

## Shellfish Protection in the Beaufort River November 2008

### Background

The Beaufort-Jasper Water & Sewer Authority operates the Port Royal Island Water Reclamation Facility (PRIWRF) SC 0048348 and is permitted to discharge highly treated wastewater to the Beaufort River. This white paper is a collaborative effort between SCDHEC and BJWSA and provides a summary of project information pertinent to water quality and shellfish protection requirements in the Beaufort River.

**Current Issues.** The PRIWRF discharges to shellfish management Area 15, which is part of the Broad River estuary and the largest of Sea Island Coastal Region estuaries. This estuary, which includes Broad River, Beaufort River, Port Royal Sound, and several tidal tributaries, includes an extensive system of marshes, tidal creeks, and sea-islands. The average depth of the estuary is approximately 7 meters at mid tide level. Broad deep natural channels exist throughout Port Royal Sound, Beaufort River, and major tidal tributaries. Large shoal areas occur primarily in the Beaufort River and the Port Royal Sound. Area 15 consists of approximately 31,090 acres of shellfish growing area habitat located in Beaufort County. It consists of the Beaufort River and Brickyard Creek and their tributaries, including McCalley, Albergotie, Broomfield, Battery, Chowan, Ballast, Station, and Morse Island Creeks. The area's northern boundary is the northern shore of McCalleys Creek. The eastern boundary extends through Lady's Island to Highway 21, then to Morse Island Creek. The southern boundary is the Atlantic Ocean at the mouth of Port Royal Sound. The western boundary extends through Parris Island and follows the western shore of Battery Creek to the portion of McCalley Creek bordered by Highway 21. The majority of the shellfish resource and harvesting activity is located in Chowan, Distant Island and Wallace Creeks. The shellfish industry in South Carolina is based on the harvest of the eastern

oyster (*Crassostrea virginica*) and hard clams (*Mercenaria mercenaria*).

The status of shellfish in Beaufort County in the Beaufort River at the PRIWRF discharge is documented in the *Shellfish Management Area 15 / 2007 Annual Update* produced by DHEC's Shellfish Sanitation Program, August 2007. Area 15 is delineated into four shellfish management classifications: Approved, Conditionally Approved, Restricted, and Prohibited, and these classifications are shown in the referenced report and the attached figure. To summarize the annual update report, storm water runoff appears to be the major source of fecal coliform bacteria contamination in Area 15. There are also Individual Sewage Treatment and Disposal Systems (ISTDS) that are a potential source for fecal coliform contamination. The full report is at: <http://www.scdhec.net/environment/water/docs/shrp15.pdf>

**Water Quality Standards.** The water quality standards are included in State Regulation 61-68. These standards include information for shellfish harvesting waters. SR 61-68 is at: <http://www.scdhec.net/environment/water/regs/r61-68.pdf>

**PRIWRF History.** In 2006, the BJWSA began operation of the PRIWRF, which was initially permitted as a 4.8 mgd facility and discharges to the Beaufort River. Flows from the Shell Point and Southside WRFs were diverted to PRIWRF when those facilities were taken out of service. Since operation began, the PRIWRF has operated with a permitted UOD of 618 lbs/day as specified in the TMDL. In addition to PRIWRF, there are two existing federal facilities that discharge to the Beaufort River – the Marine Corps Air Station WWTP SC 0000825 and Parris Island WWTP SC 0048976 and these two facilities will be eliminated with their flows being diverted to PRIWRF. With construction scheduled for completion by November 2010, the PRIWRF treatment

capacity will be expanded and the permitted UOD load will increase to 1593 lbs/day in the summer as specified in the TMDL model.

### **PRIWRF Performance Reliability**

DHEC requires BJWSA to properly and efficiently operate and maintain the PRIWRF. To ensure that PRIWRF maintains compliance with the terms and conditions of their NPDES permit, back-up and auxiliary facilities have been incorporated into the design and construction of this facility. Each critical treatment process unit was designed to meet the highest EPA Class I standards and specific reliability measures include:

- Equalization in the form of a 2.5 million gallon storage tank with automated control of valves and pumps to regulate diurnal flow variations and improve treatment efficiency. This system also allows flows to be temporarily stopped in the event of a process failure.
- The biological treatment system incorporates two parallel bioreactors with highly reliable and redundant aeration systems.
- The effluent filtration system provides tertiary treatment in three parallel units with each containing 12 filter discs and is capable of treating the design flow with one unit out of service.
- The UV disinfection system provides 3 units (banks) in series and is designed to meet a daily maximum limit of 43 cfu/100 ml and a monthly average of less than 14 cfu/100 ml for fecal coliform. It is capable of treating the design flow with one unit out of service.
- A standby generator that provides sufficient power to run all treatment units with automatic switchover if voltage fluctuates.
- A sophisticated SCADA system that will notify the duty operator in the event of a critical process failure.

- All of the major electrical switchgear are backed up with spare breakers to enable processes to keep operating in the event of electrical equipment failure.
- A weir is installed in the effluent pump station that diverts flow to the on-site storm water retention pond in the event of a major plant outage. This diversion will occur by gravity and requires no electrical or mechanical activation. This protects the UV system from flooding and captures partially treated water that can be pumped back to the plant once normal operation is restored.

During the past two years of operation, the PRIWRF has consistently met fecal coliform requirements with the highest monthly average discharge being 2.7 cfu/100 ml. This operating history indicates that the worst plant performance was still 80% less than allowable. Recently collected performance data indicates that the PRIWRF will also comply with the monthly average of 35 cfu/100 ml enterococci standard.

### **Discharge Evaluation**

**TMDL Model.** The Beaufort River TMDL model was developed using data from seven established USGS gaging stations. During the period December 1998 through September 2001, continuous data for water level, temperature, specific conductance, and dissolved oxygen provided the basis for establishing system hydrodynamics and water quality. A *Water Quality Model Report* was submitted to DHEC in November 2004 and the TMDL was subsequently issued and approved by EPA in April 2006.

Critical conditions for the tidally influenced Beaufort River were derived using this water quality model. The model evaluation for the Beaufort River developed a time frequency distribution of optimized allowable point source loads for each day and for each discharge location. The 5<sup>th</sup> percentile of these optimized allowable point source loads was then calculated. These loads are considered

consistent with the antidegradation rules of the SC water quality standards.

**Mixing & Transport.** A near-field mixing zone analysis was also performed to establish dilution ratios to protect aquatic biology from toxicity issues. The discharge outfall pipe configuration was modeled with critical tidal conditions to evaluate the concentrations of reclaimed water in the mixing zone. The CORMIX model was further modified to evaluate a far-field mixing zone analysis and predict in-stream concentrations of fecal coliforms during critical plant operating conditions. The model assumed critical tidal conditions, the PRIWRF operating at 10 mgd, and coliform concentrations at the permitted daily maximum. Also evaluated were discharges during an extreme event at the PRIWRF with a partial disinfection system failure and having a very low probability of occurring. Given the high level of process reliability designed into the plant and coupled with provisions for emergency power, it is estimated that the PRIWRF monthly coliform standard of 14 cfu/100 ml will be met the vast majority of the time and subsequently the instream standard of 14 cfu/100 ml (median or geometric mean) will also be met the majority of the time. With the normal daily maximum discharge less than 43 cfu/100 ml, the model predicts instream standards of 14 cfu/100 ml to be achieved approximately 13 feet from the outfall. Assuming a critical condition with disinfection process failure and the discharge at 5,000 cfu/100 ml, the model predicts instream standards of 14 cfu/100 ml can be achieved approximately 4,100 feet from the outfall. This is well within the current closure area which extends approximately 20,000 feet south of the discharge and 41,000 feet north of the discharge. The proposed expansion of the PRIWRF to 10 mgd will not impact the current shellfish closure area.

### **Proposed Changes to the Beaufort River Shellfish Management Plan**

**Emergency Response Plan.** The NPDES permit also includes requirements for BJWSA to notify the Department within two (2) hours of

discovery of a fecal coliform violation or if BJWSA has reason to believe that a fecal coliform violation may occur. BJWSA will also notify the Department when the problem has been corrected.

Within 1 hour of notification, if during business hours, or the next morning, if after business hours, Department shall notify the local shellfish dealers and DNR law enforcement of the fecal violation condition. Once the situation has been stabilized, the Department shall notify the local dealers and DNR law enforcement that the restrictions have been lifted.

Modifications to the emergency closure plan in the *Shellfish Management Area 15 / 2007 Annual Update* are anticipated to be included with the 2009 update and are attached.

### **Future Studies**

Subsequent to construction completion of the PRIWRF expansion, FDA has expressed an interest in performing a dye study in the Beaufort River. This dye study would serve to confirm the Cormix model transport and mixing analysis. USGS may also participate with additional field studies to refine the hydrodynamics of the Beaufort River model.

Currently the shell fish beds from Chowan Creek to Brickyard are classified "prohibited" due to the proximity of man made facilities like wastewater treatment plants and marinas. After the consolidation of the military discharges and based on continued water quality monitoring and the dye study there should be an opportunity to reclassify some of these areas.

## **Anticipated Changes to the 2009 Update Shellfish Management Area 15**

### **Implementation of an Emergency Closure Plan**

The Region 8 Environmental Quality Control (EQC) District Shellfish Sanitation Program manager is the responsible party for determining the need for a closure. In the event that the manager shall be unavailable, a responsible employee shall be designated this responsibility.

#### **A. Implementation of Closure (September through May)**

The following procedures shall be used in the event a closure is necessary:

1. The State Shellfish Sanitation Program Manager (or his designee) shall be notified upon determination of the need for any closure. Media notification shall be coordinated through the State Shellfish Sanitation Program Manager and the Office of Media Relations.
2. The Office of Media Relations (Media Relations) is the responsible authority for issuance of news releases. Media Relations shall be notified within four hours of the determination of the need for a closure. They shall be provided with specific information regarding the pollution event and affected area. In the event of the need for a weekend or holiday closure, Media Relations shall be contacted through their on-call pager number or through the Department's emergency response telephone number.
3. Within approximately four hours of determination of the need for a closure, District Shellfish staff shall notify the South Carolina Department of Natural Resources (SCDNR), Office of Commercial Fisheries Management, & SCDNR Law Enforcement, by telephone, e-mail and/or fax.
4. District Shellfish Sanitation Program staff shall notify certified Shellfish Facilities with

interests in the affected area. SCDNR is the State agency having authority for the issuance of individual commercial shellfish harvest permits and should provide notification to individual permit holders.

5. During the closure period, District Shellfish Sanitation Program officers shall insure patrols are conducted at a frequency sufficient to deter illegal harvest activities. Schedules shall include night and weekend patrols. Documentation of these patrols shall be maintained. Unless a district Shellfish Sanitation Program officer has personal knowledge that a violator has been notified of the closure, no summons should be issued during the first 48 hours following the initial call to Media Relations. Written warnings should be issued during this 48 hour period and all shellfish should be returned to the water.

#### **B. Management of Emergency Closure Areas Extraneous to the Normal Shellfish Harvest Season**

The Emergency Closure area shall remain in the closed status from May 16 through September 15.

#### **C. Enforcement of Closures**

1. SCDHEC is the agency responsible for public health protection. This includes public notice and closures of shellfish management areas.
2. District Shellfish Sanitation Program officers shall insure that the area is patrolled at a frequency adequate to prevent illegal harvesting. Documentation of these patrols shall be maintained. District Shellfish Sanitation Program officers may coordinate with other law enforcement officers to insure adequate area coverage.

#### **Control Elements Used to Reopen after Event**

Opening of areas following closure due to violation of management plan criteria shall adhere to the following control elements.

- A.** The bacteriological water quality at all stations located within, or on the boundary of,

the Emergency Closure area shall be assessed prior to reopening. The area shall remain closed and be re-sampled at a later date if more than 15% of the reopening samples exceed a fecal coliform MPN of 43.

**B.** A representative number of shellfish tissue samples shall be collected and analyzed from the Emergency Closure area. Areas represented by a sample, which exceeds an *Escherichia coli* MPN of two hundred and thirty per one hundred grams of sample or a total bacteria count of five hundred thousand per gram, shall remain closed and be re-sampled at a later date.

**C.** District Shellfish Sanitation Program staff and the State Shellfish Sanitation Program Manager (or his designee) shall concur on the decision to reopen the area.

**D.** District Shellfish Sanitation Program staff shall notify SCDNR, Division of Commercial Fisheries Management, of the opening following issuance of the news release.

**E.** Local Certified Shellfish Shippers shall be notified by SCDHEC of the opening as soon as possible.

This plan shall be evaluated once per year and included as a part of the Shellfish Management Area 15 Annual Update.

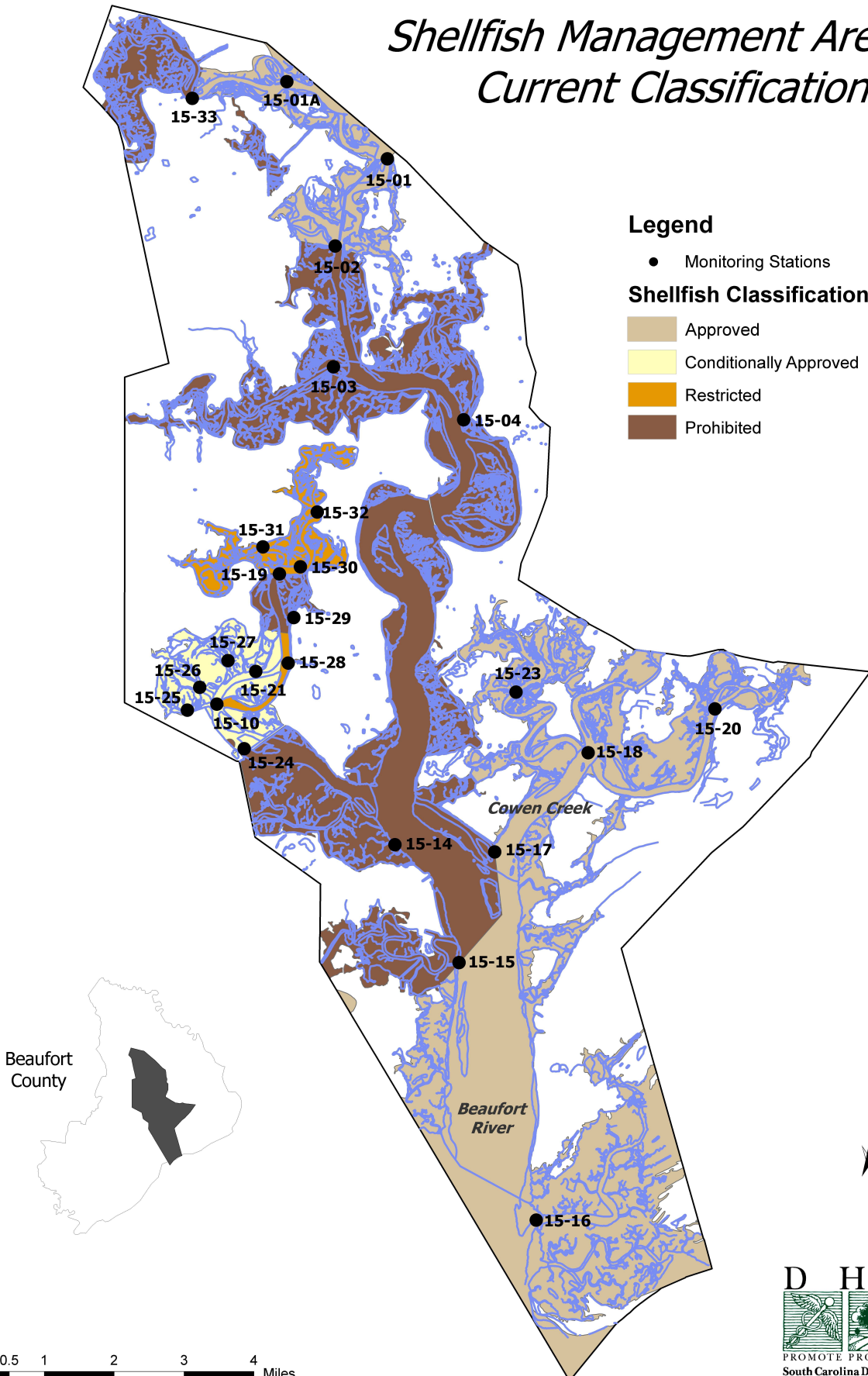
# Shellfish Management Area 15 Current Classification

## Legend

- Monitoring Stations

## Shellfish Classifications

- Approved
- Conditionally Approved
- Restricted
- Prohibited



Beaufort County

0 0.5 1 2 3 4 Miles

