South Carolina Department of Health and Environmental Control

ENVIRONMENTAL AFFAIRS

SHELLFISH MANAGEMENT AREA 02

2019 ANNUAL UPDATE

Shellfish Sanitation Section
Environmental Affairs
2600 Bull Street
Columbia, SC 29201

November 2019

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SHELLFISH MANAGEMENT AREA 02
2019 ANNUAL UPDATE

[Data Through December 2018]

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2019 ANNUAL UPDATE
Shellfish Management Area 02
SCDHEC Environmental Affairs

Data Inclusive Dates:
01/01/16 thru 12/31/18

Classification Change:
___ Yes _X_ No

Shoreline Survey Completed: Yes

Prior Report & Date: 2018 Annual Update

(I)ncreased/(D)ecreased/(N)one:
_N_ Approved
_N_ Cond. Approved
_N_ Restricted
_N_ Prohibited

SUMMARY

During the last three review periods water quality within Shellfish Management Area 02 has improved slightly over previous years. However, bacteriological sampling data continue to indicate that this area maintain a Restricted classification in its entirety and shellfish in the area should not be used for depuration purposes for the upcoming 2019-2020 shellfish harvesting season.

Shellfish Management Area 02 is a very densely populated and very popular tourist destination area off the northern coast of South Carolina. The area is under constant construction of new commercial and residential properties being built. According to Horry County Planning and Zoning, South Carolina was the 7th fastest growing state in the United States in 2018 and 31% of individuals moved to Horry County.

Much of the growing area is comprised of three swash areas which are located within these residential and commercial property areas. The growing area is not very large and adjacent to the Atlantic Ocean and beach tourism areas which are surrounded mostly by oceanfront hotels and condominiums. The primary reason for poor water quality in the area appear to be attributed to nonpoint source pollution and a lack of high salinity ocean water. The area is mostly comprised of smaller finger creek swash canals that run from inland marsh areas to ocean waters. These areas do maintain a small population of harvestable shellfish. The area does not have any major ocean inlets that could help provide a flushing effect to possibly assist in lowering fecal coliform levels in the bacteriological water quality data.

In 2017, the collection of rainfall data has been improved for consistency, accuracy, and reliability. 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 program provides shellfish program staff with real-time daily updates for rainfall accumulation which assists in properly managing each of the shellfish growing areas within South Carolina.

In 2018, annual rainfall totals were 23 inches higher than in 2017 mostly due to Hurricane Florence that made landfall in September of 2018. This storm produced 11.78 inches of rainfall

during a four-day period. During the past five years there have been four major rainfall and flooding events that has impacted the northern coast of South Carolina.

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, 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 using 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 02 (Area 02) is comprised of three separate estuaries. White Point Swash, located in the Windy Hill section of North Myrtle Beach, is bordered to the northwest by U.S. Highway 17 and to the northeast by mainland residential portions of Windy Hill, North Myrtle Beach. White Point Swash is bordered to the southwest by the Town of Briarcliff Acres and to the southeast by the Atlantic Ocean.

Singleton Swash is located approximately six miles south of White Point Swash and is bordered generally to the west by U.S. Highway 17, to the south by Dunes Golf and Beach Club of Myrtle Beach, to the north by Lake Arrowhead Road, and on the east by Shore Drive and the Atlantic Ocean.

Cane Patch Swash is located within the Myrtle Beach City limits and is bordered to the west by U.S. Highway 17, to the north by 68th Avenue North, on the south by 66th Avenue North, and on the east by the Atlantic Ocean. The combined area of shellfish waters in Area 02 is approximately 100 acres. Although the area is small, a substantial shellfish resource does exist, necessitating review and classification.

The harvesting classification of Area 02 prior to this sanitary survey was as follows:

Prohibited: None

Restricted:

1. All waters of White Point Swash;
2. All waters of Singleton Swash;
3. All waters of Cane Patch Swash.

Conditionally Approved: None

Approved: None

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*). The South Carolina Department of Health and Environmental Control currently does not allow harvesting of oysters and clams within Area 02. No relay projects have been permitted within this area during the past three-year review period.

The shellfish harvesting season in South Carolina normally extends from October 1 through May 15. 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, the South Carolina Department of Health and Environmental Control has the authority to prohibit shellfish harvesting when necessary to ensure that shellfish harvested in South Carolina waters are safe for human consumption.

POLLUTION SOURCE SURVEY

SURVEY PROCEDURES

Shoreline surveys of Area 02 were conducted by the South Carolina Department of Health & Environmental Control (SCDHEC) Environmental Affairs, Pee Dee - Myrtle Beach, Shellfish Sanitation Staff during the survey period and are ongoing. Extensive visual examination of lands adjacent to the waters of Area 02 was conducted in order to determine potential sources of pollution entering shellfish growing waters. Additionally, Pee Dee Myrtle Beach Shellfish Sanitation Staff, in conjunction with the Department's ocean water quality monitoring program, continue to monitor lands surrounding White Point Swash along with water quality issues in the area.

POINT SOURCE POLLUTION

A. **Municipal and Community Waste Treatment Facilities** - The majority of Area 02 has municipal wastewater collections systems which are serviced by the cities of Myrtle Beach and North Myrtle Beach. Discharge of effluent from their facilities is to the Atlantic Intracoastal Waterway (AIWW) and does not affect the shellfish growing waters in Area 02. Also, within Area 01 is the Town of Briarcliff Acres which is primarily serviced by individual sewage treatment and disposal systems (ISTDs). However, growing waters within Area 02 are not affected by these ISTDs.

B. **Industrial Waste** - There are no permitted point source discharges of industrial waste in Area 02.

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; (5) a dry stack facility. There are no marinas located in Area 02 due to lack of navigable channels.

D. **Radionuclides** - Sources of radionuclides have not been identified within Area 02, and radionuclide monitoring has not been conducted. No poisonous or deleterious substances have been identified.

NONPOINT 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 the majority of Area 02 waters due to dense development of the surrounding area. SCDHEC Bureau of Water in coordination with the Office of Ocean and Coastal Resource 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.

Nonpoint source runoff is the apparent primary contributor to elevated fecal coliform bacteria levels in the area. White Point Swash receives drainage from a densely developed portion of the City of North Myrtle Beach (Windy Hill). Development includes an extensive residential area in addition to numerous condominiums, restaurants, gift shops, and other entertainment facilities. Singleton Swash receives drainage from Singleton Lake and several small ponds within the management area. Development is extremely dense, primarily consisting of high-rise and smaller stick-built condominiums, campgrounds, and golf courses. Cane Patch Swash serves as a drainage outlet for northern portions of the City of Myrtle Beach. Drainage is from a series of small lakes located west of the U.S. Highway 17. Development is dense with single and multi-family residences and commercial business properties.

B. **Agricultural Runoff** - There are no commercial agricultural activities adjacent to the waters of Area 02, and sampling for pesticides and herbicides has not been conducted.

C. **Individual Sewage Treatment and Disposal (ISTD) Systems** - Individual sewage treatment and disposal (ISTD) systems are known to exist in the North Myrtle Beach

areas bordering White Point Swash and Briarcliff Acres; however, exact numbers of these systems have not been identified.

D. **Wildlife and Domestic Animals** - Wildlife in Area 02 primarily consists of birds, small rodents, deer, raccoons, and opossums. These populations, in combination with domestic cats and dogs, are contributors to nonpoint source pollution. Effective resource management of deer populations coupled with a dramatic loss of natural habitat due to continued development within, and on lands adjacent to Area 02, has resulted in efforts to reduce the deer population within the town Briarcliff Acres. Briarcliff Acres is approximately one mile southwest of White Point Swash.

E. **Boat Traffic** - The use of watercraft in Area 02 is extremely minimal due to the lack of navigable channels within the area.

NATURALLY OCCURRING PATHOGENS

A. **Marine Biotoxins** - 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 Areas 01 - Area 04. There have been no documented reoccurrences of this organism at levels requiring emergency response in South Carolina waters subsequent to the 1988 event.

Vibrio parahaemolyticus – Because State water temperatures exceed 81 degrees Fahrenheit (F) during June through September, *Vibrio parahaemolyticus* (Vp) 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 is currently closed from May 16 through October 1. 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 closed season be extended through the end of September. The Department is currently opposed to issuance of special wild-stock harvest permits to Certified Shippers during the closed season. 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.

B.

HYDROGRAPHIC AND METEOROLOGIC CHARACTERISTICS

White Point Swash is approximately 650 by 500 meters and includes approximately 42 acres of habitat suitable for shellfish production. Immediately adjacent to White Point Swash is a series of marsh areas that extend approximately 2,000 meters in a northeast - southwesterly direction and parallel the beachfront. This area averages less than 100 meters in width. This total area is approximately 35 acres. A single shallow swash connects the White Point estuary with the Atlantic Ocean.

Singleton Swash contains approximately 41 acres of bottoms suitable for shellfish production. A single shallow swash immediately adjacent to the Dunes Golf and Beach Club connects the Singleton Swash estuary with the Atlantic Ocean.

Cane Patch Swash contains less than 3 acres of bottoms suitable for shellfish production. This swash connects to the Atlantic Ocean via a shallow ditch and 36-inch drain culvert.

Tides along the beaches in Myrtle Beach and North Myrtle Beach are semidiurnal, consisting of two low and two high tides each lunar day. Mean tidal ranges are 5.00 - 5.06 feet during normal tides and 5.70 - 5.87 feet during spring tides (Tides and Currents for Windows, Version 2.2, Nautical Software Inc.).

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.

Annual average rainfall totals for this area average 40.6 inches per year, but in 2018 the annual total was 66.91 inches. Rainfall data collected during the 2015, 2016, and 2018 survey periods were skewed due to several major weather events that took place during those years. In September of 2018, Hurricane Florence made landfall just north of the South Carolina/North Carolina state line and produced 11.78 inches of rain during a four-day period. Hurricane Florence was a very slow-moving storm that produced extreme rainfall amounts in North Carolina which weeks later flowed south and flooded many areas within Horry County and Area 02. In October of 2016, Hurricane Matthew made landfall on the coast of South Carolina and produced 9.38 inches of rain and the total accumulation of rainfall for the year was 56.19 inches. In October of 2015, a rainfall and flooding event to place which produced 21.18 inches of rainfall over a four-day period. The total accumulation of rainfall for 2015 was 74.7 inches and well above the annual average. However, since the area was classified as Restricted before either storm, no special sampling was conducted, and no emergency closures were issued for the area.

Tropical storms and hurricanes occasionally produce extremely large amounts of rainfall. During winter months rainfall is more uniform in nature; heavy, short-term rainfall events are uncommon, yet occasional intense thunderstorms associated with rapidly moving low-pressure systems may generate heavy rains. Precipitation rarely occurs in the form of snow or ice during winter months, and spring weather patterns are often extremely dynamic with associated thunderstorms and severe weather conditions.

Prevailing winds along the northern portion of the South Carolina coast are from the southwest during spring and south/southwest during the summer. During autumn wind direction is generally from the Northeast. Winter winds fluctuate between Northeast and Southwest. Wind speeds average less than 10 mph; however, strong weather systems may generate winds in excess

of 25 mph. The threat of tropical storms and hurricanes frequently occur during the hurricane season months of June through October.

There are no rivers near Area 02 and freshwater input occurs from localized precipitation and resulting runoff.

WATER QUALITY STUDIES

The Department currently utilizes a systematic random sampling (SRS) strategy within Area 02 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.

One hundred and eight (108) surface water quality samples (<1.0 ft. deep) were collected for bacteriological analyses and classification purposes from three active water quality sampling stations in Area 02 during the period 01/01/16 through 12/31/18. The samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported to the South Carolina Department of Health and Environmental Control, Environmental Affairs, 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[1]).

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

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[1]Nuefeld, N. 1985. Procedures for the bacteriological examination of seawater and shellfish. In: A.E. Greenberg and D.A. Hunt (eds.) Laboratory procedures for the examination of seawater and shellfish, Fifth Edition. American Public Health Association, Washington, D.C. p. 37-63.

temperature, wind direction, tidal stage and date and time of sampling. Tidal stages were determined Nautical Software's Tides and Currents, Version 2.2.

MONITORING RESULTS

The monitoring results from the three-year bacteriological data period show that no stations in Area 02 meet the geometric mean and the estimated 90th percentile standard for an Approved classification.

All stations exceeded a geometric mean (MPN) value of 14.

All stations exceeded the estimated 90th percentile MPN value of 43.

All stations exceeded a geometric mean MPN value of 88.

All stations 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

Shellfish Management Area 02 water quality is primarily affected by nonpoint source runoff and is most likely the contributor to elevated fecal coliform bacteria levels in the area. The area is under dense development of new residential and commercial properties. Although improvements in stormwater best management practices are being embraced in the area, the area doesn't have a large volume of water within the small marsh swash areas that drain to the Atlantic Ocean. The lack of any ocean inlets and only small, very shallow swashes limits the areas ability for high saline waters to flow into the marsh and creek areas where shellfish exist.

All stations in Area 2 exceed a fecal coliform geometric mean in excess of 88 MPN/100 ml. Also, all stations in Area 2 exceeded an estimated ninetieth percentile fecal coliform value of 260 per 100 ml. Therefore, no shellfish in the area should be used for depuration purposes.

Included in this report is a long-range trend summary of each station with the estimated ninetieth percentile values in correlation to annual rainfall totals (Table #3).

RECOMMENDATIONS

Upon reviewing the shoreline survey and bacteriological data of Shellfish Management Area 02, it is recommended that Area 02 maintain its current Restricted Classification for the entire Area. Due to the excessive fecal coliform geometric mean and estimated ninetieth percentile values, no depuration activities should be permitted or allowed.

The harvesting classification of Area 02 is recommended to remain as follows:

Prohibited: None

Restricted:

1. All waters of White Point Swash;
2. All waters of Singleton Swash;
3. All waters of Cane Patch Swash.

Conditionally Approved: None

Approved: None

REFERENCES

Nautical Software Inc. Copyright 1993-1996. Tides & Currents. Version 2.2.

Nuefeld, N. 1985. Procedures of the bacteriological examination of seawater and shellfish. p. 37-63. In A. E. Greenberg and D. A. Hunt (ed.) Laboratory procedures for the examination of seawater and shellfish, Fifth Edition. American Public Health Association, Washington, D.C.

NOAA, National Weather Service data base.

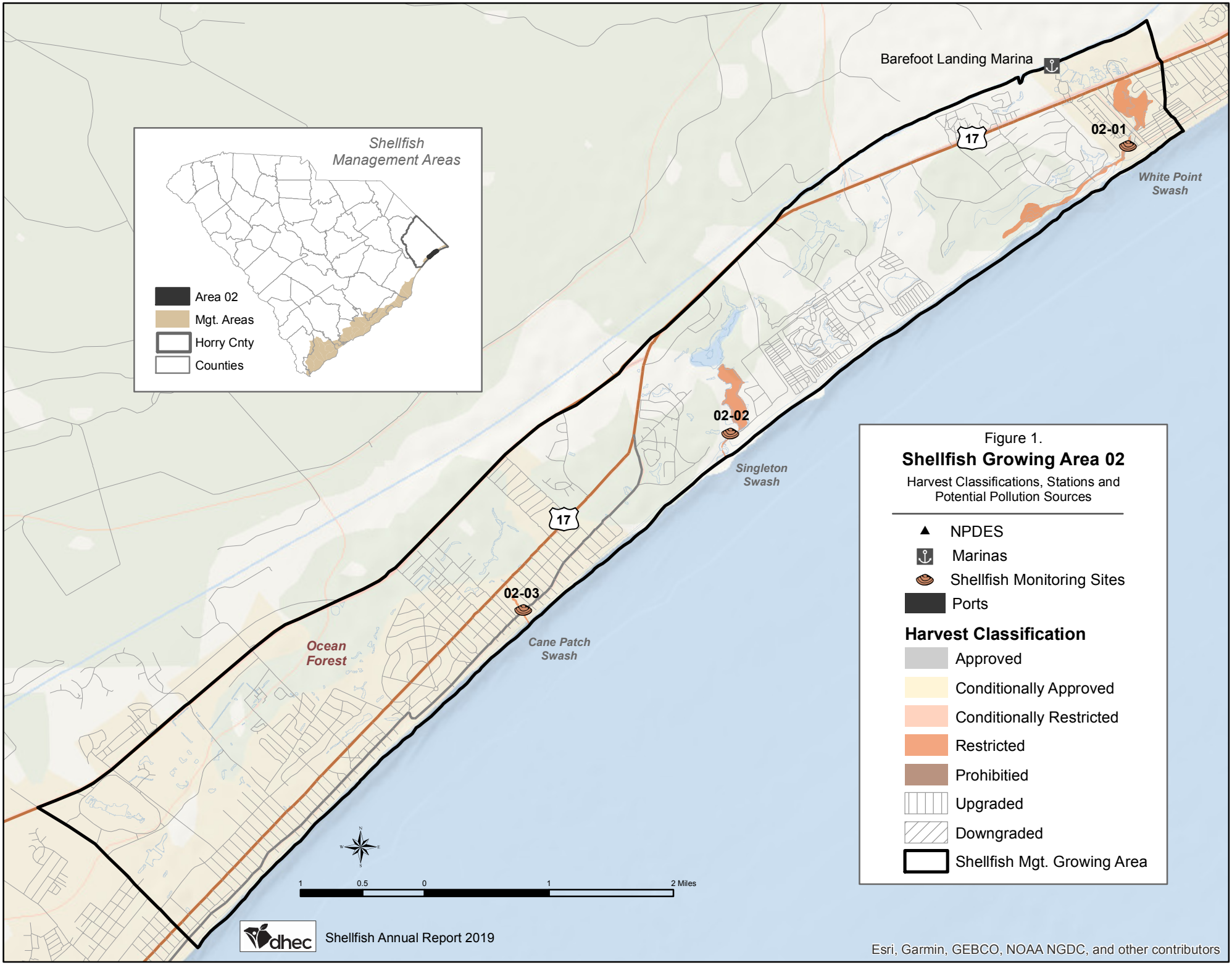
Barefoot Landing Marina
17
02-01
White Point Swash
Shellfish Management Areas
Area 02
Mgt. Areas
Horry Cnty
Counties
02-02
Singleton Swash
17
02-03
Ocean Forest
Cane Patch Swash
Figure 1.
Shellfish Growing Area 02
Harvest Classifications, Stations and Potential Pollution Sources
NPDES
Marinas
Shellfish Monitoring Sites
Ports
Harvest Classification
Approved
Conditionally Approved
Conditionally Restricted
Restricted
Prohibitied
Upgraded
Downgraded
Shellfish Mgt. Growing Area
1 0.5 0 1 2 Miles
dhec
Shellfish Annual Report 2019
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

TABLE #1

Shellfish Management Area 02
WATER QUALITY SAMPLING STATIONS DESCRIPTION

Station	Description
02-01	White Point Swash
02-02	Singleton Swash
02-03	Cane Patch Swash

(Total 3)

TABLE #2

Shellfish Management Area 02
Fecal Coliform Bacteriological Data Summary
From Shellfish Water Quality Sampling Stations between

January 01, 2016 and December 31, 2018

Station #	1	2	3
Samples	36	36	36
Geometric Mean	206.1	109.6	453.7
90th percentile	1164	912	2374
Water Quality	RND	RND	RND
Classification	RND	RND	RND

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

TABLE #3 Fecal Coliform Historical Trend Sheet											
Area 02 Stations 90th%ile Values for Annual Updates Related to Rainfall											
Station #	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**
02-01	1164	920	2033	2439	2647	1465	936	550	550	873	1302
02-02	912	1299	1467	1604	1639	1412	1186	759	759	1092	1955
02-03	2374	2296	2903	3472	3838	3492	2878	3177	3177	3466	3418
Annual Rainfall (inches)	**66.9**	**43.2**	**56.1**	**74.7**	**40.9**	**48.6**	**48.4**	**35.1**	**35.1**	**37.6**	**46.1**
ND = No Data Red = Impaired Water Quality											

TABLE #4

WATER QUALITY
SAMPLING STATION DATA

Shellfish Management Area 02

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 preparer(s), and/or reviewer(s) listed on the cover page.

TABLE # 5

RAINFALL DATA

Shellfish Management Area 02

SOURCE:

2016 Data
NOAA National Weather Service
Location: North Myrtle Beach Airport, South Carolina

2017 - 2018 Data
NOAA National Weather Service - Southeastern River Forecast Center
Location: North Myrtle Beach, South Carolina

2016 Annual Rainfall Summary
Source: NOAA National Weather Service
Location: North Myrtle Beach Airport, South Carolina

2016	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1	0.12			0.36	0.70	0.05	0.10		0.01			
2			0.03						*8.90			
3		1.16	0.30		1.57	0.13	0.18	1.83				
4		1.82	0.09		0.02							0.01
5		0.03			0.13	0.03						0.67
6		0.16				0.77						0.49
7		1.11		0.43		0.07	0.03			*1.44		
8		0.02					0.13			*7.94		
9	0.15											
10							1.56					
11							0.10		0.63			
12				0.02	0.13			0.03	1.35			0.10
13					1.26						0.17	
14							0.01		0.68			0.27
15	0.77	0.04	0.01			0.04	0.01					
16		1.07					0.02					
17	0.27				0.31							0.06
18					0.03		0.07	0.89	0.62			
19							0.45		3.00			0.23
20			0.22									0.01
21					0.01							
22	0.52	0.13		0.09	0.07				2.15			
23		0.12							0.29			
24		0.51				1.12						
25												
26			0.20						0.07		0.01	0.78
27			0.62									
28	0.07			0.09	0.13	1.03		0.04				
29					0.78			0.01				
30									0.67			
31					0.07			1.20				
Total	1.90	6.17	1.47	0.99	5.21	3.24	2.66	4.00	18.37	9.38	0.18	2.62
*Days highlighted indicate 4 or more inches of rain in a 24-hour period.												
*Sample dates are indicated in blue.						ND = No Data			ANNUAL RAINFALL			56.19

2017 Annual Rainfall Summary
Source: National Weather Service - Southeastern River Forecast Center
Location: North Myrtle Beach Airport, South Carolina

2017	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1	0.09			0.06			0.21	0.01	1.25			
2	0.13		0.13		0.22			0.02	0.16			
3	0.27							0.19	0.36			
4	0.08	0.07		0.52		0.12	0.14	0.17				
5					0.4			0.09				0.07
6				1.7	0.08	0.29	0.29	0.46	0.53			
7	0.31				0.07	0.79			0.66	0.04		0.3
8	0.07	0.61				0.63	0.01	0.29		0.43		0.45
9		0.13				0.79	0.26	0.96		0.02		0.95
10		0.09					0.34	0.03		0.96	1.04	
11	0.02						0.07	0.7	0.1	0.03		
12		ND	0.1					ND	2.82			
13			0.28					0.01		0.22		
14			0.66	0.03	0.5			0.03				
15			0.01			0.06		0.01	0.12			
16		0.42					0.36	ND				
17						0.01	0.26	ND		0.38		
18							0.42	ND				
19							0.01	ND			0.04	
20						0.13		ND				
21						0.93		0.46				1.17
22	0.27		0.1			0.07		ND	0.25		0.23	0.02
23	0.92			0.03	0.83	0.66		0.02		0.05		
24	0.06			0.58	1.11	0.01	0.01	1.66		1.8	0.07	0.01
25				0.55	0.83	0.44	0.1					0.04
26					0.13	0.21						
27	0.07											
28		0.21										0.08
29			0.01		0.08		0.06	1.19		0.88		0.06
30					0.06		0.39			0.07		0.02
31			0.29									
Total	**2.29**	**1.53**	**1.58**	**3.47**	**4.31**	**5.14**	**2.93**	**6.30**	**6.25**	**4.88**	**1.38**	**3.17**
***Days highlighted indicate 4 or more inches of rain in a 24-hour period.**												
***Sample dates are indicated in blue.**						**ND = No Data**			**ANNUAL RAINFALL**			**43.23**

2018 Annual Rainfall Summary
Source: National Weather Service - Southeastern River Forecast Center
Location: North Myrtle Beach, South Carolina

2018	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1			0.24			0.01		0.18				
2		0.08	0.17				0.07	0.55			0.31	0.59
3				0.02		0.53		0.49	0.13		0.01	0.24
4	0.43			0.02			0.06	0.36				0.03
5		0.49		0.03			0.03	0.13			0.31	
6					0.20			0.02		0.01	0.15	
7			0.18						0.04		0.11	
8		0.06		1.07			0.14			0.07	0.65	0.05
9				0.06				0.40		0.09		1.19
10		0.51		0.25						0.09	0.09	1.08
11				0.05	0.02					0.33		0.03
12	0.23	0.07	0.24		0.02	0.99			0.19	0.04		
13	1.00	0.06	0.31		0.01	0.38	0.24	0.02			0.91	
14					0.01			0.35	**0.26**		0.04	0.03
15						1.21		0.05	***6.39**		0.10	2.99
16				0.70	0.10	0.23			**2.55**		0.25	0.17
17					0.20		0.33		**2.58**	1.12		
18	0.07				0.34		0.59					
19					0.66	0.08	0.73	0.04	0.06		0.14	
20			0.30		1.37		0.91					0.02
21			0.51			0.54	2.80			0.02		0.57
22						0.13		0.03				
23	0.31			0.25			0.28					
24				2.13	0.12	0.04	0.58				0.17	
25			0.06	0.02	0.14	0.09	0.44				2.11	
26		0.01				0.36	0.22		0.26	0.05		
27		0.05		0.05	0.01		0.32			1.59	0.01	
28					1.31		0.11					0.06
29	1.81			0.01	1.51		0.07					0.90
30					0.05		2.42		0.66			
31			0.16		0.15		1.25					0.04
Total	**3.85**	**1.33**	**2.17**	**4.66**	**6.22**	**4.59**	**11.59**	**2.62**	**13.12**	**3.41**	**5.36**	**7.99**

***Days highlighted indicate 4 or more inches of rain in a 24-hour period.**

***Sample dates are indicated in blue.** | **ND = No Data** | **ANNUAL RAINFALL** | **66.91**