BUREAU OF WATER

ıth Carolina Department of Health and Environmental Control

SHELLFISH MANAGEMENT AREA 19

2008 ANNUAL UPDATE

Shellfish Sanitation Section
Water Monitoring, Assessment and Protection Division
Environmental Quality Control - Bureau of Water
2600 Bull Street
Columbia, SC 29201

September 2008

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

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SHELLFISH MANAGEMENT AREA 19
2008 ANNUAL UPDATE

[Data Through December 2007]

D H E C

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South Carolina Department of Health and Environmental Control

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Environmental Quality Control - Bureau of Water

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Data Inclusive Dates:
01/01/05 thru 12/31/07

Classification Change:
___Yes __X__No

Shoreline Survey Completed: __Yes__

Prior Report & Date: Annual -2007

(I)ncreased/(D)ecreased/(N)one:
__N__ Approved
__N__ Conditionally Approved
__N__ Restricted
__N__ Prohibited

SUMMARY

Shellfish Management Area 19 continues to exhibit excellent bacteriological water quality. All stations within the shellfish management area meet fecal coliform indicator organism standards for the Approved shellfish harvest classification. Although all stations within the management area meet Approved shellfish harvest classification criteria, a slight decline in water quality was noted at the most upstream monitoring station in the May River. The decline at Station 19-19, *May River at First Dock in Headwaters past Bluff*, appears to be directly related to 24-hour rainfall events greater than 3.00 inches.

Bacteriological water quality and shoreline survey data indicate that Area 19 is properly classified. Based upon this report, no classification changes will be implemented.

INTRODUCTION

Purpose and Scope

The authority to regulate the harvest, sanitation, processing and handling of shellfish is granted to the South Carolina Department of Health and Environmental Control by Section 44-1-140 of the Code of Laws of South Carolina, 1976, as amended. The Department promulgated Regulation 61-47 that provides the rules used to implement this authority and outlines the requirements applied in regulating shellfish sanitation in the State. This regulation specifically addresses classification of shellfish harvesting areas and requires that all areas be examined by sanitary and bacteriological surveys and classified into an appropriate shellfish harvesting classification.

The National Shellfish Sanitation Program (NSSP) Guide For The Control Of Molluscan Shellfish is used by the United States Food and Drug Administration (USFDA) to evaluate state shellfish sanitation programs. The NSSP Model Ordinance requires that a sanitary survey be in place for each growing area prior to its use as a source of shellfish for human consumption and prior to the area's

classification as Approved, Conditionally Approved, Restricted, or Conditionally Restricted. Each sanitary survey shall be updated on an annual basis and accurately reflect changes which have occurred within the area. Requirement of the annual reevaluation include, at a minimum, field observations of pollution sources, an analysis of water quality data consisting of the past year's data in combination with appropriate previously collected data, review of reports and effluent samples from pollution sources, and review of performance standards for discharges impacting the growing area. A brief report documenting the findings shall also be provided.

The following criteria consistent with the NSSP Model Ordinance and S. C. Regulation 61-47 are used in establishing shellfish harvesting classifications:

Approved Area - Growing areas shall be classified approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations that would render shellfish unsafe for human consumption. Approved classifications shall be determined upon a sanitary survey that includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform Most Probable Number (MPN) or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, nor shall more than ten percent of the samples exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform MPN shall not exceed fourteen per one hundred milliliters, nor shall the estimated ninetieth percentile exceed an MPN of forty three per one hundred milliliters (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be determined using National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology.

Conditionally Approved Area - Growing areas may be classified conditionally approved when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in non-point source pollution from rainfall runoff or discharge of a major river, a management plan describing conditions under which harvesting will be allowed shall be adopted by the Department prior to classifying an area as conditionally approved. Where appropriate, the management plan for each conditionally approved area shall include performance standards for sources of controllable pollution (e.g., wastewater treatment and collection systems), evaluation of each source of pollution, and means of rapidly closing and subsequently reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish shall not be directly marketed from a conditionally approved area until conditions for an approved classification have been met for a period of time likely to ensure the shellfish are safe for consumption. Shellstock from conditionally approved areas that have been subjected to temporary conditions of actual or potential pollution may be relayed to approved areas for purification or depurated through controlled purification operations only by special permit issued by the Department.

Restricted Area - Growing areas shall be classified restricted when sanitary survey data show 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 may be harvested from areas classified as restricted

only for the purposes of relaying or depuration and only by special permit issued by the Department and under Department supervision. The suitability of restricted areas for harvesting of shellstock for relay or depuration purposes 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. For restricted areas to be utilized as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters nor shall more than ten percent of the samples exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters nor shall the estimated ninetieth percentile exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology.

Conditionally Restricted Area - Growing areas may be classified conditionally restricted when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be prepared by the Department prior to classifying an area as conditionally restricted. Where appropriate, the management plan for each conditionally restricted area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems and an evaluation of each source of pollution, and description of the means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish may be harvested from areas classified as conditionally restricted only for the purposes of relaying or depuration and only by permit issued by the Department and under Department supervision. For conditionally restricted areas to be utilized as a source of shellstock for depuration, the fecal coliform geometric mean MPN of conditionally restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters nor shall more than ten percent of the samples exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters nor shall the estimated ninetieth percentile exceed an MPN of two hundred and sixty per one hundred milliliters (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology.

Prohibited Area - Growing areas shall be classified prohibited if there is no current sanitary survey report or if the sanitary survey report or monitoring data show unsafe levels of fecal material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or otherwise indicate that such substances could potentially reach quantities that could render shellfish unfit or unsafe for human consumption.

Background Information

Shellfish Management Area 19 (Area 19) consists of approximately 28,609 acres of shellfish growing area habitat in Beaufort and Jasper Counties. Nearly 480 acres are classified as prohibited. It is comprised of the May, Cooper, New and Wright Rivers and their tributaries including Bull Creek and Ramshorn Creek. The area's northern boundary begins at Highway 170 near the intersection of Highway 46 and Highway 170. It continues along Highway 278 to the western shore of Mackays Creek. The eastern boundary is defined by the shoreline of Calibogue Sound to the confluence of the Savannah River. The Savannah River defines the southern boundary. The western boundary begins in the vicinity of Station 19-20 in the Wright River and Station 19-21 in the New River and ends at the intersection of Highways 46 and 170. The Atlantic Intracoastal Waterway (AIWW) runs through Area 19 between the Cooper River and Savannah River. Residential development in Area 19 is centered around Highway 278 and the Bluffton area and on Daufuskie Island, which is accessible only by boat. The majority of the shellfish resources and harvesting activity is located around the May River area. The Bluffton Oyster Company operates an oyster shucking plant adjacent to the May River.

The harvesting classification of Area 19 prior to this survey was as follows:

Prohibited: (Administrative closure)

1. Freeport Marina (Cooper river), closure zone of 1000 feet around marina.
2. Melrose Landing (Cooper River), closure zone of 1000 feet around marina.
3. Savannah River, all waters in South Carolina portion.
4. Field's Cut, from its confluence with the Savannah River to its confluence with the Wright River at Station 19-22.

Restricted: None

Conditionally Approved: None

Approved: The remaining waters of Area 19.

Station Addition/Deactivation/Modification: None

The shellfish industry in South Carolina is based mainly on the harvest of the eastern oyster (*Crassostrea virginica*) and hard clams (*Mercenaria mercenaria*). Areas in South Carolina designated for commercial harvest by the South Carolina Department of Natural Resources (SCDNR) include state shellfish grounds, culture permits, mariculture permits, and Kings Grant areas.

There are five shellfish culture permit areas in Area 19. Culture Permit C-004 is leased to Bluffton Oyster Company, C-002 and C-009 to Carl Dipace, and C-033 to Neal Cooksey. The general public is allowed to harvest on three state shellfish grounds in Area 19. State Shellfish Ground S-003 is located on Turtle Island, S-005 is located on Haig Point, and S-007 is in Bull Creek. Recreational harvesting is allowed for clams and oysters in all areas, and commercial harvesting by licensed individuals is allowed, subject to seasons established by SCDNR. Recreational harvesting is only allowed on the Bull Creek/May River on Public Shellfish Ground (R-008).

Shellfish harvesting season in South Carolina extends from September 16 through May 15, although actual dates may vary. SCDNR has the authority to alter the shellfish harvest season for management purposes. The South Carolina Department of Health and Environmental Control has the authority to prohibit shellfish harvesting when necessary to ensure that all shellfish harvested in South Carolina waters are safe for human consumption.

POLLUTION SOURCE SURVEY

Survey Procedures

Shoreline surveys of Area 19 were conducted by the Region 8 Shellfish Sanitation staff, by watercraft, vehicle, and on foot, during the Annual 2007 survey period and are ongoing.

Point Source Pollution

(Reference Figure 3 for sources of potential pollution)

A. **Municipal and Community Waste Treatment Facility** - There are no direct discharges of wastewater into the waters of Area 19. Treated effluent from the area's wastewater treatment plants is typically used for spray irrigation on golf courses. Palmetto Bluff WWTP discharges treated effluent into a dedicated 86-acre golf course and a 167-acre spray field (as a backup system). Because the disposal sites are adjacent to shellfish waters, the permit's fecal coliform bacteria limits are a monthly average of 14/100 ml and a daily maximum of 43/100 ml.

B. **Industrial Waste** - There are no permitted industrial discharges in Area 19.

C. **Marinas** - In 2007, prompted by the Department's Office of Coastal Resource Management (OCRM) marina definition change, the Shellfish Sanitation Section incorporated the following marina definition. S.C. Regulation 61-47, Shellfish defines Marina as any of the following: (1) locked harbor facility; (2) any facility which provides fueling, pump-out, maintenance or repair services (regardless of length); (3) any facility which has effective docking space of greater than 250 linear feet or provides moorage for more than 10 boats; (4) any water area with a structure which is used for docking or otherwise mooring vessels and constructed to provide temporary or permanent docking space for more than ten boats, such as a mooring field; or (5) a dry stack facility.

There are two active marinas located in Area 19. Freeport Marina and Melrose Landing, located on the Cooper River at Daufuskie Island, have an approximate 1100 meter by 470 meter administratively Prohibited closure zone encompassing the facilities. Freeport Marina has a sewage pump-out facility.

D. **Radionuclides** - Due to concerns related to the Department of Energy - Savannah River site (DOE-SR), the Savannah River is routinely monitored for radionuclide impacts. All portions of the Savannah River within South Carolina, as well as Fields Cut (Savannah River to the Wright River near Station 19-22) are administratively Prohibited to shellfish

harvest. No sources of poisonous or deleterious substances have been identified within the area.

Non-Point Source Pollution

A. **Stormwater** - There is a significant amount of residential and business development in progress along Highway 278 and in the Bluffton area that is on-going. Land disturbance activities associated with these developments are subject to current stormwater regulations and, with few exceptions, all are on public sewer.

Stormwater runoff impacts water quality by transporting fecal coliform bacteria (and other pollutants) from land to the shellfish growing area. Stormwater from roads, residences, and agricultural land is directed to the lowest point of elevation that is typically the nearest creek or marsh. In addition, there are freshwater wetland areas, ditches, and impoundments that drain into tidal creeks.

Beaufort County enacted a stormwater management utility in 2001. The stormwater utility assesses a stormwater fee to residential and non-residential property owners, and the fees collected are dedicated to stormwater-related activities. These may include operation and maintenance of stormwater systems, implementation of improvements to reduce stormwater-related problems such as flooding and stormwater runoff pollution, and related studies.

The Stormwater Master Plan report was funded through the fees collected by the stormwater utility. The study was designed to identify problem areas related to stormwater, and to recommend a plan to solve problems and better control the impacts of stormwater on receiving waters in Beaufort County.

Most land disturbing activities in South Carolina must comply with the Stormwater Management and Sediment Reduction Act of 1991. The final regulations, effective on June 26, 1992, establish the procedures and minimum standards for a statewide stormwater management program. For activities in the eight coastal counties, additional water quality requirements are imposed. For all projects, regardless of size, which are located within one-half mile of a receiving water body in the coastal zone, the criteria for permanent water quality ponds having a permanent pool is that they are designed to store the first inch of runoff from the entire site over a 24-hour period or storage of the first one inch of runoff from the built-upon portion of the property, whichever is greater. Storage may be accomplished through retention, detention, or infiltration systems, as appropriate for the specific site. In addition, for those projects that are located within 1000 feet of shellfish beds, the first one and one half inches of runoff from the built-upon portion of the property must be retained on site. Since 1992, these regulations have been applied to the development of residential subdivisions, golf courses, and business areas.

B. **Agricultural Waste** - Small numbers of cattle and horses are located in Area 19, but no adverse impact to water quality has been observed.

C. **Individual Sewage Treatment and Disposal System (ISTDS) -** The majority of homes in Area 19 utilize central sewage collection systems for wastewater disposal. Older homes adjacent to the May River typically utilize ISTDS.

D. **Wildlife and Domestic Animal** - This area supports populations of white-tailed deer, raccoons, wading birds, migratory waterfowl, and other wildlife, which may contribute to fecal coliform levels in some areas. Domestic animals present in the area include dogs, cats, horses, and goats.

E. **Boat Traffic** - Calibogue Sound provides access to the Atlantic Ocean for commercial and recreational vessels. The Atlantic Intracoastal Waterway (AIWW) runs between the Cooper River and the Savannah River. Tugs and barges, commercial and recreational vessels utilize this North/South route.

F. **Hydrographic and Habitat Modification** - Hydrographic and habitat modification in estuarine areas require both State and Federal approval.

G. **Marine Biotoxin** - There have been no documented occurrences of toxic algae affecting water quality in Area 19. The Department participates in a State Task Force on Toxic Algae and maintains a toxic algae emergency response team.

HYDROGRAPHIC AND METEOROLOGICAL CHARACTERISTICS

Physiography

Area 19 is part of the Savannah River estuary, a coastal plain system that includes the New, Wright, and Savannah Rivers and several distributaries of Savannah River (e.g. Front, Back, and Middle Rivers and the South Channel). It is separated from the Broad River estuary by a tidal node in Calibogue Sound, just northeast of May River. The average depth of the estuary is approximately 5 meters at mid- tide level. Navigational channels downstream from Highway 17 in the lower Savannah and Front Rivers range from 9m to 12m in depth and facilitate the intrusion of saltwater into the estuary. The conversion of thousands of acres of saltwater wetlands into diked disposal areas on the South Carolina side could also have altered flow patterns and salinity regimes.

Most tidal exchange occurs through the entrance to Savannah River, primarily through the North Channel; however, limited exchange occurs with the Broad River estuary through Calibogue Sound. The salinity structure is primarily determined by controlled releases of freshwater from impoundments on Savannah River and its tributaries. (NOAA, 1994).

Tides - Tides in Area 19 are semidiurnal, consisting of two low and high tides each lunar day. Mean tidal range is 7.0 feet during normal tides and 8.9 feet above mean low water during spring tides. The greatest tidal ranges of the year typically occur around full moon during the months of September through December. There is considerable variation in the normal tide range due to the prevailing strength and direction of winds.

Rainfall - Rainfall data used in this survey is collected at a weather station located at the Broad Creek Public Service District, Hilton Head, SC. The rainfall gauge is typically read at approximately 7:00 AM and the rainfall amount is recorded for that date. As most shellfish samples are collected after 7:00 AM, the rainfall for the sample date + 24 hours has been added to the rainfall summary table. Rainfall for the sample date + 24 hours may correlate better and help to explain elevated fecal coliform concentrations in sample results, particularly if there was zero rainfall on the date of or prior to sampling.

Mean annual rainfall is normally 49.78 inches, with August being the wettest month. For the reporting period of 2007 and this annual update, the yearly average rainfall amount was 46.24 inches. This is slightly below the 30-year mean rainfall totals for this area (NOAA Climatological Data Center). Approximately 40% of the annual rainfall falls in the three-month period from June to August. Weather patterns during this time period are often characterized by thunderstorms and thundershower activity of short duration. In addition, these three months also have the highest numbers of days with rainfall greater than 1.00". The months of December through March historically have the greatest number of days with rainfall exceeding 0.10" and 0.50". Rainfall events during these months are typically of a longer duration.

Wind - Prevailing wind direction during January through February is generally from the west to northwest with an average speed of 8-12 MPH. During the months of March through August, wind direction is typically a southerly component at an average speed of 7-10 MPH and September through December normally maintains a north-north easterly wind direction with an average speed of 6-8 (NOAA).

River Discharge - The May River receives no freshwater from river discharges, but some from freshwater wetlands. The New River receives freshwater input from the Great Swamp. The Wright River receives most of its freshwater input from Savannah River. Fields Cut connects the AIWW and Wright River to the Savannah River. Highest river discharge usually occurs in late winter and early spring due to heavy precipitation in the Blue Ridge and piedmont areas, with the lowest discharge occurring late summer and fall. The salinity structure of the Savannah River estuary is primarily determined by controlled releases of freshwater from impoundments on Savannah River and its tributaries. Field's Cut, from the Savannah River to near its confluence with the Wright River is administratively Prohibited.

WATER QUALITY STUDIES

Description of the Program

The Department currently utilizes a systematic random sampling (SRS) strategy within Area 19 in lieu of monitoring under adverse pollution conditions. 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. Monitoring dates are computer generated prior to the beginning of each quarterly period thereby insuring random selection with respect to tidal stage and weather. Day of week selection criteria is limited to Mondays, Tuesdays, and Wednesdays due to shipping requirements and laboratory manpower constraints. Sample schedules are rarely altered.

During July 1998, an updated data analysis procedure was formalized. Samples utilized for classification purposes are limited to those samples collected in accordance with the SRS for a 36-month period beginning January 1 and ending December 31. This allows for a maximum of 36 samples per station 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 monitoring criteria.

During the period January 1, 2005 through December 31, 2007, eight hundred three (803) surface water quality samples (<1.0 ft. deep) were collected at 23 active water quality monitoring stations for bacteriological analyses and classification purposes. The samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported to South Carolina Department of Health and Environmental Control Region 8 Environmental Quality Control laboratory located in Burton, South Carolina. Each bacteriological sample run included a 120 ml water temperature control sample maintained at less than or equal to 10 degrees Celsius. Upon receipt at the laboratory, sample sets that exceeded a 30-hour holding period or contained a temperature control greater than 10 degrees Celsius were discarded.

All samples collected after September 1, 1986 have been analyzed using the five-tube/three dilution modified A-1 method described by Nuefeld (1985).

Surface water temperatures were measured utilizing hand-held, laboratory-quality calibrated centigrade thermometers. Salinity measurements were measured in the laboratory using automatic temperature compensated refractometers. Additional field data include ambient air temperature, wind direction, tidal stage and date and time of sampling. Tidal stages were determined by Nautical Software's Tides and Currents, Version 2 (1996).

The final report on "*A Baseline Assessment of Environmental and Biological Conditions in the May River, Beaufort County, South Carolina*" was released in April 2004. The report's conclusions state that: "A triad assessment of water quality, sediment quality, and biotic condition was used in this study to evaluate overall condition in each habitat (i.e., headwater creeks, large tidal creeks, and open water sites) using a weight of evidence. Based on current State criteria and regional guidelines, the results indicated that most of the May River estuarine habitats are in good condition, although several headwater creeks showed some signs of stress. Based on an evaluation of land use patterns, the stressful conditions observed in these creeks were probably not related to anthropogenic inputs,

and are likely natural phenomena of this system.

Fecal coliform bacteria concentrations, while relatively high in all headwater tidal creeks were generally not indicative of human sources (relatively 'high' concentrations of fecal coliforms have been observed in headwater creeks during previous studies.) These elevated bacterial counts in the unpopulated Palmetto Bluff Creek and the sparsely populated Stony and Rose Dhu Creek watersheds indicate a natural source of fecal coliform bacteria that is probably attributable to wildlife.

Special Sampling Studies

The SCDHEC Office of Ocean and Coastal Resource Management is in progress of completing the Waterbody Management Plan to provide the Town of Bluffton an assessment tool to better understand the delicate balance between the natural environment and the Town's continued growth in development. A copy of the progress can be found at:

http://www.townofbluffton.com/link.php?link=epa@home

The Town of Bluffton contracted BP Barber for special water quality monitoring on specific areas of the May River. That study is ongoing and conclusions should be published in future annual reports. Along with the Town of Bluffton, a combined effort is being pursued by other government agencies such as NOAA and SCDNR to analyze consolidated data for trends in water quality on the May River. Those results will be published in the 2009 Shellfish Annual Report.

Monitoring Results

All shellfish water quality monitoring stations in Area 19 meet fecal coliform indicator organism standard criteria for an Approved classification. Water quality for this review period is essentially equivalent to water quality summarized for the previous annual with the exception of a single station. Station 19-19, *May River at First Dock in Headwaters past Bluff*, exhibited a substantial increase in the fecal coliform estimated 90th percentile most probable number value. The increase from a value of 22 in the 2007 Annual Update to a value of 42 for this review period appears to be directly related precipitation. Sample data indicate a value of 920 for the June 4, 2007 sample collected at Station 19-19. Rainfall data obtained from Broad Creek Public Service District at Hilton Head, S.C. indicate a twenty-four hour total of 3.68 inches of precipitation recorded for June 2, an additional 0.21 inch recorded for June 3, and 0.35 inch recorded on the date of sampling. Analysis of fecal coliform data that excludes the June 4, 2007 sample indicates an estimated 90th percentile value of 25 and a geometric mean of 5.8 - substantially equivalent to the 2007 report year values of 22 and 5.3.

An additional 24 hour rainfall event of 3.03 inches occurred on July 30, 2007 and appears to have adversely impacted the August 1, 2007 sample (93 MPN) collected at Station 19-19. Other multiple rainfall events contributing to the 11.36 inch total rainfall recorded for July also likely influenced the sample result.

CONCLUSIONS

Based on review of fecal coliform bacteriological data and the pollution source survey, Area 19 is minimally affected by two sources of actual or potential pollution.

Non-Point Source Runoff

Stormwater runoff appears to be the primary source of the minimal fecal coliform bacteria concentrations in Area 19. Possible sources of fecal coliform bacteria contamination include pets, wildlife, domestic animals such as horses and cows, failing septic systems, and drainage from roads and freshwater wetlands.

Freshwater Inflow

Isolated heavy rainfall events can also result in low salinities and elevated fecal coliform concentrations. Increased discharge from upstream swamps and impoundments, wildlife, increased soil bacteria, and failing septic systems are possible causes of elevated fecal coliform concentrations at stations in the New and Wright Rivers.

Individual Sewage Treatment and Disposal Systems (ISTDS)

Most homes adjacent to shellfish waters in Area 19 are served by ISTDS. Soils in most areas are considered to be suitable for ISTDS and should operate properly if maintained. However, many older homes with "grandfathered" systems may not meet current standards.

RECOMMENDATIONS

The shoreline survey and bacteriological data review of Shellfish Management Area 19 indicate that current classification is appropriate. Shellfish Area 19 is recommended to retain the following classification (see Figure 2):

Prohibited: (Administrative closure)

1. Freeport Marina (Cooper river), approximately 1000 feet around marina.
2. Melrose Landing (Cooper River, approximately 1000 feet around marina.
3. Savannah River, all South Carolina portions.
4. Field's Cut, from its confluence with the Savannah River to the vicinity of the confluence with the Wright River near Station 19-22.

Restricted: None

Conditionally Approved: None

Approved: The remaining waters of Area 19.

Station Addition/Deactivation/Modification: None

Analysis of sampling data for Area 19 demonstrates the probability of a significant impact if

rainfall exceeds 4.00" during a 24-hour period. Therefore, a precautionary closure of Area 19, prohibiting the harvesting of all shellfish will be implemented following these rainfall events of greater than 4.00" within a 24-hour period, as measured at the Broad Creek Public Service District, Hilton Head, SC. This methodology is associated with the concept of the Probable Maximum Precipitation (PMP) estimates for the coastal United States published in a series of hydro-meteorological reports (HMR) by the National Weather Service (*National Weather Service*). PMP estimates for South Carolina's growing areas are derived from HMR 51, 52, and 53 (*National Research Council, 1985*).

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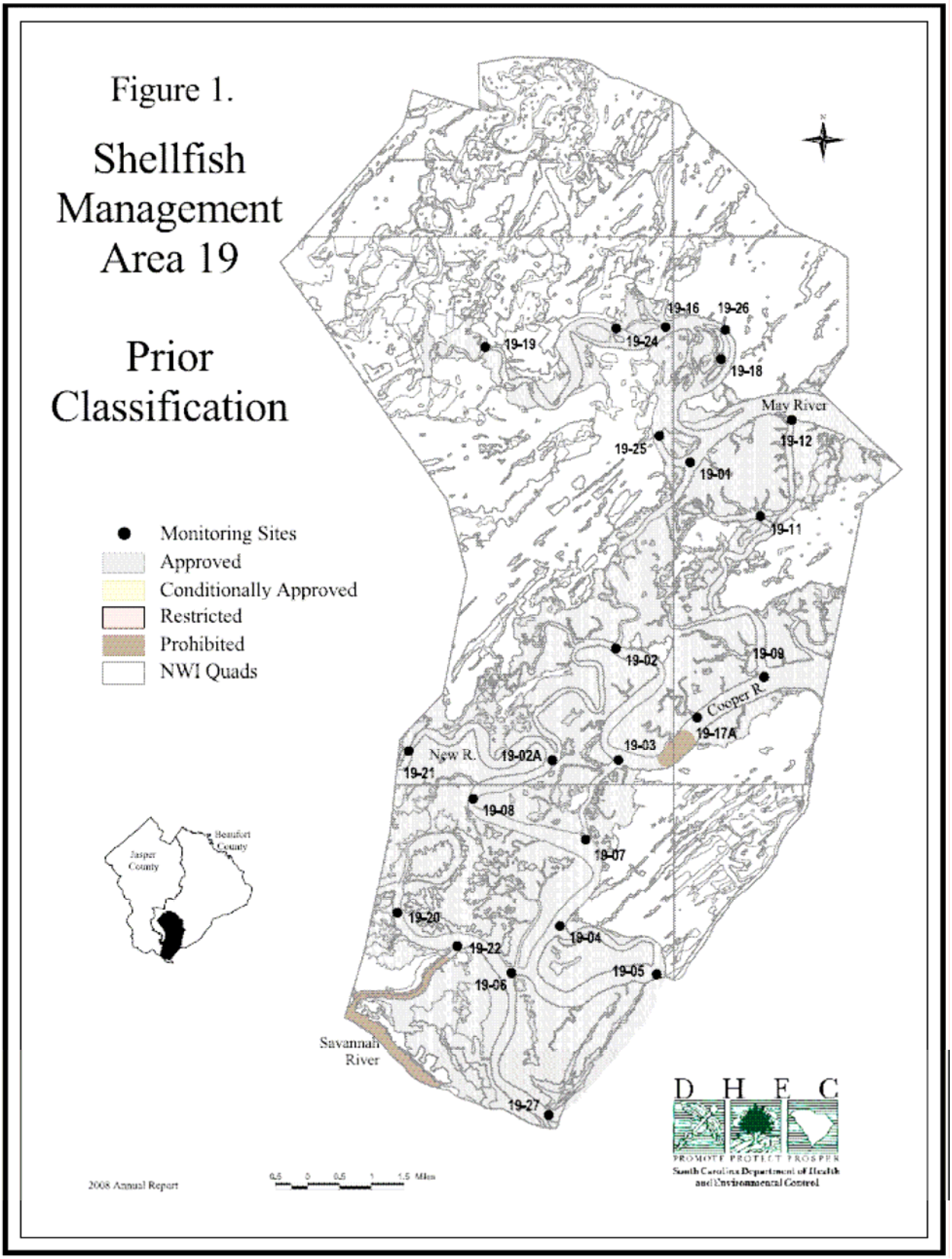
Figure 1.
Shellfish Management Area 19
Prior Classification
Monitoring Sites
Approved
Conditionally Approved
Restricted
Prohibited
NWI Quads
Jasper County
Beaufort County
19-19
19-16
19-26
19-24
19-18
May River
19-12
19-25
19-01
19-11
19-02
19-09
Cooper R.
19-17A
19-03
New R.
19-02A
19-21
19-08
19-07
19-20
19-04
19-22
19-05
19-06
Savannah River
19-27
2008 Annual Report
0.5 0 0.5 1 1.5 Miles
D H E C
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

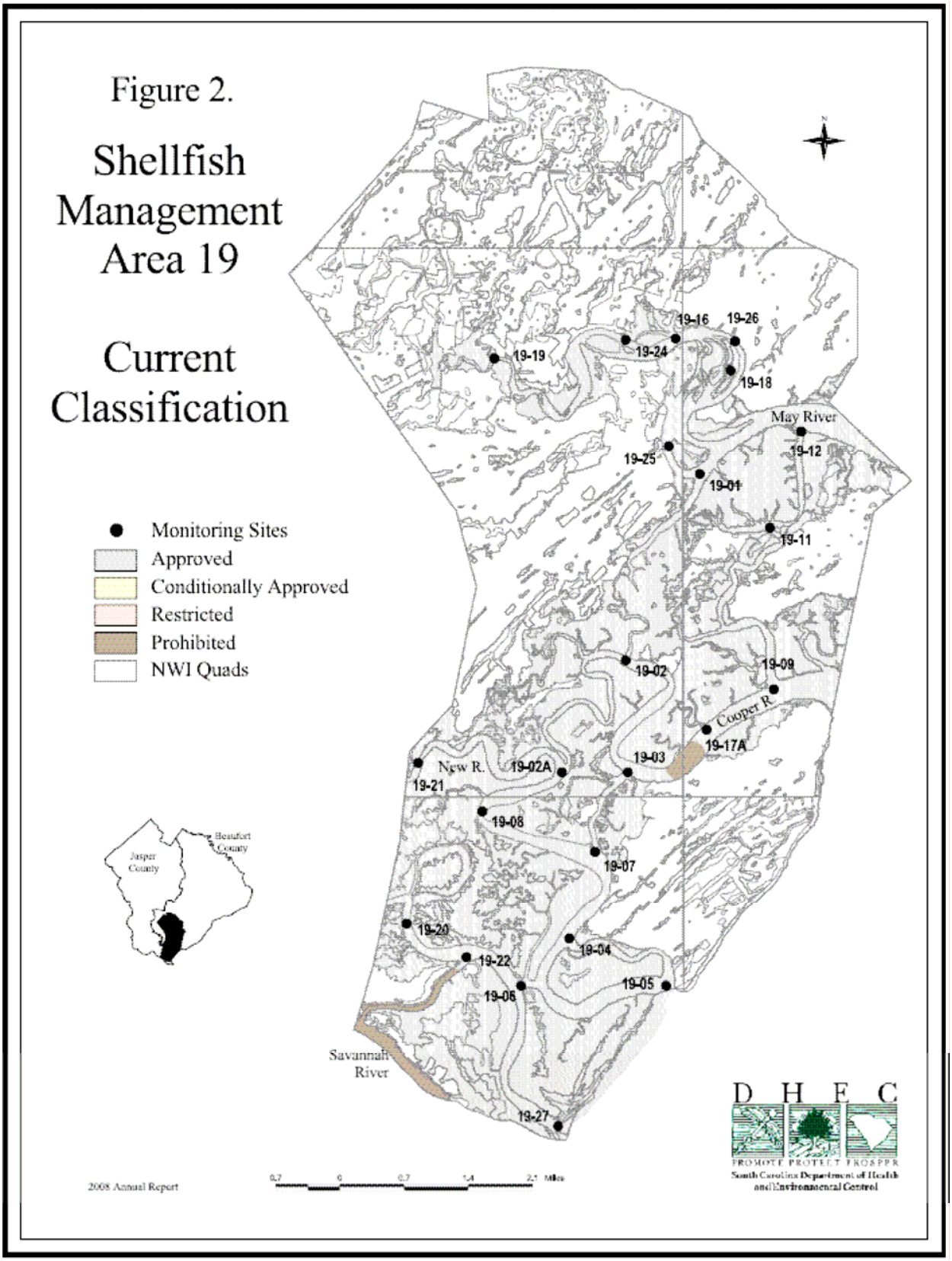
Figure 2.
Shellfish Management Area 19
Current Classification
Monitoring Sites
Approved
Conditionally Approved
Restricted
Prohibited
NWI Quads
Jasper County
Beaufort County
19-19
19-16
19-26
19-24
19-18
May River
19-12
19-25
19-01
19-11
19-02
19-09
Cooper R.
19-17A
19-03
New R.
19-02A
19-21
19-08
19-07
19-20
19-04
19-22
19-05
19-06
Savannah River
19-27
2008 Annual Report
D H E C
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

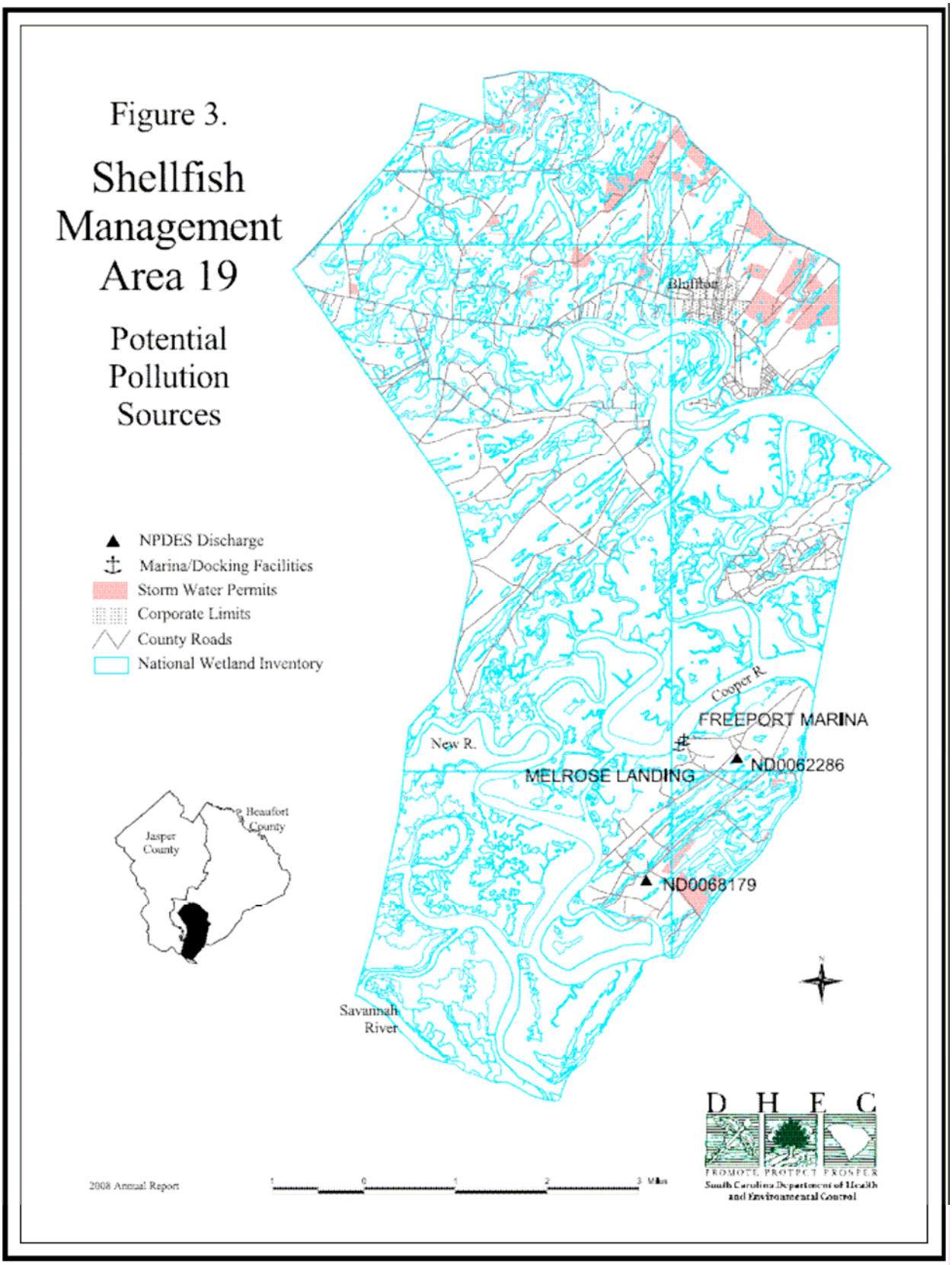
Figure 3.
Shellfish Management Area 19
Potential Pollution Sources
NPDES Discharge
Marina/Docking Facilities
Storm Water Permits
Corporate Limits
County Roads
National Wetland Inventory
Bluffton
Cooper R.
FREEPORT MARINA
New R.
ND0062286
MELROSE LANDING
ND0068179
Beaufort County
Jasper County
Savannah River
2008 Annual Report
Miles
D H E C
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

Table 1
Major Sources of Actual or Potential Pollution

PERMITTED FACILITIES	PERMIT # / TYPE OF DISCHARGE / LOCATION
BJW&SA Rose Hill Plantation WWTP	ND0061000 / Inactive / Pond
BJW&SA Bluffton WWTP	ND00699191 / Inactive / Pond
BJW&SA Palmetto Bluff WWTP	ND0082147 / Spray Irrigation / Golf Course near May River
Haig Point/Melrose WWTP	ND0062286 / Spray Irrigation / Golf Course near Marsh along Cooper River
Daufuskie Island WWTP	ND0068179 / Spray Irrigation / Golf Course North of Mungen Creek
Freeport Marina	17219 / Marina / Pump Out-Yes

Table #2

Water Quality Monitoring Stations Description

Shellfish Management Area 19

Station	Description
19-01	May River South of Palmetto Bluff, Marker #8
19-02	Unnamed Creek at Jack Crow Island in Cooper River
19-02A	Cooper River at New River
19-03	Ramshorn Creek at Cooper River
19-04	Cooper River at Marker #41 - Daufuskie Island
19-05	Bloody Point at Mungen Creek
19-06	Wright River, Marker #43
19-07	Ramshorn Creek at New River
19-08	First Creek on Left up New River at Pollution Line
19-09	Bull Creek at Cooper River
19-11	Bull Creek at Savage Creek
19-12	Bull Creek at May River
19-16	May River Behind Bluffton Oyster Co-op
19-17A	Cooper River Marina at Edge of CSZ
19-18	May River below Drainage Canals at Marker #11
19-19	May River at First Dock in Headwaters past Bluff
19-20	1.5 Miles up Wright River from Fields Cut
19-21	2.5 Miles up New River from Station 19-02A
19-22	Wright River at Fields Cut
19-24	May River at Southern end of Crane Island
19-25	May River at Green Marker #25
19-26	May River, Southeast of Heyward Cove
19-27	Wright River at confluence with Atlantic Ocean

(Total Active: 23)

Table #3

Water Quality Monitoring Station Data

Shellfish Management Area 19

Fecal Coliform Bacteriological Data Summary

from Shellfish Water Quality Sampling Stations between
January 1, 2005 through December 31, 2007

Station # ►	1	2	2A	3	4	5	6	7	8	9	11
SAMPLES	35	35	35	35	35	35	35	35	35	35	35
GEOMEAN	3.4	4.7	3.8	4.3	3.7	3.5	4.1	4.4	3.4	3.7	3.9
EST 90TH%ILE	11	16	11	14	10	9	14	12	9	11	14
WATER QLTY	A	A	A	A	A	A	A	A	A	A	A
CLASSIFICATION	A	A	A	A	A	A	A	A	A	A	A

Station # ►	12	16	17A	18	19	20	21	22	24	25	26
SAMPLES	35	35	35	35	35	34	35	34	35	35	35
GEOMEAN	3.4	5.0	3.3	4.9	6.7	4.8	6.8	5.4	7.7	3.9	4.5
EST 90TH%ILE	10	20	7	16	42	15	26	18	28	10	17
WATER QLTY	A	A	A	A	A	A	A	A	A	A	A
CLASSIFICATION	A	A	A	A	A	A	A	A	A	A	A

Station # ►	27										
SAMPLES	35										
GEOMEAN	3.6										
EST 90TH%ILE	11										
WATER QLTY	A										
CLASSIFICATION	A										

A - Approved **CA** - Conditionally Approved **R** - Restricted
RND - Restricted/No Depuration **P** - Prohibited

Detailed data for each shellfish monitoring station listed in this report's "Fecal Coliform Bacteriological Data Summary Table" and in other shellfish reports, can be obtained by writing South Carolina's Department of Health and Environmental Control – Freedom of Information Office at the address below.

Freedom of Information
SC Dept. of Health & Environmental Control
2600 Bull Street
Columbia, SC 29201

Any explanation or clarity needed on the report's content can be obtained by contacting the preparer(s), and/or reviewer(s) listed on the cover page.

Table #4

Rainfall Data

Shellfish Management Area 19

Data Source:
Broad Creek Public Service District
Hilton Head, SC

2005	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
1st	0.00	0.00	0.00	0.66	0.02	0.30	0.61	1.00	0.00	0.00	0.00	0.00
2nd	0.00	0.13	0.00	0.88	0.00	0.24	0.17	0.41	0.00	0.11	0.03	0.00
3rd	0.00	0.59	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.07	0.00	0.00
4th	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.13	0.01	0.03
5th	0.00	0.00	0.04	0.00	2.70	0.02	0.00	0.00	0.06	4.38	0.00	0.36
6th	0.00	0.00	0.01	0.00	0.10	0.00	0.00	0.02	0.86	0.18	0.00	0.00
7th	0.00	0.00	0.00	1.18	0.00	0.00	0.00	0.24	0.00	0.63	0.01	0.00
8th	0.01	0.00	0.38	0.00	0.00	0.00	0.00	1.10	0.00	0.01	0.01	1.56
9th	0.00	0.15	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.01	0.32
10th	0.01	0.00	0.00	0.00	0.00	0.04	0.02	0.15	0.00	1.73	0.00	0.00
11th	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.22	0.00	0.01	0.00	0.00
12th	0.01	0.00	0.00	0.06	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
13th	0.02	0.00	0.00	0.45	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00
14th	0.51	0.09	0.64	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.04	0.00
15th	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
16th	0.08	0.01	1.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17th	0.00	0.00	0.09	0.00	1.14	0.00	0.00	0.00	0.00	0.00	0.00	0.72
18th	0.00	0.00	0.00	0.00	0.24	0.51	0.00	0.20	0.00	0.01	0.00	0.44
19th	0.00	0.00	0.01	0.00	0.00	1.48	0.00	0.03	0.00	0.00	0.01	0.00
20th	0.00	0.01	0.00	0.00	1.73	0.00	0.00	0.00	0.00	0.00	1.16	0.00
21st	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.42	2.44	0.00
22nd	0.00	0.00	2.22	0.54	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00
23rd	0.00	0.00	0.02	0.06	0.00	0.00	0.00	1.82	0.00	0.00	0.00	0.01
24th	0.00	0.50	0.00	0.00	0.15	0.00	0.00	0.29	0.00	0.92	0.00	0.02
25th	0.00	0.10	1.14	0.00	0.00	1.91	0.00	0.38	0.00	0.00	0.00	0.20
26th	0.00	0.00	0.01	0.02	0.00	0.04	0.00	0.75	0.00	0.00	0.00	0.00
27th	0.00	1.77	3.21	0.05	0.00	0.04	0.00	0.91	0.34	0.00	0.08	0.00
28th	0.00	0.08	0.93	0.00	0.00	0.48	0.00	0.00	0.01	0.00	0.04	0.01
29th	0.45		0.00	0.00	0.00	2.96	0.00	0.00	0.00	0.00	0.01	0.24
30th	0.38		0.00	0.01	0.02	0.00	0.22	0.00	0.00	0.00	0.00	0.00
31st	0.00		0.01		1.62		0.26	0.21		0.01		0.00

Monthly Figures **Annual Rainfall Total: 63.69**

SUM	1.47	3.44	10.57	3.91	7.77	8.45	2.46	7.82	1.27	8.62	3.85	4.06
MAX	0.51	1.77	3.21	1.18	2.70	2.96	0.68	1.82	0.86	4.38	2.44	1.56
MIN	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.05	0.12	0.34	0.13	0.25	0.28	0.08	0.25	0.04	0.28	0.13	0.13

"ND" / "--" = no data (Shaded/bold cells indicate the dates shellfish waters were sampled.)

2006	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.04	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.46	0.00	0.01	0.03
2nd	0.83	1.20	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.00	0.00	0.00
3rd	0.03	0.30	0.00	0.00	0.00	0.75	0.00	0.00	0.18	0.00	0.00	0.10
4th	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00
5th	0.00	0.00	0.00	0.00	0.22	0.15	0.00	0.00	0.00	0.00	0.00	0.01
6th	0.00	0.14	0.00	0.00	0.00	0.00	0.59	0.00	0.75	0.08	0.00	0.00
7th	0.00	0.01	0.00	0.00	0.33	0.00	0.01	0.00	0.40	0.00	1.85	0.00
8th	0.00	0.00	0.00	1.12	0.00	0.00	0.00	0.01	0.00	0.16	0.01	0.00
9th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00	0.01	0.00	0.00
10th	0.00	0.20	0.00	0.00	0.01	0.02	0.00	0.13	0.00	0.00	0.00	0.00
11th	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.44	0.00	0.00	0.01	0.01
12th	0.01	0.00	0.00	0.00	0.00	0.00	1.28	1.70	0.00	0.00	0.00	0.01
13th	0.11	0.00	0.01	0.00	0.00	3.68	0.00	0.01	0.56	0.00	0.00	0.40
14th	0.00	0.00	0.15	0.00	0.42	0.05	0.00	0.00	0.85	0.00	0.00	0.00
15th	0.00	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.01	0.00
16th	0.00	0.00	0.02	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.79	0.01
17th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
18th	0.10	0.31	0.00	0.00	0.00	0.00	0.00	0.01	0.06	0.17	0.00	0.00
19th	0.00	0.05	0.00	0.50	0.00	0.00	0.00	0.16	1.48	0.01	0.00	0.01
20th	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21st	0.00	0.05	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.00
22nd	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.89
23rd	0.57	0.00	0.21	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.02
24th	0.03	0.00	0.02	0.00	0.00	0.00	0.35	0.96	0.00	0.00	0.01	0.01
25th	0.00	1.27	0.00	0.00	0.00	0.39	0.00	0.01	0.00	0.00	0.01	0.90
26th	0.00	0.33	0.00	0.58	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00
27th	0.00	0.00	0.00	0.24	0.20	0.00	0.00	0.15	0.00	0.60	0.00	0.00
28th	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.23	--	0.05	0.00	0.01
29th	0.03		0.00	0.00	0.00	0.00	0.59	0.00	0.00	0.00	0.00	0.00
30th	0.36		0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.02
31st	0.06		0.00		0.00		0.00	0.46		0.00		0.13

Monthly Figures **Annual Rainfall Total: 39.04**

SUM	2.21	3.89	0.50	2.46	1.97	5.36	2.92	5.55	7.14	1.09	3.39	2.56
MAX	0.83	1.27	0.21	1.12	0.78	3.68	1.28	1.70	2.40	0.60	1.85	0.90
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.07	0.14	0.02	0.08	0.06	0.18	0.09	0.18	0.24	0.04	0.11	0.08

"ND" / "- -" = no data (Shaded/bolded cells indicate the dates shellfish waters were sampled.)

2007	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.10	1.31	2.06	0.00	0.00	0.00	1.19	0.00	4.92	0.00	0.00	0.00
2nd	0.00	0.03	0.18	0.00	0.00	3.68	3.27	0.49	1.13	0.76	0.00	0.00
3rd	0.00	0.00	0.00	0.06	0.00	0.21	0.00	3.29	0.00	1.34	0.00	0.00
4th	0.01	0.00	0.00	0.00	0.01	0.35	0.00	0.01	0.00	0.53	0.00	0.00
5th	0.53	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.08	0.00	0.01
6th	0.01	0.00	0.00	0.00	0.57	0.01	0.01	0.00	0.00	0.02	0.00	0.00
7th	0.00	0.00	0.00	0.00	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.00
8th	0.21	0.00	0.00	0.00	0.17	0.00	0.13	0.00	0.00	0.00	0.00	0.00
9th	0.00	0.06	0.00	0.00	0.14	0.00	0.33	0.00	0.00	0.00	0.00	0.00
10th	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
11th	0.00	0.00	0.00	0.03	0.00	0.36	0.02	0.00	0.00	0.00	0.00	0.01
12th	0.00	0.00	0.00	0.00	0.00	0.52	0.00	0.04	0.13	0.00	0.00	0.01
13th	0.00	0.17	0.00	0.00	0.27	0.27	0.00	0.00	0.01	0.01	0.01	0.01
14th	0.00	0.01	0.00	0.01	0.00	0.00	0.32	0.00	1.17	0.00	0.00	0.01
15th	0.00	0.00	0.00	0.02	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.13
16th	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59
17th	0.20	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18th	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00
19th	0.01	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.01	0.01	0.00	0.00
20th	0.00	0.00	0.00	0.67	0.00	0.18	0.00	0.00	1.11	0.00	0.00	0.01
21st	0.00	0.18	0.00	0.00	0.00	0.05	0.00	0.00	0.20	0.00	0.00	1.98
22nd	0.19	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
23rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03
24th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00
25th	0.00	0.04	0.00	0.00	0.00	0.01	0.59	0.02	0.00	0.00	0.05	0.13
26th	0.00	0.01	0.00	0.00	0.00	0.00	0.84	0.42	0.00	0.40	0.00	0.01
27th	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.01	0.00	0.00
28th	0.51	0.01	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00
29th	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
30th	0.00		0.00	0.00	0.00	0.00	3.03	0.00	0.00	0.00	0.00	0.12
31st	0.00		0.00		0.00		0.00	0.23		0.00		0.00

Monthly Figures **Annual Rainfall Total: 46.24**

SUM	2.31	1.83	2.39	0.79	1.19	6.56	11.36	4.53	8.70	3.45	0.06	3.07
MAX	0.54	1.31	2.06	0.67	0.57	3.68	3.27	3.29	4.92	1.34	0.05	1.98
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.07	0.06	0.08	0.02	0.04	0.22	0.37	0.15	0.28	0.11	0.00	0.10

"ND" / "- -" = no data (Shaded/bolded cells indicate the dates shellfish waters were sampled.)

Table #5

Summary of Rainfall Data

During, Prior and
72 Hours After Fecal Coliform Sampling Collection

Sample Date	Sample Date + 24 hours	Sample Date	Sample Date - 24 hours	Sample Date - 48 hours	Sample Date - 72 hours
01/26/05	0.00	0.00	0.70	0.00	0.00
02/09/05	0.20	0.00	0.00	0.00	0.00
03/15/05	0.84	0.00	0.00	0.00	0.00
04/19/05	0.00	0.00	0.00	0.00	0.00
05/02/05	0.00	0.00	0.20	0.00	0.00
06/21/05	0.04	0.31	0.17	0.00	0.00
07/20/05	0.00	0.00	0.00	0.00	0.00
08/09/05	0.40	No Data	No Data	No Data	No Data
09/26/05	0.00	0.09	0.00	0.00	0.00
10/04/05	No Data	No Data	No Data	0.00	0.00
11/28/05	No Data	0.70	0.11	No Data	No Data
12/05/05	1.10	No Data	0.06	0.00	0.00
01/24/06	0.00	0.03	0.57	0.04	0.00
02/22/06	0.00	0.01	0.05	0.00	0.05
03/08/06	0.00	0.00	0.00	0.00	0.00
04/04/06	0.00	0.00	0.00	0.00	0.00
05/15/06	0.00	0.78	0.42	0.00	0.00
06/05/06	0.00	0.15	0.00	0.75	0.00
07/19/06	0.00	0.00	0.00	0.00	0.08
08/03/06	0.35	0.00	0.00	0.00	0.00
09/27/06	No Data	0.00	0.00	0.00	0.00
10/23/06	0.00	0.00	0.00	0.00	0.00
11/27/06	0.00	0.00	0.00	0.01	0.01
12/19/06	0.00	0.01	0.00	0.00	0.01
01/03/07	0.01	0.00	0.00	0.10	0.13
02/06/07	0.00	0.00	0.00	0.00	0.00
03/26/07	0.00	0.00	0.00	0.00	0.00
04/10/07	0.03	0.00	0.00	0.00	0.00
05/16/07	0.03	0.00	0.00	0.00	0.27
06/04/07	0.72	0.35	0.21	3.68	0.00
07/17/07	0.00	0.00	0.00	0.00	0.32
08/01/07	0.49	0.00	0.00	3.03	0.00
09/09/07	0.00	0.00	0.00	0.00	0.00
10/31/07	0.00	0.00	0.00	0.00	0.00
11/01/07	0.00	0.00	0.00	0.00	0.00
12/17/07	0.00	0.00	0.59	0.13	0.01

Amounts Shown Are per Day (in.), not Cumulative