South Carolina Department of Environmental Services

OFFICE OF LAW ENFORCEMENT

SHELLFISH MANAGEMENT AREA 05

2025 ANNUAL UPDATE COMPREHENSIVE REPORT

Shellfish Sanitation Program
Office of Law Enforcement
2600 Bull Street
Columbia, SC 29201

SC DEPARTMENT *of* ENVIRONMENTAL SERVICES

September 2025

SHELLFISH MANAGEMENT AREA 05
2025 ANNUAL UPDATE
COMPREHENSIVE REPORT

[Data Through December 2024]

SC DEPARTMENT *of*
ENVIRONMENTAL
SERVICES

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2025 ANNUAL UPDATE COMPREHENSIVE REPORT
Shellfish Management Area 05

Data Inclusive Dates:
01/01/22 thru 12/31/24

Classification Change:
__X__ Yes ___ No

Shoreline Survey Completed: Yes

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

Prior Report & Date: 2024 Annual Update Comprehensive Report

SUMMARY

There will be two classification changes recommended within Shellfish Management Area 05 (SFMA 05) for the upcoming 2025-2026 shellfish harvesting season. Stations 05-16 (DeBordieu Creek and Bass Hole Bay) and Station 05-20 (Winyah Bay Main Channel, Buoy 19a, Range E) all now meet the water quality criteria for an Approved classification, however they both will retain a Restricted classification for the upcoming shellfish harvesting season and Station 04-16 will be a boundary station.

During this review period nonpoint source pollution impacts from rainfall and river flooding from major storm events such as Hurricane Ian in 2022 and a major rainfall event in 2023 show correlations for some Restricted classifications in the lower Winyah Bay and Mud Bay portions of SFMA 05. Freshwater river flow from the Waccamaw, Black, Pee Dee, and Sampit Rivers can dilute high salinity ocean water within these areas which can have direct impacts on fecal coliform levels. Stations located in this portion of SFMA 05 shows that fecal coliform levels where highest when lower water salinity and ebb tides were documented when sampling was conducted.

INTRODUCTION

PURPOSE AND SCOPE

The authority to regulate the harvest, sanitation, processing, and handling of shellfish is granted to the South Carolina Department of Environmental Services (SCDES) by Section 44-1-140 of the Code of Laws of South Carolina, 1976, as amended. The Department promulgated Regulation 61-47, which 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 the 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 the 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 05 consists of approximately 35,709 acres of classified shellfish growing waters. The area is comprised of two distinctly different estuarine environments: Winyah Bay and North Inlet are separated by an area of limited intermixing - Oyster Bay and Mud Bay. Winyah Bay, a class B type estuary according to Pritchard (1955), extends to the south-southeast approximately 12 nautical miles from the city of Georgetown, South Carolina. Winyah Bay is bounded to the north by the U.S. Highway 17 bridges traversing the Waccamaw, Black, Pee Dee, and Sampit Rivers. It is bounded to the south and east by the Atlantic Ocean, Mud Bay, and highlands of the Waccamaw Neck and to the west-southwest by approximately 20 miles of shoreline extending from the city of Georgetown and including South and Cat Islands.

North Inlet, possessing characteristics of a classical well-mixed system, is bounded to the south and west by Mud Bay, Winyah Bay, and highlands of the Waccamaw Neck, and to the north by the DeBordieu Colony Club development. The eastern boundary is defined by Debidue Island, North Island, and the Atlantic Ocean.

The shellfish industry in South Carolina is based primarily on the harvest of the eastern oyster (*Crassostrea virginica*) and hard clams, which include both the northern clam (*Mercenaria mercenaria*) and several small populations of the southern clam (*Mercenaria campechiensis*). No clam relay project has been permitted and conducted in Restricted portions of Winyah Bay during the past three-year review period.

The shellfish harvesting season in South Carolina normally extends from October 1 through May 31. The South Carolina Department of Natural Resources (SCDNR) has the authority to alter the shellfish harvesting season for resource management purposes and grant permits for year-round mariculture operations. Additionally, SCDES has the authority to prohibit shellfish harvesting when necessary to ensure that shellfish harvested in South Carolina waters are safe for human consumption.

The harvesting classification of Area 05 **prior** to this sanitary survey was as follows:

PROHIBITED

1. Portions of Mud Bay and Winyah Bay, north and west of an imaginary line extending northeastward from the Estherville Minim Creek Canal (AIWW) to the northwestern tip of Big Marsh Island and continuing to the mainland.
2. All tidal portions of Cat and South Islands.
3. All portions of the Estherville Minim Creek Canal.

RESTRICTED

1. All portions of North Inlet north of the confluence of Debordieu Creek and Bass Hole Bay at station 05-16.
2. All waters south and west of an imaginary line from the mainlands of Goat Island extending east to Station 05-09 (Town Creek at Southern Reach of Clambank Creek) then southeast through Station 05-02 (Noble Slough) then southwest through Stations 05-07 (Jones Creek at Mud Bay) and 05-21 (Winyah Bay Main Channel, Buoy 17, Range E).
3. All portions of Mud Bay and Winyah Bay upstream and west of Stations 05-07 and 05-21.

CONDITIONALLY APPROVED

None

APPROVED

1. Central portions of the North Inlet estuary not listed above.
2. Southern portions of Winyah Bay, seaward of Stations 05-07 and 05-21.

Station Addition/Reactivation/Deactivation/Modification: None

POLLUTION SOURCE SURVEY

SURVEY PROCEDURES

The South Carolina Department of Environmental Services (SCDES), Pee Dee - Myrtle Beach, Shellfish Sanitation Staff routinely conducts shoreline survey activities in SFMA 05. Extensive visual examination of lands adjacent to the waters of SFMA 05 was conducted to determine type of activities, location of significant concentrations of domestic animals and other actual and potential sources of pollution entering shellfish growing waters.

POINT SOURCE POLLUTION

A. **Municipal and Community Waste Treatment Facilities** - The sole domestic wastewater treatment facility within close proximity to waters suitable for the direct harvest or relaying of shellfish is the DeBordieu Colony Club facility. This facility utilizes a high degree of treatment including filtration and dilution prior to spray irrigation on the development's golf course. The National Pollutant Discharge Elimination System (NPDES) permit (ND0065668) is indicated on the Map of Potential Pollution Sources. The City of Georgetown's (NPDES SC0040029) facility is located well up stream of any usable growing area in the Prohibited Classification of SFMA 05. No permits have been applied for or issued during this review period. Below is a table summarizing any sanitary sewer overflows (SSO's) in the management area during this review period that had direct impacts on SFMA 05. During 2022-2024 there were no SSO's reported that impacted the growing area.

Sanitary Sewer Overflows				
City of Georgetown (2022-2024)				
Date	**Location**	**Gallons**	**Water Body Entered**	**Comments**
N/A	N/A	N/A	N/A	N/A
DeBordieu Colony (2022-2024)				
Date	**Location**	**Gallons**	**Water Body Entered**	**Comments**
N/A	N/A	N/A	N/A	N/A

B. **Industrial Discharges** - Two industrial wastewater discharges which are combined in one

NPDES permit (SC0001431-001, 002) are located within the boundaries of SFMA 05. These facilities ultimately discharge to the extreme northern portion of Winyah Bay. The permitted industrial wastewater discharges are - (1) Liberty Steel Georgetown (formally Georgetown Steel Mill) - A major producer of wire and structural re-bar, and (2) Georgetown Steel-DRI Plant – which previously produced iron briquettes for steel production at Georgetown Steel but was closed years ago and dismantled. The locations of the discharges are indicated on the Map of Potential Pollution Sources.

C. **Marinas -** In 2007, prompted by the Department's Bureau of Coastal Management (BCM formally known as the Office of Coastal Resource Management-OCRM) marina definition change, the Shellfish Sanitation Program 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.

   Several marinas and commercial boat docking facilities are located within SFMA 05; however, none of these facilities are within Approved, Conditionally Approved, or Restricted waters. All are located well upstream of any viable shellfish populations. The locations of these facilities are indicated on the Map of Potential Pollution Sources.

D. **Radionuclides -** Sources of radionuclides have not been identified within SFMA 05 and no other sources of poisonous or deleterious substances have been identified within the area.

NON-POINT SOURCE POLLUTION

A. **Urban and Suburban Stormwater Runoff -** Stormwater runoff from construction activities can have a significant impact on water quality. As stormwater flows over a construction site, it can pick up pollutants like sediment, debris, and chemicals and transport these to a nearby storm sewer system or directly to a river, lake, coastal waterways, or shellfish growing area. Stormwater runoff is a substantial problem in most SFMA 05 waters due to dense development of the surrounding area. SCDES Bureau of Water in coordination with the Bureau of Coastal Management ensure that land disturbance activities are permitted accordingly and utilize stormwater best management practices to ensure potential pollutants are not introduced into the environment and nearby water bodies.

   Several ponds and brackish water impoundments adjacent to the northern portion of North Inlet receive discharge from the DeBordieu Colony property and surrounding lands. These discharges appear to adversely affect water quality within DeBordieu Creek. Additionally, several ditches drain into the North Inlet estuary from the Belle W. Baruch Foundation property. These ditches drain areas that contain substantial wildlife populations; however, flow rates appear to be substantially less at these sites than at the main culverts along the northern portion of the estuary. Additionally, all shellfish management areas are closed to harvest as a precaution following any rainfall event of greater than four inches in 24 hours.

B. Agricultural Runoff - Undeveloped lands adjacent to SFMA 05 harvest areas, are primarily controlled by the Belle W. Baruch Foundation, the Tom Yawkey Wildlife Center, and the DeBordieu Colony Club. Mr. George Chastain, Forest Director for the Belle W. Baruch Foundation, indicated the facility does not utilize chemical fertilizers, pesticides, or herbicides for forestry management purposes. According to Mr. Don Lipscomb, former Forest Director for Clemson University's Baruch Forestry Institute, Lindane was used previously for spot application; however, this practice was discontinued approximately 35 years ago.

DeBordieu Colony Club utilizes various chemical compounds within the boundaries of the development, primarily for golf course maintenance. The development corporation has compiled a management plan outlining specific chemical application rates and guidelines for storage and runoff control.

C. Individual Sewage Treatment and Disposal (ISTD) Systems - Several individual sewage treatment and disposal systems are located near North Inlet waters. The University of South Carolina Marine Laboratory is serviced by a single 1,500-gallon unit which utilizes a 177-gallon pump-tank and 400 linear feet of field line. Approximately 15 ISTD systems are currently being used on the Baruch Foundation's approximately 9,000 acres adjoining the North Inlet estuary. It is unlikely that these systems could adversely impact the estuary due to their distance from it.

The Tom Yawkey Wildlife Center on South and Cat Islands is used for waterfowl management and is comprised of approximately 4,325 acres of uplands, 6,235 acres of wetlands, 314 acres of beach, and 2,374 acres of impoundments and non-tidal fresh water. Approximately ten families reside on these islands in residences owned by the Yawkey Foundation. Structures other than residences include shop and maintenance facilities as well as four dormitories and a recreation hall for graduate students. All structures are serviced by ISTD systems within areas of sandy soil.

The Winyah Bay lighthouse facility located on the southwest shore of North Island includes one ISTD system. However, this facility has not been in use for several years and any impact to waters from this ISTD would be very minimal.

D. Wildlife and Domestic Animals - SFMA 05 supports substantial populations of both wildlife and domestic animals. The lands surrounding and draining to the North Inlet and Winyah Bay estuaries support populations of feral hogs, beaver, rabbit, white-tailed deer, raccoon, opossum, alligators, various rodents, and birds typical of the coastal Carolinas. Migratory waterfowl and resident marine birds are also common throughout the area. Due to the secluded nature of lands within the Belle W Baruch Foundation property these animals comprise a rather large population within the estuary.

E. Boat Traffic - Boat traffic in North Inlet primarily consists of small vessels (12-20 feet) involved in recreational and commercial fishing activities. Boating in the estuary is limited due to lack of convenient access. Two private boat ramps are within the confines of North Inlet. These are on the Belle W. Baruch Foundation property and the DeBordieu Colony Club

lands. Those without access to one of these facilities must cross Winyah Bay from its western shore, travel downstream from Georgetown, or enter the estuary via its ocean inlet.

Winyah Bay's main channel depths allow commercial freighter access to the South Carolina State Ports Authority docks in Georgetown. Additionally, a small commercial fishing fleet, which primarily harvests shrimp, finfish, and blue crabs, operates from private docks as well as several commercial fish houses.

The U. S. Corps of Engineers dredges portions of Winyah Bay to maintain adequate channel depths. The Corps historically utilized open water spoil disposal. Although data obtained from lower Winyah Bay does not indicate an adverse public health concern associated with the harvesting of shellfish for relaying purposes (Moore and Cooper, 1992), the presence of dioxins prompted a search for upland spoil disposal sites.

NATURALLY OCCURRING PATHOGENS

A. **Marine Biotoxins** - Bivalve shellfish contamination from marine biotoxins has not been shown to be a human health concern within Area 05. During the winter and spring of 1988, South Carolina experienced an occurrence of "Red Tide", specifically Ptychodiscus brevis (K. brevis), which affected water quality in SFMA 01 south to SFMA 04. There have been no documented reoccurrences of this organism at levels requiring emergency response in South Carolina waters subsequent to the 1988 event. Due to the vast media coverage of events related to Pfiesteria pisicida, the Department participates in a State Task Group on Toxic Algae and operates a toxic algae emergency response team. The Department also has a Marine Biotoxin Contingency Plan in place that must be evaluated and updated annually.

B. ***Vibrio Management Plan*** – Because State water temperatures exceed 81 degrees Fahrenheit (F) during June through September; *Vibrio* management controls must be implemented during these months. Management controls for permitted Aquaculture facilities are specifically addressed in R.61-47. The season for wild-stock harvest of oysters is typically closed from June 1 through September 30th. Because R.61-47 does not specifically address control of wild-stock harvest from waters exceeding 81 degrees F, the Department will recommend to and request of SCDNR that the wild stock harvesting season not be opened until October 1. The Department is currently not opposed to the issuance of special wild-stock harvest permits to Certified Shippers during the closed season as long as special permit conditions are included. Special permit conditions for maricultured triploid oysters during the vibrio control months must include current R.61-47 and NSSP temperature control requirements to be included in the Certified Shipper's HACCP plan.

HYDROGRAPHIC AND METEOROLOGICAL CHARACTERISTICS

Shellfish Management Area 05 (SFMA 05) consists of approximately 35,709 acres of shellfish growing area. It is comprised of two distinctly different estuarine environments separated by an area of limited intermixing. North Inlet is a Class C type estuary, described as classical well-mixed, bar built (Pritchard, 1955), typical of the northern South Carolina and southern North Carolina coastlines.

The estuary is approximately two nautical miles at its maximum width (east-west) with a maximum length of approximately seven nautical miles (north-south). Characteristics of the estuary are ebb and flood tidal deltas and protective point bars. Extensive high marsh areas of smooth cord grass *(Spartina alterniflora*) are found within the northern and central portions of North Inlet. Mixed vegetation occurs in the high marsh areas of the southern reach and is not dominated by a particular species; however, black needlerush (*Juncus roemerianus*) and big cord grass (*Spartina cynosuroides*) are abundant. Drier, brackish conditions occur in this area (Schwing and Kjerfve, 1980). Throughout the estuary, expansive mud flats and sand bars are evident during ebb tide and intertidal oyster reefs are abundant. Main channel depths are typically less than 15 feet.

Salinities near the North Inlet mouth usually range from 32-35 parts per thousand (ppt); however, substantial rainfall commonly causes salinities to decline. Salinities of less than five ppt have been documented in the southern reach of the estuary (Schwing and Kjerfve, 1980).

Winyah Bay, in contrast, is a Class B type estuary partially mixed or moderately stratified, according to Pritchard's classification (1955). The estuary extends in a northwest-southeast direction approximately 12 nautical miles from the City of Georgetown, South Carolina. Width varies from less than one nautical mile near the ocean entrance, to over four nautical miles between the Minum Creek Canal, through Mud Bay, an on to No Man's Friend Creek.

Water depths in Winyah Bay are typically less than 16 feet; however, main channel depths of 27 feet are maintained by the United States Army Corps of Engineers. Mud Bay, an expansive and relatively shallow area, generally exhibits depths of less than three feet measured at mean low water.

The tides in SFMA 05 are semidiurnal, consisting of two low and two high tides approximately every 24 hours. Predicted mean tidal range and mean spring tidal range (MHWS) at North Inlet's Clambank Landing dock are 4.73 and 5.49 feet, respectively. Mean tidal range in Winyah Bay is 3.81 feet. Similarly, mean spring tidal range varies from approximately 4.1 to 5.4 feet (NOAA Tides and Currents. Station ID 8662549).

In 2017, the collection of rainfall data has been improved for a more consistent, accurate, and reliable data set that can be accessed directly from a shellfish staff member's computer or phone. With assistance from the National Weather Service's Southeastern River Forecast Center, the development of the South Carolina Shellfish Rainfall Program was introduced and utilized. This new technology provides shellfish program staff with real-time daily updates for rainfall accumulation in each of the South Carolina shellfish growing management areas, as well as providing critical triggers that alert staff to when rainfall thresholds for closures are exceeded.

The annual rainfall total for 2024 was 42.15 inches. The 10-year annual average for the area is 47.62 inches. Several major storms have impacted the area in recent years. In October of 2022, Hurricane Ian produced 6.60 inches of rain over a 2-day event. On December 18th, 2023, a major rainfall event produced 7.13 inches of rainfall during a 24-hour period. For both events SFMA 05 was under a precautionary closure until special sampling could be performed to reopen the growing area. On August 6, 2024, Tropical Storm Debby produced over 7 inches of rain over several days. No precautionary closures were implemented because the open shellfish harvesting season was closed during this time and no summer harvesting is performed in this growing area.

The seasonal precipitation pattern in SFMA 05 indicates that approximately 30 percent of the annual rainfall occurs from June - August (the closed season for the harvest of shellfish). Approximately 20 percent occurs from September - November and is typically the result of tropical low-pressure systems or thunderstorms. December-February accounts for an average of 18 percent of the total. Winter precipitation is generally uniform throughout the area. Finally, March - May account for 32 percent of the annual rainfall. Dynamic weather patterns including widespread, intense, and rapidly moving thunderstorms are quite common.

Prevailing winds for the South Carolina coast are generally southerly during the spring through summer months and northerly during the fall and winter months. Sustained wind velocities are typically less than 15 miles per hour (mph); however, intense low and high pressure systems routinely generate winds of 20-30 mph. Tropical storms and hurricanes, generating winds in excess of 45 mph, sometimes occur between June and October. "Northeasters" are not uncommon during the late fall through winter months.

Freshwater input to Winyah Bay originates from four major rivers: (1) the Pee Dee/Yadkin system, originating in the Blue Ridge Mountains; (2) the Waccamaw River, which meanders through the swampy coast land of Horry and Georgetown Counties from southern North Carolina; (3) the Black River; and (4) the Sampit River. Both the Black and Sampit Rivers possess smaller watersheds than the other rivers entering Winyah Bay. According to Johnson (1972), freshwater entering Winyah Bay ranges from 2,000 cubic feet per second (cfs) to approximately 100,000 cfs, with a mean flow of approximately 15,000 cfs.

During periods of average flow, a salt wedge extends upriver near the U.S. Highway 17 bridges traversing the Pee Dee, Waccamaw, and Black Rivers. However, during periods of low flow, the salt wedge may extend more than 15 miles upstream of the bridges, (Allen, et al., 1984). During periods of high river flow, the salt wedge becomes more defined as vertical stratification increases. During periods of low flow, the salt wedge's leading edge all but disappears as the two water masses gradually become vertically homogeneous.

Tidal currents are reversing, flowing for approximately six hours, becoming slack, and then ebbing for approximately six hours. Maximum current velocities in North Inlet are approximately 2.3 m/s (Schwing and Kjerfve, 1980). Winyah Bay current velocities are similar to those of North Inlet.

A hydrographic study conducted by Dingman, et. al. (1987) in the northern reach of North Inlet during February and March 1987, indicated that during approximately the first three hours of ebb tide, when winds are from the northeast, sheet flow occurs from DeBordieu Creek to Old Man Creek via Bass Hole Bay. As the tide drops below mean sea level (msl), the bottoms of the shallow water bay become exposed. A continuous water channel is cut off at this point thus the direction of ebb flow is reversed through DeBordieu Creek.

A limited area of intermixing occurs in the southern portions of the North Inlet estuary. Depending upon the amount of freshwater inflow to Winyah Bay, net exchange between the two estuaries varies. Schwing and Kjerfve (1980) documented the existence of a nodal point in the southern portion of Jones Creek near Nancy Creek. Eighty percent of the exchange between the North Inlet and Winyah Bay systems may occur through Jones Creek (Kjerfve, 1978). On numerous occasions, Department personnel have observed plumes of brackish, discolored water slightly southward of

the confluence of Jones and Nancy Creeks. Plumes have also been observed at the confluence of Jones and Sign Creeks.

Exchange of water between the estuaries also occurs through No Man's Friend Creek but to a lesser degree. Allen, et al. (1982) found that direction of flood in No Man's Friend Creek appears to be related to tidal amplitude unless complicated by strong southerly winds. Low tidal amplitude (<5.7 feet) results in direction of flood toward Winyah Bay. Conversely, high tidal amplitude (>5.7 feet) results in flood toward North Inlet. Gaines (1973) found that during the first half of flood tide, movement of water was from North Inlet toward Winyah Bay, but during the second half of the flood, the direction reversed due to an increase in tidal gradient in Winyah Bay. Shifting tidal nodes were observed in Jones, Haulover, and Town Creeks.

WATER QUALITY STUDIES

DESCRIPTION OF THE PROGRAM

The Department currently utilizes a systematic random sampling (SRS) strategy within SFMA 05 in lieu of sampling 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. Sampling dates are computer generated prior to the beginning of each calendar year 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 sampling criteria.

Six Hundred Ninety-Six (696) surface water quality samples (<1.0 ft. deep) were collected for bacteriological analyses from 20 active water quality sampling stations in SFMA 05 during the period 01/01/22 through 12/31/24. Samples were collected in accordance with the SRS plan for classification purposes. The samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported by staff to the South Carolina Department of Environmental Services, Lowcountry – Charleston laboratory in North Charleston, South Carolina. An additional 120 ml water sample was included with each shipment as a temperature control. Upon receipt at the laboratory, sample sets that exceeded a 30-hour holding time or contained a temperature control >10 degrees C. were discarded. 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 Nautical

Software's Tides and Currents, Version 2 (1996).

MONITORING RESULTS

Stations 05-01, 05-02, 05-03, 05-04, 05-07, 05-08, 05-09, 05-10, 05-11, 05-12, 05-14, 05-15, 05-16, 05-20, 05-21, and 05-24 meet the water quality criteria for Approved classification.

Stations 05-13 and 05-25 exceed a fecal coliform geometric mean MPN value of 14.

Stations 05-05, 05-06, 05-13, and 05-25 exceeded a fecal coliform MPN estimated 90th percentile value of 43.

No station exceeded a fecal coliform geometric mean MPN value of 88.

No station exceeded a fecal coliform MPN estimated 90th percentile value of 260.

Fecal coliform data collected are summarized in Table #2. Also, included in this report is a long-range trend summary of each station with the estimated 90th percentile values in correlation to annual rainfall totals (Table #3).

CONCLUSIONS

There will be two classification changes recommended within Shellfish Management Area 05 (SFMA 05) for the upcoming 2025-2026 shellfish harvesting season. Stations 05-16 (DeBordieu Creek and Bass Hole Bay) and Station 05-20 (Winyah Bay Main Channel, Buoy 19a, Range E) all now meet the water quality criteria for an Approved classification, however they both will retain a Restricted classification for the upcoming shellfish harvesting season and Station 04-16 will be a boundary station.

Water quality within SFMA 05 is impacted by freshwater inflow from Winyah Bay, as well as nonpoint source stormwater runoff. River flow into Winyah Bay and subsequently into Mud Bay and Oyster Bay adversely impact the southern portions of North Inlet. The effects of nonpoint source pollution are complicated in the southern reaches of the North Inlet estuary by hydrographic and meteorological conditions. Conditions such as strong southerly-southwesterly winds combined with high-river flows may temporarily increase the area of intermixing between North Inlet and Winyah Bay/Mud Bay.

No commercial harvesting of shellfish is allowed in the North Inlet portion of Area 05, therefore, the use of the Conditionally Approved classification in North Inlet and Winyah Bay estuary is not recommended.

RECOMMENDATIONS

Upon reviewing the shoreline survey and bacteriological data of Shellfish Management Area 05, the following classifications are recommended:

PROHIBITED

1. Portions of Mud Bay and Winyah Bay, north and west of an imaginary line extending northeastward from the Estherville Minim Creek Canal (AIWW) to the northwestern tip of Big Marsh Island and continuing to the mainland.
2. All tidal portions of Cat and South Islands.
3. All portions of the Estherville Minim Creek Canal.

RESTRICTED

1. All portions of North Inlet north of the confluence of Debordieu Creek and Bass Hole Bay at station 05-16.
2. All waters south and west of an imaginary line from the mainlands of Goat Island extending east to Station 05-09 (Town Creek at Southern Reach of Clambank Creek) then southeast through Station 05-02 (Noble Slough) then southwest through Stations 05-07 (Jones Creek at Mud Bay) and 05-21 (Winyah Bay Main Channel, Buoy 17, Range E).
3. All portions of Mud Bay and Winyah Bay upstream and west of Stations 05-07 and 05-21.

CONDITIONALLY APPROVED

None

APPROVED

1. Central portions of the North Inlet estuary not listed above.
2. Southern portions of Winyah Bay, seaward of Stations 05-07 and 05-21.

Station Addition/Reactivation/Deactivation/Modification: None

All portions of the SFMA 05 should be closed upon receipt of four or more inches of rain in a twenty-four hour period as recorded by the South Carolina Shellfish Rainfall Program. This methodology is associated with the concept of the Probable Maximum Precipitation (PMP). PMP estimates for the coastal United States have been published in a series of hydro-meteorological reports (HMRs) by the National Weather Service (*National Weather Service*). PMP estimates for South Carolina's growing areas are derived from HMRs 51, 52 and 53 (*National Research Council, 1985*). Additionally, all portions of the area should be placed under a precautionary closure when sustained river flooding induced turbidity is observed.

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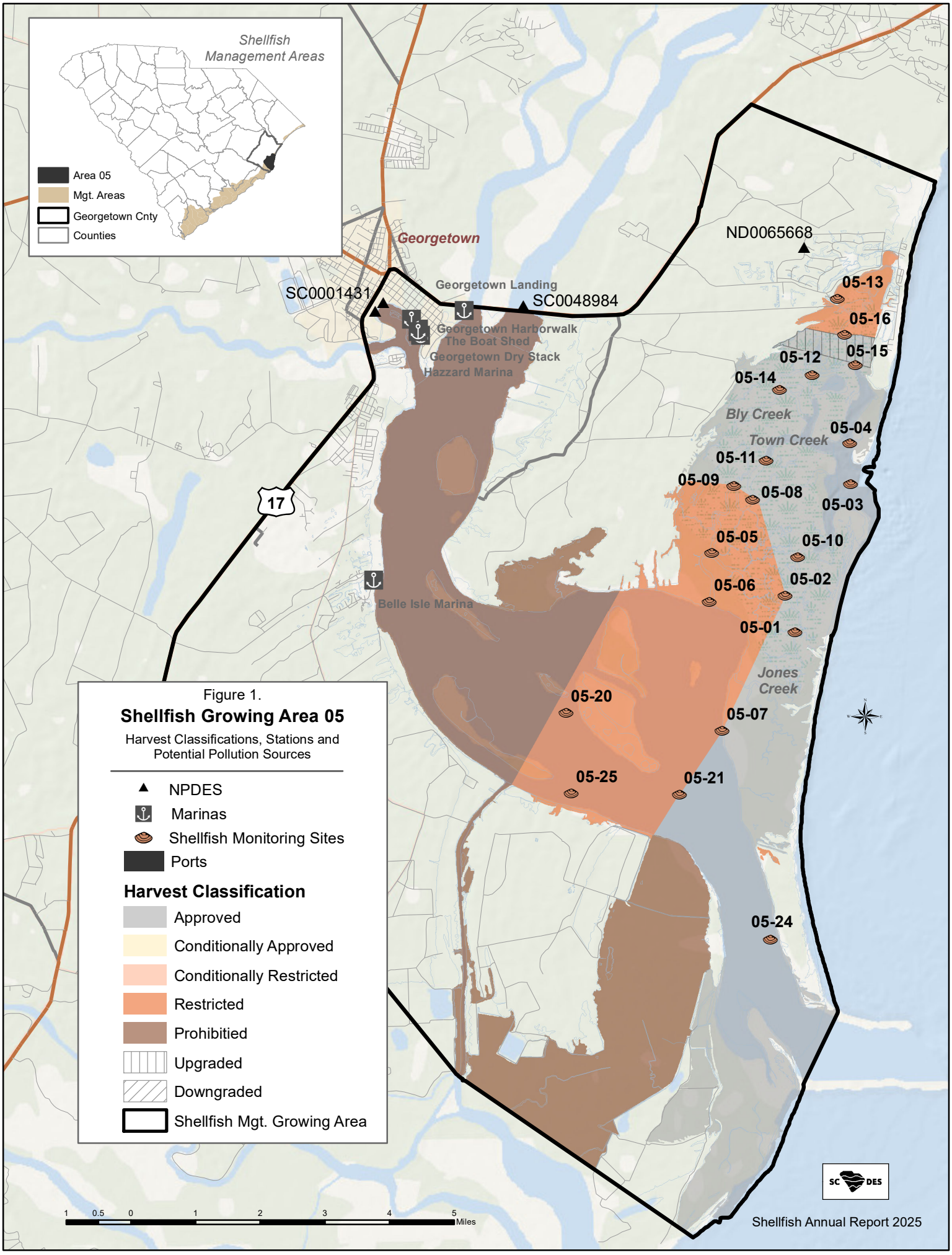

Shellfish Management Areas
Area 05
Mgt. Areas
Georgetown Cnty
Counties
Georgetown
ND0065668
SC0001431
Georgetown Landing
SC0048984
Georgetown Harborwalk
The Boat Shed
Georgetown Dry Stack
Hazzard Marina
Belle Isle Marina
17
Bly Creek
Town Creek
Jones Creek
05-13
05-16
05-15
05-12
05-14
05-04
05-11
05-09
05-08
05-03
05-05
05-10
05-06
05-02
05-01
05-20
05-07
05-25
05-21
05-24
Figure 1.
Shellfish Growing Area 05
Harvest Classifications, Stations and Potential Pollution Sources
NPDES
Marinas
Shellfish Monitoring Sites
Ports
Harvest Classification
Approved
Conditionally Approved
Conditionally Restricted
Restricted
Prohibited
Upgraded
Downgraded
Shellfish Mgt. Growing Area
1 0.5 0 1 2 3 4 5 Miles
SC DES
Shellfish Annual Report 2025

Figure 2. - Shellfish Management Area 05 - Point Source Map

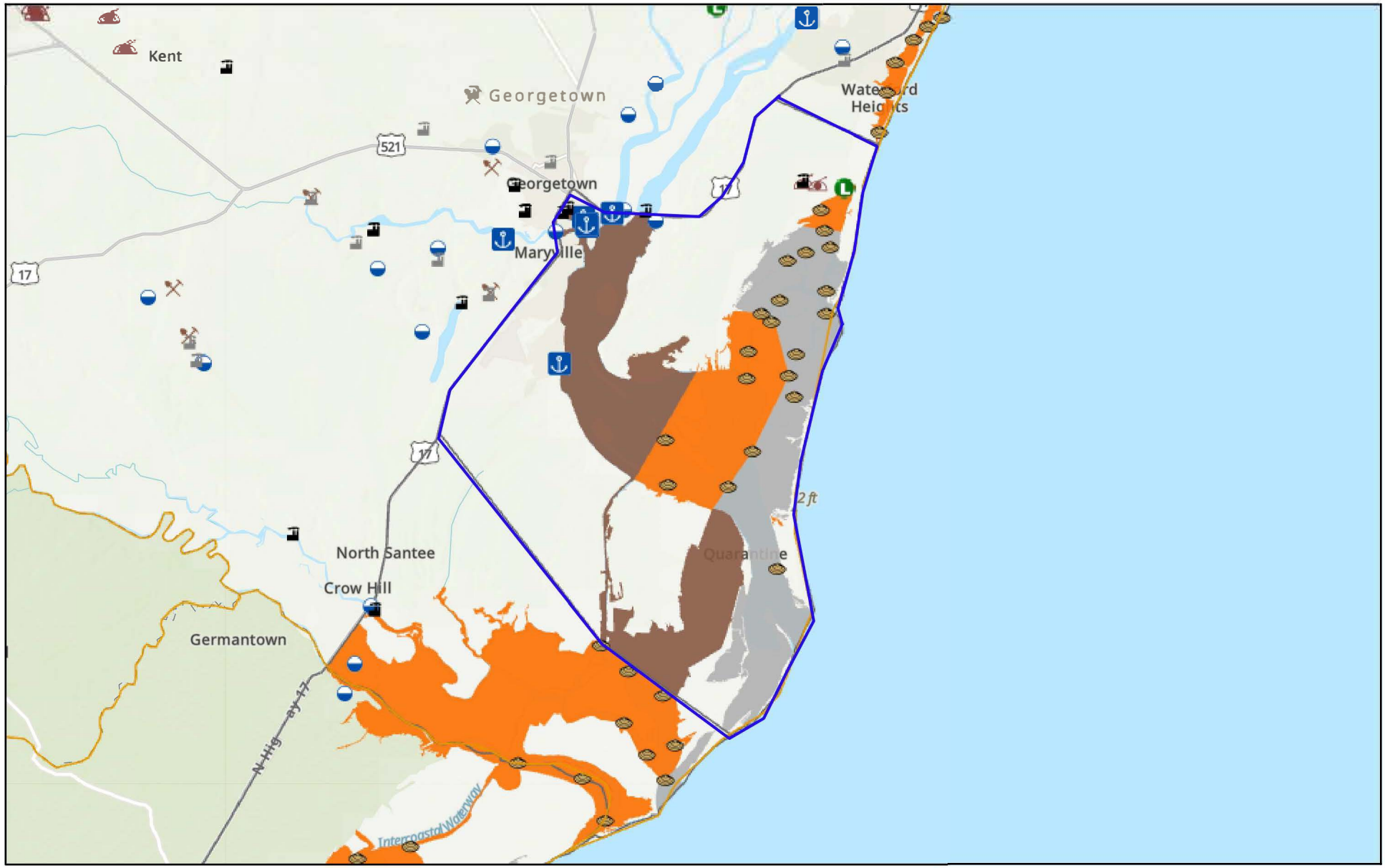


TABLE #1
Shellfish Management Area 05
WATER QUALITY SAMPLING STATIONS DESCRIPTION

Station	Description
05-01	Jones Creek at Nancy Creek
05-02	Noble Slough
05-03	North Inlet
05-04	Town Creek at DeBordieu Creek
05-05	Oyster Bay near Cutoff Creek
05-06	No Man's Friend Creek at Mud Bay
05-07	Jones Creek at Mud Bay
05-08	Town Creek at Sixty Bass Creek
05-09	Town Creek at Southern Reach of Clambank Creek
05-10	Jones Creek at Duck Creek
05-11	Town Creek at Bread and Butter Creek
05-12	Old Man Creek and Sea Creek Bay
05-13	DeBordieu Creek at Boat Basin
05-14	mid Channel Island, Bly Creek
05-15	DeBordieu Creek and Cooks Creek
05-16	DeBordieu Creek and Bass Hole Bay
05-20	Winyah Bay Main Channel, Buoy 19a, Range E
05-21	Winyah Bay Main Channel, Buoy 17, Range E
05-24	Winyah Bay Main Channel, Coast Guard Dock, Range C
05-25	Winyah Bay, Tip of Western Channel Island

(Total 20)

TABLE #2

Shellfish Management Area 05
FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY
From Shellfish Water Quality Sampling Stations

January 01, 2022 to December 31, 2024

Station #	1	2	3	4	5	6	7	8	9	10
SAMPLES	35	35	35	35	35	35	35	35	35	35
GEOMEAN	5.6	4.1	2.6	3.2	10.3	9.5	10.4	3.6	5.4	3
90TH %ILE	29	14	7	9	63	59	41	13	21	8
WATER QLTY	A	A	A	A	R	R	A	A	A	A
CLASSIFICATION	A	A	A	A	R	R	R	R	R	A

Station #	11	12	13	14	15	16	20	21	24	25
SAMPLES	35	35	35	35	35	35	34	34	34	34
GEOMEAN	4.1	2.8	19.7	2.7	4.2	8.2	11.1	7.1	4.5	19.2
90TH %ILE	15	8	103	6	15	41	42	26	16	95
WATER QLTY	A	A	R	A	A	A	A	A	A	R
CLASSIFICATION	A	A	R	A	A	R	R	R	A	R

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

TABLE #3 Fecal Coliform Historical Trend Sheet											
Area 05 Stations 90th%ile Values for Annual Updates Related to Rainfall											
Station #	**2024**	**2023**	**2022**	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**	**2015**	**2014**
05-01	29	35	57	54	58	28	29	17	21	17	15
05-02	14	12	22	19	24	14	15	10	9	8	8
05-03	7	7	9	9	10	8	7	5	4	6	6
05-04	8	8	9	10	11	10	7	7	5	5	7
05-05	63	57	50	63	73	64	68	62	79	63	59
05-06	59	59	64	60	67	64	73	56	90	72	68
05-07	41	40	63	66	80	59	55	40	61	73	97
05-08	13	21	28	24	16	9	10	8	8	8	9
05-09	21	23	29	33	39	24	26	17	17	12	11
05-10	8	6	10	11	16	9	9	8	8	7	3
05-11	15	10	14	14	15	11	10	7	6	5	6
05-12	8	9	12	13	20	18	19	14	11	10	6
05-13	103	154	173	199	137	168	246	242	135	60	61
05-14	6	10	16	17	20	15	13	11	13	16	14
05-15	15	17	14	21	26	36	30	27	22	22	17
05-16	41	45	38	28	37	34	44	39	37	25	17
05-20	42	51	66	56	46	27	27	21	35	44	52
05-21	26	30	47	62	54	42	32	34	54	63	72
05-24	16	16	20	23	27	16	14	11	19	20	27
05-25	95	102	100	93	84	116	112	117	96	96	114
Annual Rainfall (inches)	**42.15**	**50.53**	**38.80**	**34.88**	**42.94**	**35.75**	**52.34**	**39.99**	**60.93**	**73.35**	**46.7**
ND = No Data Red = Impaired Water Quality											

TABLE # 4

WATER QUALITY
SAMPLING STATION DATA

Shellfish Management Area 05

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 Environmental Services – Freedom of Information Office at the address below.

Freedom of Information
SC Dept. of Environmental Services
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 # 5

RAINFALL DATA

Shellfish Management Area 05

SOURCE:

2022 – 2024 Data
NOAA National Weather Service - Southeastern River Forecast Center
Location: North Inlet (Georgetown), South Carolina

2022 Annual Rainfall Summary
Source: NOAA National Weather Service - Southeastern River Forecast Center
Location: North Inlet (Georgetown), South Carolina

2022	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1				0.04			0.52			*4.72		0.13
2						0.01	0.71	0.42				
3	0.10						0.08					
4						0.10			0.13			
5		0.23			0.02	0.53	0.57					
6				0.27							0.01	0.05
7		0.01		0.98								
8		0.08		0.01			0.04	0.01				
9			0.78			0.03	0.06	0.04	0.03			
10	0.03		0.18				0.13	0.02	0.60			0.08
11			0.01				1.60		0.21		0.76	
12			0.13			0.02		0.02	0.03		0.08	0.01
13			0.02		0.15	0.21	0.83	0.54		1.25		
14		0.02			0.13		0.02					
15					0.04	0.19	0.81					0.05
16	0.17						0.48	0.74			0.22	0.04
17	0.80		0.45	0.27	0.11	0.07	0.04	0.01				
18		0.01		0.17		0.36	0.07		0.09			
19		0.03		0.09			0.12	0.29	0.03			
20							0.34	3.70				
21	0.02						0.04	0.01				0.37
22	0.15							0.24				0.35
23					0.86		0.11	0.06			0.01	0.08
24			0.61				0.30	0.13				
25			0.47				0.01	0.14			0.09	
26								0.18			0.01	
27				0.12			0.06	0.04			0.01	
28		0.08			0.92	0.02					0.02	
29						0.24		0.02		0.01		
30						0.44		0.69	*2.88			
31							1.32			0.11		
Total	1.27	0.46	2.65	1.95	2.23	2.22	8.26	7.30	4.00	6.09	1.21	1.16

*Days highlighted indicate 4 or more inches of rain in a 24-hour period. Blank fields indicate no rainfall.

*Sample dates are indicated in blue. | ND = No Data | ANNUAL RAINFALL | 38.80

2023 Annual Rainfall Summary
Source: NOAA National Weather Service - Southeastern River Forecast Center
Location: North Inlet (Georgetown), South Carolina

2023	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1	0.04				0.54			0.26				
2								0.02				
3		0.34	0.04									0.03
4		0.11	0.01	0.25				0.29				
5	0.06							0.76				
6		0.28					0.78					
7												
8				0.02		0.21	0.02	0.46				
9				0.86	0.44		0.30	0.01	0.36			
10		0.01			0.08		0.21		0.25			
11		0.32	0.15				2.21		0.32		0.04	0.17
12		1.81				0.62		0.26	0.04	0.79	0.37	
13	0.04	0.05	0.29			0.19				0.44	0.17	
14				0.37			0.03	0.49	0.01	0.30		
15				0.03	0.90	0.12			0.04			
16				0.01			0.20	0.16		0.01		
17				0.06				0.49			0.31	0.53
18		0.01	0.04		0.66			0.06	2.76		0.01	*7.13
19			0.21		0.64							
20						0.80	0.24					
21						0.47	1.93	0.12	0.07	0.34	0.01	
22	0.03			0.28	0.05	0.34	0.03	0.02	0.29		0.09	
23	1.65		0.01	0.26		0.48	0.14	0.12	0.72		0.57	
24						0.11	0.62	0.01				
25		0.04				0.04						
26	0.18				0.02		0.01	0.01				0.21
27				0.02	1.12	0.51		0.03	0.07		0.15	0.62
28			0.08	0.03	0.63		0.33		0.01			0.01
29					0.04		0.41	0.02				
30	0.55			0.21			0.66	0.29				
31	0.11						1.03	2.45				
Total	**2.66**	**2.97**	**0.83**	**2.40**	**5.12**	**3.89**	**9.15**	**6.27**	**4.94**	**1.88**	**1.72**	**8.70**

***Days highlighted indicate 4 or more inches of rain in a 24-hour period. Blank fields indicate no rainfall.**

***Sample dates are indicated in blue.** | **ND = No Data** | **ANNUAL RAINFALL** | **50.53**

2024 Annual Rainfall Summary
Source: NOAA National Weather Service - Southeastern River Forecast Center
Location: North Inlet (Georgetown), South Carolina

2024	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1		0.02					0.09		0.01			
2			1.23		0.03		1.69	0.01	0.04			
3				0.01				0.04	0.27			
4	0.06			0.73				0.31				
5		0.04			0.01			0.17		0.01	0.02	
6	0.03	0.01	0.05		0.06	0.72		***1.81**			0.03	
7	0.17		0.35		0.33			***2.40**	0.85		0.38	
8					0.09			***1.60**			0.13	
9	0.01		0.28		0.03	0.11	0.25	***1.27**	0.57			
10	0.74		0.93		0.17	0.32	0.12			0.01		
11				0.62			0.09	0.12			0.05	
12		0.22		0.41			0.41	1.06			0.10	0.18
13	0.04	1.40					1.20	0.83	0.01			
14					0.02		0.42		0.01			
15					0.54	0.22	0.01		0.46		0.15	
16			0.02		1.24				0.69			
17	0.01						0.13		0.06			
18			0.01					0.46				
19					0.08		0.01	0.06	0.03			0.02
20				0.03	0.05		0.39	0.91	0.02		0.02	
21							0.26					
22				0.27			0.23					
23			0.79				0.45					
24		0.18	0.04			0.07	0.09					0.06
25					0.36	0.36	0.71		0.02			0.10
26					0.85		0.68					
27							1.06		1.55	0.04		0.08
28			0.39		0.15	1.40			0.78			
29			0.13								0.01	
30						0.03						0.53
31	0.01						0.42					
Total	**1.07**	**1.87**	**4.22**	**2.07**	**4.01**	**1.86**	**8.71**	**11.05**	**5.37**	**0.06**	**0.89**	**0.97**

***Days highlighted indicate 4 or more inches of rain in a 24-hour period. Blank fields indicate no rainfall.**

***Sample dates are indicated in blue.** | **ND = No Data** | **ANNUAL RAINFALL** | **42.15**

TABLE #6
Shellfish Management Area 05
Precautionary & Pollution Event Closures
2021-2023

Event	Date(s)	Sample Date(s)	Reopening Date	Comments
Tropical Storm Debby	8/6/2024	N/A	N/A	Storm produced over 7 inches of rain during several days. No closures were put in place because the growing area was closed to open season shellfish harvesting and does not have any summer harvesting operations.
Rainfall Event	12/18/2023	12/27/2023	12/29/2023	Event produced 7.13 inches of rain during a 24-hour period. Special sampling was conducted to reopen the area to shellfish harvesting.
Hurricane Ian	09/30/2022	10/06/2022	10/12/2022	Hurricane produced 6.60 inches of rain during a 2-day period. Special sampling was conducted to reopen the area to shellfish harvesting.