	92.3	43	40.9	2.1	See Note Below	55.7%	0%[5]	55.7%
09B-06	138.5	43	40.9	2.1	See Note Below	70.5%	0%[5]	70.5%
09B-07	121.7	43	40.9	2.1	See Note Below	66.4%	66.4%[6]	66.4%
09B-09	252.5	43	40.9	2.1	See Note Below	83.8%	0%[5]	83.8%
09B-10	133.1	43	40.9	2.1	See Note Below	69.3%	0%[5]	69.3%
09B-11	40.1	43	40.9	2.1	See Note Below	0%	0%[5]	0%
09B-12	84.6	43	40.9	2.1	See Note Below	51.7%	0%[5]	51.7%
09B-18	69.5	43	40.9	2.1	See Note Below	41.2%	41.2%[6]	41.2%
09B-21	41.3	43	40.9	2.1	See Note Below	0.88%	0.88%[6]	0.88%

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 = Samples shall not 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. As long as the conditions within the SCDOT MS4 area remain the same the Department deems the current contributions from SCDOT negligible and no reduction of FC bacteria is necessary. SCDOT must continue to comply with the provisions of its approved NPDES stormwater permit.
6. 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 these TMDLs and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 permit.
7. Percent reduction applies to existing concentration.

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 the Wando River 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 NPDES. Point sources can be broken down into continuous and non-continuous point sources. Some examples of a continuous point source are domestic and industrial WWTF. Non-continuous point sources are related to stormwater and include MS4s and construction activities, etc. Current and future NPDES discharges in the referenced watersheds are required to comply with the load reductions prescribed in the 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 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* (SC DHEC, 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 these TMDLs and reduce nonpoint source fecal coliform loadings to the Wando River. Congress amended the CWA in 1987 to establish the §319 Nonpoint Source Management Program. Under §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.

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 Berkeley and Charleston Counties Soil and Water Conservation Districts, local 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 the Wando River 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 watersheds while demonstrating consistency with the assumptions and requirements of the TMDLs. 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 Wando River is classified as SFH and direct discharges are not permitted. Currently, there are no direct discharges to the Wando River.

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 MS4 permit. Public nonpoint source pollution education is another. Other permit requirements for implementing WLAs in approved TMDL documents will vary across waterbodies, discharges, and pollutant(s) of concern. The allocation within a TMDL area 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 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, existing 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 (US EPA, 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.

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 (US EPA, 2005).

Illicit discharge detection and elimination efforts are also necessary. Discharges from MS4s often include wastes and wastewater from non-stormwater sources. These discharges enter the system through either direct connections or indirect connections. The result is untreated discharges that contribute high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving waterbodies (US EPA, 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 (US EPA, 2005). For information on specific BMPs please refer to the SCDHEC Stormwater Management BMP Handbook online at: http://www.scdhec.gov/environment/water/swater/BMPhandbook.htm

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 (US EPA, 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 (US EPA, 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/HomeAndEnvironment/Water/Watersheds/Contacts/

For additional information on stormwater discharges associated with MS4 entities please see the US EPA 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 stations 09B-02 and 09B-11, it is recommended that measures be taken to reduce nonpoint source runoff in the form of stormwater runoff to the Wando River.

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 or rain pillow (for single family residential units or other small buildings), or a rain water collection system, such as a cistern, 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 numerous equestrian related facilities within the Wando River watershed. Some of these facilities are near the Wando River with limited buffers. Potential sets of BMPs to reduce fecal matter 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 and maintaining vegetative buffers may be helpful for reducing runoff especially in areas that are adjacent to the Wando River and its tributaries.

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 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. 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 electronic links for these programs are 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 available at the time this document was written, some of the homes around the Wando River utilize onsite 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't's are as follows:

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

Do's:

- Conserve water to reduce the amount of wastewater that must be treated and disposed of by your system. Doing laundry over several days will put less stress on your system.

- Repair any leaking faucets or toilets. To detect toilet leaks, add several drops of food dye to the toilet tank and see if dye ends up in the bowl.
- Divert down spouts and other surface water away from your drainfield. Excessive water keeps the soil from adequately cleansing the wastewater.
- Have your septic tank inspected yearly and pumped regularly by a licensed septic tank contractor.

Don't's:

- 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/environment/envhealth/Septic/

6.2.4 Wildlife and Domestic Animals

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 (US EPA, 2001).

Planting and maintaining a vegetative buffer around the residential areas will help filter pet waste that may accumulate in gardens and public walkways. 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 dispensers 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 (US EPA, January 2010). Therefore, it is important to bring attention of boating public to available pumpout facilities near the Wando River. A map of available pumpout facilities can be found at http://www.dnr.sc.gov/marine/vessel/pdf/coastalmaps2013.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 located in Cooper and Ashley Rivers and within the Charleston Harbor (SC DNR, 2012). Marinas are prohibited unless the area is prohibited for shellfish harvesting.

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.

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

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

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

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

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

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

SCDHEC Stormwater Outreach – Resources for Phase II Stormwater. Available at: http://www.scdhec.gov/environment/water/ms4/html/other_programs.htm

7.2 General Information for Nonpoint Sources

7.2.1 Pet Waste

EPA Nonpoint Source Outreach Toolbox. Pet Care. Available at: http://cfpub.epa.gov/npstbx/FeaturedProductsDetail.cfm?TopicID=70

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

7.2.2 Wildlife

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://cfpub.epa.gov/npstbx/FeaturedProductsDetail.cfm?TopicID=70

Clemson Extension Home*A*Syst. Available at:
http://www.clemson.edu/psapublishing/Pages/Water/WQL21.pdf

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/wps/portal/nrcs/detailfull/national/programs/alphabetical/?cid=stelprdb1042016

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.habitat.noaa.gov/pdf/tncnoaa_shellfish_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

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

7.5 Stormwater

Stormwater Ponds in Coastal South Carolina, Denise M. Sanger. S.C. Sea Grant Consortium (n.d.). Accessed on February 26, 2014. Available at: http://www.dnr.sc.gov/marine/NERR/present/stormwater/SangerStormwaterPondsSC.pdf

7.6 Wando River Watershed Resources

Town of Mt. Pleasant Water Quality information for residential, commercial properties, and construction projects, available at: https://www.tompsc.com/index.aspx?NID=198

Charleston River Keeper. Information available at: http://charlestonwaterkeeper.org/

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Available at: http://www.animalagteam.msu.edu/uploads/files/20/cowstreamsecoli.pdf
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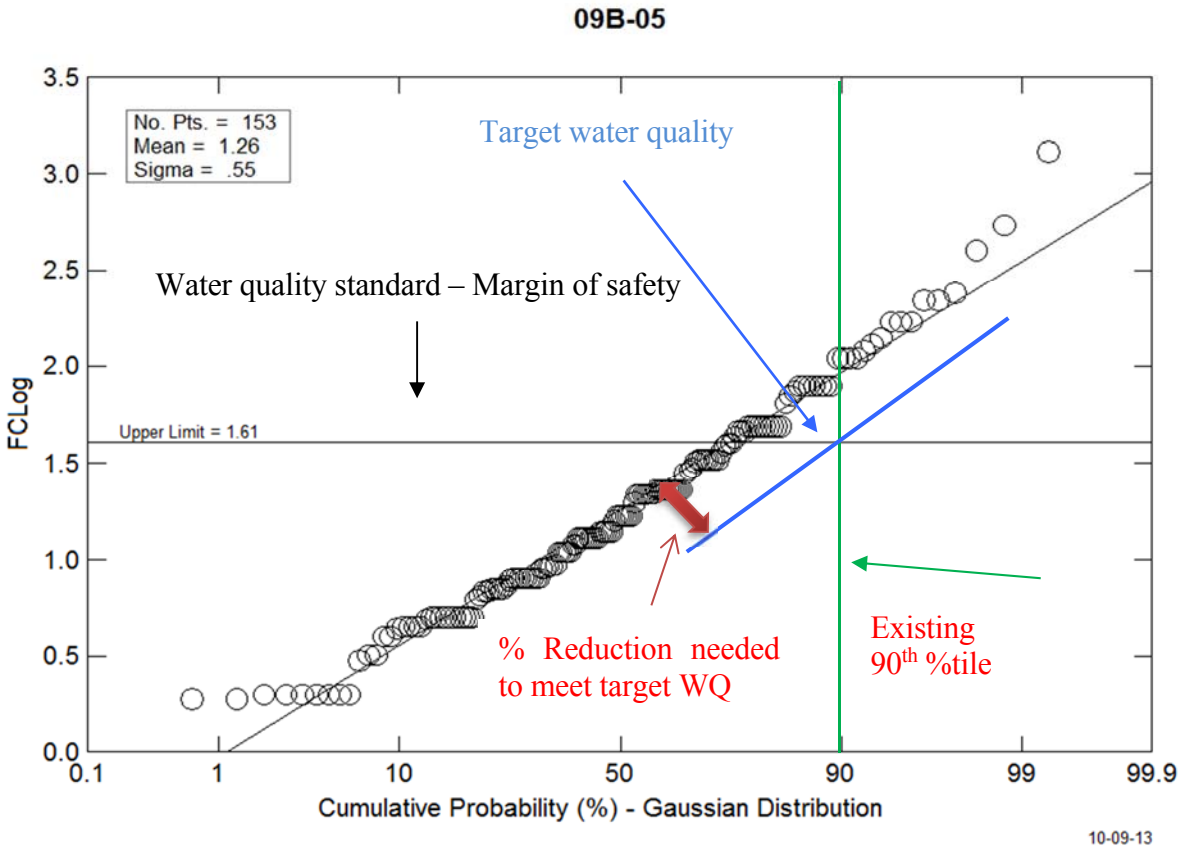
Appendix A - Cumulative Probability Graphs

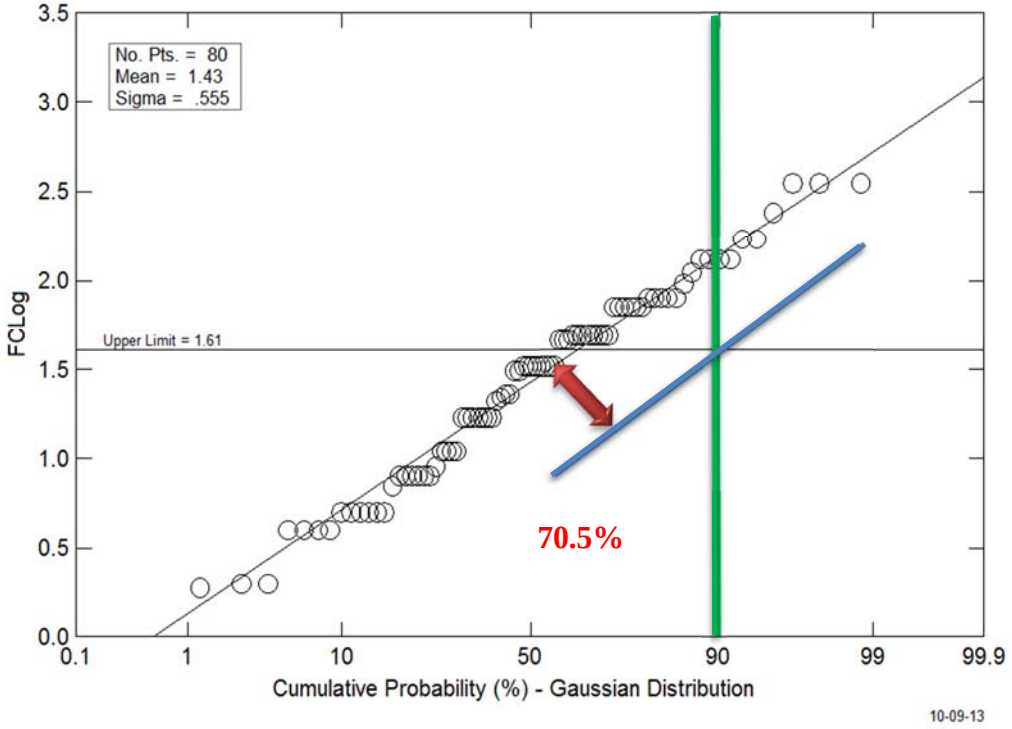


Above graph has been labeled as a guide where,

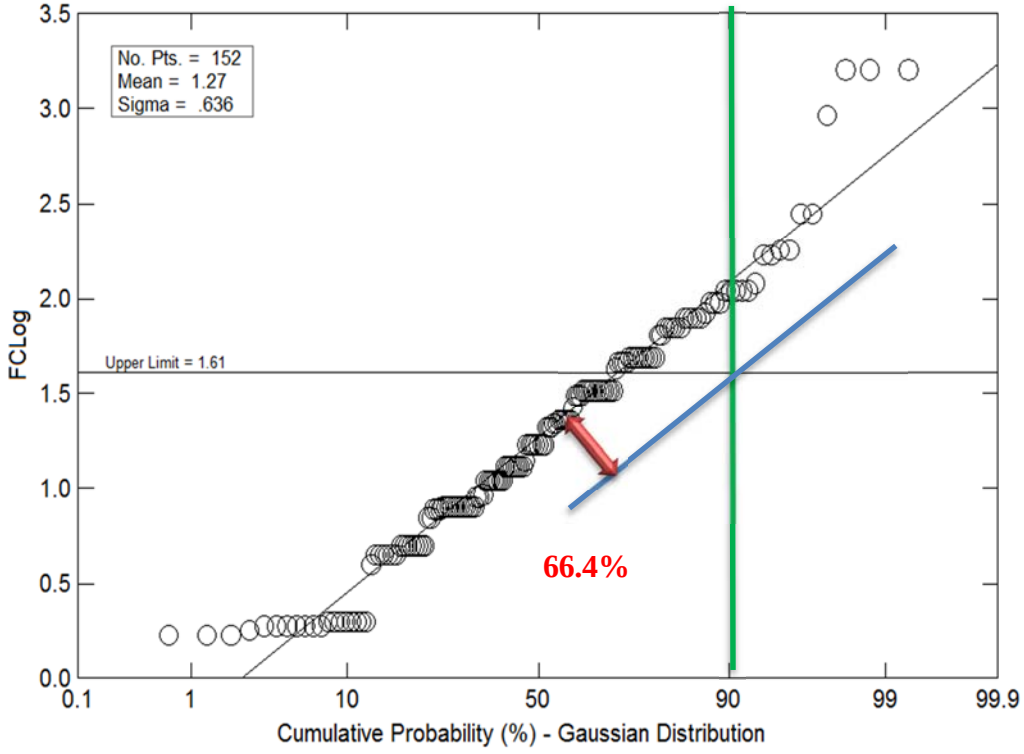
- **Black** horizontal line represents the water quality standard – margin of safety in Log10 (43 MPN/100ml – 5% = 40.9 MPN/100 ml),
- **Blue** diagonal line represents the target water quality,
- **Green** perpendicular line represents the existing 90th %tile, and
- **Red**, diagonal arrow represents whether a % reduction is needed to meet the target water quality. If a reduction is needed, percentage reduction will be shown in **red**.

The remainder of the graphs in this Appendix A will follow the same format, but are not labeled except for % reduction needed to meet WQS.

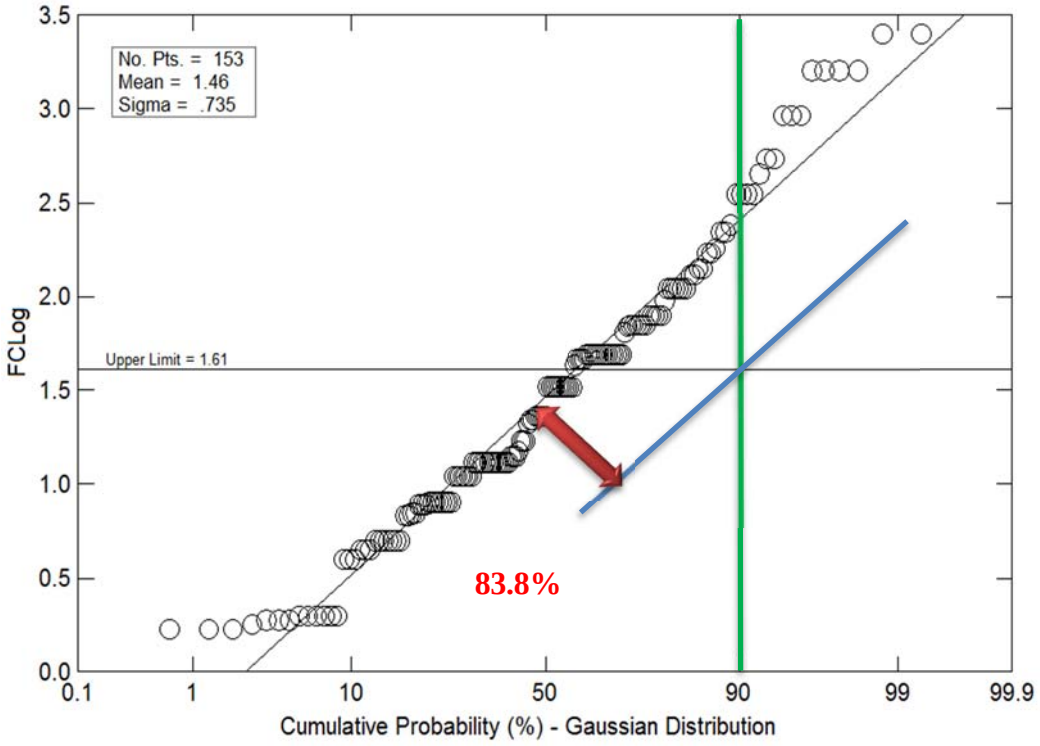
09B-06


No. Pts. = 80
Mean = 1.43
Sigma = .555
Upper Limit = 1.61
70.5%
FCLog
Cumulative Probability (%) - Gaussian Distribution
10-09-13

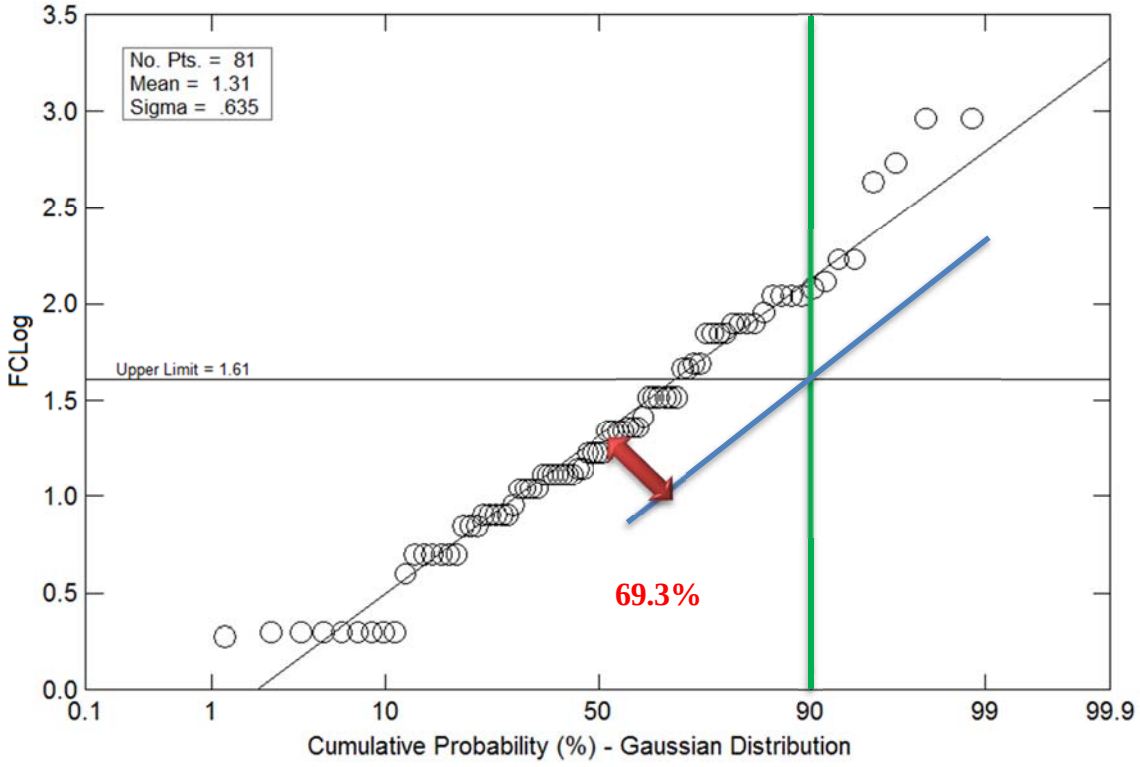
09B-07

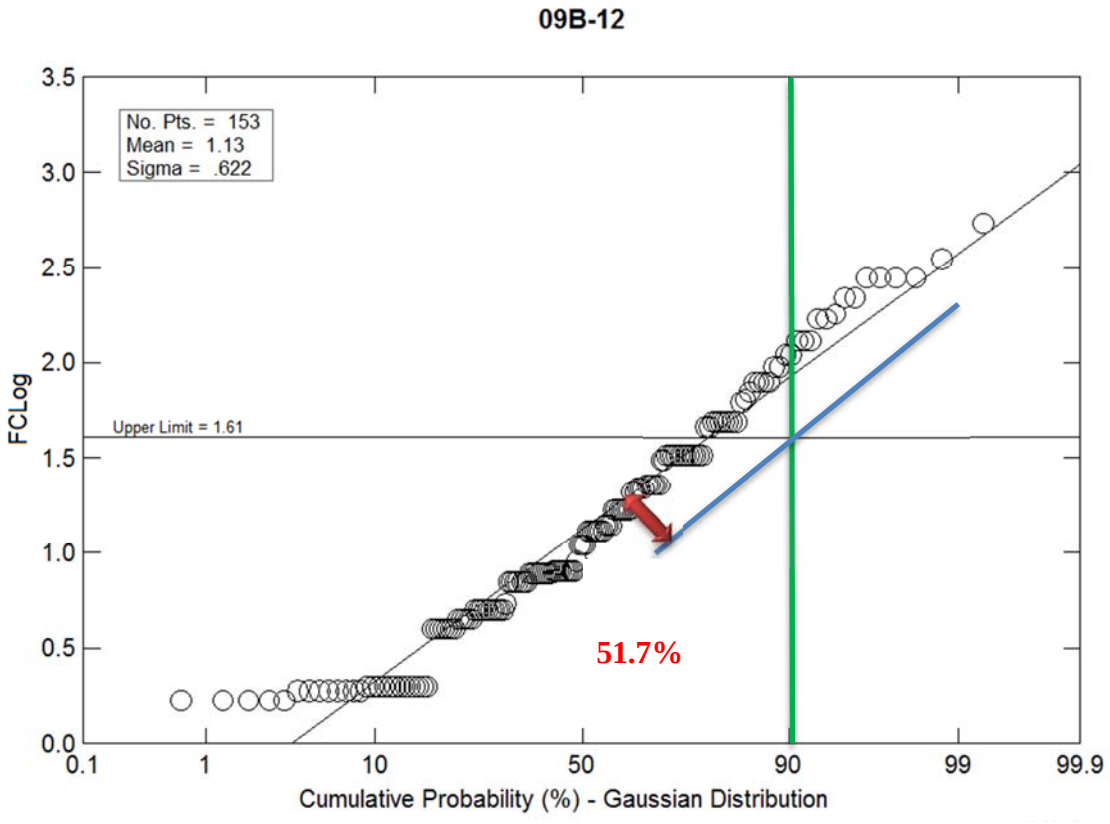

No. Pts. = 152
Mean = 1.27
Sigma = .636
Upper Limit = 1.61
66.4%
FCLog
Cumulative Probability (%) - Gaussian Distribution

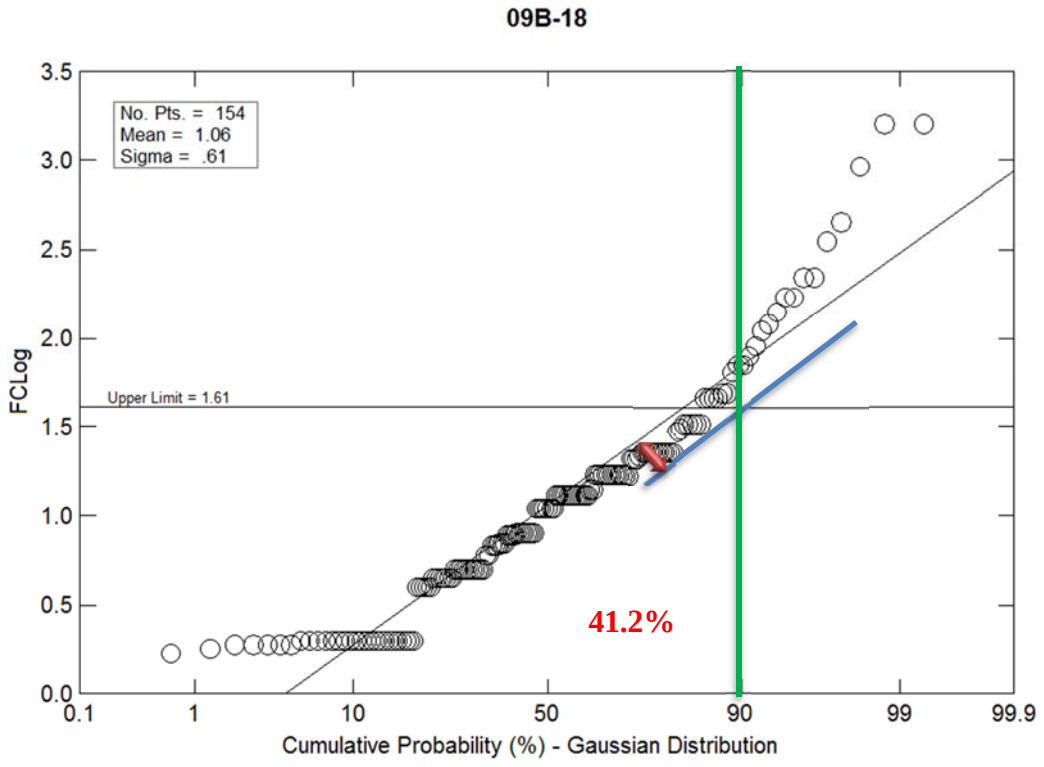
09B-09

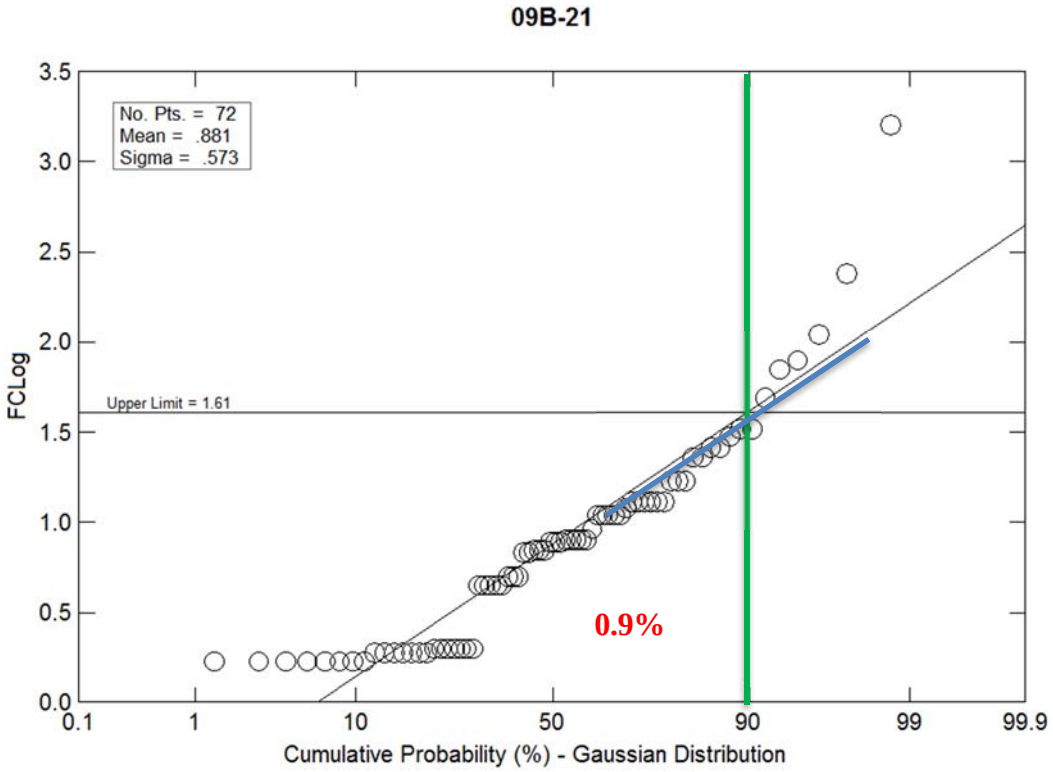

No. Pts. = 153
Mean = 1.46
Sigma = .735
Upper Limit = 1.61
83.8%
FCLog
Cumulative Probability (%) - Gaussian Distribution
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0.1
1
10
50
90
99
99.9

09B-10


No. Pts. = 81
Mean = 1.31
Sigma = .635
Upper Limit = 1.61
69.3%
FCLog
Cumulative Probability (%) - Gaussian Distribution
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0.1
1
10
50
90
99
99.9


09B-12
No. Pts. = 153
Mean = 1.13
Sigma = .622
Upper Limit = 1.61
51.7%
FCLog
Cumulative Probability (%) - Gaussian Distribution
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.1
1
10
50
90
99
99.9


09B-18
No. Pts. = 154
Mean = 1.06
Sigma = .61
Upper Limit = 1.61
41.2%
FCLog
Cumulative Probability (%) - Gaussian Distribution
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.1
1
10
50
90
99
99.9


09B-21
No. Pts. = 72
Mean = .881
Sigma = .573
Upper Limit = 1.61
0.9%
FCLog
Cumulative Probability (%) - Gaussian Distribution
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.1
1
10
50
90
99
99.9

Appendix B -2011 NLCD Individual Landuses of TMDL Stations

	TMDL Station Landuse (mi2)*										
Landuse Category	**09B-04**	**09B-05**	**09B-06**	**09B-09**	**09B-10**	**09B-11**	**09B-12**	**09B-18**	**09B-02**	**09B-07**	**09B-21**
Open Water	0.19	0.12	0.32	0.01	0.18	0.71	0.26	0.00	0.14	0.04	0.14
Woody Wetlands	0.94	0.43	19.08	0.40	0.39	1.16	4.12	0.08	0.01	0.23	0.47
Emergent Herbaceous Wetlands	0.56	0.26	1.54	0.7	0.20	1.67	3.06	0.51	0.57	0.30	0.97
Total Wetlands/Open Water	***1.69***	***0.81***	***20.94***	***1.11***	***0.77***	***3.54***	***7.44***	***0.59***	***0.72***	***0.57***	***1.58***
Developed, Open Space	0.59	0.02	0.68	0.00	0.01	1.68	0.11	0.28	0.00	0.80	1.19
Developed, Low Intensity	0.4	0.00	0.22	0.00	0.00	1.07	0.01	0.42	0.00	0.60	0.82
Developed, Medium Intensity	0.07	0.00	0.01	0.00	0.00	0.2	0.00	0.22	0.00	0.05	0.16
Developed, High Intensity	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.02
Total Developed	***1.08***	***0.02***	***0.91***	***0.0***	***0.01***	***2.95***	***0.12***	***0.96***	***0.0***	***1.45***	***2.19***
Deciduous Forest	0.00	0.00	0.01	0.01	0.00	0.03	0.00	0.00	0.00	0.02	0.02
Evergreen Forest	1.58	0.16	7.03	0.13	0.47	1.49	4.29	0.18	0.04	0.51	1.35
Mixed Forest	0.06	0.00	0.07	0.00	0.01	0.03	0.11	0.00	0.00	0.05	0.05
Total Forested	***1.64***	***0.16***	***7.11***	***0.14***	***0.48***	***1.55***	***4.4***	***0.18***	***0.04***	***0.58***	***1.42***
Pasture/Hay	0.01	0.06	0.56	0.02	0.01	0	0.04	0	0	0.06	0.01
Cultivated Crops	0	0	0.07	0	0	0	0	0	0	0.18	0.01
Total Agricultural	***0.01***	***0.06***	***0.63***	***0.02***	***0.01***	***0.0***	***0.04***	***0***	***0.00***	***0.24***	***0.02***
Scrub/Shrub	0.14	0.06	1.22	0.03	0.04	0.21	0.44	0.01	0	0.1	0.22
Grassland/Herbaceous	0.14	0.00	0.28	0	0.01	0.04	0.20	0	0.01	0.05	0.03
Barren Land	0.03	0	0.05	0	0.01	0.01	0	0	0	0	0.02

Total Other	***0.31***	***0.06***	***1.55***	***0.03***	***0.06***	***0.26***	***0.64***	***0.01***	***0.01***	***0.15***	***0.27***
Total Area (mi2)	***4.73***	***1.12***	***31.14***	***1.3***	***1.32***	***8.3***	***12.64***	***1.74***	***0.77***	***2.99***	***5.48***

* Stations in the table above are grouped and colored coded by subwatersheds, in ascending order. Please refer to the maps in the document for station locations.

Appendix C - Shellfish Data

Station	Sampling Date	FC MPN/100 ml		Station	Sampling Date	FC MPN/100 ml
09B-03	1/5/2000	2		09B-09	5/12/2009	13
09B-03	2/8/2000	5		09B-09	6/15/2009	70
09B-03	3/6/2000	31		09B-09	7/21/2009	21
09B-03	4/4/2000	1.9		09B-09	8/3/2009	920
09B-03	5/9/2000	2		09B-09	9/14/2009	33
09B-03	7/5/2000	1.9		09B-09	10/19/2009	17
09B-03	8/15/2000	23		09B-09	11/23/2009	4.5
09B-03	9/6/2000	33		09B-09	12/14/2009	450
09B-04	1/5/2000	46		09B-09	1/27/2010	180
09B-04	2/8/2000	2		09B-09	2/1/2010	46
09B-04	3/6/2000	79		09B-09	3/8/2010	15
09B-04	4/4/2000	46		09B-09	4/13/2010	49
09B-04	5/9/2000	2		09B-09	5/4/2010	6.8
09B-04	7/5/2000	8		09B-09	6/2/2010	23
09B-04	8/15/2000	79		09B-09	7/26/2010	130
09B-04	9/6/2000	220		09B-09	8/3/2010	7.8
09B-04	10/11/2000	49		09B-09	9/28/2010	170
09B-04	11/27/2000			09B-09	10/6/2010	33
09B-04	12/5/2000	2		09B-09	11/3/2010	140
09B-04	1/10/2001	2		09B-09	12/14/2010	4.5
09B-04	2/27/2001	5		09B-09	1/19/2011	13
09B-04	3/28/2001	13		09B-09	2/1/2011	11
09B-04	4/4/2001	540		09B-09	3/9/2011	1.8
09B-04	5/29/2001	5		09B-09	4/3/2011	13
09B-04	6/11/2001	9		09B-09	5/3/2011	46
09B-04	7/24/2001	31		09B-09	6/6/2011	1.7
09B-04	8/21/2001	14		09B-09	7/26/2011	1600
09B-04	9/10/2001	5		09B-09	8/2/2011	2
09B-04	10/1/2001	11		09B-09	9/19/2011	1.7
09B-04	11/5/2001	13		09B-09	10/10/2011	79
09B-04	12/18/2001	4		09B-09	11/7/2011	7.8
09B-04	1/18/2002	1.9		09B-09	12/14/2011	4.5
09B-04	2/5/2002	8		09B-09	1/23/2012	43
09B-04	3/13/2002	540		09B-09	2/1/2012	1.7
09B-04	4/10/2002	1600		09B-09	3/13/2012	33
09B-04	5/1/2002	79		09B-09	4/11/2012	6.8
09B-04	6/12/2002	5		09B-09	5/2/2012	17
09B-04	7/10/2002	79		09B-09	6/25/2012	2
09B-04	8/20/2002	79		09B-09	7/25/2012	14
09B-04	9/18/2002	280		09B-09	8/6/2012	2
09B-04	10/8/2002	79		09B-09	9/26/2012	23
09B-04	11/6/2002	95		09B-09	10/8/2012	70
09B-04	12/17/2002	110		09B-09	11/7/2012	7.8
09B-04	1/15/2003	13		09B-09	12/17/2012	11

09B-04	2/10/2003	1.9		09B-10	1/5/2000	110
09B-04	3/11/2003	8		09B-10	2/8/2000	11
09B-04	4/15/2003	23		09B-10	3/6/2000	110
09B-04	5/12/2003	33		09B-10	4/4/2000	14
09B-04	6/17/2003	13		09B-10	5/9/2000	5
09B-04	7/23/2003	110		09B-10	7/5/2000	11
09B-04	8/5/2003	5		09B-10	8/15/2000	90
09B-04	9/15/2003	8		09B-10	9/6/2000	540
09B-04	10/8/2003	33		09B-10	10/11/2000	22
09B-04	11/19/2003	49		09B-10	11/27/2000	8
09B-04	12/16/2003	7		09B-10	12/5/2000	2
09B-04	1/13/2004	2		09B-10	1/10/2001	2
09B-04	2/2/2004	8		09B-10	2/27/2001	1.9
09B-04	3/15/2004	8		09B-10	3/28/2001	13
09B-04	4/6/2004	8		09B-10	4/4/2001	46
09B-04	5/17/2004	13		09B-10	5/29/2001	23
09B-04	6/21/2004	1.9		09B-10	6/11/2001	17
09B-04	7/13/2004	11		09B-10	7/24/2001	33
09B-04	8/10/2004	49		09B-10	8/21/2001	7
09B-04	9/14/2004	540		09B-10	9/10/2001	8
09B-04	10/6/2004	23		09B-10	10/1/2001	5
09B-04	11/22/2004	33		09B-10	11/5/2001	9
09B-04	12/14/2004	13		09B-10	12/18/2001	13
09B-04	1/24/2005	8		09B-10	1/18/2002	2
09B-04	2/8/2005	2		09B-10	2/5/2002	13
09B-04	3/2/2005	350		09B-10	3/13/2002	33
09B-04	4/5/2005	33		09B-10	4/10/2002	110
09B-04	5/4/2005	17		09B-10	5/1/2002	33
09B-04	6/14/2005	8		09B-10	6/12/2002	2
09B-04	7/19/2005	46		09B-10	7/10/2002	13
09B-04	8/16/2005	33		09B-10	8/20/2002	130
09B-04	9/20/2005	8		09B-10	9/18/2002	79
09B-04	10/17/2005	23		09B-10	10/8/2002	170
09B-04	11/7/2005	17		09B-10	11/6/2002	430
09B-04	12/20/2005	79		09B-10	12/17/2002	17
09B-04	2/7/2006	22		09B-10	1/15/2003	23
09B-04	3/13/2006	350		09B-10	2/10/2003	5
09B-04	4/10/2006	79		09B-10	3/11/2003	5
09B-04	5/22/2006	8		09B-10	4/15/2003	79
09B-04	6/19/2006	17		09B-10	5/12/2003	79
09B-04	7/5/2006	1.9		09B-10	6/17/2003	22
09B-04	9/20/2006	14		09B-10	7/23/2003	920
09B-04	10/18/2006	1600		09B-10	8/5/2003	26
09B-04	11/20/2006	170		09B-10	9/15/2003	22
09B-04	12/4/2006	920		09B-10	10/8/2003	70
09B-04	1/2/2007	110		09B-10	11/19/2003	70

09B-04	2/12/2007	4		09B-10	12/16/2003	8
09B-04	3/29/2007	8		09B-10	1/13/2004	7
09B-04	4/23/2007	2		09B-10	2/2/2004	8
09B-04	5/15/2007	49		09B-10	3/15/2004	17
09B-04	6/5/2007	5		09B-10	4/6/2004	2
09B-04	7/10/2007	49		09B-10	5/17/2004	11
09B-04	8/7/2007	13		09B-10	6/21/2004	8
09B-04	9/17/2007	1.9		09B-10	7/13/2004	13
09B-04	10/8/2007	23		09B-10	8/10/2004	49
09B-04	11/5/2007	70		09B-10	9/14/2004	920
09B-04	12/12/2007	5		09B-10	10/6/2004	22
09B-04	1/28/2008	11		09B-10	11/22/2004	49
09B-04	2/11/2008	5		09B-10	12/14/2004	5
09B-04	3/3/2008	11		09B-10	1/24/2005	2
09B-04	4/28/2008	8		09B-10	2/8/2005	4
09B-04	5/13/2008	8		09B-10	3/2/2005	170
09B-04	6/11/2008	2		09B-10	4/5/2005	2
09B-04	7/28/2008	70		09B-10	5/4/2005	5
09B-04	8/18/2008	11		09B-10	6/14/2005	13
09B-04	9/10/2008	110		09B-10	7/19/2005	79
09B-04	10/15/2008	33		09B-10	8/16/2005	17
09B-04	11/23/2008	33		09B-10	9/20/2005	33
09B-04	12/8/2008	46		09B-10	10/17/2005	23
09B-04	1/13/2009	95		09B-10	11/7/2005	14
09B-04	2/2/2009	2		09B-10	12/20/2005	110
09B-04	3/3/2009	110		09B-10	2/7/2006	33
09B-04	4/13/2009	30		09B-10	3/13/2006	46
09B-04	5/12/2009	7.8		09B-10	4/10/2006	70
09B-04	6/15/2009	7.8		09B-10	5/22/2006	70
09B-04	7/21/2009	22		09B-10	6/19/2006	13
09B-04	8/3/2009	170		09B-10	7/5/2006	2
09B-04	9/14/2009	13		09B-10	9/20/2006	7
09B-04	10/19/2009	7.8		09B-10	10/18/2006	120
09B-04	11/23/2009	4.5		09B-10	11/20/2006	11
09B-04	12/14/2009	70		09B-10	12/4/2006	33
09B-04	1/27/2010	49		09B-11	1/5/2000	11
09B-04	2/1/2010	21		09B-12	1/5/2000	110
09B-04	3/8/2010	6.2		09B-12	2/8/2000	1.9
09B-04	4/13/2010	41		09B-12	3/6/2000	79
09B-04	5/4/2010	6.8		09B-12	4/4/2000	22
09B-04	6/2/2010	17		09B-12	5/9/2000	5
09B-04	7/26/2010	33		09B-12	7/5/2000	1.9
09B-04	8/3/2010	6.1		09B-12	8/15/2000	49
09B-04	9/28/2010	130		09B-12	9/6/2000	280
09B-04	10/6/2010	46		09B-12	10/11/2000	170
09B-04	11/3/2010	170		09B-12	11/27/2000	22

09B-04	12/14/2010	4.5		09B-12	12/5/2000	5
09B-04	1/19/2011	7.8		09B-12	1/10/2001	1.9
09B-04	2/1/2011	2		09B-12	2/27/2001	2
09B-04	3/9/2011	9.3		09B-12	3/28/2001	11
09B-04	4/3/2011	4.5		09B-12	4/4/2001	21
09B-04	5/3/2011	4		09B-12	5/29/2001	8
09B-04	6/6/2011	2		09B-12	6/11/2001	33
09B-04	7/26/2011	1600		09B-12	7/24/2001	33
09B-04	8/2/2011	4.5		09B-12	8/21/2001	5
09B-04	9/19/2011	1.7		09B-12	9/10/2001	7
09B-04	10/10/2011	280		09B-12	10/1/2001	8
09B-04	11/7/2011	17		09B-12	11/5/2001	5
09B-04	12/14/2011	2		09B-12	12/18/2001	8
09B-04	1/23/2012	17		09B-12	1/18/2002	2
09B-04	2/1/2012	4.5		09B-12	2/5/2002	7
09B-04	3/13/2012	17		09B-12	3/13/2002	170
09B-04	4/11/2012	2		09B-12	4/10/2002	7
09B-04	5/2/2012	7.8		09B-12	5/1/2002	23
09B-04	6/25/2012	2		09B-12	6/12/2002	2
09B-04	7/25/2012	7.8		09B-12	7/10/2002	14
09B-04	8/6/2012	1.7		09B-12	8/20/2002	8
09B-04	9/26/2012	33		09B-12	9/18/2002	33
09B-04	10/8/2012	11		09B-12	10/8/2002	13
09B-04	11/7/2012	2		09B-12	11/6/2002	33
09B-04	12/17/2012	6.8		09B-12	12/17/2002	23
09B-05	1/5/2000	220		09B-12	1/15/2003	13
09B-05	2/8/2000	1.9		09B-12	2/10/2003	4
09B-05	3/6/2000	49		09B-12	3/11/2003	22
09B-05	4/4/2000	8		09B-12	4/15/2003	220
09B-05	5/9/2000	5		09B-12	5/12/2003	49
09B-05	7/5/2000	5		09B-12	6/17/2003	8
09B-05	8/15/2000	110		09B-12	7/23/2003	540
09B-05	9/6/2000	240		09B-12	8/5/2003	21
09B-05	10/11/2000	79		09B-12	9/15/2003	17
09B-05	11/27/2000	8		09B-12	10/8/2003	31
09B-05	12/5/2000	5		09B-12	11/19/2003	95
09B-05	1/10/2001	2		09B-12	12/16/2003	2
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09B-05	4/4/2001	46		09B-12	3/15/2004	8
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09B-05	7/24/2001	49		09B-12	6/21/2004	2
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09B-05	9/10/2001	8		09B-12	8/10/2004	130
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09B-05	1/18/2002	2		09B-12	12/14/2004	7
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09B-05	3/13/2002	79		09B-12	2/8/2005	2
09B-05	4/10/2002	23		09B-12	3/2/2005	130
09B-05	5/1/2002	49		09B-12	4/5/2005	5
09B-05	6/12/2002	7		09B-12	5/4/2005	2
09B-05	7/10/2002	2		09B-12	6/14/2005	33
09B-05	8/20/2002	49		09B-12	7/19/2005	110
09B-05	9/18/2002	70		09B-12	8/16/2005	17
09B-05	10/8/2002	46		09B-12	9/20/2005	13
09B-05	11/6/2002	49		09B-12	10/17/2005	17
09B-05	12/17/2002	46		09B-12	11/7/2005	7
09B-05	1/15/2003	14		09B-12	12/20/2005	33
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09B-05	3/11/2003	11		09B-12	3/13/2006	31
09B-05	4/15/2003	23		09B-12	4/10/2006	220
09B-05	5/12/2003	130		09B-12	5/22/2006	64
09B-05	6/17/2003	17		09B-12	6/19/2006	8
09B-05	7/23/2003	79		09B-12	7/5/2006	1.9
09B-05	8/5/2003	17		09B-12	9/20/2006	11
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09B-05	9/14/2004	49		09B-12	10/8/2007	46
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09B-05	11/22/2004	79		09B-12	12/12/2007	2
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09B-05	3/2/2005	170		09B-12	4/28/2008	5
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09B-05	6/14/2005	8		09B-12	7/28/2008	9
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09B-05	8/16/2005	33		09B-12	9/10/2008	180

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09B-05	10/17/2005	22		09B-12	11/23/2008	8
09B-05	11/7/2005	14		09B-12	12/8/2008	23
09B-05	12/20/2005	170		09B-12	1/13/2009	23
09B-05	2/7/2006	33		09B-12	2/2/2009	5
09B-05	3/13/2006	540		09B-12	3/3/2009	70
09B-05	4/10/2006	110		09B-12	4/13/2009	14
09B-05	5/22/2006	33		09B-12	5/12/2009	4
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09B-05	7/5/2006	2		09B-12	7/21/2009	7.8
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09B-05	10/18/2006	120		09B-12	9/14/2009	33
09B-05	11/20/2006	49		09B-12	10/19/2009	4
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09B-05	1/2/2007	49		09B-12	12/14/2009	130
09B-05	2/12/2007	8		09B-12	1/27/2010	46
09B-05	3/29/2007	1.9		09B-12	2/1/2010	23
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09B-05	5/15/2007	29		09B-12	4/13/2010	62
09B-05	6/5/2007	9		09B-12	5/4/2010	4
09B-05	7/10/2007	33		09B-12	6/2/2010	13
09B-05	8/7/2007	43		09B-12	7/26/2010	13
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09B-05	10/8/2007	40		09B-12	9/28/2010	79
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09B-05	12/12/2007	8		09B-12	11/3/2010	49
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09B-05	2/11/2008	23		09B-12	1/19/2011	4.5
09B-05	3/3/2008	22		09B-12	2/1/2011	4.5
09B-05	4/28/2008	9		09B-12	3/9/2011	1.7
09B-05	5/13/2008	23		09B-12	4/3/2011	13
09B-05	6/11/2008	16		09B-12	5/3/2011	7.8
09B-05	7/28/2008	170		09B-12	6/6/2011	1.7
09B-05	8/18/2008	30		09B-12	7/26/2011	350
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09B-05	12/8/2008	22		09B-12	11/7/2011	4.5
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09B-05	4/13/2009	17		09B-12	3/13/2012	14
09B-05	5/12/2009	9.2		09B-12	4/11/2012	7.8
09B-05	6/15/2009	9.3		09B-12	5/2/2012	7.8
09B-05	7/21/2009	11		09B-12	6/25/2012	1.7
09B-05	8/3/2009	22		09B-12	7/25/2012	7.8

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09B-05	10/19/2009	13		09B-12	9/26/2012	7.8
09B-05	11/23/2009	14		09B-12	10/8/2012	2
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09B-05	2/1/2010	40		09B-18	1/5/2000	21
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09B-05	4/13/2010	74		09B-18	3/6/2000	7
09B-05	5/4/2010	39		09B-18	4/4/2000	13
09B-05	6/2/2010	6.2		09B-18	5/9/2000	17
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09B-05	8/3/2010	13		09B-18	8/15/2000	17
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09B-05	10/6/2010	110		09B-18	10/11/2000	5
09B-05	11/3/2010	79		09B-18	11/27/2000	13
09B-05	12/14/2010	4.5		09B-18	12/5/2000	2
09B-05	1/19/2011	4.5		09B-18	1/10/2001	2
09B-05	2/1/2011	4.5		09B-18	2/27/2001	8
09B-05	3/9/2011	3.2		09B-18	3/28/2001	8
09B-05	4/3/2011	6.8		09B-18	4/4/2001	46
09B-05	5/3/2011	14		09B-18	5/29/2001	70
09B-05	6/6/2011	4.4		09B-18	6/11/2001	4
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09B-05	8/2/2011	4.5		09B-18	8/21/2001	33
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09B-05	3/13/2012	22		09B-18	3/13/2002	79
09B-05	4/11/2012	3.2		09B-18	4/10/2002	170
09B-05	5/2/2012	7.8		09B-18	5/1/2002	11
09B-05	6/25/2012	2		09B-18	6/12/2002	2
09B-05	7/25/2012	6.8		09B-18	7/10/2002	2
09B-05	8/6/2012	6.5		09B-18	8/20/2002	21
09B-05	9/26/2012	36		09B-18	9/18/2002	64
09B-05	10/8/2012	12		09B-18	10/8/2002	17
09B-05	11/7/2012	4.9		09B-18	11/6/2002	70
09B-05	12/17/2012	7.3		09B-18	12/17/2002	17
09B-06	1/5/2000	170		09B-18	1/15/2003	6
09B-06	2/8/2000	5		09B-18	2/10/2003	2
09B-06	3/6/2000	79		09B-18	3/11/2003	5
09B-06	4/4/2000	46		09B-18	4/15/2003	49
09B-06	5/9/2000	4		09B-18	5/12/2003	1.9
09B-06	7/5/2000	8		09B-18	6/17/2003	2

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09B-06	9/6/2000	70		09B-18	8/5/2003	33
09B-06	10/11/2000	49		09B-18	9/15/2003	13
09B-06	11/27/2000	11		09B-18	10/8/2003	46
09B-06	12/5/2000	5		09B-18	11/19/2003	920
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09B-06	2/5/2002	17		09B-18	1/24/2005	5
09B-06	3/13/2002	33		09B-18	2/8/2005	11
09B-06	4/10/2002	130		09B-18	3/2/2005	17
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09B-06	8/20/2002	49		09B-18	7/19/2005	23
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09B-06	12/17/2002	23		09B-18	11/7/2005	23
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09B-06	3/11/2003	33		09B-18	3/13/2006	21
09B-06	4/15/2003	79		09B-18	4/10/2006	350
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09B-06	7/23/2003	130		09B-18	7/5/2006	2
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09B-06	12/16/2003	9		09B-18	1/2/2007	110
09B-06	1/13/2004	8		09B-18	2/12/2007	11
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09B-06	3/15/2004	17		09B-18	4/23/2007	5
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09B-06	8/10/2004	33		09B-18	9/17/2007	5
09B-06	9/14/2004	95		09B-18	10/8/2007	11
09B-06	10/6/2004	46		09B-18	11/5/2007	11
09B-06	11/22/2004	240		09B-18	12/12/2007	8
09B-06	12/14/2004	17		09B-18	1/28/2008	23
09B-06	1/24/2005	2		09B-18	2/11/2008	2
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09B-06	3/2/2005	70		09B-18	4/28/2008	6
09B-06	4/5/2005	11		09B-18	5/13/2008	170
09B-06	5/4/2005	8		09B-18	6/11/2008	5
09B-06	6/14/2005	17		09B-18	7/28/2008	33
09B-06	7/19/2005	79		09B-18	8/18/2008	30
09B-06	8/16/2005	130		09B-18	9/10/2008	46
09B-06	9/20/2005	22		09B-18	10/15/2008	11
09B-06	10/17/2005	33		09B-18	11/23/2008	2
09B-06	11/7/2005	70		09B-18	12/8/2008	5
09B-06	12/20/2005	79		09B-18	1/13/2009	31
09B-06	2/7/2006	49		09B-18	2/2/2009	2
09B-06	3/13/2006	350		09B-18	3/3/2009	8
09B-06	4/10/2006	170		09B-18	4/13/2009	7.8
09B-06	5/22/2006	70		09B-18	5/12/2009	7.8
09B-06	6/19/2006	5		09B-18	6/15/2009	23
09B-06	7/5/2006	4		09B-18	7/21/2009	2
09B-06	9/20/2006	8		09B-18	8/3/2009	220
09B-06	10/18/2006	350		09B-18	9/14/2009	6.8
09B-06	11/20/2006	33		09B-18	10/19/2009	11
09B-06	12/4/2006	46		09B-18	11/23/2009	7.8
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09B-07	7/5/2000	8		09B-18	5/4/2010	13
09B-07	8/15/2000	95		09B-18	6/2/2010	14
09B-07	9/6/2000	1600		09B-18	7/26/2010	1.9
09B-07	10/11/2000	95		09B-18	8/3/2010	6.8
09B-07	11/27/2000	49		09B-18	9/28/2010	46
09B-07	12/5/2000	49		09B-18	10/6/2010	120
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09B-07	2/27/2001	5		09B-18	12/14/2010	4
09B-07	3/28/2001	13		09B-18	1/19/2011	1.8
09B-07	4/4/2001	79		09B-18	2/1/2011	17
09B-07	5/29/2001	49		09B-18	3/9/2011	4.5
09B-07	6/11/2001	17		09B-18	4/3/2011	2

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09B-07	9/10/2001	49		09B-18	7/26/2011	1600
09B-07	10/1/2001	9		09B-18	8/2/2011	4.5
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09B-07	1/18/2002	13		09B-18	11/7/2011	4.5
09B-07	2/5/2002	33		09B-18	12/14/2011	2
09B-07	3/13/2002	170		09B-18	1/23/2012	4.5
09B-07	4/10/2002	70		09B-18	2/1/2012	7.8
09B-07	5/1/2002	79		09B-18	3/13/2012	23
09B-07	6/12/2002	8		09B-18	4/11/2012	4.5
09B-07	7/10/2002	17		09B-18	5/2/2012	1.7
09B-07	8/20/2002	70		09B-18	6/25/2012	2
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09B-07	2/10/2003	11		09B-18	11/7/2012	4.5
09B-07	3/11/2003	17		09B-18	12/17/2012	17
09B-07	4/15/2003	79		09B-21	1/2/2007	26
09B-07	5/12/2003	70		09B-21	2/12/2007	1.9
09B-07	6/17/2003	23		09B-21	3/29/2007	5
09B-07	7/23/2003	110		09B-21	4/23/2007	1.9
09B-07	8/5/2003	13		09B-21	5/15/2007	33
09B-07	9/15/2003	5		09B-21	6/5/2007	8
09B-07	10/8/2003	70		09B-21	7/10/2007	23
09B-07	11/19/2003	8		09B-21	8/7/2007	7
09B-07	12/16/2003	11		09B-21	9/17/2007	5
09B-07	1/13/2004	7		09B-21	10/8/2007	17
09B-07	2/2/2004	11		09B-21	11/5/2007	8
09B-07	3/15/2004	17		09B-21	12/12/2007	1.9
09B-07	4/6/2004	11		09B-21	1/28/2008	1.9
09B-07	5/17/2004	110		09B-21	2/11/2008	7
09B-07	6/21/2004	1.9		09B-21	3/3/2008	8
09B-07	7/13/2004	79		09B-21	4/28/2008	8
09B-07	8/10/2004	46		09B-21	5/13/2008	13
09B-07	9/14/2004	170		09B-21	6/11/2008	5
09B-07	10/6/2004	33		09B-21	7/28/2008	11
09B-07	11/22/2004	23		09B-21	8/18/2008	1.9
09B-07	12/14/2004	9		09B-21	9/10/2008	11
09B-07	1/24/2005	1.9		09B-21	10/15/2008	13
09B-07	2/8/2005	8		09B-21	11/23/2008	7
09B-07	3/2/2005	280		09B-21	12/8/2008	11
09B-07	4/5/2005	5		09B-21	1/13/2009	8

09B-07	5/4/2005	5		09B-21	2/2/2009	2
09B-07	6/14/2005	8		09B-21	3/3/2009	13
09B-07	7/19/2005	33		09B-21	4/13/2009	4.5
09B-07	8/16/2005	110		09B-21	5/12/2009	13
09B-07	9/20/2005	5		09B-21	6/15/2009	4.5
09B-07	10/17/2005	33		09B-21	7/21/2009	9.2
09B-07	11/7/2005	1.9		09B-21	8/3/2009	70
09B-07	12/20/2005	64		09B-21	9/14/2009	17
09B-07	2/7/2006	120		09B-21	10/19/2009	6.8
09B-07	3/13/2006	33		09B-21	11/23/2009	7.8
09B-07	4/10/2006	79		09B-21	12/14/2009	240
09B-07	5/22/2006	84		09B-21	1/27/2010	79
09B-07	6/19/2006	8		09B-21	2/1/2010	30
09B-07	7/5/2006	8		09B-21	3/8/2010	2
09B-07	9/20/2006	13		09B-21	4/13/2010	12
09B-07	10/18/2006	280		09B-21	5/4/2010	1.9
09B-07	11/20/2006	17		09B-21	6/2/2010	2
09B-07	12/4/2006	49		09B-21	7/26/2010	2
09B-07	1/2/2007			09B-21	8/3/2010	1.9
09B-07	2/12/2007	2		09B-21	9/28/2010	33
09B-07	3/29/2007	1.9		09B-21	10/6/2010	49
09B-07	4/23/2007	5		09B-21	11/3/2010	110
09B-07	5/15/2007	49		09B-21	12/14/2010	2
09B-07	6/5/2007	8		09B-21	1/19/2011	23
09B-07	7/10/2007	49		09B-21	2/1/2011	7.8
09B-07	8/7/2007	13		09B-21	3/9/2011	2
09B-07	9/17/2007	8		09B-21	4/3/2011	4.5
09B-07	10/8/2007	110		09B-21	5/3/2011	4.5
09B-07	11/5/2007	21		09B-21	6/6/2011	1.7
09B-07	12/12/2007	7		09B-21	7/26/2011	1600
09B-07	1/28/2008	1.9		09B-21	8/2/2011	2
09B-07	2/11/2008	5		09B-21	9/19/2011	1.7
09B-07	3/3/2008	23		09B-21	10/10/2011	17
09B-07	4/28/2008	17		09B-21	11/7/2011	1.7
09B-07	5/13/2008	31		09B-21	12/14/2011	11
09B-07	6/11/2008	8		09B-21	1/23/2012	7.8
09B-07	7/28/2008	8		09B-21	2/1/2012	1.7
09B-07	8/18/2008	4		09B-21	3/13/2012	6.8
09B-07	9/10/2008	46		09B-21	4/11/2012	1.7
09B-07	10/15/2008	33		09B-21	5/2/2012	13
09B-07	11/23/2008	17		09B-21	6/25/2012	1.7
09B-07	12/8/2008	23		09B-21	7/25/2012	1.7
09B-07	1/13/2009	22		09B-21	8/6/2012	1.7
09B-07	2/2/2009	14		09B-21	9/26/2012	13
09B-07	3/3/2009	31		09B-21	10/8/2012	11
09B-07	4/13/2009	11		09B-21	11/7/2012	4.5

09B-07	5/12/2009	1.9		09B-21	12/17/2012	26
09B-07	6/15/2009	33				
09B-07	7/21/2009	11				
09B-07	8/3/2009	180				
09B-07	9/14/2009	17				
09B-07	10/19/2009	11				
09B-07	11/23/2009	4.5				
09B-07	12/14/2009	920				
09B-07	1/27/2010	43				
09B-07	2/1/2010	23				
09B-07	3/8/2010	4.5				
09B-07	4/13/2010	31				
09B-07	5/4/2010	27				
09B-07	6/2/2010	4.5				
09B-07	7/26/2010	9.3				
09B-07	8/3/2010	13				
09B-07	9/28/2010	46				
09B-07	10/6/2010	33				
09B-07	11/3/2010	1600				
09B-07	12/14/2010	7.8				
09B-07	1/19/2011	21				
09B-07	2/1/2011	23				
09B-07	3/9/2011	2				
09B-07	4/3/2011	4.5				
09B-07	5/3/2011	7.8				
09B-07	6/6/2011	1.7				
09B-07	7/26/2011	1600				
09B-07	8/2/2011	1.7				
09B-07	9/19/2011	1.7				
09B-07	10/10/2011	64				
09B-07	11/7/2011	49				
09B-07	12/14/2011	4.5				
09B-07	1/23/2012	49				
09B-07	2/1/2012	2				
09B-07	3/13/2012	1.8				
09B-07	4/11/2012	4.5				
09B-07	5/2/2012	70				
09B-07	6/25/2012	2				
09B-07	7/25/2012	2				
09B-07	8/6/2012	2				
09B-07	9/26/2012	33				
09B-07	10/8/2012	33				
09B-07	11/7/2012	2				
09B-07	12/17/2012	7.8				
09B-09	1/5/2000	33				
09B-09	2/8/2000	1.9				

09B-09	3/6/2000	110				
09B-09	4/4/2000	140				
09B-09	5/9/2000	4				
09B-09	7/5/2000	49				
09B-09	8/15/2000	540				
09B-09	9/6/2000	1600				
09B-09	10/11/2000	920				
09B-09	11/27/2000	17				
09B-09	12/5/2000	8				
09B-09	1/10/2001	1.9				
09B-09	2/27/2001	5				
09B-09	3/28/2001	11				
09B-09	4/4/2001	350				
09B-09	5/29/2001	49				
09B-09	6/11/2001	46				
09B-09	7/24/2001	49				
09B-09	8/21/2001	4				
09B-09	9/10/2001	49				
09B-09	10/1/2001	11				
09B-09	11/5/2001	5				
09B-09	12/18/2001	33				
09B-09	1/18/2002	13				
09B-09	2/5/2002	22				
09B-09	3/13/2002	350				
09B-09	4/10/2002	1600				
09B-09	5/1/2002	70				
09B-09	6/12/2002	23				
09B-09	7/10/2002	49				
09B-09	8/20/2002	33				
09B-09	9/18/2002	69				
09B-09	10/8/2002	49				
09B-09	11/6/2002	110				
09B-09	12/17/2002	110				
09B-09	1/15/2003	14				
09B-09	2/10/2003	5				
09B-09	3/11/2003	13				
09B-09	4/15/2003	33				
09B-09	5/12/2003	70				
09B-09	6/17/2003	5				
09B-09	7/23/2003	1600				
09B-09	8/5/2003	70				
09B-09	9/15/2003	11				
09B-09	10/8/2003	49				
09B-09	11/19/2003	220				
09B-09	12/16/2003	8				
09B-09	1/13/2004	5				

09B-09	2/2/2004	13				
09B-09	3/15/2004	23				
09B-09	4/6/2004	11				
09B-09	5/17/2004	13				
09B-09	6/21/2004	2				
09B-09	7/13/2004	49				
09B-09	8/10/2004	49				
09B-09	9/14/2004	2500				
09B-09	10/6/2004	95				
09B-09	11/22/2004	79				
09B-09	12/14/2004	11				
09B-09	1/24/2005	1.9				
09B-09	2/8/2005	2				
09B-09	3/2/2005	130				
09B-09	4/5/2005	110				
09B-09	5/4/2005	7				
09B-09	6/14/2005	13				
09B-09	7/19/2005	350				
09B-09	8/16/2005	13				
09B-09	9/20/2005	33				
09B-09	10/17/2005	33				
09B-09	11/7/2005	8				
09B-09	12/20/2005	79				
09B-09	2/7/2006	170				
09B-09	3/13/2006	220				
09B-09	4/10/2006	240				
09B-09	5/22/2006	49				
09B-09	6/19/2006	13				
09B-09	7/5/2006	5				
09B-09	9/20/2006	22				
09B-09	10/18/2006	2500				
09B-09	11/20/2006	79				
09B-09	12/4/2006	540				
09B-09	1/2/2007	70				
09B-09	2/12/2007	8				
09B-09	3/29/2007	5				
09B-09	4/23/2007	4				
09B-09	5/15/2007	33				
09B-09	6/5/2007	13				
09B-09	7/10/2007	49				
09B-09	8/7/2007	13				
09B-09	9/17/2007	2				
09B-09	10/8/2007	110				
09B-09	11/5/2007	46				
09B-09	12/12/2007	8				
09B-09	1/28/2008	7				

09B-09	2/11/2008	8				
09B-09	3/3/2008	49				
09B-09	4/28/2008	23				
09B-09	5/13/2008	13				
09B-09	6/11/2008	14				
09B-09	7/28/2008	64				
09B-09	8/18/2008	8				
09B-09	9/10/2008	920				
09B-09	10/15/2008	79				
09B-09	11/23/2008	49				
09B-09	12/8/2008	13				
09B-09	1/13/2009	350				
09B-09	2/2/2009	8				
09B-09	3/3/2009	110				
09B-09	4/13/2009	33				

Appendix D– Statistical Trend Analysis

Results of the Mann-Kendall tests are shown in the following pages.

Guide for interpreting the information in this Appendix:

- Correlation coefficient Kendall's tau: If negative number, one variable is increasing while the other decreasing. If positive number, both values are increasing
- S is the Kendall test statistic. S being a number other than zero is an indication of a monotonic trend in Y over time
- Z is the standard normal deviate. The sign (+, -) shows the direction of the trend for that station
- p-value is the significance of trend. To test for statistical significance, $\alpha = 0.05$ was used. A p-value less than 0.05 indicates a statistical significance where a p-value more than 0.05 is an indication of no significance. However, a statistical significance is not the only measure of significance. The slope and the direction of the trend line should also be kept in mind as well as the time period in years
- Slope and intercept describe the overall direction of the trend in the data

Kendall's tau Correlation Test

US Geological Survey, 2005

Data set: 09B-02TMDL MK4a - Mann-Kendall test, input type 4

The tau correlation coefficient is -0.023

S = -274.

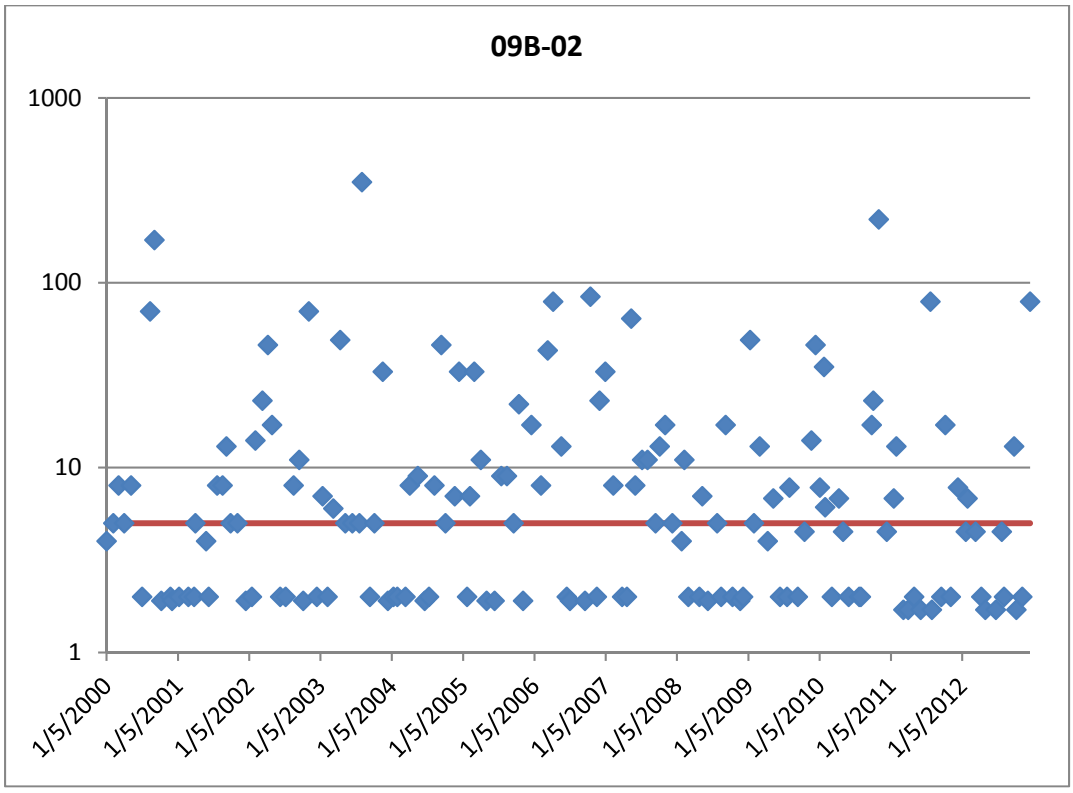
z = -0.440

p = 0.6599

The relation may be described by the equation:

Y = 5.0000 + 0.000 * X

Station not impaired: Boundary station. Results not significant. TMDL period 2000 to 2012



Kendall's tau Correlation Test

US Geological Survey, 2005

Data set: 09B-04 2000-2012 TMDL period MK4a - Mann-Kendall test, inpu

The tau correlation coefficient is -0.106

S = -1222.

z = -1.948

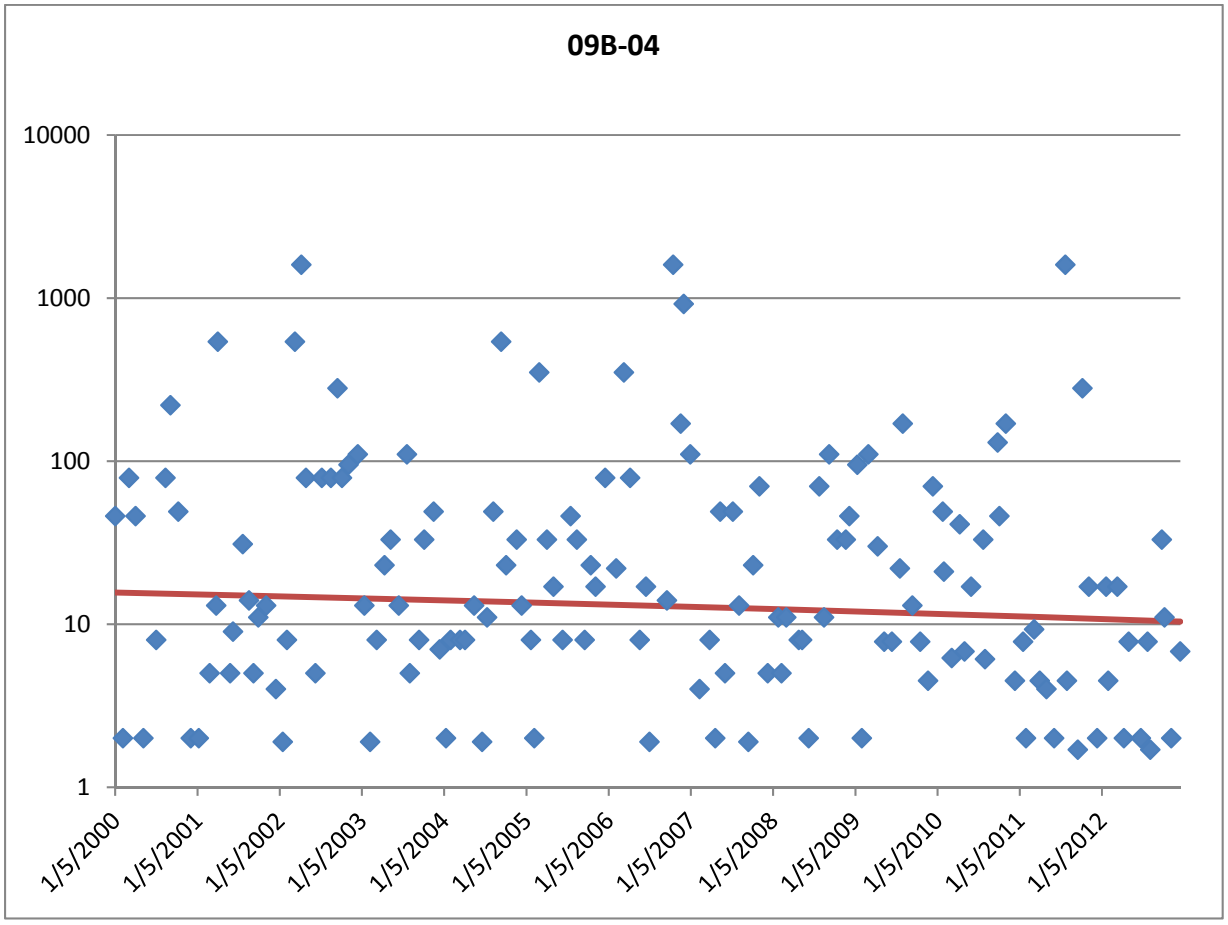
p = 0.0514

The relation may be described by the equation:

Y = 827.44 + -0.4059 * X

****

NOT SIGNIFICANT- TMDL period 2000-2012



Kendall's tau Correlation Test

US Geological Survey, 2005

Data set: 09B-05 TMDL period-Mann-Kendall test, input type 4

The tau correlation coefficient is -0.050

S = -521.

z = -0.890

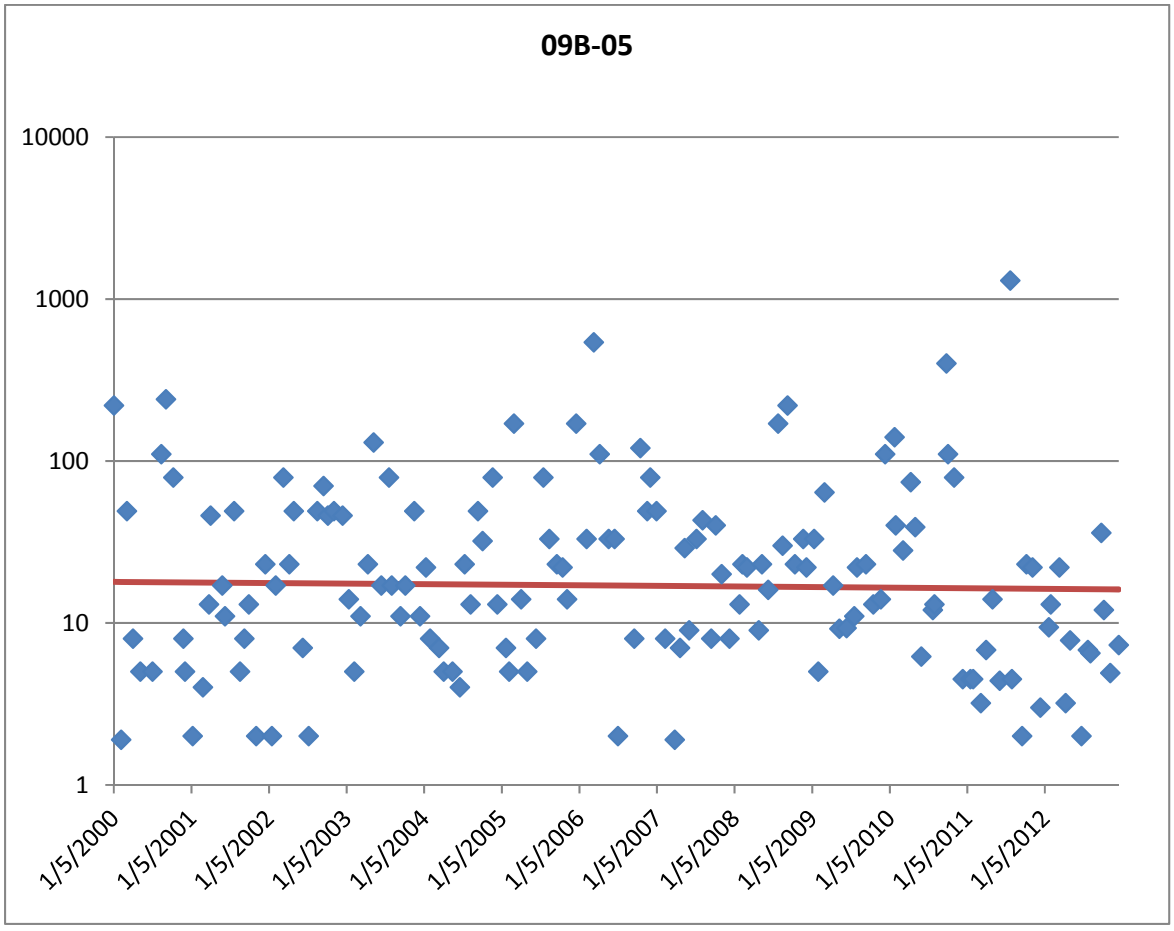
p = 0.3736

The relation may be described by the equation:

Y = 301.54 + -0.1418 * X

****

NOT SIGNIFICANT- TMDL period 2000-2012



Kendall's tau Correlation Test

US Geological Survey, 2005

Data set: 09B-06 2000-2006 MK4a-Mann-Kendall test, input type 4

The tau correlation coefficient is 0.069

S = 223.

z = 0.908

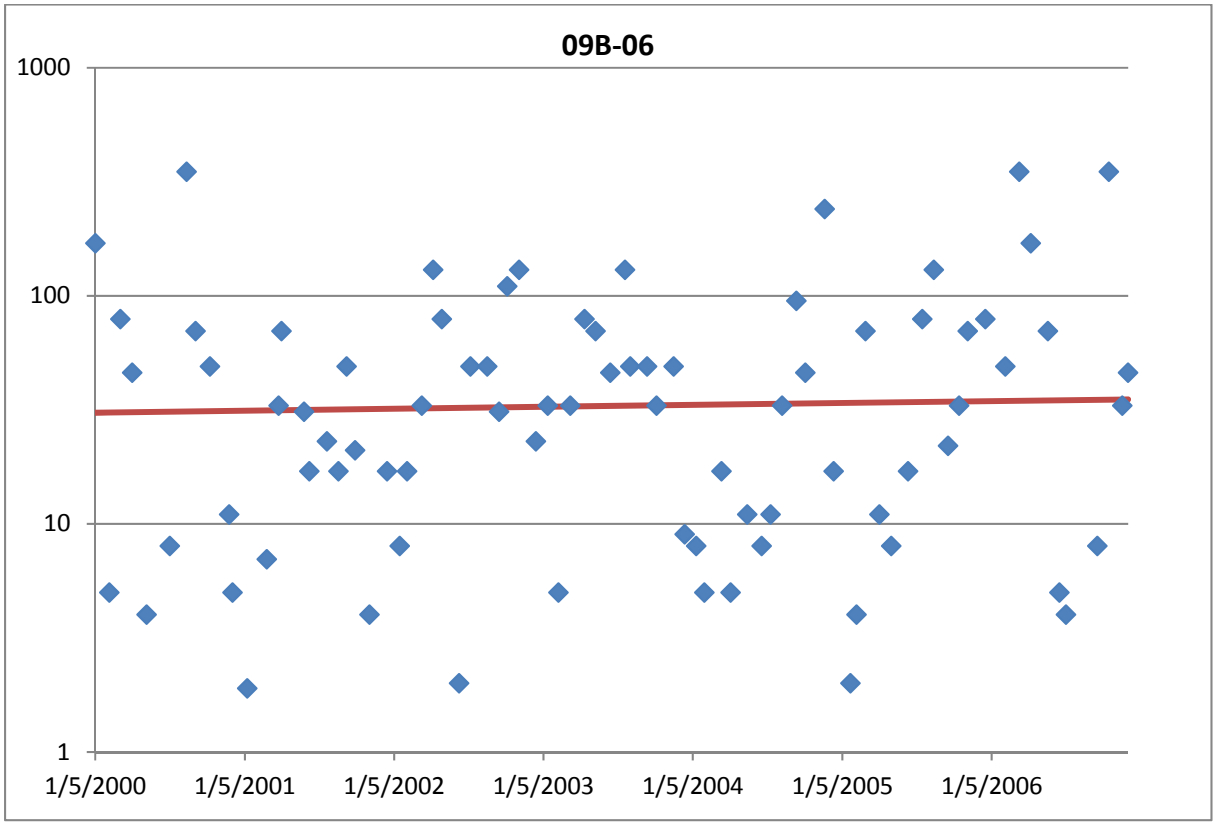
p = 0.3640

The relation may be described by the equation:

Y = -1250.1 + 0.6404 * X

****

Discontinued Station… NOT SIGNIFICANT- TMDL period 2000-2006



Kendall's tau Correlation Test

US Geological Survey, 2005

Data set: 09B-07TMDL MK4a - Mann-Kendall test, input type 4

The tau correlation coefficient is -0.167

S = -1914.

z = -3.052

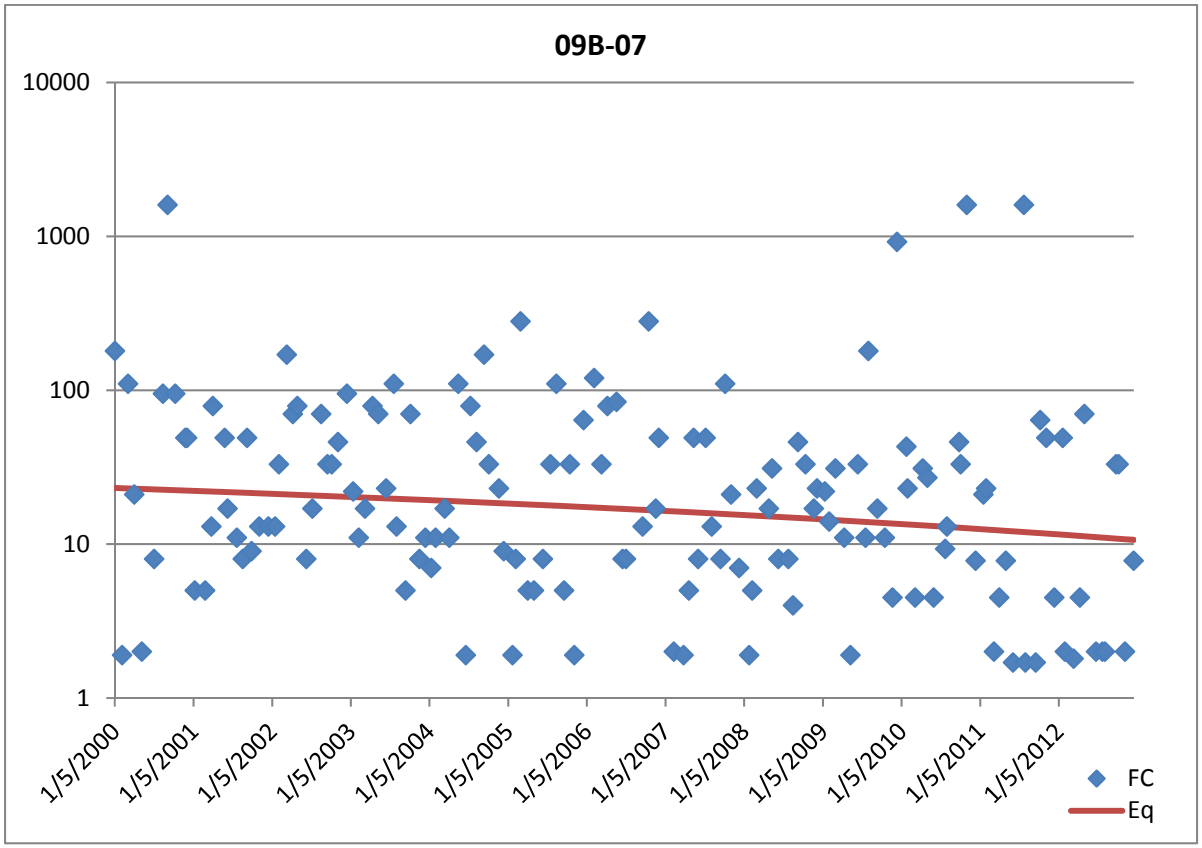
p = 0.0023

The relation may be described by the equation:

Y = 1957.0 + -0.9669 * X

****

SIGNIFICANT- TMDL period 2000-2012



Kendall's tau Correlation Test

US Geological Survey, 2005

Data set: 09B-09TMDL MK4a - Mann-Kendall test, input type 4

The tau correlation coefficient is -0.104

S = -1205.

z = -1.902

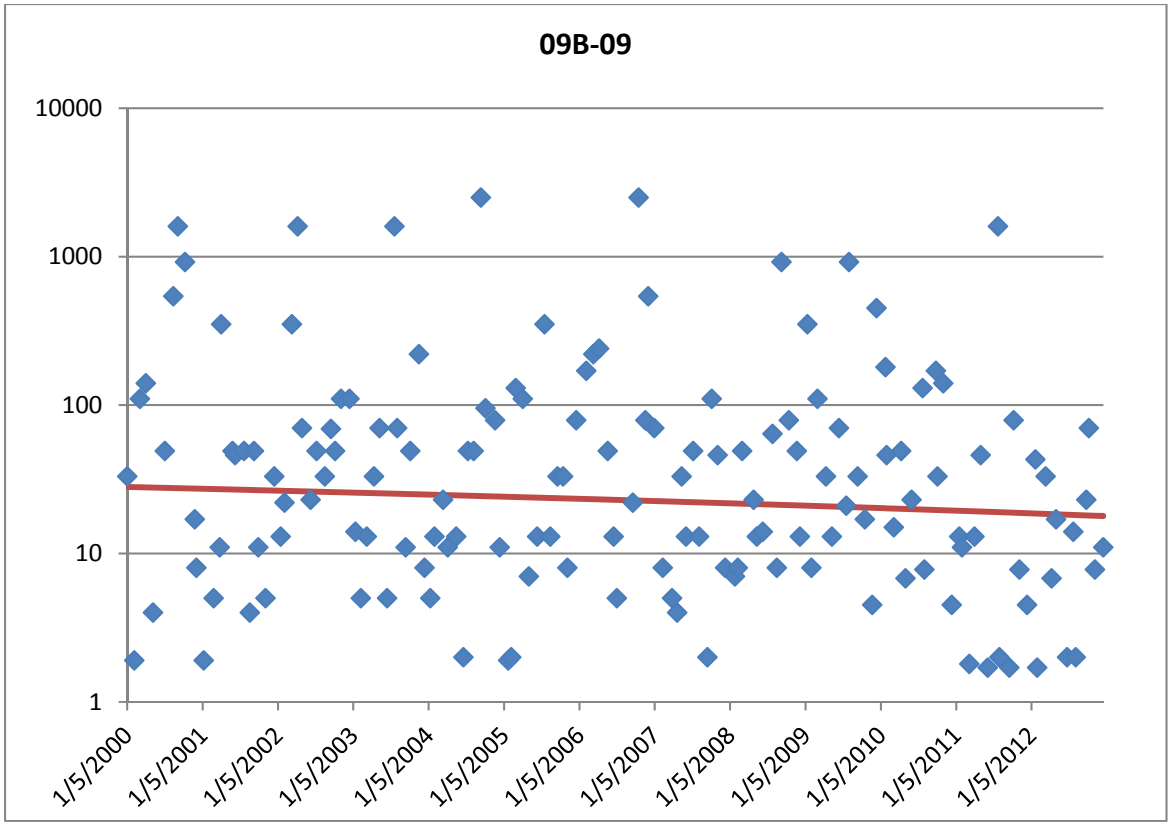
p = 0.0572

The relation may be described by the equation:

Y = 1602.5 + -0.7872 * X

****

NOT SIGNIFICANT - TMDL period 2000-2012



Kendall's tau Correlation Test

US Geological Survey, 2005

Data set: 09B-10TMDL MK4a - Mann-Kendall test, input type 4

The tau correlation coefficient is 0.040

S = 130.

z = 0.527

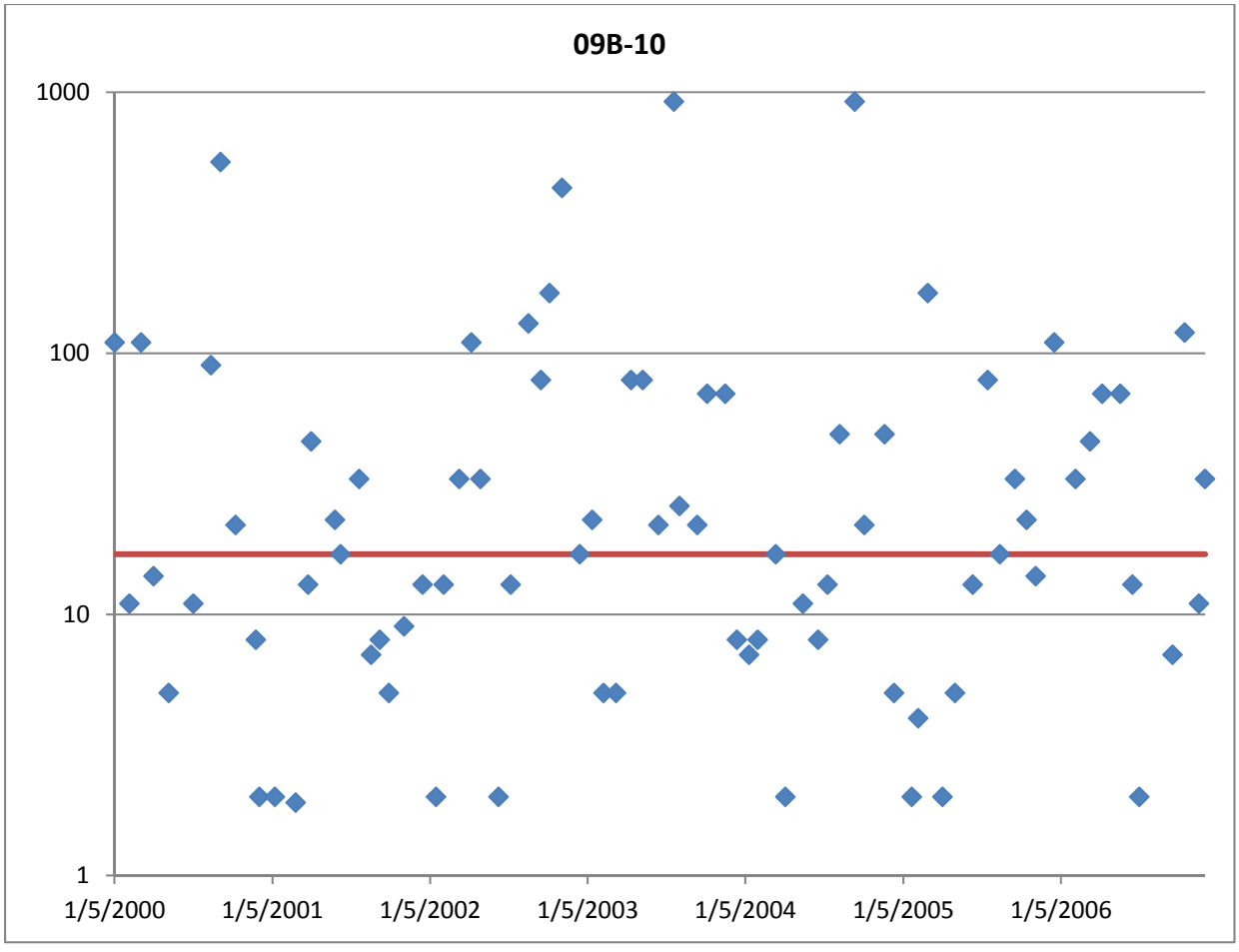
p = 0.5981

The relation may be described by the equation:

Y = 17.000 + 0.000 * X

****

Discontinued Station… NOT SIGNIFICANT- TMDL period 2000-2006



Kendall's tau Correlation Test

US Geological Survey, 2005

Data set: 09B-11TMDL MK4a-Mann-Kendall test, input type 4

The tau correlation coefficient is -0.093

S = -1090.

z = -1.708

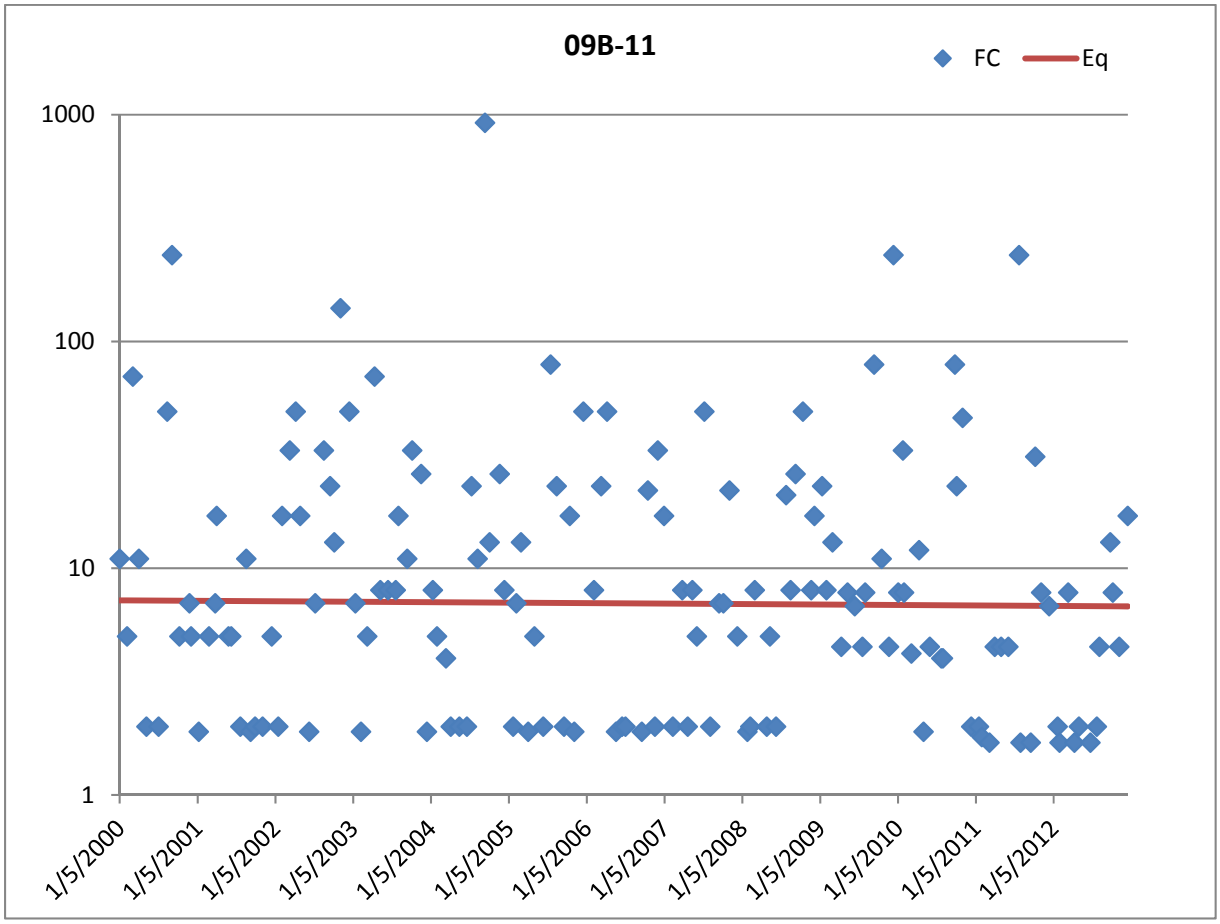
p = 0.0877

The relation may be described by the equation:

Y = 73.335 + -0.3306E-01 * X

****

STATION NOT IMPAIRED: BOUNDARY STATION. NOT SIGNIFICANT- TMDL period 2000-2012



Kendall's tau Correlation Test

US Geological Survey, 2005

Data set: 09B-12TMDL MK4a-Mann-Kendall test, input type 4

The tau correlation coefficient is -0.088

S = -1029.

z = -1.624

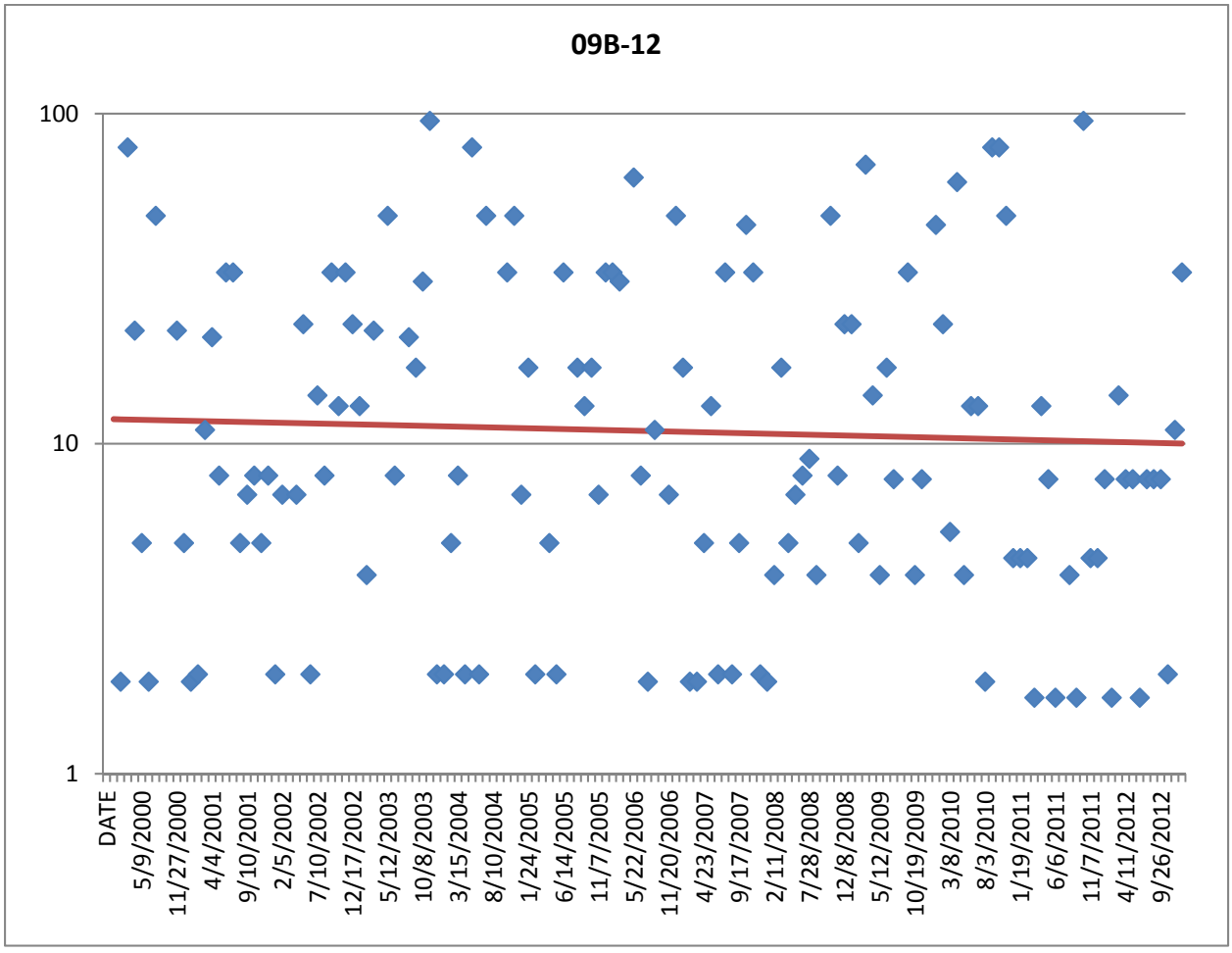
p = 0.1044

The relation may be described by the equation:

Y = 298.67 + -0.1434 * X

****

NOT SIGNIFICANT- TMDL period 2000-2012



Kendall's tau Correlation Test

US Geological Survey, 2005

Data set: 09B-21 2007-12 MK4a-Mann-Kendall test, input type 4

The tau correlation coefficient is -0.098

S = -258.

z = -1.227

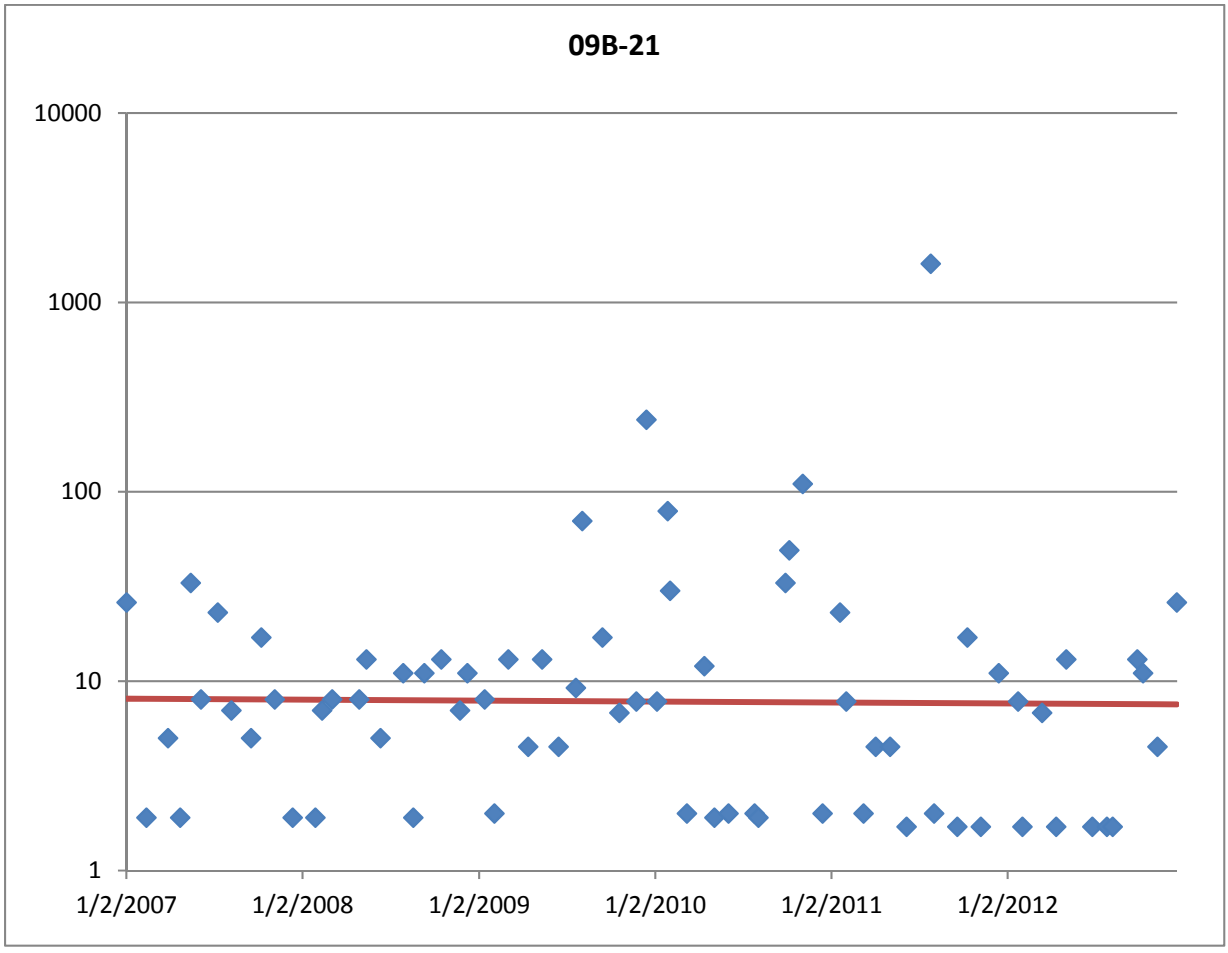
p = 0.2196

The relation may be described by the equation:

Y = 189.41 + -0.9035E-01 * X

****

NOT SIGNIFICANT- TMDL period 2007-2012



Appendix E - 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

Wando River SFH FC Bacteria TMDLs Responsiveness Summary

Comments were received from the following:

Berkeley County

Charleston County

City of Charleston

SC Department of Natural Resources

Town of Mount Pleasant

Berkeley County comments were submitted by Sonia Shahnaj

BC Comment 1, Page 4 and 16:
"In general, although the TMDL developers have recognized urban runoff to be negligible and the headwaters to be within the Francis Marion National Forest, MS4s draining into many of the headwater sites (09B-05, 09B-06, and 09B-12) has been given a load reduction"

BC Response 1:
The sentence referred to in the above comment has been amended for clarification. Section "3.2.3 Urban and Suburban Stormwater Runoff" of the Draft TMDL document explains urban runoff is negligible only upstream of station 09B-06, and that there could be contributing urban runoff in the more developed portions of the remaining watersheds.

Waste load allocations (WLA) have been allocated when appropriate, to non-continuous point sources as there are no continuous point sources discharging to the Wando River. It is important to consider that there may be other stormwater dischargers present in the watershed, such as current and future industrial and construction stormwater permitted entities. Please see tables Ab-1 and 6 along with footnote 4 below both tables. Also refer to section "3.1.2 Non-Continuous Point Sources" for an explanation of types of non-continuous point sources that may be allocated a WLA.

BC Comment 2, Page 10:
"On page 25, SCDHEC acknowledges the importance of flow; however, no information has been documented about the flow regime of the water quality samples (i.e., whether they were collected during storm or non-storm conditions). It is very important to have that information to assess the impact of stormwater runoff on water quality. MS4s are only responsible for the runoff coming from their jurisdiction. Accurate information on flow regime based fecal coliform concentrations could assist, to an extent, in disaggregating an MS4's fecal contribution."

BC Response 2:
As noted in the draft document, flow in the Wando River is tidally influenced. The daily net outflow is dependent upon but not limited to factors such as the tidal amplitude, atmospheric conditions, presence or absence of freshwater inflow, physical attributes, and lunar cycle.

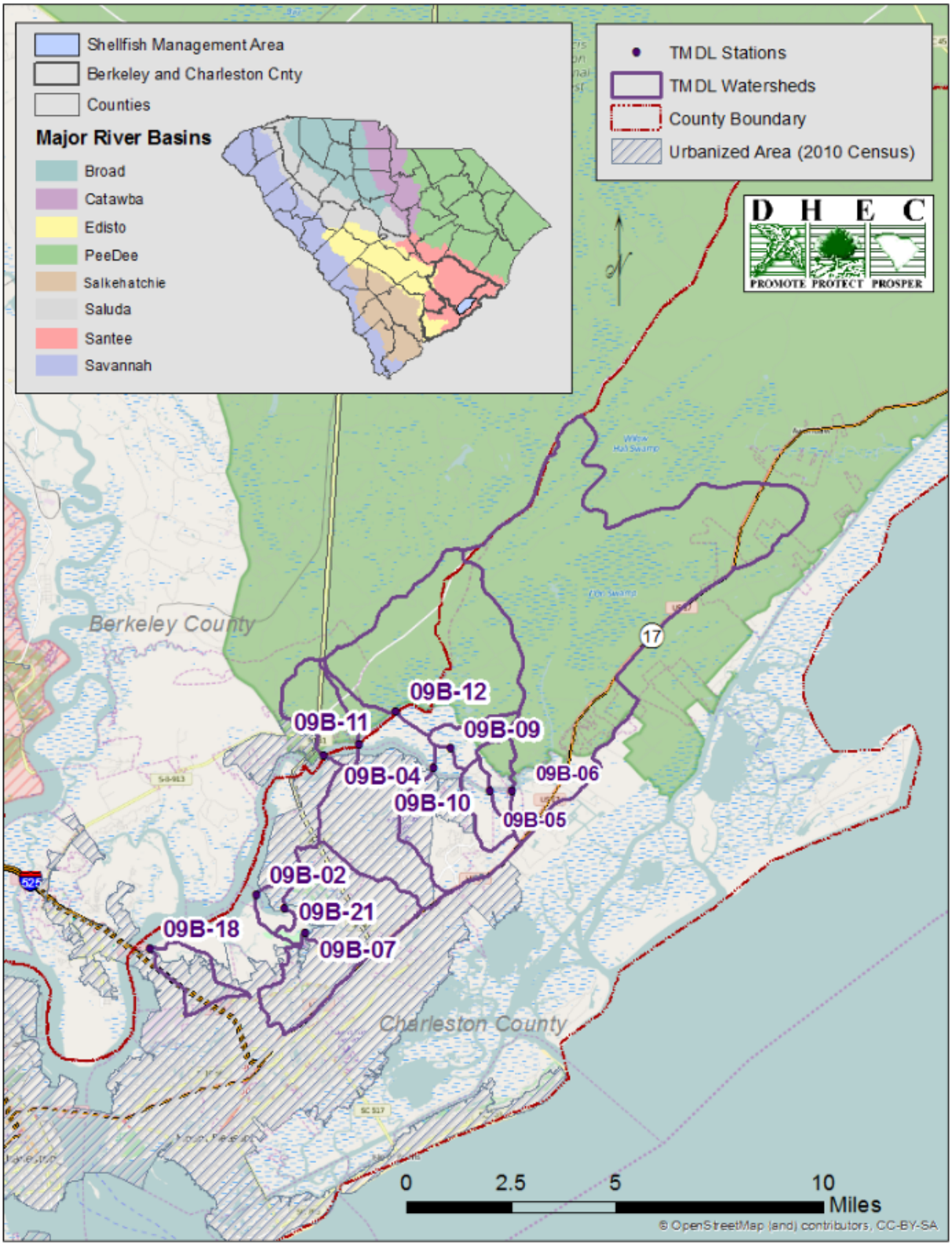
Section "2.0 Water Quality Assessment" describes the sampling methodology utilized by SCDHEC Shellfish Program. The TMDL document recognizes that compliance with the MS4 permit in regards to this TMDL document is determined at the point of discharge to waters of the state,; therefore, the flow regime in the Wando River may not be required for the MS4 permittees. The MS4 may elect to monitor instream for the purpose of permit compliance although the difficulty of disaggregating multiple sources is apparent.

Note the FDA pathogen standard was developed with an acceptable concentration-based exposure in mind. The SFH FC bacteria standard should be targeted from their outfalls to the MEP. If the standard is being met, than they would not be causing or contributing to an impairment instream for that pollutant. In addition, the concentration-based standard is equivalent to the overall TMDL target of 43 cfu/100 ml. Percentage reductions prescribed in the WLA and LA are the reductions necessary in order to meet the TMDL target minus the margin of safety. Disaggregating the FC bacteria loadings would not result in a change to those TMDL targets.

BC Comment 3:
"Berkeley County was not specifically mentioned as NPDES MS4 Permit operator in the draft TMDL document. Based on the urbanized areas from 2010 census, a portion of Berkeley County's urbanized area drains into Wando River TMDL watershed (Page 15, Figure 7). As indicated in the TMDL, all existing and future NPDES permitted stormwater discharges including MS4, construction and industrial discharges covered under permits numbered SCS & SCR are subjected to Waste Load Allocation (WLA) and will be required to demonstrate consistency with the assumptions and requirements of the TMDL. Is there any specific reason why Berkeley County was not mentioned in the TMDL document?**"**

BC Response 3:
At the time of draft TMDL development, the jurisdictional boundaries of the regulated SMS4s within the Wando River TMDL watersheds had not been established using the updated urbanized areas from the 2010 census. The GIS urbanized area coverage was based on the 2000 census and using this coverage, only Charleston County, Town of Mount Pleasant and SC DOT were identified as the MS4s within the TMDL areas. Based on a review of Stormwater Management Plans submitted to the Department, the jurisdictional boundaries are now established; Berkeley County (SCR031501) and the City of Charleston (SCR031901) currently have regulated MS4s present in the TMDL watershed for site 09B-16.

However, station 09B-16 is currently meeting the WQ standard for SFH FC Bacteria and references to the site have been removed from the draft TMDL document. Berkeley County and City of Charleston are not regulated MS4s located within any of the other TMDL boundaries, therefore are not assigned WLAs in the draft TMDL document.



Urbanized areas based on 2010 census within the Wando River TMDL areas

BC Comment 4, Page 12:

"Although SCDHEC has recognized the sanitary sewer overflow (SSO) problem in the watershed, no load reductions have been given to address the problem. Water quality samples did not eliminate SSOs as a problem.**"**

BC Response 4:
The draft TMDL document indicates the potential for Sanitary Sewer Overflows (SSO) in the TMDL watersheds serviced by sewer collection systems. SSOs are illegal and therefore are not covered under a WLA. SSOs may be captured implicitly within the LA component of these TMDLs; however, SSOs are subject to compliance and enforcement mechanisms and, if reported, should be addressed by the party responsible for maintenance of the collection system.

The goal of shellfish monitoring stations in the Wando River and other shellfish harvesting areas are to determine the safety of shellfish for human consumption by preventing shellfish harvest from contaminated growing areas, and is not to eliminate sources of pollution or pollutants.

BC Comment 5, Page 12:
"Although there are deficiencies in the modeling approach and data collection methods, based on the above abstract from the TMDL document, as long as the MS4s are in compliance with their SWMP they may demonstrate progress towards the WLA.**"**

BC Response 5:
The Department has successfully used this modeling approach for prior EPA approved shellfish TMDLs. Data collection method is based on US Food and Drug Administration (FDA) National Shellfish Sanitation Program (NSSP) guidelines. The Department acknowledges progress towards the goals of the TMDLs can be demonstrated by the regulated stormwater community through following:

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

Page ii: "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 Wando River watershed.

Page 12: "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 Maximum Extent Practicable (MEP) definition is met, even where the numeric percent reduction may not be achieved in the interim."

BC Comment 6, Page 17:
"SCDHEC has acknowledged the lack of information on the effects of septic tank repairs on water quality. Were repairs conducted in other parts of the watershed? Did the problem persist or was it reduced?**"**

BC Response 6:
The Department had awarded a §319 Grant to Mount Pleasant Water Works and Shabica and Associates, Inc. for "Demonstration of Innovative Nonpoint Source Reduction: Septic Systems Managements". These entities have completed some septic tank repairs. At the time of TMDL development, the results of these repairs and whether the repairs had any effect in the vicinity of the study area are unknown.

It is not known whether other septic tank repairs were completed in other watersheds. Once a septic tank construction permit has been issued by the Department, it is the homeowner's responsibility to properly maintain their septic tanks.

BC Comment 7, Page 19:
"Fecal coliform deposited near the stream bank has a higher wash off and entry probability to the stream during storm events, not to mention the impact of fecal matter deposited directly into the stream. This was not considered for the conditions outlined in the previous paragraph. Did SCDHEC consider the deposition of fecal coliform in the streams by wild animals while drinking water during the dry periods? On page 19, SCDHEC has acknowledged that both raccoons and feral pigs spend time near the water's edge on tidal flats and both may be major contributors to fecal coliform exceedances.**"**

BC Response 7:

A portion of the previous respond to BC Comment 7 has been modified as below:
The paragraph referenced in the comment is specifically for station 09B-06. BSLC method and references to it has been removed from the draft TMDL document. As stated in the draft TMDL document, chance of fecal matter on the Frances Marion Forest floor reaching the Wando River is negligible due to minimal freshwater inflow to the Wando River from the Francis Marion Forest (Conrads and Smith, 1996).

Also, the Wando River is brackish to saline and land based wildlife would not use the Wando River as a source of drinking water; however, such activities may be captured implicitly within the LA component of the TMDLs.

BC Comment 8:
"Are walkways and docks a responsibility of an MS4? How would conditions change if those structures did not exist? Those structures potentially intercept fecal coliforms and provide opportunity for decay through exposure to the sun before being washed into the stream.**"**

BC Response 8:
The referenced statement indicates a possibility of runoff during rain events from these structures. By pointing out these possibilities, the draft document is indicating where BMPs or public education

campaigns could be directed by the permitted entity. Structural BMPs for the walkways and docks include but are not limited to, spikes and monofilament on the walkway and dock railings, metal cones and decoys.

Responsibilities for addressing FC bacteria from private docks and walkways may be limited by public accessibility, local ordinances, taxing authority or other jurisdictional factors unique to the local MS4. Point source discharges from permitted MS4s are subject to the WLA component of the TMDLs. If it is determined that the regulated MS4 is not responsible for reducing such bacterial loadings, these NPS reductions remain subject to the LA.

BC Comment 9:
"*Based on the report, MS4s are responsible for the urbanized portion of their jurisdiction. Referring to the urbanized map in the report, WLAs have been assigned to MS4s even at some sites, such as 09B-05, which do not have any urbanized area within the contributing watershed.***"**

BC Response 9:
See BC Response 1.

Presence or absence of an "urbanized area" does not correlate to existence of a permitted entity or to allocation of WLAs. As it was explained in the draft document, there are different types of NPDES permitted entities besides MS4s that are permitted to discharge stormwater.

Also note that the percent reduction applies to all NPDES-permitted stormwater discharges, including current and **future** MS4, construction and industrial discharges covered under permits numbered SCS & SCR.

BC Comment 10, Page 23:
"No verification was conducted to determine if stations 09B-06 and 09B-10 have attained the fecal standards in the last 7.5 years.**"**

BC Response 10:
These two stations have been discontinued for monitoring by the shellfish program and are on the 303(d) list of impaired waters for exceeding the FC bacteria standard for shellfish harvesting waters. Until a TMDL has been calculated and approved by US Environmental Protection Agency (EPA), these stations will continue to be included on the 303(d) list as impaired due to exceedances of the FC bacteria standard for shellfish harvesting waters.

At this time, the Department's shellfish program does not plan to conduct future monitoring at these two locations in the Wando River. http://www.scdhec.gov/FoodSafety/ShellfishMonitoring/MonitoringProgramOverview/

BC Comment 11, Page 23:
"The proposed reductions are based on fecal coliform concentrations and not on the basis of calculated loadings. The method is not in alignment with the definition of "Total Maximum Daily Load".

BC Response 11:
The method is in alignment with the definition of TMDL. Based on the Code of Federal Regulations, Title 40, Chapter 1, Subchapter D, Section 130.2, "…TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure…".
Available at:
http://www.ecfr.gov/cgi-bin/text-idx?SID=44db8f8fd448f60f101873e1963fa8d7&node=se40.22.130_12&rgn=div8

The FDA pathogen standard was developed with an acceptable concentration-based exposure in mind and the percent reductions expressed in the draft TMDL document, once met, would achieve the SFH FC bacteria water quality standard (the TMDL target).

The Wando River is a tidally complex waterbody. The required percent reductions are based on data collected during a wide range of meteorological and tidal conditions. 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 Chechessee Creek, Jeremy Inlet/Scott Creek, the Okatie and Toogoodoo Rivers.

BC Comment 12, Page 23:
"Isn't this information available from NOAA? Did SCDHEC contact NOAA to obtain this information or they elect not to include tidal influence in their model? If so, what is the reason for not considering tidal influence? Tidally-influenced loading was considered by SCDHEC in assessing surface load for the TMDL for Fecal Coliform in Shellfish Waters of the Murrell's Inlet Estuary (2005). This should be included to accurately model the pollutant loading in the watershed.**"**

BC Response 12:

See BC Response 11.

NOAA operates a tidal gage at Cainhoy which is used for daily tide predictions. This gage does not record flow information.

The Murrells Inlet TMDLs were not calculated by the Department; rather the project was contracted by EPA Region 4 to Quantitative Environmental Analysis, LLC (QEA, LLC). The assessment completed by QEA, LLC indicated that freshwater inputs in the form of precipitation runoff through overland were the most important source of FC bacteria loading to the system. The daily freshwater flows were estimated from precipitation records and tidally influenced flows were estimated from typical tidal ranges that were measured at a NOAA tidal gage. Adequate data were used for the calculations of the Wando River TMDLs. Furthermore, additional information in the form of trend analysis, as well as other supplemental information such as wildlife counts, pet statistics, etc. are presented in the draft TMDL document.

It is worth noting that the Department previously reviewed the 2005 Murrells Inlet TMDL in response to questions from partners working on a watershed based plan development project for the

Murrells Inlet estuary. The purpose of the watershed based planning was to develop strategies for implementing the TMDL and improving water quality in Murrells Inlet. The purpose in reviewing the 2005 TMDL was to assist the partners in translating the TMDL results into targeted approaches for restoring water quality at specific locations.

While the 2005 TMDL did attempt to account for tidal effects, the problem was the modeling approach used by the EPA contractor developing the TMDL determined averaged reductions over large areas. To assist the partners, TMDL program staff calculated percent reductions for individual sites using the same cumulative probability approach used here.

Results are compared as follows: 2005 TMDL percent reduction for Main Creek segment (stations 04-01, 04-01A, 04-02, and 04-27) = 80.4%; recalculated percent reductions using cumulative probability over the same data period: 04-01 = 93%; 04-01A = 89%; 04-02 = 44%; 04-27 = 66%. Results for individual sites were scattered about the "average" value computed for the segment. We concluded that both methods were giving similar results and that the cumulative probability approach actually seemed to yield more useful information for implementation efforts.

The FDA pathogen standard was developed with an acceptable concentration-based exposure in mind and the percent reductions expressed in the draft TMDL document, once met, would achieve the SFH FC bacteria water quality standard (the TMDL target).

BC Comment 13, Page 28:
"Based on 2011 NLCD (Table 2, page 9), the increase in development since 2001 is 22.01%, whereas Station 09-B16 with predominantly urbanized area shows significant decreasing trend in fecal coliform level. In addition, as indicated in the TMDL document station 09B-16 is not included in the draft 2014 303(d) list. Considering the fact that station 09B-16 has shown a negative trend and has not been listed in the draft 2014 303(d) list, how would the implementation of the WLA by Berkley County in sub-basin 09B-16 aid in improving water quality? This station should not have been given any WLA in the proposed TMDL.**"**

BC Response 13:
Based on a review of the Shellfish Management Area 2015 Annual Update and a review of more recent data collected at site 09B-16, the station is attaining (meeting) the WQS for the pollutant of concern. Therefore, the TMDL document has been updated and references to station 09B-16 has been removed. Berkeley County and City of Charleston are not regulated MS4s located within any of the other TMDL boundaries, therefore are not assigned WLAs in the draft TMDL document.

BC Comment 14, Page 29:
"Based on 2011 NLCD (Table 2, page 9), total developed area, total wetlands and total forested area in the Wando River Basin are approximately 11%, 43%, and 20%, respectively. Although, the percentage of developed area in the Wando River watershed is half of the percentage of forested area, equal reduction percentages (LAs and WLAs) have been allocated to both the sources without clearly disaggregating the load between the two drastically different sources.**"**

BC Response 14:
The aggregate landuses documented in the draft TMDL document are only for stations included in draft TMDL document and are not for the Wando River watershed as a whole.

The FDA pathogen standard was developed with an acceptable concentration-based exposure in mind and the percent reductions expressed in the draft TMDL document, once met, would achieve the SFH FC bacteria water quality standard. If all WLA and LA sources are reduced by the percentage prescribed, then the instream FC bacteria standard will be attained and the shellfish harvesting use will be achieved. The concentration-based standard is equivalent to the overall TMDL target of 43 cfu/100 ml. Percentage reductions prescribed in the WLA and LA are the reductions necessary in order to meet the TMDL target minus the margin of safety. Disaggregating the FC bacteria loadings would not result in a change to those TMDL targets.

BC Comment 15:
"Berkley County owns and operates only 0.54 square miles of unincorporated urbanized area in the watershed. The associated cost to improve water quality in this watershed by implementing best management practices in the unincorporated urbanized area will be daunting and the impact would be negligible and less visible because of the 12.9% reduction goal.**"**

BC Response 15:

Station 09B-16 is currently meeting WQ standard and has been removed from the TMDL document. Therefore, Berkeley County is not assigned a WLA.

Charleston County comments were submitted by James Neal

CC Comment 1:
"Please normalize all samples to NOAA's Mean Sea level and to the season during which they were gathered (winter or summer). This will facilitate the extrapolation of the critical condition, allowing the selection of BMP's to be tailored to function during the most critical occurrences."

CC Response 1:
The Wando River is a tidally complex waterbody. The required percent reductions are based on data collected during a wide range of meteorological and tidal conditions. 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 Chechessee Creek, Jeremy Inlet/Scott Creek, the Okatie and Toogoodoo Rivers.

CC Comment 2:
"The document does not provide the laboratory certification of those entities (both internal and external) who are providing fecal coliform sampling data to SCDHEC in accordance with South Carolina Regulation 61-81.

a. South Carolina Regulation 61-81 gives the Office of Environmental Laboratory Certification authority to issue certification to laboratories analyzing regulatory compliance samples for reporting to the S. C. Department of Health and Environmental Control (SCDHEC).

b. Regulation 61-81 applies to any laboratory performing analyses to determine the quality of air, drinking water, hazardous waste, solid waste, or wastewater; performing bioassays; or performing any other analyses related to environmental quality evaluations required by the Department or which will be officially submitted to the Department."

CC Response 2:
Samples for FC bacteria analysis are collected by the Shellfish Sanitation Program and analyzed by the Department's regional offices based on the National Shellfish Sanitation Program Model Ordinance for the protection of human health. Shellfish bacteria standards, monitoring methodology and laboratory analyses, etc. comply with guidance set forth in the Model Ordinance.
a. Office of Environmental Laboratory Certification is a part of DHEC and certifies laboratories within South Carolina.
b. There are no outside entities submitting sample results.

All data collected by the Department are collected in accordance with the South Carolina Water Quality Monitoring Strategy. The monitoring strategy is a quality assurance project plan (QAPP) approved internally by DHEC with concurrence from USEPA Region 4.

CC Comment 3:
"Baseline and/or natural background data was not presented to provide an understanding on how pollutants can be reduced by some percentage. The methodology by which MS4 entities can reduce Colony Forming Units (CFUs) from those in excess of the baseline and/or natural loads should be presented."

CC Response 3:
It is not feasible to quantify "baseline" or "natural background" loading of FC bacteria with limited data and limited resources. Regardless of the units used to express the TMDLs, the endpoint is ensuring that the SFH water quality standard for FC bacteria is being met. Reductions from all sources, whether considered "baseline", "natural background" or other, must be achieved in order for the SFH water quality standard for FC bacteria to be met. Regulated MS4s are subject to the WLA component of the TMDL and are only responsible for reducing FC bacteria contributions from their jurisdictional area to the MEP. NPS contributions, such as those from "natural background", are subject to the LA component of the TMDL. If all WLA and LA sources are reduced by the percentage prescribed, then the instream FC bacteria standard will be attained and the shellfish harvesting use will be achieved. 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.

The FDA pathogen standard was developed with an acceptable concentration-based exposure in mind and the percent reductions expressed in the draft TMDL document, once met, would achieve the SFH FC bacteria water quality standard. The concentration-based standard is equivalent to the TMDL target of 43 cfu/100 ml. Percentage reductions prescribed in the WLA and LA are the

reductions necessary in order to meet the TMDL target minus the margin of safety. Disaggregating the FC bacteria loadings would not result in a change to those TMDL targets.

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 Maximum Extent Practicable (MEP) definition is met, even where the numeric percent reduction may not be achieved in the interim.

CC Comment 4:
"Means for MS4 entities to demonstrate compliance with new construction and industrial activities should be provided."

CC Response 4:
Compliance with terms and conditions of future and existing individual MS4, construction, and industrial permits is outside the scope of this TMDL document. Consistency of new construction and industrial activities with this TMDL is demonstrated by attainment of the SFH FC bacteria water quality standard in stormwater outfalls from these new activities. For questions concerning NPDES stormwater permit compliance, please contact DHEC's Storm Water Permitting Section.

CC Comment 5:
"An explanation of why the proposed reduction in CFU loads, which are said to be negligible contributors, emanating from the urban wildlife (rodents, raccoons, pigeons, etc.) located within the Francis Marion National Forest into the Wando River watershed are subject to load reductions."

CC Response 5:
Urban wildlife is described as wild animals that can live and thrive in urban environments and the Francis Marion National Forest (FMNF) is not located within an urbanized area. If it is determined runoff from FMNF meets the water quality standard (the TMDL target), no further FC bacteria reductions are needed from this area. Other reaches located south and west are increasingly urbanized and FC bacteria contributions from urban wildlife may be more relevant.

In order to meet the SFH standard and designated uses, the Department recognizes the prescribed percent reductions must be met from all sources covered under the WLA or LA of the TMDLs. Regulated MS4s are subject to the WLA component of the TMDL and are only responsible for reducing FC bacteria contributions from their jurisdictional area and through their conveyance system to the MEP. NPS contributions are subject to the LA component of the TMDL.

CC Comment 6:
"Clarify the calculation of the proposed reductions which appear to be based on fecal coliform "concentrations" not "loadings"."

CC Response 6:
The FDA pathogen standard was developed with an acceptable concentration-based exposure in mind and the percent reductions expressed in the draft TMDL document, once met, would achieve the SFH FC bacteria water quality standard (the TMDL target).

The cumulative probability method has been described in section "4.0 Cumulative Probability Method" section of the draft document. The Wando River is a tidally complex waterbody. The required percent reductions are based data collected during a wide range of meteorological and tidal conditions. 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 Chechessee Creek, Jeremy Inlet/Scott Creek, the Okatie and Toogoodoo Rivers.

CC Comment 7:
"Please clarify or correct the disparity between the TMDL acreage of 79.53 mi.² and the acreage of 73.41 mi.² derived from ArcMap's 12 digit HUC's."

CC Response 7:
The Wando River TMDL watersheds span two 12-digit Hydrologic Unit Codes (HUC); 030502010401 and 030502010402. Using ARCGIS, these 12-digit HUCs served as a basis for estimating the overall drainage boundaries of the TMDL subwatersheds. In addition, the drainage contribution for each station was further subdivided using 7.5 minute USGS topographical maps as well as Light Detection And Ranging (LiDAR) data for Berkeley and Charleston Counties. Based on the Departments calculations, combined drainage area of all the subwatersheds included in the draft TMDL document is estimated as 79.53 mi^2.

CC Comment 8:
"Berkeley County and City of Charleston are not listed as MS4s within the TMDL although they are within the geographic TMDL boundary. Further, state why SCDOT is assigned a Waste Load Allocation (WLA) percent reduction and then stated that the WLA is negligible as long as SCDOT follows their NPDES stormwater permit?"

CC Response 8:
See BC Response 3 in regards to identifying Berkeley County and City of Charleston in the draft TMDL document.

In certain less-urbanized watersheds and as long as conditions remain the same, FC bacteria contributions from SC DOT owned/operated properties are deemed negligible and no further FC bacteria reduction is necessary. For these watersheds, because the SCDOT contribution is negligible, SCDOT is assigned a WLA percent reduction of zero.

SC DOT is not a traditional MS4. SC DOT does not regulate landuse, zoning, issue development and building permits and does not have statutory taxing or enforcement powers. Like all other MS4 permittees, SC DOT must comply with the provisions of their stormwater permit to the MEP and demonstrate consistency with the assumptions and requirements of TMDLs.

CC Comment 9:
"Why were the stakeholders within the Wando River basin not invited to collaborate with SCDHEC and be given the opportunity to be a part of the formulation of this TMDL?"

CC Response 9:
In accordance with requirements set forth in Regulation 61-110 (2005), the Department announced commencement of the Wando River Shellfish TMDLs on its website beginning December 2, 2013. As stated on the commencement page of the website, stakeholders are invited to submit any data or information that supports the development of TMDL(s). The Department's webpage of "TMDLs under development" can be found at: http://www.scdhec.gov/HomeAndEnvironment/Water/ImpairedWaters/TMDLsUnderDevelopment/. There is opportunity for stakeholders to engage in development as TMDLs are commenced, during the 30-day public comment period and through the end of a 15-day Notice of Department Decision (NODD). Also, the Department has made the draft document available to affected regulated MS4s for preliminary review on August 6, 2014, before the 30-day public comment period officially opened on August 29, 2014.

Stakeholder involvement may also occur after the EPA's approval of the TMDL document and during the implementation phase.

CC Comment 10:
"Please provide the rationale as to why the FDA fecal coliform standard of 43/14 CFU is given to MS4s as a standard when other point sources such as wastewater treatment plants are given a fecal coliform limit of 200/100 CFU."

CC Response 10:
In waters classified in R. 61-69 (2012) as "shellfish harvesting waters (SFH)", all continuous and non-continuous point sources are subject to the FDA FC bacteria standard due to human health concerns related to shellfish consumption. The Shellfish FDA standard is different from a primary and secondary contact recreation standard. Because the Wando River classified as "Shellfish Harvesting Waters" in the portions were the impaired stations are located, the FDA FC bacteria standard for SFH waters is applicable. Other saltwater bodies of waters classified as "SA" or "SB" have different bacteria standards and criteria because the "use" of those waters are for primary and secondary contact recreation and not for shellfish harvesting.

Currently, there are no continuous point sources in the Wando River. In the future, if there is an NPDES-permitted point source discharger within the Wando River and its tributaries, that facility must meet FC bacteria criteria of 14 MPN/100 ml as a geometric mean and 43MPN/100 ml as a single sample maximum at the end of their pipe.

Since 2013, the primary and secondary contact recreation FC bacteria criteria of 200 cfu/100 ml as a 30-day geometric mean and 400 cfu/100 ml as a single sample maximum are no longer applicable water quality criteria in SA and SB waters. Reissued or future NPDES permits for discharges to either SA and SB waters will be required to meet the current primary and secondary contact recreation Enterococci standard in lieu of the former FC bacteria standard.

For further information on class descriptions, designations and standards of surface waters, and for a listing of classified waters in South Carolina, please see "Water Classifications and Standards Regulation 61-68" and "Classified Waters Regulation 61-69" (June 22, 2012), available at: http://www.scdhec.gov/Agency/docs/water-regs/R.61-68.pdf and http://www.scdhec.gov/Agency/docs/water-regs/R.61-69.pdf

City of Charleston comments were submitted by Kinsey Holton

"General Comments:
The development of a fecal coliform bacteria TMDL seems antiquated. While, historically, this methodology has been utilized for evaluation of marine waters, the Department evaluated the use of other indicator bacteria and found enterococci to be a much more accurate indicator if impairment, particularly in the coastal zone. Since the Department went through the diligent study to determine "best use" indicators, why is this TMDL being developed using indicator bacteria that have been shown to be less indicative of water quality?
The lack of tidal influence analysis in this TMDL is disconcerting. The TMDL document has attributed loading contributions based on only overland flow discharges with no assessment or analysis of tidal influences in the watershed. What led the Department to take a different assessment approach in this TMDL versus previously developed coastal fecal coliform TMDLs? It is highly recommended from both an analytical standpoint and TMDL consistency standpoint, that a revised modeling approach be utilized in this TMDL. As an example, the TMDL for Fecal Coliform in Shellfish Waters of the Murrell's Inlet Estuary (2005), is a much more appropriate modeling approach for this type of TMDL, which considers overland inputs and tidal influences."

Response to General Comments:
In accordance with the Clean Water Act (CWA), TMDLs must be developed for impaired waters. The Department had conducted a Pathogen Indicator Study and indeed found Enterococci to be a better indicator for presence of disease causing bacteria for primary and secondary contact recreation. Based on the FDA guidance, only fecal coliforms or total coliforms can be used to determine the safety of shellfish for human consumption in shellfish harvesting waters. For this reason, the applicable water quality standard for shellfish protection in Class SFH waters continues to be fecal coliform in accordance with S.C. Regulation 61-68.

Regarding tidal influence, please see BC Response 12 and CC Response 10..

CoC Comment 1, Page 2:
"The Bejarano, et al. 2004 study references the use of land practices with respect to polycyclic aromatic hydrocarbons (PAHs), metals and pesticides and their influence on shellfish estuaries. A reference to a technical document of this sort in the introduction of this document is misleading in that it represents that this study supports urbanization and development as a causal influence of fecal coliform levels in shellfish waters. While there may be published studies correlating fecal coliform levels and urbanization in receiving shellfish waters, the study referenced in the TMDL document is not such a study. Additionally, the excerpt taken from this document is actually a reference to a 1993 Fulton, et al. study, "The effects of urbanization on small high salinity estuaries of the

Southeastern United States", which also analyzed PAHs and does not address fecal coliform bacteria as it relates to urbanization and impact to shellfish waters. Furthermore, the Fulton report specifically states that "the impact of urban runoff on estuarine ecosystems has not been well defined, especially in the many small, high salinity estuaries of the southeastern US." If it is the Department's decision to include bibliographic references to published study with respect to this TMDL, it is suggested that references to documentation directly correlating fecal coliform and urbanization be utilized. Otherwise, factual references and documentation included in this fecal coliform TMDL could be considered misleading to the general public."

CoC Response 1:
Bejarano et al., 2004 is a research article published in a peer reviewed journal. Research papers with different focuses are referenced in the draft Wando River technical document to point out that urban runoff carries variety pollutants to surface waters including PAHs, metals, bacteria, sediments, etc.

CoC Comment 2, Page 3:
"This report references the approved 2012 list of 303(d) impaired waters, but further in the document, utilizes data obtained through 2012 to develop the parameters of this TMDL. The 2012 data collected would be included as part of the 2014 303(d) list of impaired waters. As a recommendation, the Department should delay the issuance of this TMDL until which time the EPA has verified the data from 2012, via the approval of the 2014 303(d) list. Previous TMDL development timing has resulted in the delisting of selected sites from inclusion in published TMDLs due to 303(d) lists being approved and issued during the development and adoption of TMDLs. This proposed Draft TMDL has significant influence on the non-continuous point source communities in the watersheds and it is strongly recommended that the Department delay issuance of this TMDL until the publication of the 2014 303(d) list of impaired waters."

CoC Response 2:
The Department's 2014 303(d) list of impaired waters was approved by EPA on May 27, 2015. Due to natural variance in precipitation patterns, tides, landuse, etc., shellfish stations may be removed from or added to the 303(d) list, depending on attainment status. However, the stations included in the draft document are on the EPA approved 2012 303(d) list of impaired waters. The Department is mandated by CWA to develop TMDLs for stations not meeting the water quality standards.

The Department has revised the document to acknowledge changes to impairment status as result of approval of the 2014 303(d) list. Regarding sites included on the approved 2012 303(d) list and not included on the 2014 303(d) list:

If it is demonstrated that the standard is being attained at either a representative stormwater outfall or at the instream location, the stormwater discharge is not causing or contributing an instream impairment. Standard attainment, as described, demonstrates consistency with the assumptions and requirements of pathogen TMDL(s) and, in accordance with 3.1.1.2 of the NPDES MS4 permit, no further action is necessary by the SMS4 entity to reduce pathogen loadings.

In addition, if the biennial 303(d) assessment of DHEC water quality data demonstrates the impairment no longer exists (standard attainment), then no further action is necessary to reduce pathogen levels instream.

Regarding Site 09B-016, see BC Response 13.

CoC Comment 3, Page 5: "The TMDL identifies urban development as a key contributor to fecal coliform levels within the estuaries. However, it is identified that 80% of the watershed is wetlands, open water and forested land, with only 10.8% of the watershed fully developed. This urbanization does not directly correlate to the most impaired subwatersheds in the estuary, which are primarily in the headwaters of the system and receive overland discharge from the Francis Marion National Forest.**"**

CoC Response 3:
Based on NLCD 2011, combined total developed area of the TMDL watersheds is 9.81 mi2 which corresponds to 13.2% of the total area. This is an increase of 17.8 % developed area since 2001. The Wando River is tidally influenced with many small tributaries receiving drainage from the surrounding areas. During flood tide, pollutants may also be carried to these areas from other portions of the watershed. These pollutants can become trapped in these tributaries and the upper most portions of the Wando River. Without adequate flushing, it may take numerous tidal cycles to flush out these pollutants from the upper reaches of the Wando River. Many scientific studies have shown the effects of increases in development, urbanization and impervious surfaces can have on surface waters.

CoC Comment 4, Page 9: "The landuse does indicate an increase in urbanization within the overall watershed. However, it does also indicate a measurable increase in wetlands and open water. It appears that the increase in waters and wetlands was disregarded in this analysis and the sole focus was on the increase in urbanization. However, actual data and trends analyzed throughout this report do not correlate fecal coliform directly to urbanization."

CoC Response 4:
The change in "open water" category is less than 1% and therefore considered de minimus. In contrast woody wetlands has increased by 19.9% since 2001. Utilizing the "NLCD 2006 to 2011 Land cover Change" GIS layer, it was determined the increases in "woody wetland" category in the overall landuse of the TMDL area occurred within the boundaries of the Francis Marion Forest. The above mentioned GIS layer is available at: http://www.mrlc.gov/nlcd11_data.php

CoC Comment 5, Page 10: "Change "insure" to "ensure"."

CoC Response 5:
Suggested change has been made in the draft TMDL document.

CoC Comment 6, Page 21: "The figure on this page represents the feral hog population distribution that is reflected on Page 18. However, the development of the WLA and LA do not reflect the distribution of this or other wildlife within the subwatersheds. If the distribution is as significant as reflected in the document, how is the entire WLA/LA being applied to the non-continuous point source discharger only? It would appear, through the wildlife distribution, that there are non-urbanized sources of impairment that should not be solely attributed to the NPDES dischargers and

other urbanized areas, as they constitute, according to this document, only 10.8% of the entire watershed."

CoC Response 6:
Due to lack of information from non-continuous point sources, it is not possible to differentiate between WLA and LA loadings. MS4s are subject to the WLA component of the TMDL and are only responsible for reducing FC bacteria contributions from their jurisdictional area to the MEP. NPS contributions are subject to the LA component of the TMDL. Implementation of the LA is voluntary and can be challenging.

The FDA pathogen standard was developed with an acceptable concentration-based exposure in mind and the percent reductions expressed in the draft TMDL document, once met, would achieve the SFH FC bacteria water quality standard. The concentration-based standard is equivalent to the TMDL target of 43 cfu/100 ml. Percentage reductions prescribed in the WLA and LA are the reductions necessary in order to meet the TMDL target minus the margin of safety. Disaggregating the FC bacteria loadings would not result in a change to those TMDL targets.

Please refer to section "5.2.2 Non-Continuous Point Sources" of the draft TMDL document for information needed by the Department to further define loadings for permitted entities.

CoC Comment 7, Page 23: "Is there not sufficient historic tidal information to develop the loadings throughout the watershed? This information is available from NOAA and can be used to develop a more accurate loading model for the watersheds. Tidal modeling is critical in source assessment and determination of all potential factors contributing to fecal coliform loading.**"**

CoC Response 7:
Please see BC Response 2.

CoC Comment 8, Page 27: "The load allocation (LA) portion of this document refers to the MS4 communities. The MS4s are covered under the WLA section of the document and are not held to reduction requirements associated with LAs.**"**

CoC Response 8:
On Page 26, paragraph 6 of the document the following language has been changed to "Regulated MS4s are subject to the WLA component of this TMDL; however, there may be other unregulated stormwater discharges located in the watershed that are subject to the LA component of this TMDL."

The referenced language is meant to address unregulated stormwater that may be present in the watershed. These include stormwater discharges from construction, industrial or other discreet conveyances not included under an MS4 Permit.

CoC Comment 9, Page 28: "The statistical analysis of the data, and associated Appendix E – Statistical Trend Analysis, indicate very little correlation over time. Only two stations, 09B-07 and 09B-16, reflect any significant trend, and those are trending downward (water quality improvement). These two watersheds are within highly urbanized areas. With the data presented on Page 9 indicating a 22.01% increase in urbanization since 2001, these results seem to indicate

that there is no direct correlation between urbanization and fecal coliform impairment within these watersheds. If the Department intends to enforce WLA requirements on the MS4 communities, stronger correlation between fecal coliform pollution and urbanization should be provided in this document."

CoC Response 9:
The results of the trend analysis did show statistically significant decreasing trend for station 09B-07. Currently, station 09B-16 is meeting the WQ standard thus has been removed from the TMDL document. As it is explained in the draft document, the slopes are weak and there have been high bacteria readings. Therefore, the Department cannot conclude if these are natural variations or actual decline in bacteria counts. There are other stations with trend lines showing a decrease but not a significant difference.

If it is demonstrated that the standard is being attained at either a representative stormwater outfall or at the instream location, the stormwater discharge is not causing or contributing an instream impairment. Standard attainment, as described, demonstrates consistency with the assumptions and requirements of pathogen TMDL(s) and, in accordance with 3.1.1.2 of the NPDES MS4 permit, no further action is necessary by the SMS4 entity to reduce pathogen loadings.

CoC Comment 10, Page 28: "This document reflects that the MS4 does not have to reduce loads prescribed as LA. However, they are identified on pages 26-27 under the load allocation section. Additionally, the LA and WLA identified in this document are identical."

CoC Response 10:

See BC Response 3.

In order to clarify the current status of MS4 responsibility in the document, the following language has been added/clarified in paragraph 1, page 28 of the TMDL document: "Besides SCDOT, there are currently other regulated MS4s that may be located in at least one of the TMDL drainage areas: Charleston County and the Town of Mt. Pleasant. Regulated MS4s are subject to the WLA component of these TMDLs. There may also be other unregulated stormwater discharges located in the watershed that are subject to the LA component of these TMDLs."

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 from regulated MS4s are required to meet the WLA percentage reduction or the existing instream standard for the pollutant of concern to the MEP. The concentration-based standard is equivalent to the TMDL target of 43 cfu/100 ml. Percentage reductions prescribed in the WLA and LA are the reductions necessary in order to meet the TMDL target minus the margin of safety. Disaggregating the FC bacteria loadings would not result in a change to those TMDL targets. If all WLA and LA sources are reduced by the percentage prescribed, then the instream FC bacteria standard will be attained and the shellfish harvesting use will be achieved.

CoC Comment 11, Page 29: "The WLA and LA associated with this TMDL are identical. Based on the information provided in the document, roughly 90% of the watershed is undeveloped. Throughout the document, the Department has identified potential background and non-urbanized sources of contamination of the estuary. However, in the calculations, the non-continuous sources WLA, non-continuous SCDOT sources WLA and LA reduction requirements are the same."

CoC Response 11:

See CoC Responses 6 and 10.

CoC Comment 12, Page 29:
"The entire reduction requirement has been placed on the non-continuous point dischargers. Based on information in this TMDL, this is incorrect. Even if it is assumed that there are no background sources of fecal coliform regrowth (Desmarais, et al 2001, document attached), the information provided in this TMDL directly contradicts this allocation of WLA. Appendix D, Bacteria Source Load Calculator, clearly identifies potential non-point sources of contamination, and can be accepted as analytical data used in the development of the TMDL, based on the Department's decision to include this data in the TMDL. This information was not broken down by subwatershed in the Appendix, but as a whole, pets and humans comprise only 67% of the potential sources. On a landuse basis, residential only constitutes 67.9% of the potential contamination sources. This would indicate that, even on a conservative basis, urbanization, and conversely Urbanized Areas (UAs), only contribute approximately 68% of potential contamination sources. This should be reflected in the WLA requirements, with the remaining percentages being identified as LA; since they apply to forest, crops and pasture lands outside of regulated MS4 areas.

Furthermore, based on assumption made for fecal coliform loading within this document, stations 09B-06 and 09B-12 consist of greater than 80% of their landuses in forest land. WLA cannot be judiciously applied to these watersheds requiring existing and future NPDES permitted entities bear the burden of load reduction on Federal Park lands."

CoC Response 12:
See CoC Responses 6, 9 and 10.

Note that, based on comments received regarding Appendix D, the Bacteria Source Load Calculator (BSLC) references and results were removed from the document. The remaining appendices were also relabeled accordingly.

Said document was not attached.

CoC Comment 13, Page 100:
"As presented in Appendix G, the Department identifies potential sources of fecal coliform within the watershed. In watersheds 09B-09 and 09B-12 there are no potential sources identified with direct links to UAs, either through urban pet waste or stormwater runoff. However, the WLAs for these two watersheds are 83.8% and 51.7%, respectively. As these pollutant sources are not associated with typical urban sources, how does the Department expect the regulated communities to comply

with these WLAs? While it is understood that the TMDL includes the statement, "the regulated MS4 entity is only responsible for implementing the TMDL WLA in accordance with their MS4 permit requirements…" the Department must understand that the time, expense and effort the MS4s will have to undertake to justify that they **don't** contribute to the impairment is a waste of public funds and staff efforts that could be more effectively applied elsewhere. This is particularly true in instances where the Department has identified, in this TMDL document, that specific watersheds are not receiving impairments from the urbanized areas. It is recommended that the Department strongly consider revising this TMDL to include appropriate modeling and, subsequently, appropriate WLA that are consistent with the science utilized to develop and evaluate loadings within the watershed.

CoC Response 13:

See BC Response 1, 11.

See CoC Responses 6, 9 and 10.

Appendix G has been removed from the document.

South Carolina Department of Natural Resources comments were submitted by Priscilla Wendt

DNR Comment 1:
"Based on the analysis of potential fecal coliform contributions from nonpoint sources using the Bacteria Source Load Calculator (BSLC), as described in Appendix D, the highest estimated source of fecal coliform bacteria is from pets in residential areas, followed by wildlife. "Human activities" is listed as a distant third source. While "human activities" (as defined in the TMDL document) may represent a relatively small proportion of the total fecal coliform loading to the watershed, it is certainly more amenable to regulation and voluntary implementation of BMPs than any attempt to control loadings from wildlife. The implementation of the fecal coliform TMDL should, therefore, focus on human activities, which we consider to include pet ownership, rather than on wildlife."

DNR Response 1:
BMP implementation is voluntary beyond jurisdictional boundaries of regulated MS4s. Within those jurisdictions, the authority to implement BMPs and enforce ordinances lays with the NPDES permitted entities. The goals of these TMDLs will not be met until the prescribed reductions from a combination of all sources are achieved.

The FDA pathogen standard was developed with an acceptable concentration-based exposure in mind and the percent reductions expressed in the draft TMDL document, once met, would achieve the SFH FC bacteria water quality standard.

Note that, based on comments received regarding Appendix D, the Bacteria Source Load Calculator (BSLC) references and results were removed from the document. The remaining appendices have been relabeled accordingly.

DNR Comment 2:
"The DNR believes that the recommendation to discourage birds from congregating on docks will have a negligible effect on fecal coliform loadings to the watershed. Furthermore, while hazing (harassing or scaring) birds is not illegal, the public should be made aware that almost all native species of birds (including their nest and eggs) are protected under the Migratory Bird Treaty Act, and that a depredation permit is required to capture or kill any protected bird or to destroy an active bird nest. The TMDL document should at least acknowledge this fact, and refer the reader to the U.S. Fish and Wildlife Service website (http://www.fws.gov/migratorybirds/) for additional information."

DNR Response 2:
The Department is sensitive to the Migratory Bird Treaty Act and is not suggesting culling of wildlife. There are other means of discouraging waterfowl and birds from roosting on surfaces such as, sheet metal cones, spikes and monofilament lines on dock railings, reflective diverters and tapes, water spray devices, also predator/raptor decoys. Waterfowl can also be discouraged from grazing on lawns by mowing less often, using water sprayers, decoys, etc. Local ordinances and public education focusing on not feeding wildlife are some of the methods that can be utilized by local municipalities.

DNR Comment 3:
"As shown in the spreadsheet on p. 78, human activities include "septic systems" and "straight pipe" discharges to the TMDL area; however, in the pie chart on p. 80, which ostensibly presents "Estimated Contributions by Landuse", straight pipes are lumped together with wildlife in a single "landuse" category. This seems illogical and appears to misrepresent the contribution by wildlife. DHEC should explain why "Wildlife & straight pipes" is even considered to be a "landuse" category at all and, secondly, why "straight pipes" would not be included along with "failed septic systems" in the "Residential" landuse category.

DNR Response 3:

BSLC tool and references to it has been removed from the document.

DNR Comment 4:
"The spreadsheet on p. 78 shows station 09B-09 to have, by far, the greatest number of "unsewered houses" and the greatest number of "septic systems" of all ages, including the "oldest"; however, in the first table on p. 82, the estimated loading due to "Failed Septic Systems" at this station is lower than either of the other two stations that have many fewer unsewered houses and septic tanks (09B-07 and 09B-18). Please explain why this would be the case.

DNR Response 4:
See response to previous question.

DNR General Comment 5:

"The DNR believes that successful implementation of the proposed TMDL should result in a substantial improvement in water quality of the Wando River. The SCDNR commends DHEC on developing a protective TMDL for fecal coliform bacteria and supports all reasonable efforts to improve and sustain water quality to the greatest extent possible, particularly in SFH waters."

DNR Response 5:
The Department appreciates SCDNR's support of the Wando River Fecal coliform TMDLs.

Town of Mount Pleasant comments were submitted by Hillary Repik

ToMP Comment 1:
"Many of the quotes in this document are used to alert, alarm, or draw connections between land development and pollution run-off. Many of these pre-date the implementation and subsequent updates to Municipal Storm Sewer System NPDES Permits, NPDES construction general permits and other land development and land management techniques. The claims presented in many of the quotes are not supported by the evidence presented in the TMDL document, to include the current state of land development and run-off control practices. Some of the studies referenced in the TMDL document did not directly correlate FCB as a source of pollution, but rather other sources of pollution, contributed to shellfish bed closures. SCDHEC's monitoring data did not reference closure of the beds for any other pollutants that would make the use of these studies relevant."

ToMP CC Response 1:
The comments are noted by the Department.

DHEC's Shellfish Sanitation Section collects data in accordance NSSP guidelines to assess the water quality in shellfish harvesting waters for shellfish consumption and related human health concerns and not for evaluating water quality for aquatic life or recreational uses. However, within the tributaries of the Wando River there are three other stations included in the 2012 303(d) list of impaired waters, listed below. These stations, impairments as well as uses are:
RO-056092, Beresford Creek is listed for not meeting the dissolved oxygen standard for aquatic life use support.
RT-052100, Boone Hall Creek is listed for exceeding the fecal coliform standard for recreational uses.
RT-06012, Toomer Creek is listed for not meeting the dissolved oxygen standard for aquatic life use support.

ToMP Comment 2:
"The most heavily impacted monitoring stations are located in undeveloped areas which does not support the claim that development is the cause. The documents states that development could cause additional impacts; this does not justify huge economic commitments by regulated towns and counties (non-continuous dischargers) to solve a problem that is not related to their operations."

ToMP CC Response 2:
Please see CoC Responses 3, 6 and 10.

ToMP Comment 3:
"This proposed TMDL makes no reference to tidal influences on data collection. Tidal flow can have an impact on sampling to determine potential sources, but also can influence how pollutants and waters interchange above the creek line into estuary areas. Water may fluctuate between different creeks and the flushing rates of the river may have an impact on bacteria levels that should be studied further."

ToMP CC Response 3:
Please see CoC Response 3.

The Wando River is a tidally complex waterbody. The required percent reductions are based data collected during a wide range of meteorological and tidal conditions. 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 Chechessee Creek, Jeremy Inlet/Scott Creek, the Okatie and Toogoodoo Rivers.

The FDA pathogen standard was developed with an acceptable concentration-based exposure in mind and the percent reductions expressed in the draft TMDL document, once met, would achieve the SFH FC bacteria water quality standard (the TMDL target).

In further response to the comments on tidal effects, tidal influence on the data was examined by dividing the fecal coliform bacteria results into two sample groups, those collected on the ebb or outgoing tide and those collected on the flood or incoming tide. Ebb and flood tide bacteria levels were compared for each site. Results are shown in the table below. In every case, and to a large degree, bacteria concentrations are higher on the outgoing tide than on the incoming tide, clearly pointing to landward rather than estuarine sources and increased dilution moving from tidal creeks toward open water. The data could be segregated for the purpose of calculating the TMDLs, resulting in higher percent reductions; however, doing so would not represent overall conditions at the monitoring sites.

Station_Tidal State	GeoMean FC Bacteria (cfu/100ml)	90th Percentile FC Bacteria (cfu/100ml)
09B-02_EBB	8	46
09B-02_FLOOD	5	26
09B-04_EBB	31	236
09B-04_FLOOD	10	73
09B-05_EBB	25	110
09B-05_FLOOD	13	55

09B-06_EBB	32	142
09B-06_FLOOD	21	70
09B-07_EBB	30	110
09B-07_FLOOD	12	49
09B-09_EBB	52	410
09B-09_FLOOD	17	100
09B-10_EBB	28	124
09B-10_FLOOD	13	64
09B-11_EBB	11	49
09B-11_FLOOD	6	24
09B-12_EBB	18	150
09B-12_FLOOD	10	49
09B-16_EBB	13	72
09B-16_FLOOD	6	32
09B-18_EBB	16	164
09B-18_FLOOD	9	30
09B-21_EBB	12	70
09B-21_FLOOD	5	26

ToMP Comment 4:
"Page 2 of the SCDHEC Shellfish management area 09B 2012 report states that non-point source run-off appears to be the primary source of fecal coliform bacteria. This is further supported by the TMDL document. "

ToMP CC Response 4:
By "non-point source" the annual update for shellfish area 09B is referring to non-continuous point source and non-point source pollution.

ToMP Comment 5:
"The referenced land-uses should be updated to include a category for estuarine environment when looking at coastal areas, especially when these areas are considered to be a main source of the pollutant. SCDHEC's own description of the Wando River Basin indicates that the entire basin contains "a total of 20.3 stream miles, 70.9 acres of lake waters, and **5,509.1 acres of estuarine areas in this watershed**". (http://www.scdhec.gov/HomeAndEnvironment/Docs/50201-080.pdf). The TMDL document does not appear to include the acreage for estuarine areas, which are known to contain a myriad of transitory wildlife during low tide and high tide cycles that can introduce fecal bacteria into the water column is understated in the TMDL document – only referencing that Development pushes wildlife to the marsh edge. Many of the monitoring sites are located near conservation or estuarine areas, far from any stormwater discharge points or non-point run-off sources. It is a significant assumption to propose that in a tidal environment, non-point or point sources run-off from land is the direct source of pollution or a monitoring station in larger river hundreds if not thousands of feet from a monitoring station."

ToMP CC Response 5:
The Wando River TMDL watersheds' landuses were calculated utilizing three different sets of the National Land Cover Database (NLCD). NLCDs have been developed by Multi-Resolution Land Characteristics (MRLC) which is a consortium of a group of federal agencies. The coverages provided by MRLC utilize a uniform classification system for the US and "estuary" is not a classification utilized by the system. However, open water and wetland areas have been identified in the draft document.

The Department is not aware of estuarine environment being main sources of pollutants. Also, estuarine areas are diverse in flora and fauna, are spawning grounds for many aquatic organisms, and food source for wildlife. Estuaries are transitional zones between freshwater and saltwater environments and are considered one of the most productive habitats. However due to the population increases along the coastal areas which also include estuaries, estuarine areas are becoming negatively impacted by various types of pollution and pollutants.

The acreage of estuarine areas is not the focus of the fecal coliform impairments documented in the draft TMDL document. Sources of fecal coliform from wildlife are part of the load allocation and implementing LAs are voluntary. Furthermore, the Department does not advocate culling of wildlife.

WLAs 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. Regulated MS4s are subject to the WLA component of the TMDL and are only responsible for reducing FC bacteria contributions from their jurisdictional area to the MEP.

The referenced link, no longer active, is for the older Santee River Watershed Water Quality Assessment document that was published in December 2005 which used the 11-digit HUCs. The new assessment document, published in 2013, is available through the Department website. Section applicable to the Wando River is available at:
http://www.scdhec.gov/HomeAndEnvironment/Water/Watersheds/WatershedMap/SanteeWatershed/

ToMP Comment 6:
"There are many different forms of wildlife that, with or without development, utilize the estuaries as a food source and therefore as a depository for fecal bacteria. Wildlife in a coastal environment is drawn to the estuary without the impact of development because of the diversity and availability of food ; deer have been seen swimming across large rivers, hogs feed on spartina, raccoons, opossums consume mollusks and other shelfish in the found in the marshes.

In addition, the State supports and promotes coastal buffer areas, which can serve as water quality filter from developments but also creates a wildlife corridor. The State is supporting a best management practice and then citing it as a possible justification for pollution from developed land. Regulated areas that utilize these land conservation and preservation techniques promoted by the State should not be held responsible for their potential impacts or management of wildlife within."

ToMP CC Response 6:
Your comments are noted.

ToMP Comment 7:
"On a Table on page 100 titled Potential Sources of Fecal Bacteria indicates that stormwater runoff is only a "potential source" in (4) of the station areas. While direct deposition on tidal flats and general residential or wildlife are listed as more common source. Compliance with the NPDES MS4 permit will not change these numbers as the permit addresses point source discharges and retrofitting."

ToMP CC Response 7:
Appendix G has been removed from the TMDL document.

ToMP Comment 8:
"There is a proposed 2014 update to the 303(d) list. 2014 Shellfish Management area updates are generally published every 2 years in October, with a report due in the next month, this TMDL should be suspended until these documents have been approved and provided to stakeholders for review. The TMDL should then be reevaluated after the publishing of this update. The TMDL should be developed after the publishing of this list to ensure that all data for listed and delisted stations is considered. Data collected since the data used in the 2012 Shellfish and 303(d) reports may include delisting of some monitoring sites, as has occurred in other TMDL developments. Sites that are scheduled to be de-listed should not be included in any TMDL at this time. Due to the significant financial impact to the regulated jurisdictions the TMDL publishing should be delayed until further reviews and data collection actions have been completed. Consideration of new MS4 program requirements in 2014 should also be considered and allowed to be implemented prior to adding additional regulations."

ToMP CC Response 8:
See CoC Response 2.

Also note that 2015 Annual Shellfish Sanitation Reports are available online at the following link: http://www.scdhec.gov/FoodSafety/ShellfishMonitoring/MonitoringStationReports/

Please note that the 2015 Annual Reports will serve as the basis for the 2016 303(d) assessment and subsequent drafting of the List of Impaired Waters. Additionally, shellfish sanitation reports are updated annually, using previous three years of data, and subsequently the SFH waters' classifications' are evaluated and update when necessary.

ToMP Comment 9:
"The State is supposed have switched over to the enterococci standard. This TMDL should be suspended until enough actual enterococci data is collected. Correlations to fecal numbers should not be made; current data using new technologies should be collected and utilized in all new TMDL developments."

ToMP CC Response 9:

See BC Response 12 12, CC Response 10, and CoC Response "General Comments".

ToMP Comment 10:
"SCDHEC should revise the allocations to accurately reflect the load and waste load contributions as illustrated by this document. MS4s should be given priority allocations for 319 funding to implement programs and actions for load reductions. All wasteload allocations should be deferred until additional data is collected unless trends in pollution levels increase."

ToMP CC Response 10:
See CoC Responses 6 and 10.

MS4s are eligible to receive §319 funding as long as funds are not used to implement requirements under their NPDES stormwater permit. Priorities are established in the initial request for proposal (RFP) and projects are funded based on available resources.

The Department believes there are sufficient data available for calculations of TMDLs. Also, as shown on Table #3 of the 2012 shellfish sanitation report for shellfish area 09B, these TMDL stations consistently have had, for the last 11 years, 90^{th} %tile values above the shellfish fecal coliform standards.

ToMP Comment 11:
"1.1 Background "Impacts of **rapid and often loosely managed growth** can drastically alter the quality of life of people living in the Southeast (DeVoe & Kleppel, 2006).

Mount Pleasant utilizes Comprehensive Land Use Planning, meets and exceeds state standards for Land Development through the use of critical area and wetland buffers, and manages construction projects, land development run-off levels at the pre-and post-discharge rates, requires the inclusion and maintenance of water quality practices under the State under the NPDES Programs. All regulated MS4s operate under the same regulations. The 2006 quote is not consistent with current state regulations and should not be a justification for this TMDL as the conditions do not apply to Mount Pleasant as development is not "loosely managed"."

ToMP CC Response 11:
The comment is noted. The Department supports The Town of Mt. Pleasants efforts to regulate stormwater discharges to the Wando River Watershed.

In accordance with the Clean Water Act (CWA), TMDLs must be developed for impaired or 303(d)-listed waters. The term "loosely managed", in the context of the draft document, is not meant as an overall justification for TMDL development.

ToMP Comment 12:
"1.1 Background: 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."

The majority of this TMDL and the Shellfish Area Management Report for this area indicates that the bacteria sources come from natural areas; in fact data supports that developed areas have lower bacteria concentrations and overall trends in bacteria levels show declines in developed areas. This document and the data used do not support the 1998 quote, which pre-dates the SMS4 program and the findings of this report that the bacteria sources are from non-point run-off associated with wildlife."

ToMP CC Response 12:
The TMDL document does not state the sources of FC bacteria are from natural sources. Both the draft TMDL document and Annual Update to Shellfish Area 09B indicate the potential sources of pollution are from both non-continuous point sources and nonpoint sources (including natural background).

ToMP Comment 13, Page 4 and 16:
"A large portion of the TMDL area includes headwaters of the Wando River, where stations 09B-04, 09B-05, 09B-06, 09B-09, 09B-10, 09B-11 and 09B-12 are located. Headwater of the Wando River is within the Francis Marion National Forest. The forest consists primarily of longleaf and loblolly pines, followed by open pine savannahs and bald-cypress-tupelo gum swamps. To a lesser degree bottomland hardwood forest, shrub/scrub (pocosins), southern mixed hardwood forests and deciduous woods are also found (National Audubon Society, 2013)."

"There are 'urban' wildlife such as resident waterfowl, squirrels, rodents, raccoons, pigeons, and other birds, all of which can contribute to the FC load. Urban runoff is considered to be negligible within the headwaters, i.e. upstream of station 09B-06, portion of the TMDL watershed however; there **could be** significant urban runoff in the more developed portions of the watershed."

"Could be" – is not a justification to implement this TMDL.

Page 2 of the SCDHEC Shellfish Management area 2012 update report states "A Substantial Portion of the Francis Marion National Forest drains into area 09B."

Given the study's own acknowledgement that Stormwater runoff is not a significant source of FCB, the MS4s have been given a wasteload allocation in 10 of the sub-basins, including those that contain the headwaters of the forest. The table on page 100 lists stormwater run-off as a potential pollution source for only four stations.

Fecal coliform deposited near the stream bank has a higher wash off and entry probability to the stream during storm events, not to mention the impact of fecal matter deposited directly into the stream. This was not considered for the conditions outlined in the previous paragraph. Did SCDHEC consider the deposition of fecal coliform in the streams by wild animals while drinking water during the dry periods? On page 19, SCDHEC has acknowledged that both raccoons and feral pigs spend time near the water's edge on tidal flats and both may be major contributors to fecal coliform exceedances.

Smaller Sub-basins studies and future regulations, if warranted, may be more appropriate for use in addressing water quality issues in this complex watershed."

ToMP CC Response 13:
In accordance with the Clean Water Act (CWA), TMDLs must be developed for impaired or 303(d)-listed waters. The term "could be", in the context of the draft document, is not meant as an overall justification for TMDL development.

Shellfish sanitation report is indicating the drainage area of the Wando River starts and includes the Francis Marion Forest.

See BC Responses 1 and 7.

ToMP Comment 14, Page 5:
"Stations 09B-07, 09B-21 (Figure 2) and 09B-02, are located in Horlbeck Creek. Portions of this watershed are highly developed with residential communities, private docks and golf courses. The watershed also includes the Palmetto Islands County Park and a Boone Hall Plantation and Gardens.

Station -02 is not impaired but only included for an FDA standard.
Station -21 shows a declining trend in fecal levels,
Station -07 shows a significant declining trend in fecal levels and yet the WLA reduction allocation is 66.4%

The wasteload allocation for station -21 is less than 1%. The economic/ financial impact on a regulated jurisdiction to implement a mandatory monitoring and point source retrofit program to achieve a <1% reduction does not meet the MEP standard and is fiscally irresponsible given the intended reduction numbers, however if the WLA is assigned to MS4s, the program MUST be implemented per the municipal NPDES permit.

Palmetto County Parks and Boone Hall Plantation are both large natural areas within this sub-basin which are all or partially served by septic tank systems. They are also expected to contain and contribute a large population of wildlife. There are significant intertidal flats in this area between stormwater outflows and monitoring sites.

Docks are not regulated by the Town but by the State and are privately owned. How does a jurisdiction regulate docks or control wildlife that may utilize the facilities, this is not practicable. Golf Courses have been placed under conservation zoning and implement their own best management practices to control their run-off. Fertilization and other practices are controlled by the State's pesticides regulation. Regulated communities cannot control wildlife populations to prevent them from utilizing open space areas for congregation. Many of these facilities have been permitted by the State SCDHEC under their NPDES permits. If these types of facilities are known by the state to generate pollution or degrade water quality then the state should take action to correct, regulate, and manage sites that they permit, not the MS4s.

This basin should not be given any WLA until additional data is collected and reviewed with stakeholders."

ToMP CC Response 14:

If it is demonstrated that the standard is being attained at either a representative stormwater outfall or at the instream location, the stormwater discharge is not causing or contributing an instream impairment. Standard attainment, as described, demonstrates consistency with the assumptions and requirements of pathogen TMDL(s) and, in accordance with 3.1.1.2 of the NPDES MS4 permit, no further action is necessary by the SMS4 entity to reduce pathogen loadings.

In addition, if the biennial 303(d) assessment of DHEC water quality data demonstrates the impairment no longer exists (standard attainment), then no further action is necessary to reduce pathogen levels instream.

Regarding docks, see BC Response 8.

ToMP Comment 15, Page 5:
"Station 09B-18 is located on the Rathall Creek. This watershed is also highly developed with residential areas, a recreational center, Highway 526, and Port of Charleston Wando Welsh.

Comment references highly developed area. The entire port does not drain to this basin. The recreation area also does not drain to the basin as illustrated on the map on page 13. Interstate 526 utilizes vegetated roadside swales as a major conveyance of stormwater flows. This basin also contains a major estuarine area. Has the relationship between intertidal flows between adjacent creeks been considered? . Stormwater run-off is not listed in the table on page 100 as a potential source. Given that the TMDL indicates that the potential sources of pollution are wildlife run-off and direct deposition of tidal flats, residential and wild life? Most of the developed area contains significant stormwater treatments systems as well as protected coastal buffers and conservation areas. A wasteload allocation is not appropriate. Revise the Load allocations in this document to adequately reflect % of contribution to the load allocations as reflected in this document."

ToMP CC Response 15:

Stormwater (non-continuous regulated or unregulated) has been checked as a potential source for all subwatersheds in the draft Wando River SFH FC bacteria TMDLs document, P. 100.

Regulated MS4s are subject to the WLA component of the TMDL and are only responsible for reducing FC bacteria contributions from their jurisdictional area and through their conveyance system to the MEP. Unregulated stormwater that may be present in the watershed. These include stormwater discharges from construction, industrial or other discreet conveyances not included under an MS4 Permit. Such discharges are subject to the LA component of the TMDL and not the responsibility of a regulated MS4.

See ToMP Response 14.

ToMP Comment 16, Page 10: "The SCDHEC Shellfish Program currently utilizes the systematic random sampling (SRS) strategy within Area 09B 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 (SC DHEC, 2013)."

On page 25, SCDHEC acknowledges the importance of flow; however, no information has been documented about the flow regime of the water quality samples (i.e., whether they were collected during storm or non-storm conditions and tidal cycles. This information is critical to assess the impact of point source stormwater runoff on water quality vs. non-point sources. Further analysis should be conducted and collected to provide these correlations. The SCDHEC Management area report on page 3&4 defines a restricted shellfish be as one with "a MODERATE degree of pollution…that may cause water quality to fluctuate unpredictably…." This TMDL document supports that the pollution impact is in decline and is moderate – just unpredictable. A goal of the State should be to collect enough data to correlate and identify trends, rainfall and tidal data should be used in evaluations and prior to assigning WLA to regulated entities.

However on the Shellfish report on page 6 – the report indicates that there were no substantial changes in pollution in this area since 2011, and yet the beds were reclassified from approved to restricted. This seems to be a large jump in classifications and the implementation of significant economic burdens on jurisdictions for an area that has not declined. What is the basis for the state's decision to implement a TMDL in this watershed and given that the State's own 2012 303(d) list indicated that 2020 was a more appropriate timeframe for implementation. The document does not support urbanization and growth in this area as the source of pollution. "

Response 16:

See BC Response 11 and CoC Response 6..

More…
Based on an assessment against the appropriate water quality standard, elevated FC bacteria levels and/or a classification which restricts shellfish harvesting in a designated harvesting area indicates nonsupport of uses and the location may be included on the §303(d) list of impaired waters. Note that the determination of shellfish area classification is beyond the scope of the draft Wando River TMDL document. Instead, classifications are based on protocol established by the shellfish program.

All TMDL target dates are subject to change, based on the severity of pollution, designated use, the availability of additional site-specific information, available resources, or other factors the Department deems appropriate for scheduling TMDL development.

ToMP Comment 17, Page 11:
"The South Carolina Department of Transportation (SCDOT) is a designated MS4s within the Wando River watershed. The SCDOT operates under NPDES MS4 Permit SCS040001 and owns and operates roads within the watershed. 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. The SCDOT does have the ability, either as an agency or with SCDHEC as an enforcement arm to provide enforcement and regulation of discharges into their MS4 system. The DOT has the ability to issue and enforce encroachment permits, require utilities and other agencies to implement BMPS and take actions to correct discharges and other operations within their rights-of-way. If the DOT, through their individual permit and as a sister state agency to SCDHEC has been afforded a system of special management practices for TMDL implementation, the state should consider revising the NPDES general permit and should develop a similar program for smaller MS4s who have even less financial support than the DOT to implement programs. Most small MS4 systems are comparable to a DOT system. Right of way issues as well as cross connectivity with other jurisdictions and private land owners issues are the same.

The legal or financial ability of a local MS4 to regulate land development and zoning does not provide the jurisdictions the authority to enter and control activities such as pet waste collection, wildlife management, and fertilization, etc., on private property or the ability to remove pollution from direct non-point runoff or to regulate non-point source run off from its citizens or wildlife populations is not more obtainable by a local jurisdiction any more than SCDHEC, SCDNR, or the SCDOT.

Best Management practices such as education are possible however; no jurisdiction should be expected to implement a higher WLA from its storm sewer system to compensate for non-point source contributions. The MEP standard may be in place but the cost to monitor and retrofit systems that are not the contributors is not practicable."

ToMP CC Response 17:
Regulated MS4s are subject to the WLA component of the TMDL and are only responsible for reducing FC bacteria contributions from their jurisdictional area and through their conveyance system to the MEP. Regulated MS4s are not responsible for sources that do not pass through their conveyance system. Stormwater runoff from unregulated sources is covered by the LA and would not be the responsibility of the regulated MS4. Other NPS contributions may include direct runoff to streams and wildlife and are also subject to the LA component of the TMDL.

SCDOT owns or operates a network of roads statewide and are subject to most, if not all, of the over 100 approved TMDL watersheds and over 500 individual TMDL sites statewide. The presence of SCDOT owned-operated roads may range from less dense network, in rural environments to a more dense network in urban environments. SCDOT must consider the full range of responsibilities and address their contributions in accordance with their Phase I MS4 permit.

Compliance with terms and conditions of future and existing individual MS4, construction, and industrial permits is outside the scope of this TMDL document. Specific questions/Requests regarding the SMS4 general stormwater permit should be directed to the DHEC Stormwater Permitting Section.

ToMP Comment 18, Page 12:
"Other than SCDOT, there are two additional permitted stormwater systems in this watershed. Town of Mount Pleasant operates under NPDES MS4 Permit SCR031906 and Charleston County operates under NPDES MS4 Permit SCR031902."

On page 1, the TMDL Document notes that "the Wando River is located in the Sea Islands/Coastal Marsh and Carolina Flatwoods ecoregions of South Carolina within Berkeley and Charleston Counties". Why not all MS4s in the TMDL area included? What about the City of Charleston and Berkeley Counties?"

ToMP CC Response 18:
See BC Response 3.

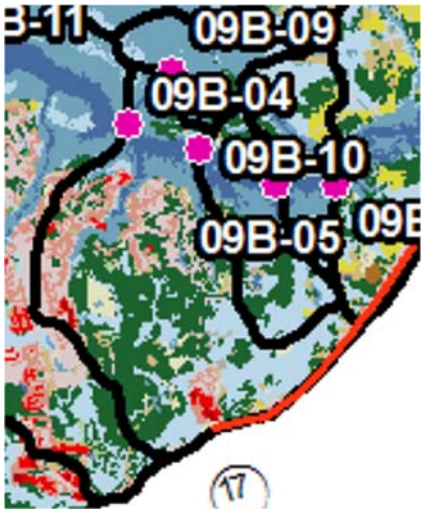
ToMP Comment 19, Page 12: "(SSOs) to surface waters have the potential to severally impact water quality"

Please identify a load allocation to represent this severe impact. The Water Quality samples did not indicate any correlation between SSOs were or were not a problem, Many SSOs occur can be direct or indirectly discharged through municipal storm systems. SCDHEC should develop a stronger process to addressing SSO incidents to include response and long term clean-up or monitoring programs for the Sewer industry. Wastewater operators are not always under the control of local jurisdictions. MS4 operators such as the Town, County, or SCDOT cannot control or remediate SSOs without adequate support from the State."

ToMP CC Response 19:
See BC Response 4.

ToMP Comment 20, Page 13:
"The Land use map on page 13 Map - at Station -04, seems to illustrate that the monitoring site is in the middle of the river when it is really located in the mouth of a creek on the opposite side of the river from Mount Pleasant. While the sub-basin map seems to indicate that a large area of urbanized Mount Pleasant drains to the Wando River, it is difficult to correlate how Mount Pleasant could be responsible for a WLA of 70.6% reduction given all of the other water sources and the sub-basin -09 that is directly upstream from this monitoring site is not more of a contributing source that the Mount Pleasant basins.

The of the TMDL document represents that a significant portion of Mount Pleasant discharges and contributes to fecal data at station -04,



Stormwater run-off is listed as a potential pollution source for station -04, the other stations are not listing stormwater as a potential source (table page 100) WLA should not be given to Mount Pleasant based upon data from this station without further data collection. The State's monitoring site is in the mouth of a creek on the opposite side of the river from the town's jurisdiction and approximately 2,700 feet from the nearest Town outfall point.

SCDHEC's own Water Quality tools indicate that this station is situated on the opposite side of the river from Mount Pleasant, at the mouth of another creek that receives discharges from a separate sub-basin.

"

ToMP Response 20:

The Department realizes it is difficult to delineate a watershed in this portion of the state however; the watersheds in the draft TMDL document were delineated using LiDAR data as well as USGS

7.5 minute topographic maps. In the 2013 shellfish sanitation report for this area, the location description for station 09B-04 is given as "Wando River at Deep Creek".

Station 09B-04 is located across the Wando River from the Mount Pleasant urban area as noted. However, it is not possible with existing data to quantify individual sources contributing to impairment at the monitoring site. Due to tidal mixing and wind-driven circulation, which can be an important factor in open estuarine waters such as the Wando River, it is unlikely that Mount Pleasant's stormwater has no effect on 09B-04. Still, based on the location of the Mount Pleasant stormwater outfalls on the opposite side of the river from the monitoring site, it is not unreasonable to question the degree to which Mount Pleasant affects bacteria levels at 09B-04.

Available ambient monitoring data on Mount Pleasant's side of the river were evaluated to better understand potential stormwater impacts in this area. Ambient monitoring site RT-06012 on Toomer Creek is within the urbanized area. Fecal coliform data at this site are available for 2006. This data is not assessed as part of the shellfish program, and different sampling methods are used for this ambient water quality site, but the data are indicative of fecal coliform levels on the Mount Pleasant side. The data summary is as follows: N=12, geomean=22 cfu/100ml, 90th percentile=122 cfu/100 ml. Furthermore, calculating a percent reduction in the manner that the TMDL is calculated for 09B-04 gives a 79% reduction for RT-06012. These results are comparable to 09B-04 (geomean=18 cfu/100ml, 90th percentile=128 cfu/100ml, percent reduction=70.6%). Based on available data, bacteria levels and necessary reductions are essentially the same for both areas.

Based on these factors and the tidal nature of the Wando River, the Department believes the WLAs have been assigned correctly.

ToMP Comment 21, Page 16:
"Populations of Dogs and Cats – Mount Pleasant has an aggressive pet waste scooping effort underway, with numerous pet waste pick up stations at public and private facilities in use, open counts of dog populations many no longer statistically valid. The TMDL recommends that jurisdictions implement BMPS that are already in use. The TMDL document illustrates steady or declining fecal trends in the urbanized areas and significantly higher wildlife contributions.

For example, table 3 on page 16 of the document reports estimated pet populations for station -11 are provided in table 3 are the highest at 3,515 pets, and yet this station is not listed as impaired or given a wasteload or load allocation.

The table on page 17 shows that the raccoon population is over 26,592 for the same area, in addition to deer and other wildlife populations in the same area – noting that table 4 did not include the additional geese and other wildfowl populations – which should be significant in these coastal regions..

Station -06 indicates the potential of over 99,000 raccoons alone in the sub-basin.

The Jurisdictions are not able to fully utilize a calculation of BMP benefits to meet WLA because MS4 permits now require monitoring and retrofitting, regardless of the level of other BMPs that have been implemented. The Department should revise and update the TMDL process to include a stage

of in-depth local data collection when the monitoring data supports allocations to the MS4s. The MS4s should not have to carry the burden of meeting WLAs when the data does not support the economic or actual Water quality benefits."

ToMP CC Response 21:
The Department commends the Town of Mount Pleasant for their efforts in reducing FC bacteria contributions from pet wastes into their conveyance system. Quantifying the results of these public education efforts, in terms of reductions, will help demonstrate consistency with the assumptions and requirements of the TMDLs to the MEP.

Local data collection is supported by the Department as TMDLs are developed or revised. Section 5.2.2. *Non-Continuous Point Sources* states: "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." The document also outlines examples of data types that may be used to revise TMDLs.

As earlier noted, the concentration-based standard is equivalent to the TMDL target of 43 cfu/100 ml. Percentage reductions prescribed in the WLA and LA are the reductions necessary in order to meet the TMDL target minus the margin of safety. Disaggregating the FC bacteria loadings or revising the percent reduction would not result in a change to those TMDL targets.

Local data may also be used to demonstrate MS4 permit compliance to the MEP. If it is demonstrated that the standard is being attained at either a representative stormwater outfall or at the instream location, the stormwater discharge is not causing or contributing an instream impairment. Standard attainment, as described, demonstrates consistency with the assumptions and requirements of pathogen TMDL(s) and, in accordance with 3.1.1.2 of the NPDES MS4 permit, no further action is necessary by the SMS4 entity to reduce pathogen loadings.

ToMP Comment 22, Page 17:
"Through the course of this project several septic tanks were repaired, some were pumped out, and some were replaced"

"SCDHEC is the agency responsible for issuing septic tank permits and should be a responsible and regulated party in addressing failing septic tanks. Regulated MS4 jurisdictions that have no authority over septic tank installation and maintenance should not be given a wasteload allocation for an area that SCDHEC is a responsible agency. SCDHEC should provide additional data regarding the results of the study conducted, and should monitor the results and future impacts if they are permitting and controlling an activity that is documented to be a source of pollution in a listed waterbody. Mount Pleasant has limited stormwater outfalls and is not the regulated MS4 jurisdiction in some of these areas study areas. The Town should not receive a WLA in a basin that has wildlife and septic issues when ."

ToMP CC Response 22:
Under SC R. 61-56, the Department is provided the authority to permit the installation of new onsite wastewater systems (septic systems) where a wastewater treatment facility is not accessible for connection by individuals. In addition, Sections 301 & 302 SC R. 61-56 outline the Department's

enforcement capacity when septic tanks are not properly maintained and result in a discharge "to the surface of the ground or any stream of body or water in South Carolina without a permit from the Department".

Section 4.2.3. of the MS4 permit requires the regulated MS4 to implement an illicit discharge detection and elimination program. Under the terms of conditions of the permit, the entity is required to identify priority areas, conduct field screening to identify illicit discharges, develop procedures for tracing illicit discharges and demonstrate minimum investigation requirements. If a failing septic system is identified to discharge to the regulated MS4, the Department should be notified by the MS4 entity in order to address the concern under the authority outlined in SC R. 61-56.

In some cases there may also be local ordinances in place to prevent and eliminate illicit discharges such as failing onsite septic systems. Such ordinances, combined with efforts to implement the MS4 permit, may be effective measures for demonstrating consistency with the assumptions and requirements of TMDLs to the MEP.

Nonpoint sources, such as failing septic systems, may be subject LA and not the WLA of the TMDL document. Required reductions in the LA portion of these TMDLs can be implemented through voluntary measures and are eligible for CWA §319 grants.

ToMP Comment 23, Page 18:
"Horses and sheep were counted between December 16-23, utilizing Bing and Google Maps – this is not adequate data collection.

"SCDNR's 2008 deer density study indicates there are approximately 15 to 45 deer per square mile in the Wando River TMDL area (SC DNR, 2013)."

This a wide range of population. The report although utilizing DNR studies and data from other states seems to have wildlife numbers below what are seen by residents and staff in the regulated areas. Additional actual basin data should be collected and utilized to refine the significant wildlife contribution."

ToMP CC Response 23:
See ToMP Response 21.

ToMP Comment 24, Page 19:
"Majority of the drainage area for station 09B-06 is rural and a large portion of it is within the Francis Marion National Forest. As mentioned above, there is a variety of wildlife within the forest and results of BSLC (Appendix D) indicate loading of fecal coliform to the forest surface and not into the streams, is approximately 14.4% of the total contribution of fecal coliform to the land surface. However, there is negligible amount of freshwater input from the headwaters of the Wando River (Conrads & Smith, 1996) and under dry conditions; it is highly unlikely there would be any fecal coliform input from the Francis Marion National Forest into the Wando River. Also, forest canopy intercepts most of the precipitation and since forest floor is highly pervious, it is not likely there

would be significant amounts of fecal coliform with runoff reaching the Wando River and impacting the bacteria levels.

During two field reconnaissance, DHEC District personnel indicated the presence of large populations of raccoons and feral pigs within the TMDL watersheds. As shown in Figure 10, (Dr. Joseph Corn personal communication, April 7, 2014), feral pigs are known to exist within certain portions of the Wando River watershed. **Both raccoons and feral pigs spend time near water's edge on tidal flats and both may be major contributors to fecal coliform exceedances.**

The Forest is a headwaters for the Wando River, it is difficult to assume that limited or no run off comes from the forest or that fecal is not attributable to this area when numerous other statements in the document make a direct correlation between the forest and the bacteria conditions. On Page 5 of the TMDL document recognizes that 80% of the watershed is wetlands, open water, or forested lands and only 10.8% is fully developed. The document does not recognize the use of numerous water quality BMPs in the land development in these areas, of the municipal NPDES efforts in these areas.

The load and wasteload allocations should be adjusted to accurately represent the contributions. Current trends show a decline in bacteria numbers. Data in this study does not directly correlate land development and urbanization to the fecal bacteria levels in this proposed TMDL area. WLA should be removed until further data is collected. Since data collection was stopped at this station in 2006, the data should not be used to implement WLA."

ToMP CC Response 24:
See BC Response 13, ToMP Response 21.

Regulated MS4s are subject to the WLA component of the TMDL and are only responsible for reducing FC bacteria contributions from their jurisdictional area and through their conveyance system to the MEP. NPS contributions are subject to the LA component of the TMDL.

ToMP Comment 25, Page 23:
"Bacteria for stations -06 and -10 has not been collected or evaluated for over 7 years and at station -21 data has been collected for only 5 years. Additional data should be collected in this entire watershed using the enterococci standard until enough new relevant data has been collected – or it should not be used in evaluating the area of the TMDL."

ToMP CC Response 25:
See BC Response 10 regarding data for stations 09B-06 and 10.

See CoC's Response "General Comments" and CC Response 10 in regards to fecal coliform versus enterococci.

ToMP Comment 26, Page 24:
"The necessary percent reduction is calculated as the difference between the distributions at the 90th percentile point:

The proposed reductions are based on fecal coliform concentrations and not on the basis of calculated loadings. The method is not in alignment with the definition of "Total Maximum Daily Load"."

ToMP Response 26:
See response to BC Response11.

ToMP Comment 27, Pages 27-28:
"There may be other stormwater discharges located in the watershed that are subject to the LA component of this TMDL".

Conflicting language needs to be cleared up. And the allocations need to be reviewed and adjusted to show the true LA impacts as illustrated by the data. MS4s are charged with addressing WLA not a LA per their NPDES permits. Document page 28 - 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." MS4s control the management of stormwater though point discharges in compliance with NPDES permits. "
ToMP Response 27:
See BC Response 1 and CoC Response 8.

ToMP Comment 28, Page 29:
"By assigning the same WLA and LA, the bacteria reductions has been in most cases equally assigned the non-continuous sources WLA, non-continuous SCDOT sources WLA , since the LA are the same percentages. Even with development, the watershed is mostly forested or wetlands and the local allocations should reflect that actual contributions and appropriate target areas for resource allocation to achieve maximum benefits. As the document clearly references that non-point sources and more specifically wildlife are the primary bacteria sources. The WLA needs to be revisited, along with the data in the Bacteria Load Calculator section, which indicates residential pets and the primary source and residential land as the largest contributing land use, this is not supported by the rest of the TMDL document."

ToMP Response 28:
See BC Response 14 and CoC Response 6.

Note that, based on comments received regarding Appendix D, the Bacteria Source Load Calculator (BSLC) references and results were removed from the document. The remaining appendices have been relabeled accordingly.

ToMP Comment 29, Page 77:
"The wildlife population charts do not include contributions from other wildlife. If it is possible to estimate dog and cat contributions then other contributions should be included as well. The list of other wildlife on page 17 does not include opossum, squirrel, rats, feral cats, coyote, and other urban wildlife. These numbers should be adjusted to more accurately represent the wildlife population in all the sub-basin areas. The wildlife population charts do not include contributions from other wildlife found the area. Ground studies should be conducted to revise population and animal numbers and species. Especially with geese populations."

ToMP Response 29:
The comment is noted. The Department acknowledges that the aforementioned wildlife may be present in the watershed at any given point in time.

See ToMP Response 21.

ToMP Comment 30:
"There are many different wildlife that with or without development utilize the estuaries as a food source and therefore as a depository for fecal bacteria. The State supports and promotes coastal buffer areas, which can serve as water quality filter but also create a wildlife corridor. Coastal buffers can provide filtering of pollution from development run off and provide habitat for wildlife to re-pollute the run-off. SCDHEC needs to decide which issue has the greater need or impact and update state regulations to support what the state wants to regulate."

ToMP Response 30:
The comment is noted.

ToMP Comment 31, Page 79:
"The assumption is that the graph presented is illustrative of the entire watershed and not taken as separate, smaller sub basins. The graph showing domestic pet populations as being the most significant source of fecal bacteria is contradictory to the majority of the TMDL document, which supports that undeveloped areas and wildlife along intertidal zones are the most probable source of the bacteria. Programs such as pet waste collection stations and population habits constantly drive this number down. The data on wildlife vs. pet populations should be studied further and revaluate. The data is not consistent with the findings of the rest of the TMDL.

For example, table 3 on page 16 of the document reports estimated pet populations for station -11 are provided in table 3 are the highest at 3,515 pets, and yet this station is not listed as impaired or given a wasteload or load allocation. The table on page 17 shows that the raccoon population is over 26,592 for the same area, in addition to deer and other wildlife populations in the same area – noting that table 4 did not include the additional geese and other wildfowl populations – which should be significant in these coastal regions..

Station -06 indicates the potential of over 99,000 raccoons alone in the sub-basin.

The household pet source book is not available without purchase and so the data cannot be confirmed and based upon nationwide study of 50,000 households (nationwide there are over 115 million households). Local data should be refined. In addition, many cats are kept as indoor pets and would not contribute to non-point source pollution."

ToMP Response 31:
The comment is noted.

The Department acknowledges there is a level of uncertainty associated with these estimates.

The referenced book need not be purchased. Please follow the link and associated website provided on page 17 of the draft document to acquire information cited for calculation of pet statistics.

ToMP Comment 32, Page 86:
"This chart of sources is in conflict with the findings of all other SCDHEC and SCDNR reports about wildlife and land use in this area. Please revisit land use and contribution charts. Where do the open water/ wetlands get calculated in the land use charts – these areas are listed as a significant contribution?"

ToMP Response 32:
The chart on page 86 of the draft TMDL document contains a load/duration curve for site 09B-04 and not source information. For the purposes of a response, it is assumed the commenter is referring to the chart on page 80 of the document addressing loading estimates versus landuse.

The loading contributions are estimates and illustrate relative contributions based on literature rates and assumptions for landuse. The estimates are not meant to contradict other sources of information but, instead, to provide supplemental information for the watershed as a whole. Loading contributions will vary by watershed.

Estimates are not provided in the document for the open water/wetlands landuse category. The overall goal of TMDL implementation is to reduce upland sources of FC bacteria to achieve the applicable water quality standard in stream (the open water).

ToMP Comment 33, Page 100:
"This table indicates that stormwater runoff is not the probable source of pollution in the waterway. In one basin no WLA is given and in another (-21) the reduction number is below 1%, this reduction rate is not equal to the economic impact to the regulated jurisdiction of implementing the TMDL on this watershed, based upon the current MS4 program requirements. Basins -06 and -21 should be studied more thoroughly before assigning any WLA."

ToMP Response 33:
The referenced table is an inventory of "potential" sources. The table is not indicating "probable" sources of FC bacteria impairment in the waterway.

Inadvertently, an incomplete table was included in the draft document. Please see the corrected table in Appendix G of the document titled: "Potential Sources of Fecal Bacteria"

ToMP Comment 34, Page 100:
"The TMDL document in in a Table "Potential Sources of Fecal Bacteria" indicates that stormwater runoff is only a potential source in (4) of the station areas. While direct deposition on tidal flats and general residential or wild life are listed as the main source. Compliance with the NPDES MS4 permit will not change these numbers as the permit focuses a majority of resources to addresses point source discharges and retrofitting of systems with wasteload allocations. If these areas are not the sources, then resources would be more effectively targeted at the source (load allocations)."

ToMP Response 34:
See ToMP Response 33.

The current NPDES MS4 permit requires the regulated MS4 to implement an illicit discharge detection and elimination program. Under the terms of conditions of the permit, the entity is required to **identify priority areas**, conduct field screening to identify illicit discharges, develop procedures for tracing illicit discharges and demonstrate minimum investigation requirements. If a failing septic system is identified to discharge to the regulated MS4, the Department should be notified by the MS4 entity in order to address the concern under the authority outlined in SC R. 61-56.

MS4s may choose to **identify priority areas** where it is believed wildlife contributions are less of a factor. Resources may be deployed in those areas to demonstrate TMDL compliance with their MS4 permit. As earlier stated, regulated MS4s are subject to the WLA component of the TMDL and are only responsible for reducing FC bacteria contributions from their jurisdictional area and through their conveyance system to the MEP.

Wildlife contributions directly instream or outside of the MS4 conveyance, are subject to the LA component of the TMDL. Resources may also be deployed voluntarily by interested parties to address the non-point source (LA) component of the TMDLs.

If all WLA and LA sources are reduced by the percentage prescribed, then the instream FC bacteria standard will be attained and the shellfish harvesting use will be achieved.

TMDL Document Amendments

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

Amendment 1:
Wording/clarification has been added to *Paragraph 2, Page 12:*

"Currently, there are no continuous NPDES-permitted discharges to the Wando River with a FC bacteria effluent limit on their NPDES permit. The existing three permits are general permits; two are for mining related operations, and the third for a car wash. These three permitted discharges are not expected to contain FC bacteria. Future NPDES dischargers in the referenced watersheds are required to comply with the load reduction prescribed in the WLA and demonstrate consistency with the assumptions and requirements of the TMDL."

Amendment 2:
The below figures have been replaced with an updated shellfish area classification.

Figure 3. General overview of the Wando River TMDL area and Shellfish Management Area 09B, Berkeley and Charleston Counties, South Carolina. Figure 4. Shellfish Management Area 09B classifications and shellfish monitoring stations within the Wando River TMDL areas.

Amendment 3:
Appendix A – Cumulative Probability Graphs
Graphs for sites 09B-02 and 09B-11 have been removed from the document.

Amendment 4:
Appendix C – Shellfish Data
Data for sites 09B-02, 09B-11, and 09B-16 have been removed from the document. Each of the three sites are assigned a 0% reduction.

Wando River SFH FC bacteria TMDL Document Revisions after the closing of Public Comment Period of August 29, 2014 – September 29, 2014.

Since September 30, 2014, SCDHEC has been engaged in continued discussions with Charleston County (CC) and the Town of Mt. Pleasant (ToMP) regarding the draft Wando SFH FC bacteria TMDL document. Meetings regarding this TMDL document were attended by CC, the ToMP, and SCDHEC on August 26, 2015, and December 23, 2015. Revisions to the draft document were discussed at these meetings.

Subsequent edits were made to the draft TMDL document after receiving additional comments from the ToMP and CC on May 17, 2016. The Department reviewed the ToMP and CC's suggestions and made changes where appropriate. Note that some revisions such as page renumbering, movement of paragraphs, figures, tables, and overall restructuring of the document was considered unnecessary by the Department. Adjustments such as these are stylistic or editorial in nature and so not materially affect the document. Incorporating numerous stylistic changes into the document would result in a departure from the original draft to a point where a separate public notice may be required.

Additional substantive comments were reviewed and the following revisions were made to the document prior to commencing a 15-day Notice of Department Decision (NODD):

1) Station 09B-16 has attained WQS for shellfish harvesting waters and was not included in the 2014 EPA approved 303(d) list of impaired waters. As a result, drainage area of the overall TMDL watershed as well as landuses of the TMDL area (Table 2) has been recalculated and changed in the draft document. Additionally, all references to station 09B-16 has been removed from the draft document.

2) The number of impaired stations in the document were changed from twelve to eleven.

3) The ToMP has suggested MS4 compliance language to be added to footnote 4 and has created another footnote to Tables Ab-1 and 6. The Department believes the tables and their footnotes are sufficiently descriptive. We would also point out that these footnotes are the same for all TMDLs, and the text was developed in coordination with NPDES permitting and has been reviewed by EPA. In addition, the suggested language regarding "…specific actions agreed upon between the MS4 and the Department…" appears to relate to permitting and/or compliance arrangements which we believe are beyond the scope of the TMDL document. We further note that MS4 compliance is determined in accordance with MS4 permit, and not by the TMDL document. For these reasons, the Department has retained the original footnote text in Tables Ab-1 and 6.

4) The following excerpt was deleted from Section 1.0 of the draft document after the public comment period had ended. The excerpt was initially going to be added to the draft TMDL document based upon comments received at the end of the advertised public comment period of August 29, 2014 – September 29, 2014, but was ultimately removed, based on the comments received on May 17, 2016. Also, as mentioned at number 1 above (this page), station 09B-16 is currently meeting the WQS and was not included in the EPA approved 2014 303(d) list of impaired waters:

"After the initial draft of this document was made available during a public comment period (08/29/14 – 09/29/14), a review of more recent of data and shellfish area classification information was conducted. This included a review of the 2013 and 2014 Shellfish Management Area Annual Updates. Based on this information, it was determined and site 09B-16 is currently meeting the FC bacteria standard. Consequently, the draft 2014 303(d) list no longer includes site 09B-16 as impaired due to SFH FC bacteria. In addition, the shellfish area classification has been approved for shellfish harvesting since 2013. For the purposes finalizing this TMDL document, 09B-16 will no longer be considered impaired due to SFH FC bacteria as of May 2015".

5) In Section 1.1, the following has been changed from: "Therefore, stations 09B-04, 09B-05, 09B-06, 09B-09, 09B-10, and 09B-12 to station 09B-11, stations 09B-07 and 09B-21 to 09B-02 and upstream of station 09B-16 of the Wando River are restricted for shellfish harvesting in accordance with FDA guidance (US FDA, 2011 Revision)."
And changed to: "Therefore, stations 09B-04, 09B-05, 09B-06, 09B-09, 09B-10, and 09B-12 to station 09B-11, stations 09B-07 and 09B-21 to 09B-02, and between stations 09B-15 and 09B-24 including station 09B-18 and its drainage area of the Wando River are restricted for shellfish harvesting in accordance with FDA guidance (US FDA, 2011 Revision)."

6) Figures and tables were not moved nor renumbered as suggested by the ToMP because the Department believes it is unnecessary to reorganize or renumber tables and figures in the document. Also, such reorganization and renumbering would not preserve the integrity of the original public noticed document. However, the maps were updated to reflect, and correspond to 2014 EPA approved 303(d) List of Impaired waters.

7) Beresfords and Nowell Creeks were removed from Section 1.2.

ToMP suggested removing the word "highly" from the description of stations 09B-02, 09B-07, 09B-18 and 09B-21. Two paragraphs describing these stations were modified as follows:

"Stations 09B-07, 09B-21 and 09B-02 (Figure 2), are located in Horlbeck Creek. Developed areas in the 09B-07 and 09B-21 watersheds are 48.5% and 40% of total area, respectively, including residential communities, private docks and golf courses. The watershed also includes the Palmetto Islands County Park and a Boone Hall Plantation and Gardens.

Station 09B-18 is located on the Rathall Creek. Developed area in this watershed is 55% of the total area with residential areas, a recreational center, Highway 526, and is adjacent to Port of Charleston Wando Welsh."

8) In section 1.3, ToMP suggested removal of the sentence regarding individual landuses of the station from Appendix B. There were also other suggested ways of reorganizing information within the draft TMDL document. The individual landuses of monitoring stations are relevant descriptive information to include, regardless of how the document is organized. The Department believes it is unnecessary to reorganize the landuse descriptive information in the draft TMDL document prior to finalization.

Under section 1.4, ToMP has suggested the removal of the word "a" from the description of the WQS for SFH waters. Regulation 61-68 defines SFH Waters as quoted in the draft TMDL document, indicated by quotation marks, and is not an interpretation or a grammatical error. Because the regulation was promulgated as quoted in the TMDL document, it is not necessary to make the suggested edit.

9) The ToMP has suggested the removal of station 09B-17 from Section 1.5. Wando River SFH FC TMDL was commenced on December 2, 2013 and at that time, per USDA shellfish regulations, station 09B-17 was the boundary station for the "restricted" area upstream of its location. Based on the data analysis for the drafting of the 2014 303(d) list of impaired waters, station 09B-11 was meeting the SFH WQS, and became the boundary station for the "restricted" area up stream of its location. During the review and edit process of the draft TMDL document, 09B-17 was inadvertently left in the document. This mistake was corrected in the revised document. In addition, Figures 3, 4, 6, 7, and 10 have been updated to remove the delineated drainage area for site 09B-17.

Regarding sections 1.3 and 3.1.2, there is a comment by the ToMP requesting additional information regarding watershed delineations. A similar comment was also provided by the ToMP during the advertised public comment period, and addressed by the Department in the responsiveness summary (See ToMP Response 20). However, the Department would like to add following information:

Wando River shellfish monitoring stations' boundaries were delineated using ArcGIS tool. As a starting point, stations' locations within in 12-digit hydrologic unit codes (HUC) were determined, which are 030502010401 and 030502010402. These HUCs were delineated for each station using digitized USGS 7.5 minute topo maps, Light Detection and Ranging (LiDAR) data, and aerial imagery such as Google or Bing Maps as needed.

Contour lines, representing ground elevations, on topo maps were used to determine the highest points near a station, which essentially are the gross boundaries contributing runoff to a station. As a general rule, water flows perpendicular to contour lines, therefore highest points around a station were connected to establish its boundary.

Some areas in the Wando River watershed are developed where the topography has changed. Also this part of the state exhibits lower elevations and flat topography. LiDAR data was also used in conjunction with topo maps and aerial imagery to further refine station boundaries. More precise determinations of drainage and stormwater outfall locations may be developed using local data during implementation.

Also under section 3.1.2, the ToMP has suggested moving the paragraph concerning SSOs to "continuous discharge" section and agrees with the Department that SSOs "can have significant impacts on a watershed". SSOs are not permitted, discernable or confined to pipe discharges, such as NPDES permitted continuous point sources discharges. However they are illegal, non-continuous discharges and are not always reported to the Department. Although SSOs can have significant impact on WQ, as well as other non-continuous discharges and activities, it is the responsibility of the owner/operator of the collection system to prevent these discharges, and to properly contain in cases of accidental spills/discharges according to their SOP.

Under section 3.1.2, the ToMP has suggested updating and moving the last paragraph ("The Department acknowledges that progress…"). The paragraph is consistent with other EPA approved SFH FC TMDLs and will remain as is. The ToMP also commented that "not all non-continuous discharge operators are MS4 operators." Throughout the document, the Department has repeated statements making the distinction between types of MS4s, as well as other types of legal and illegal discharges, and therefore the Department believes no further changes are necessary.

10) Station 09B-16 has attained water quality standards and is no longer impaired, therefore, references to Berkeley County and City of Charleston MS4s from were removed from section 3.1.2. The ToMP has suggested changing the number of MS4s from two to four (excluding SCDOT), adding Berkeley County and City of Charleston, in addition to Charleston County Town of Mount Pleasant. Berkeley County and City of Charleston are not within TMDL watersheds, therefore these MS4s will not be added.

In section 3.2.3, the ToMP suggested that the following sentence be removed: "Urban runoff is considered to be negligible within the headwaters, i.e. upstream of station 09B-06, portion of the TMDL watershed however; there could be significant urban runoff in the more developed portions of the watershed". The Department has revised the sentence to the following: "Urban runoff is considered to be negligible within the headwaters, i.e. upstream of station 09B-06 portion of the TMDL watershed (Conrads & Smith, 1996); however, there may be urban runoff contributing in more developed portions of the watershed". Also, a reference that had previously been omitted has been added.

11) Under section 3.2.4, the ToMP has suggested language regarding septic tanks. As was explained in the responsiveness summary of the draft TMDL document to the question raised by Berkeley County (BC)'s comment 6, after the inspection and installation, it is the home owners' responsibility to properly maintain their septic tanks. Unless there is a complaint, the Department does not do post construction septic tank inspections.

Under the same section, the ToMP inquires if the paragraph regarding a CWA section 319 grant is necessary since the results are inconclusive. The Department agrees with the commenter and have removed the paragraph from the finalized TMDL document.

12) The ToMP has requested that the Department remove the Bacteria Source Load Calculator (BSLC) references and results. The Department has decided to remove all references to BSLC from the finalized TMDL document.

13) In section 3.2.6, the ToMP suggested removing information regarding marine sanitation devices (MSDs). The suggestions were considered by the Department although the information was not removed. The point of the narrative is to illustrate the differences among MSDs, to raise awareness, and to note that MSDs have the potential to contribute to FC loadings. Furthermore, the draft TMDL document is a technical document where literature citations are appropriate.

14) In section 5.2.2, the ToMP suggested reorganizing by copying/pasting to and from sections 3.1.2 and 5.4. These changes were deemed unnecessary by the Department. However the following paragraph was modified from: "Charleston County, SCDOT and Town of Mount Pleasant are the designated MS4s located in the TMDL areas (Figure 7). Also note that Berkeley County (SCR031501) and the City of Charleston (SCR031901) also have regulated stormwater systems that are located within one of these TMDL watersheds (09B-16). Regardless, as long as conditions in the 09B-16 watershed area remain the same (not impaired), regulated MS4s are not currently subject to a WLA reduction as the standard is currently being attained in this watershed. In watersheds where the applicable water quality standard is not being attained (impaired), existing and 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 TMDLs."

Modified paragraph in the finalized TMDL document is as follows: "Charleston County, SCDOT and Town of Mount Pleasant are the designated MS4s located in the TMDL areas (Figure 7). In watersheds where the applicable water quality standard is not being attained (impaired), existing and 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 TMDLs. If a TMDL site attains the applicable water quality standard in the future (not impaired), then regulated MS4s within that TMDL watershed are not subject to a WLA reduction".

15) The ToMP has suggested that Table 6 should be "updated to the most current 303(d)". The 2016 303(d) list has been submitted to EPA; however, it is not known when the list will be approved and considered final. To that end, the EPA-approved 2014 303(d) list is the most current 303(d) list referenced in the draft TMDL document.

For informational purposes, TMDLs were re-calculated, using provisional FC bacteria data through March 2016. Results are provided below for informational purposes only. It is worth mentioning that, regardless of what the percent reduction may be, for all non-continuous point sources the TMDL target is the WQS which 43 mpn/100 ml. The results of re-calculated TMDLs are shown in the first table below. Second table shows the period of records used for calculations of the TMDLs. Columns with **blue fill-in color** show values from the draft TMDL document. Columns with **green fill-in color** are re-calculated values using data up to March 2016.

Updating the TMDL tables in the draft document were deemed unnecessary and Tables Ab-1 and 6 were not changed by the Department.

Station	TMDL – WQ Target (mpn/100ml)	Draft TMDL 90th %tile of Existing Load (mpn/100)	Including 2016 partial data 90th %tile of Existing Load (mpn/100)	Draft TMDL document WLAs Non-Continuous Sources (% Reduction)	Recalculated, including 2016 partial data, WLAs Non-Continuous Sources (% Reduction)
09B-02	**43**	29.1	27.4	0%	0%
09B-04	**43**	139.2	117.3	70.6%	65.1%
09B-05	**43**	92.3	88.1	55.7%	53.6%
09B-06	**43**	138.5	138.5	70.5%	70.5%
09B-07	**43**	121.7	114.7	66.4%	64.3%
09B-09	**43**	252.5	219.8	83.8%	81.4%
09B-10	**43**	133.1	133.1	69.3%	69.3%
09B-11	**43**	40.1	36.7	0%	0%
09B-12	**43**	84.6	74.3	51.7%	44.9%
09B-16	**43**	<43	49.7	0%	8.9%
09B-18	**43**	69.5	64.8	41.2%	36.9%
09B-21	**43**	41.3	41.2	0.88%	0.8%

Station	Data Period for TMDL document	Data Period for Recalculated Reductions
09B-02	2000-2012	2000- March 2016
09B-04	2000-2012	2000- March 2016
09B-05	2000-2012	2000- March 2016
09B-06	2000-2004	N/A
09B-07	2000-2012	2000- March 2016

09B-09	2000-2012	2000- March 2016
09B-10	2000-2006	N/A
09B-11	2000-2012	2000- March 2016
09B-12	2000-2012	2000- March 2016
09B-16	2000-2012	2000- March 2016
09B-18	2000-2012	2000- March 2016
09B-21	2007-2012	2007- March 2016

16) The ToMP suggested that Sections 6 and 7 be removed from the draft TMDL document. The Department provides these sections as guidance/reference for both point-source and nonpoint-source implementation. These sections are not considered MS4 permit requirements and do not change the TMDL targets established in the draft TMDL document. The Department believes the sections should remain in the finalized document, consistent with other approved pathogen TMDLs in the State.

17) There is a comment by the ToMP regarding Appendix C inquiring how to download shellfish data. Shellfish FC data until 2012 is available at EPA STORET (https://www.epa.gov/waterdata/storage-and-retrieval-and-water-quality-exchange). The Wando River draft SFH FC TMDL document's Appendix C includes all the FC data used for the calculations of the TMDL. Data after 2012 can be requested from the Department through Freedom of Information Act (FOI), however, as a courtesy, the fecal coliform data from 2013 to March 2016 have been included at the end of this document.

18) Appendix D: *Bacteria Source Load Calculator* has been removed from the original draft document and the order of remaining appendices have been revised accordingly.

19) BC Responses 3, 7, 13, 15 in the original responsiveness summary have been modified after receiving additional comments from ToMP and CC.

20) The CoC Responses 3, 9, 10, 12, 13 in the original responsiveness summary have been modified after receiving additional comments from ToMP and CC

21) DNR Responses 1, 3 and 4 in the original responsiveness summary have been modified after receiving additional comments from ToMP and CC.

22) The ToMP Responses 7, 8, and 28 in the responsiveness summary have been modified after receiving additional comments from ToMP and CC.

23) Section 8.0 References have been modified as listed below:

Added the following references:

Conrads, P.A., Smith, P. A., 1996. Simulation of Water Level, Streamflow, and Mass Transport for the Cooper and Wando Rivers near Charleston, Sout Carolina, 1992-95. U. S. Geological Survey. Water-Resources Investigation Report 96-4237. Columbia, South Carolina

Corn, J., April 7, 2014. Personal communication.

The following refences were removed from works cited:

Ecology and Management of a Forested Landscape, 2005. *Fifty Years on the Savannah River Site.*. s.l.:Island Pres.

Johns, P. E. & Kilgo, J. C., 2005. White-Tailed Deer. In: J. C. Kilgo & J. I. Blake, eds. *Ecology and Management of a Forested Landscape: Fifty Years on the Savannah River Site.* s.l.:Island Press, p. 479.

Kennamer, R. A., 2005. Waterfowl. In: J. C. Kilgo & J. I. Blake, eds. *Ecology and Management of a Forested Landscape: Fifty Years on the Savannah River Site.* s.l.:Island Press, p. 479.

Kilgo, J. C., 2005. Small Game. In: J. C. Kilgo & J. I. Blake, eds. *Ecology and Management of a Forested Landscape.* s.l.:Island Press, pp. p. 341-347.

Mayer, J., 2005. Wild Hog. In: J. Kilgo & J. Blake, eds. *Ecology and Management of a Forested Landcape: Fifty Years on the Savannah River Site.* s.l.:Island Press, p. 479.

Mayer, J., Wike, L. & Caudell, M., 2005. Furbearers. In: J. Kilgo & J. Blake, eds. *Ecology and Management of a Forested Landscape.* s.l.:Island Press, p. 479.

Moore, W. F., Kilgo, J. C., Carlisle, W. D. & Caudell, M. B., 2005. Wild Turkey. In: J. C. Kilgo & J. I. Blake, eds. *Ecology and Management of a Forested Landscape: Fifty Years on the Savannah River SIte.* s.l.:Island Press, pp. p. 359-266.

Dates of the following citations have been updated:

SC DHEC, 2012a. *Water Classifications and Standards, R.61-68.* Columbia(SC): s.n.

SC DHEC, 2012b. *Classified Waters (R.61-69),* Columbia (SC): Bureau of Water.

SC DHEC, 2013. *Shellfish Management Area 09B, 2013 Annual Update.,* s.l.: Bureau of Water.

SC DHEC, 2014. *State of South Carolina Section 303(d) List for 2014.,* s.l.: Bureau of Water.

2013 – March 2016 Fecal coliform data.

Station	SF_Date	FCMPNResults
09B-02	1/22/2013	4.5
09B-02	2/4/2013	<1.8
09B-02	3/11/2013	7.8
09B-02	4/10/2013	<1.8
09B-02	5/6/2013	33
09B-02	6/4/2013	4.5
09B-02	7/24/2013	<1.8
09B-02	8/21/2013	33
09B-02	9/17/2013	11
09B-02	10/8/2013	7.8
09B-02	11/6/2013	4
09B-02	12/11/2013	2
09B-02	1/22/2014	<1.8
09B-02	2/3/2014	2
09B-02	3/17/2014	4.5
09B-02	4/9/2014	2
09B-02	5/6/2014	<1.8
09B-02	6/3/2014	4.5
09B-02	7/22/2014	22
09B-02	8/5/2014	13
09B-02	9/3/2014	<1.8
09B-02	10/8/2014	33
09B-02	11/25/2014	49
09B-02	12/10/2014	2
09B-02	1/20/2015	7.8
09B-02	2/3/2015	2
09B-02	3/9/2015	<1.8
09B-02	4/14/2015	2

Station	SF_Date	FCMPNResults
09B-02	11/24/2015	13
09B-02	12/1/2015	4.5
09B-02	1/20/2016	<1.8
09B-02	2/1/2016	4.5
09B-02	3/8/2016	33
09B-04	1/22/2013	4.5
09B-04	2/4/2013	<1.8
09B-04	3/11/2013	11
09B-04	4/10/2013	<1.8
09B-04	5/6/2013	46
09B-04	6/4/2013	33
09B-04	7/24/2013	11
09B-04	8/21/2013	17
09B-04	9/17/2013	33
09B-04	10/8/2013	4.5
09B-04	11/6/2013	6.8
09B-04	12/11/2013	4.5
09B-04	1/22/2014	<1.8
09B-04	2/3/2014	<1.8
09B-04	3/17/2014	33
09B-04	4/9/2014	31
09B-04	5/6/2014	11
09B-04	6/3/2014	<1.8
09B-04	7/22/2014	33
09B-04	8/5/2014	17
09B-04	9/3/2014	4
09B-04	10/8/2014	23
09B-04	11/25/2014	49

Station	SF_Date	FCMPNResults
09B-04	5/20/2015	2
09B-04	6/2/2015	4.5
09B-04	7/27/2015	7.8
09B-04	8/4/2015	4.5
09B-04	9/16/2015	33
09B-04	11/24/2015	70
09B-04	12/1/2015	17
09B-04	1/20/2016	130
09B-04	2/1/2016	2
09B-04	3/8/2016	49
09B-05	1/22/2013	33
09B-05	2/4/2013	4.5
09B-05	3/11/2013	10
09B-05	4/10/2013	<1.8
09B-05	5/6/2013	79
09B-05	6/4/2013	80
09B-05	7/24/2013	7.8
09B-05	8/21/2013	110
09B-05	9/17/2013	49
09B-05	10/8/2013	7.8
09B-05	11/6/2013	4.5
09B-05	12/11/2013	11
09B-05	1/22/2014	<1.8
09B-05	2/3/2014	4.5
09B-05	3/17/2014	13
09B-05	4/9/2014	49
09B-05	5/6/2014	7.8
09B-05	6/3/2014	6.8

09B-02	5/20/2015	<1.8
09B-02	6/2/2015	2
09B-02	7/27/2015	<1.8
09B-02	8/4/2015	2
09B-02	9/16/2015	2

Station	SF_Date	FCMPNResults
09B-05	12/10/2014	11
09B-05	1/20/2015	13
09B-05	2/3/2015	23
09B-05	3/9/2015	12
09B-05	4/14/2015	79
09B-05	5/20/2015	<1.8
09B-05	6/2/2015	7.8
09B-05	7/27/2015	1.8
09B-05	8/4/2015	4.5
09B-05	9/16/2015	7.8
09B-05	11/24/2015	33
09B-05	12/1/2015	13
09B-05	1/20/2016	130
09B-05	2/1/2016	7.8
09B-05	3/8/2016	110
09B-07	1/22/2013	23
09B-07	2/4/2013	4.5
09B-07	3/11/2013	6.8
09B-07	4/10/2013	2
09B-07	5/6/2013	170
09B-07	6/4/2013	240
09B-07	7/24/2013	6.8
09B-07	8/21/2013	33
09B-07	9/17/2013	79
09B-07	10/8/2013	4.5
09B-04	12/10/2014	7.8
09B-04	1/20/2015	11
09B-04	2/3/2015	7.8
09B-04	3/9/2015	<1.8
09B-04	4/14/2015	130

Station	SF_Date	FCMPNResults
09B-07	7/22/2014	350
09B-07	8/5/2014	49
09B-07	9/3/2014	2
09B-07	10/8/2014	<1.8
09B-07	11/25/2014	17
09B-07	12/10/2014	4.5
09B-07	1/20/2015	7.8
09B-07	2/3/2015	11
09B-07	3/9/2015	4.5
09B-07	4/14/2015	240
09B-07	5/20/2015	2
09B-07	6/2/2015	<1.8
09B-07	7/27/2015	7.8
09B-07	8/4/2015	<1.8
09B-07	9/16/2015	2
09B-07	11/24/2015	22
09B-07	12/1/2015	6.8
09B-07	1/20/2016	31
09B-07	2/1/2016	4.5
09B-07	3/8/2016	110
09B-09	1/22/2013	7.8
09B-09	2/4/2013	2
09B-09	3/11/2013	17
09B-09	4/10/2013	4.5
09B-09	5/6/2013	49
09B-05	7/22/2014	79
09B-05	8/5/2014	64
09B-05	9/3/2014	13
09B-05	10/8/2014	23
09B-05	11/25/2014	33

Station	SF_Date	FCMPNResults
09B-09	2/3/2014	<1.8
09B-09	3/17/2014	4
09B-09	4/9/2014	240
09B-09	5/6/2014	7.8
09B-09	6/3/2014	4.5
09B-09	7/22/2014	540
09B-09	8/5/2014	130
09B-09	9/3/2014	23
09B-09	10/8/2014	33
09B-09	11/25/2014	33
09B-09	12/10/2014	4.5
09B-09	1/20/2015	11
09B-09	2/3/2015	7.8
09B-09	3/9/2015	4
09B-09	4/14/2015	170
09B-09	5/20/2015	<1.8
09B-09	6/2/2015	4.5
09B-09	7/27/2015	23
09B-09	8/4/2015	7.8
09B-09	9/16/2015	13
09B-09	11/24/2015	46
09B-09	12/1/2015	17
09B-09	1/20/2016	70
09B-09	2/1/2016	6.8
09B-09	3/8/2016	46

09B-07	11/6/2013	6.1
09B-07	12/11/2013	49
09B-07	1/22/2014	<1.8
09B-07	2/3/2014	7.8
09B-07	3/17/2014	17
09B-07	4/9/2014	11
09B-07	5/6/2014	6.8
09B-07	6/3/2014	4

Station	SF_Date	FCMPNResults
09B-11	9/17/2013	46
09B-11	10/8/2013	9.2
09B-11	11/6/2013	7.8
09B-11	12/11/2013	6.8
09B-11	1/22/2014	2
09B-11	3/17/2014	1.8
09B-11	4/9/2014	13
09B-11	5/6/2014	2
09B-11	6/3/2014	2
09B-11	7/22/2014	9.3
09B-11	8/5/2014	13
09B-11	9/3/2014	<1.8
09B-11	10/8/2014	7.8
09B-11	11/25/2014	13
09B-11	12/10/2014	
09B-11	1/20/2015	22
09B-11	2/3/2015	2
09B-11	3/9/2015	2
09B-11	4/14/2015	33
09B-11	5/20/2015	<1.8
09B-11	6/2/2015	<1.8

09B-09	6/4/2013	170
09B-09	7/24/2013	7.8
09B-09	8/21/2013	27
09B-09	9/17/2013	110
09B-09	10/8/2013	13
09B-09	11/6/2013	2
09B-09	12/11/2013	46
09B-09	1/22/2014	<1.8

Station	SF_Date	FCMPNResults
09B-12	5/6/2013	33
09B-12	6/4/2013	46
09B-12	7/24/2013	4.5
09B-12	8/21/2013	140
09B-12	9/17/2013	46
09B-12	10/8/2013	2
09B-12	11/6/2013	4.5
09B-12	12/11/2013	33
09B-12	1/22/2014	<1.8
09B-12	2/3/2014	<1.8
09B-12	3/17/2014	4.5
09B-12	4/9/2014	33
09B-12	5/6/2014	17
09B-12	6/3/2014	2
09B-12	7/22/2014	49
09B-12	8/5/2014	17
09B-12	9/3/2014	7.8
09B-12	10/8/2014	23
09B-12	11/25/2014	21
09B-12	12/10/2014	7.8
09B-12	1/20/2015	6.8

09B-11	1/22/2013	6.8
09B-11	2/4/2013	<1.8
09B-11	3/11/2013	4.5
09B-11	4/10/2013	<1.8
09B-11	5/6/2013	17
09B-11	6/4/2013	4.5
09B-11	7/24/2013	4.5
09B-11	8/21/2013	70

Station	SF_Date	FCMPNResults
09B-12	3/8/2016	46
09B-15	1/22/2013	<1.8
09B-15	2/4/2013	4.5
09B-16	1/22/2013	23
09B-16	2/4/2013	<1.8
09B-16	3/11/2013	13
09B-16	4/10/2013	<1.8
09B-16	5/6/2013	13
09B-16	6/4/2013	70
09B-16	7/24/2013	4.5
09B-16	8/21/2013	7.8
09B-16	9/17/2013	70
09B-16	10/8/2013	2
09B-16	11/6/2013	2
09B-16	12/11/2013	11
09B-16	1/22/2014	<1.8
09B-16	2/3/2014	<1.8
09B-16	3/17/2014	6.8
09B-16	4/9/2014	11
09B-16	5/6/2014	<1.8
09B-16	6/3/2014	2

09B-11	7/27/2015	<1.8
09B-11	8/4/2015	4.5
09B-11	9/16/2015	4.5
09B-11	11/24/2015	7.8
09B-11	12/1/2015	4.5
09B-11	1/20/2016	33
09B-11	2/1/2016	<1.8
09B-11	3/8/2016	33
09B-12	1/22/2013	11
09B-12	2/4/2013	<1.8
09B-12	3/11/2013	13
09B-12	4/10/2013	7.8

09B-12	2/3/2015	13
09B-12	3/9/2015	<1.8
09B-12	4/14/2015	23
09B-12	5/20/2015	<1.8
09B-12	6/2/2015	2
09B-12	7/27/2015	11
09B-12	8/4/2015	4
09B-12	9/16/2015	2
09B-12	11/24/2015	22
09B-12	12/1/2015	4.5
09B-12	1/20/2016	33
09B-12	2/1/2016	2

09B-16	7/22/2014	350
09B-16	8/5/2014	13
09B-16	9/3/2014	<1.8
09B-16	10/8/2014	7.8
09B-16	11/25/2014	22
09B-16	12/10/2014	6.8
09B-16	1/20/2015	7.8
09B-16	2/3/2015	4.5
09B-16	3/9/2015	2
09B-16	4/14/2015	70
09B-16	5/20/2015	1.8
09B-16	6/2/2015	<1.8

Station	SF_Date	FCMPNResults
09B-16	7/27/2015	4.5
09B-16	8/4/2015	7.8
09B-16	9/16/2015	13
09B-16	11/24/2015	9.3
09B-16	12/1/2015	4.5
09B-16	1/20/2016	4.5
09B-16	2/1/2016	2
09B-16	3/8/2016	49
09B-18	1/22/2013	23
09B-18	2/4/2013	<1.8
09B-18	3/11/2013	11
09B-18	4/10/2013	4.5
09B-18	5/6/2013	4.5
09B-18	6/4/2013	280
09B-18	7/24/2013	4
09B-18	8/21/2013	13

Station	SF_Date	FCMPNResults
09B-18	2/3/2015	13
09B-18	3/9/2015	4.5
09B-18	4/14/2015	170
09B-18	5/20/2015	2
09B-18	6/2/2015	6.1
09B-18	7/27/2015	<1.8
09B-18	8/4/2015	23
09B-18	9/16/2015	7.8
09B-18	11/24/2015	23
09B-18	12/1/2015	11
09B-18	1/20/2016	7.8
09B-18	2/1/2016	6.8
09B-18	3/8/2016	33
09B-21	1/22/2013	4.5
09B-21	2/4/2013	<1.8
09B-21	3/11/2013	4

Station	SF_Date	FCMPNResults
09B-21	9/3/2014	2
09B-21	10/8/2014	11
09B-21	11/25/2014	17
09B-21	12/10/2014	4.5
09B-21	1/20/2015	4
09B-21	2/3/2015	2
09B-21	3/9/2015	4.5
09B-21	4/14/2015	46
09B-21	5/20/2015	13
09B-21	6/2/2015	2
09B-21	7/27/2015	4.5
09B-21	8/4/2015	4.5
09B-21	9/16/2015	22
09B-21	11/24/2015	13
09B-21	12/1/2015	2
09B-21	1/20/2016	13

09B-18	9/17/2013	23
09B-18	10/8/2013	23
09B-18	11/6/2013	4
09B-18	12/11/2013	13
09B-18	1/22/2014	<1.8
09B-18	2/3/2014	6.8
09B-18	3/17/2014	4.5
09B-18	4/9/2014	7.8
09B-18	5/6/2014	7.8
09B-18	6/3/2014	11
09B-18	7/22/2014	140
09B-18	8/5/2014	<1.8
09B-18	9/3/2014	<1.8
09B-18	10/8/2014	7.8
09B-18	11/25/2014	33
09B-18	12/10/2014	11
09B-18	1/20/2015	33

09B-21	4/10/2013	<1.8
09B-21	5/6/2013	70
09B-21	6/4/2013	49
09B-21	7/24/2013	4.5
09B-21	8/21/2013	49
09B-21	9/17/2013	33
09B-21	10/8/2013	7.8
09B-21	11/6/2013	2
09B-21	12/11/2013	7.8
09B-21	1/22/2014	<1.8
09B-21	2/3/2014	6.1
09B-21	3/17/2014	2
09B-21	4/9/2014	6.8
09B-21	5/6/2014	4.5
09B-21	6/3/2014	2
09B-21	7/22/2014	170
09B-21	8/5/2014	23

09B-21	2/1/2016	2
09B-21	3/8/2016	23