# Reappraisal Report for Shellfish Growing Area BB3
# (Westecunk Creek to Sunrise Beach)



## December 2013

State of New Jersey
Chris Christie, Governor
Kim Guadagno, Lt. Governor

NJ Department of Environmental Protection
Bob Martin, Commissioner

# Reappraisal Report for Shellfish Growing Area BB3
## (Westecunk Creek to Sunrise Beach)

New Jersey Department of Environmental Protection
Water Resources Management


Water Monitoring and Standards


Bureau of Marine Water Monitoring
Bruce Friedman, Bureau Chief


December 2013

2009 - 2013


Report Prepared by:
Mike Curtis

Cover Photo – Under Sail – Central Barnegat Bay, Barnegat Bay, NJ
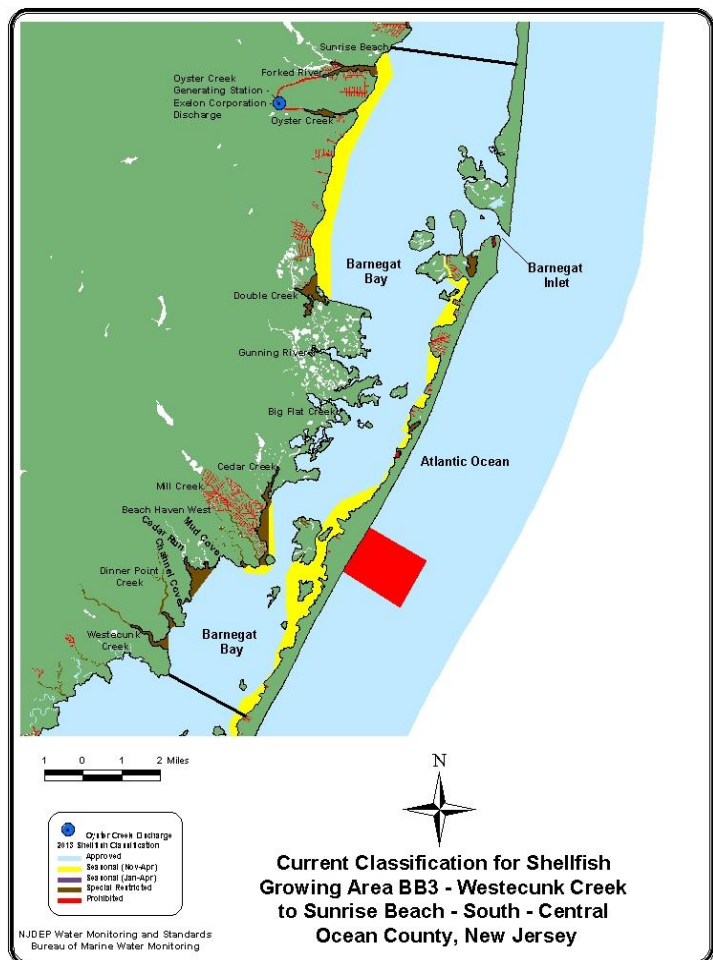
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# EXECUTIVE SUMMARY

Shellfish Growing Area BB3 consists of all the back bay waters that extend 16 miles from Westecunk Creek or West Creek in the northern sector of Little Egg Harbor to Sunrise Beach in the south-central sector of Barnegat Bay. In total, there are 40,062 shellfish growing water acres in BB3.

Following regulation updates, the proposed acreage by classification for BB3 will equate to 35,188.58 *Approved*, 3,377.42 *Seasonal* (Nov – Apr), 988 *Special Restricted*, and 508 *Prohibited*. Current shellfish growing water classifications (those preceding regulation updates – see map below right) for BB3 can be viewed throughout this report, and in the State of New Jersey 2012 Shellfish Growing Water Classification Charts (i.e., 7 - 10) section of Water Monitoring and Standards' (WM&S'), Bureau of Marine Water Monitoring's (BMWM's) website (see *www.state.nj.us/dep/wms/bmw*).

The Oyster Creek (nuclear) Generating Station provides a potential direct source of cooling water input to the waters of Shellfish Growing Area BB3. Aside from change in ambient temperature, there has been no apparent direct and or long-term impact to BB3 shellfish growing water classifications from discharge, plant error, or operation. As this generating facility does not presently provide a continuing influence on shellfish growing water quality, BB3 is sampled utilizing the Systematic Random Sampling (SRS) strategy.

There is potential for non-point inputs such as those that might emanate from streams, creeks, rivers, lagoon/bayfront properties, marina's, or storm water outfalls located within the waters of BB3. The waters surrounding potential non-point sources in BB3 are appropriately designated with buffers or protective classifications. Although impact from these locations has been limited for this reporting period, such classifications are a necessity to protect public health.



Current Classification for Shellfish Growing Area BB3 - Westecunk Creek to Sunrise Beach - South - Central Ocean County, New Jersey

The monitoring program for shellfish growing waters provided by WM&S/BMWM in conjunction with National Shellfish Sanitation Program (NSSP) criteria provides the basis for designating shellfish growing water classifications in the State. For this Reappraisal, the results of water quality
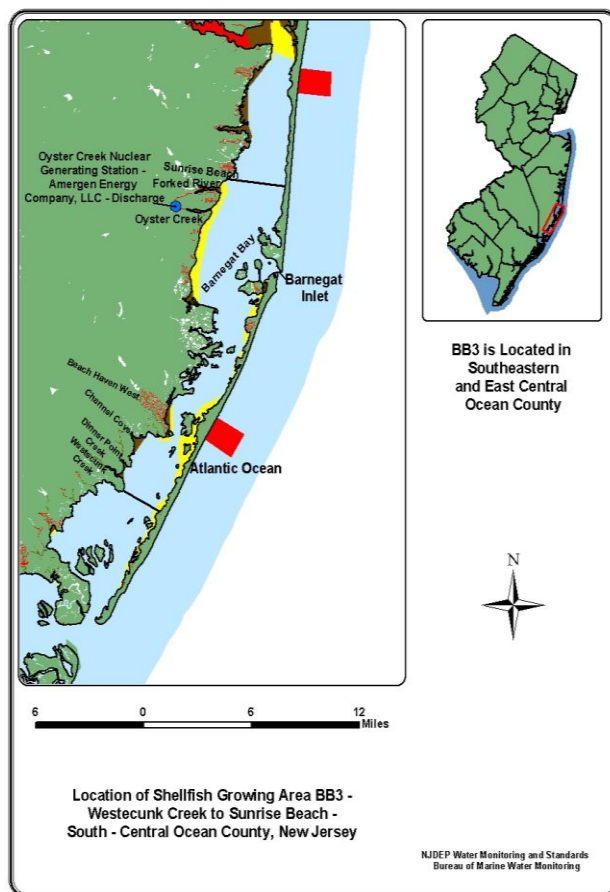
analyses for samples collected between January 2009 and October 2013, suggest all stations comply with applicable water quality criteria regarding current classification and analysis practices for FC. Such practices involve the utilization of formerly accumulated TC data from three – tube, three - dilution in a statistically combined analysis with more currently obtained mTEC data to produce a FC result. Classifications for the waters in which BB3 stations are located and monitoring schedules remain appropriately designated, requiring no changes for this reporting period.

# GROWING AREA PROFILE

## LOCATION AND DESCRIPTION

This Reappraisal covers shellfish growing waters from northern Little Egg Harbor to south-central Barnegat Bay (BB3 – see map to right). BB3 consists of 16 miles of back bay waters. It extends from the mouth of Westecunk Creek in a southeasterly direction toward Beach Haven Terrace on Long Beach Island, northward to Island Beach State Park and west to Sunrise Beach (Please Note: references to "miles" in this report are in Nautical Measure, whereby, one Nautical Mile equates to 6,086 feet).

There is a mixture of year round and seasonal communities surrounding this shellfish growing area. With seasonal expansions in population, this area experiences greater population density during the late spring, summer, and early fall. Although much of the area surrounding BB3 is not heavily populated, residential development and redevelopment occurs within the towns that comprise the eastern and western shorelines. Commercial development within this growing area is limited, although it has some presence within areas of Route 72 in Stafford Township and north on Route 9 toward Lacey Township.



Location of Shellfish Growing Area BB3 - Westecunk Creek to Sunrise Beach - South - Central Ocean County, New Jersey

NJDEP Water Monitoring and Standards
Bureau of Marine Water Monitoring

BB3 is Located in Southeastern and East Central Ocean County

The majority of the shellfish growing waters present in this area are classified as *Approved,* with several small sections of *Seasonally Approved, Special Restricted,* and *Prohibited* waters, which act as buffers for the developed sections of shoreline along the bay, which include marinas, lagoonfront, and bayfront communities.

There are a number of water sources such as Westecunk Creek, Dinner Point Creek, Mill Creek, Double Creek, Oyster Creek, and Forked River that feed into the general body of water (Barnegat Bay) that comprises this shellfish growing area. These rivers and creeks are classified as *Prohibited* or *Special Restricted* depending on water quality, or the presence of nearby infrastructure such as a

marina that has the potential to provide adverse inputs to the waterway. *Special Restricted* or *Seasonally Approved* classifications are often designated (when necessary) at the mouths of these waterways, in order to buffer an area that enters into *Approved* waters.
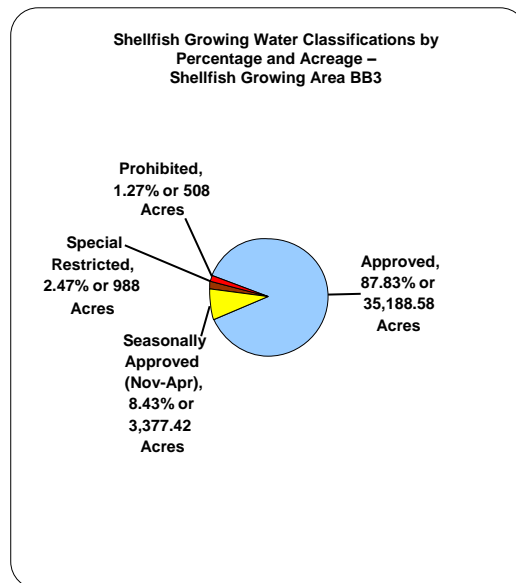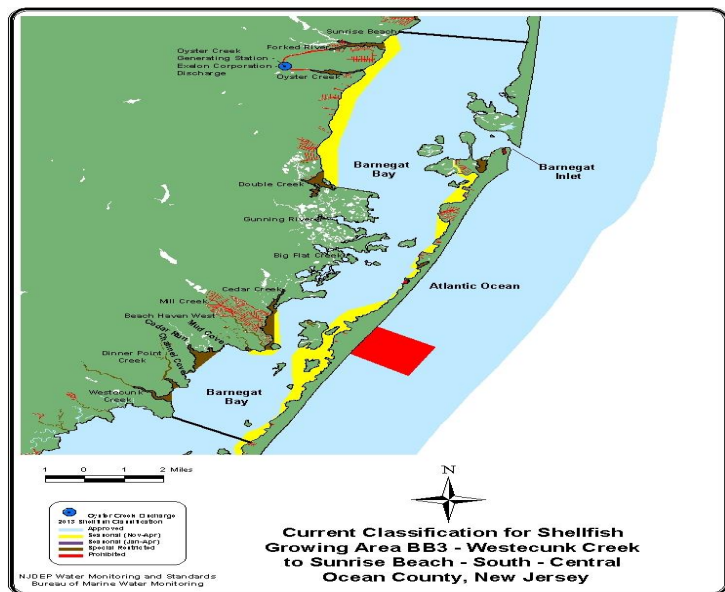
A portion of the combined water sources that make up shellfish growing area BB3 will enter the Atlantic Ocean by way of Barnegat Inlet in the north-central sector. Other water's of BB3 will exit the growing area to the south (beyond the confines of this growing area) by way of Little Egg Inlet.

## GROWING AREA CLASSIFICATION SUMMARY

The last Sanitary Survey covering this area was finalized in 2012 and the last Reappraisal was written in 2008. In the 2012 Sanitary Survey, certain waters abutting Cedar Bonnet Island and southward warranted an upgrade. That change consisted of 318.58 acres of *Seasonal* (Nov-Apr) waters, which were upgraded to *Approved.* The data analyzed in this Reappraisal (2013), supports the changes made in the 2012 Sanitary Survey along with all remaining classifications.

Prior to the 2012 Sanitary Survey, BB3's classification acreage consisted of the following: *Approved* - 34,870, *Seasonal* (Nov-Apr) - 3696, *Special Restricted* – 988, and *Prohibited* – 508, equating to 40,062 acres. The pending regulation update noted in the Executive Summary will reallocate the 318.58 acre upgrade noted above, providing the following acreage: *Approved* - 35,188.58, *Seasonal* (Nov-Apr) – 3,377.42, *Special Restricted* – 988, and *Prohibited* - 508.

A current classification map (prior to regulatory update) along with a pie chart showing expected growing water acreage and percentages (post-regulatory updates) are shown below. Maps and pie charts showing classifications and acreage for pre/post upgrade conditions were previously presented in the 2012 Sanitary Survey. As noted in the Executive Summary, current BB3 classifications can also be reviewed in the State of New Jersey 2012 Shellfish Growing Water Classification Charts (i.e., 7 - 10) section of the WM&S/BMWM website (see *www.state.nj.us/dep/wms/bmw*).



Current Classification for Shellfish Growing Area BB3 - Westecunk Creek to Sunrise Beach - South - Central Ocean County, New Jersey



Shellfish Growing Water Classifications by Percentage and Acreage – Shellfish Growing Area BB3

# EVALUATION OF BIOLOGICAL RESOURCES

There are a large number of plants and animals that comprise the Barnegat Bay Estuary. They provide us with a unique estuarine community. As a result, there is a conservative balance between the species (plant, animal, and human) that live and interact within and about the system.

For the regional area known as Barnegat Bay, the blue crab (Callinectes sapidus) and the hard clam (Mercenaria mercenaria) represent today's most important shellfish species from a recreational and commercial standpoint. For the purpose of this report, the focus is predominately placed on the hard clam bi-valve.

Historically, baymen working the *Approved* and *Seasonally Approved* sections of this shellfish growing area have harvested hard clams (*Mercenaria mercenaria*) and soft shelled clams (*Mya arenaria*). However, the dominant molluscan shellfish species in this area is the hard clam, as minimal numbers of soft shelled clams are present today. (Celestino, 2011) provided the NJDEP Fish and Wildlife hard clam survey map for a portion of shellfish growing area BB3 (shown upper right).

Approximately 96 % of BB3 shellfish growing waters are currently classified as *Approved or Seasonally Approved* for the harvest of shellfish. There are no quotas set for the harvest of shellfish in *Approved* and *Seasonally Approved* waters. Areas designated as *Seasonally Approved* can only be harvested during winter months. The specific months during which a *Seasonally Approved* area can be harvested are November through April (six months) or January through April (four months) depending on the variation of water quality within these time frames. At present, there are no waters in BB3 that are classified as *Seasonal* (Jan – Apr).

With 96 % of the water's contained in BB3 classified as *Approved* or *Seasonally Approved*, there are a substantial amount of waters currently available for the harvesting of shellfish. For this and

many other reasons, the Barnegat Bay Estuary, which contains the waters of BB3, is considered a very valuable ecological, biological, recreational, and commercial resource. Due to its natural and economic value, the Barnegat Bay was made a part of the National Estuary Program in July of 1995 by the USEPA.
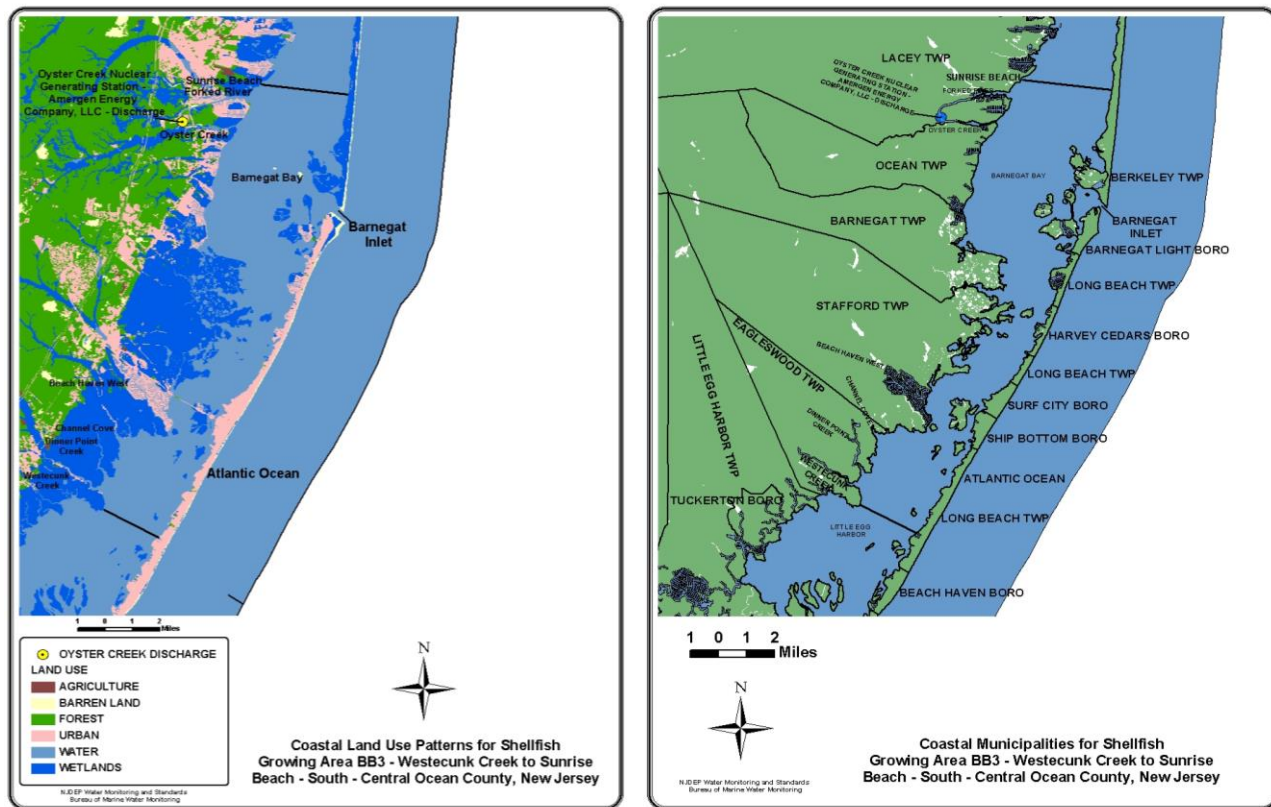
# SHORELINE SURVEY: EVALUATION OF POTENTIAL POLLUTION SOURCES

Shoreline surveys or site specific tours of areas nearby or abutting shellfish growing waters can provide insight as to the location and nature of land use, surface water discharges, marinas, unpermitted discharges, and stormwater inputs. A shoreline survey of BB3 was conducted on August 20, 2013, and the following sections detail information derived collectively from that survey (most specific – p. 16, Bacteriological Quality, Compliance with NSSP SRS *Approved* Criteria), and those that preceded it.

## LAND USE

Urban environments, comprised of numerous municipalities are interspersed and make up the primary development in the area. The communities along the shore and those immediately to the west are primarily using city water and sewer, although there are communities further inland utilizing septic.

There is little agriculture connected with the lands abutting BB3. The vegetative communities comprising the ecosystems of BB3 are generally composed of either wetland or pineland forest species. The figures on the next page show the land use, vegetation, and municipalities that surround this shellfish growing area.

Coastal Land Use Patterns for Shellfish
Growing Area BB3 - Westecunk Creek to Sunrise
Beach - South - Central Ocean County, New Jersey

Coastal Municipalities for Shellfish
Growing Area BB3 - Westecunk Creek to Sunrise
Beach - South - Central Ocean County, New Jersey

The mainland side of the bay has large areas of wetlands, which become forested lands further inland. Portions of a number of BB3's wetlands comprise the protected lands for the Edwin B, Forsythe National Wildlife Refuge. Further, there are wetlands to northeast, which make up another protected area across Barnegat Inlet, known as Island Beach State Park. Generally, the barrier islands that make up the eastern side of BB3 have sporadic areas of wetlands located in or alongside the bay.

Projects bordering on eco-sensitive areas (e.g., salt marshes) are required by local, state, and federal regulations to utilize specific set backs and buffers as a means of protecting flora and fauna specific to wetland, riparian, or estuarine locations.

The majority of urban developed areas along the bay contain bayfront or lagoonfront communities. Lagoonfront communities consist of dredged canals/lagoons running through residential communities. Lagoon and bayfront communities are frequently the choice for recreational boaters, as these types of developments provide access to the bay for boat traffic.

## SURFACE WATER DISCHARGES - NUCLEAR GENERATING FACILITY EFFLUENTS

The Oyster Creek Generating Station (a nuclear facility) is a direct effluent source for this area. The primary discharge from this facility is non-contact cooling water. This primarily involves the discharging of thermally elevated waters into Oyster Creek.

The discharge location in Oyster Creek (see map to right) is approximately 2.33 Nautical Miles from Barnegat Bay allowing for additional mixing and dilution. Safety zones (*Prohibited* area classifications) have been established around the Oyster Creek canal/receiving area for thermally impacted water, or areas near the discharge location. *Restricted* buffers are located further out from the discharge location and abutting bayfront areas have been blanketed with *Seasonal* classifications, providing an additional buffer.

Should the Oyster Creek Generating Station malfunction, this Bureau has sufficient time to cease shellfishing in harvestable waters outside the plant's immediate location. Shellfish harvesting from contaminated waters and subsequent human ingestion is unlikely with the aid of safety zones, and warning systems.



Direct Discharge to Waters of Shellfish Growing Area BB3 - Westecunk Creek to Sunrise Beach - South - Central Ocean County, New Jersey
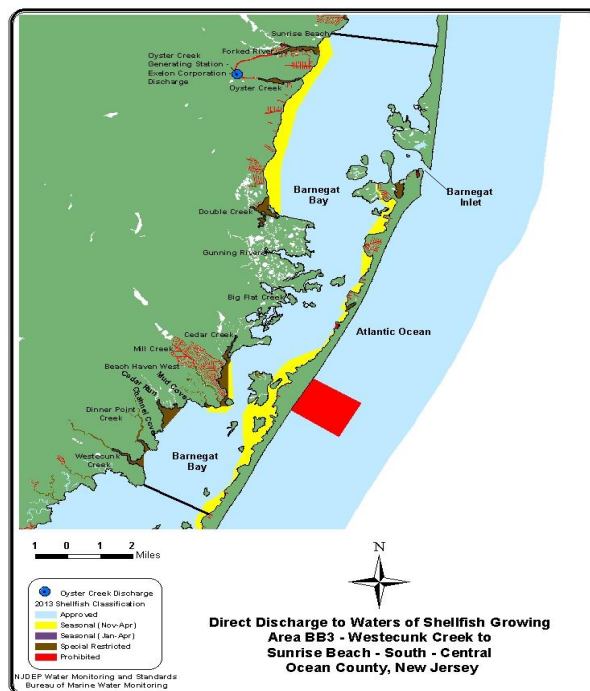
Monitoring reports and review of State and Federal inspection summaries provide important information as this plant represents the only potential point source of contamination in the BB3 shellfish growing area. A summary of the Oyster Creek Generating Station follows.

**Oyster Creek Generating Station**

Exelon's Oyster Creek (nuclear) Generating Station is located in Lacey Twp. on Route 9 South, PO Box 388, Forked River, New Jersey 08731. Operations began in December 1969 and continued operation is expected until its retirement date of 2019.

The Oyster Creek nuclear facility utilizes a single boiling water reactor. It produces 645 net megawatts of electricity and is rated for 670 megawatt production. The plant serves nearly 600,000 homes.

| Facility Name | *Waste Type* | Avg. Waste Quantity (MGD) | Discharge |
|---|---|---|---|
| **Oyster Creek Nuclear Generating Station** | Non-Contact Cooling Water and Stormwater | 1326 | Thermally Impacted Cooling Water and Stormwater Effluent |

Intake water for the plant is primarily provided by Forked River. Intake water is used for two purposes. The first entails the circulating and service water systems. That operation utilizes as much as 662.4 MGD to cool the main condenser. Four intake pumps with a capacity of 115,000 gallons per minute service the circulating and service water systems. Intake water is also used for the dilution water system. For this second operation, an average of 708 MGD is used to counter the

thermal effects in the discharge canal. However, dilution water can reach as much as 1123.2 MGD. Three low speed pumps that individually have a capacity of up to 260,000 gallons per minute provide water for the dilution water system.

The facility has a New Jersey Pollution Discharge Elimination System (NJPDES) Permit (# NJ0005550) that allows them to discharge the following: non-contact cooling water from the operation of the plant, and storm water runoff. The daily discharge into Oyster Creek is 1,326 MGD (see table on previous page). This is comprised of 592 MGD non-contact cooling water from the circulating water and service water systems, and 732 MGD of dilution water along with 2.4 MGD of intake screen wash water.

The regulatory standards for thermal surface water quality for the plant in relation to its utilization of Forked River, Oyster Creek, and Barnegat Bay follow: Ambient temperatures in the receiving waters shall not increase more than 4 degrees F from September through May. During June through August, ambient temperatures can not move higher than 1.5 degrees F, and water temperatures shall not exceed 85 degrees F except in areas designated for heat reduction.

Fish kills have been associated with the Oyster Creek Nuclear Generating Facility. Rapid ambient temperature increases resulting from warm water effluents have been the cause in such instances. Generally, fish kill events have been occasional circumstances.

Oyster Creek has also been involved in diluting a tritium plume that had been identified in 2009. This plume was discovered to have built up in ground water following the discovery of a leak in plant infrastructure. At this time, the plant suggests that tritium plume size has been greatly reduced, and tritium levels through dilution processes are negligible.

Tritium pumped up from ground water sources, has been diluted by the plant and with NJDEP approval, has been subsequently released into their discharge canal. Inquiries on the plant can be researched at http://datamine2.state.nj.us/dep/DEP_OPRA/ when using Water Quality as your Program and the Program Interest ID of 46400. Additional nuclear regulatory information research can be gathered from the Nuclear Regulatory Commissions' web site, www.nrc.gov/ and the Bureau of Environmental Radiation (NJDEP) site at www.state.nj.us/dep/rpp/ber/.

The Oyster Creek plant is required by permit to monitor for radio nucleotide emissions on a quarterly basis. All monitoring reports must be sent to the New Jersey Department of Environmental Protection, Bureau of Environmental Radiation for review.

The facility is also required to test the local environment for impacts from radiation. This provides information for an annual report that must be compiled and submitted to the NRC. Testing includes air particulates, soil, stream, and bay sediments, along with shellfish, crustacean, and finfish flesh. Two primary isotopes examined for the plants annual report include Cobalt - 60 and Cesium - 137. Comparison or background samples are taken from Great Bay.

Aside from circumstances related to sudden increases in ambient water temperature, and the ongoing dilution of tritium from groundwater beneath the plant, this generating facility's operation and operational standards, appear to be in order at this time. As there appears to be a lack of impact

related circumstances connected to the direct discharges of Oyster Creek and BB3 shellfish growing waters, no dimensional adjustments requiring an increase in the size of *Prohibited* or *Special Restricted* areas surrounding the facility are required at this time.

Direct inputs discharged from facilities can require the use of Adverse Pollution Condition Strategy for monitoring under conditions that have historically resulted in elevated levels of coliform for a particular growing area. The Oyster Creek facility discharges thermally impacted water in an area at some distance from the primary growing waters of BB3. Impact from a bacteriological standpoint for this plant has not been an issue from Bureau monitoring and available data. As a result, the direct discharge of this plant has not been connected with the need to use the APC Strategy and the SRS strategy is used instead.
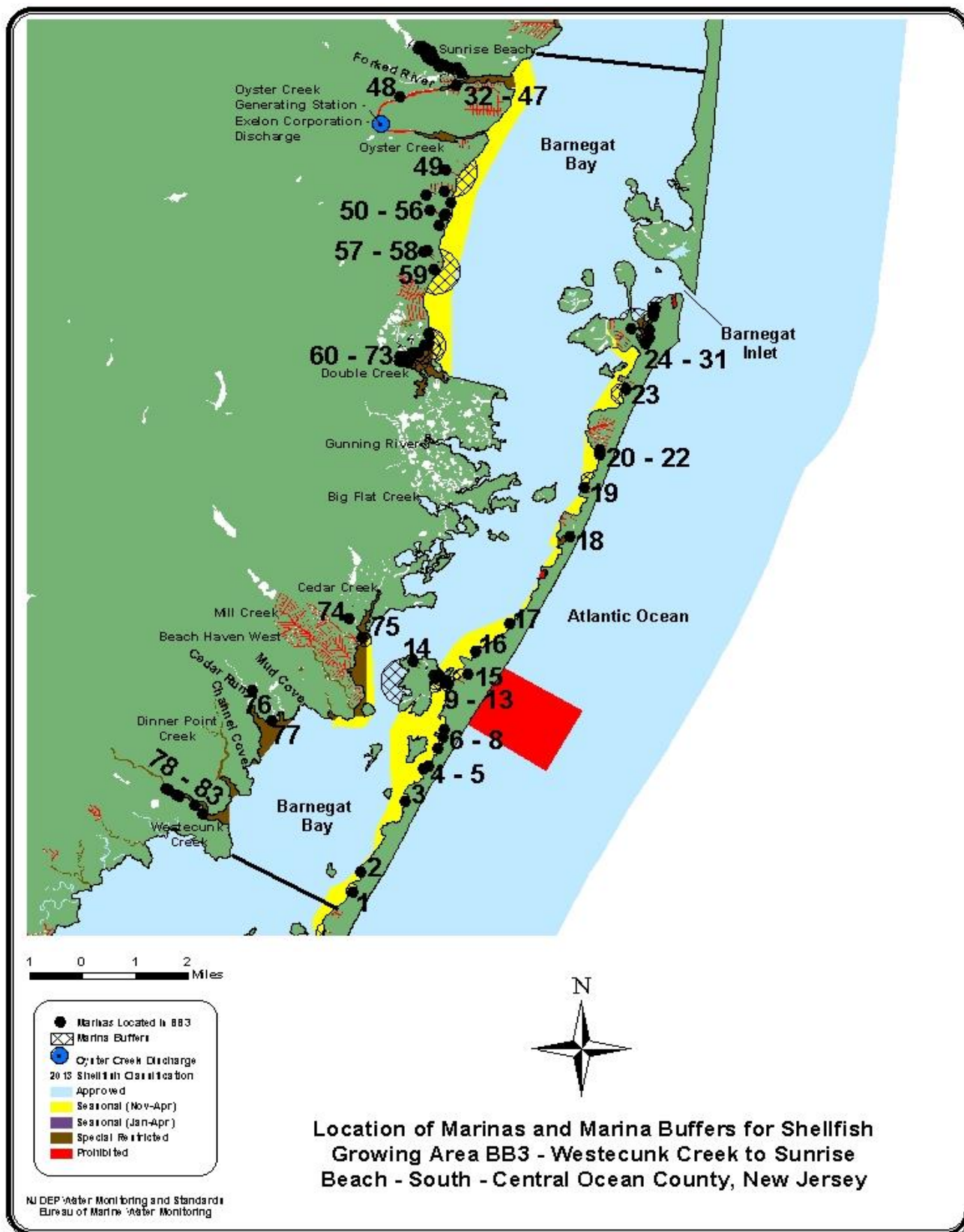
## MARINAS

Marina facilities have the potential to affect the suitability of shellfish growing areas for the harvest of shellfish. This potential evolves from the concern over public health and safety in relation to the biological and chemical contamination that may be associated with marina facilities.

There are 83 marinas in Shellfish Growing Area BB3, as presented in the map and tables shown on the pages that follow. Generally, these marinas are spread throughout the back bay shorelines of BB3 (both western and eastern shores). The majority of the marinas are located in or near developed urban areas. Frequently, marinas are located outside lagoon and bayfront communities, cove areas, creeks, or rivers.

The largest clusters of marinas in BB3 are located in Forked River, Double Creek, Barnegat Light, and Ship Bottom. There are no marinas on the more northeast section of BB3, as that section is part of Island Beach State Park.

The waters enclosed by marinas (marina basins) are classified as *Prohibited*. Depending on the size of the marina and water quality, the waters immediately adjacent to each marina may be classified as *Prohibited*, *Special Restricted,* or *Seasonally Approved* (no harvest during summer months when the marina is active).

Marina buffer zones for State waters were calculated using the NJ Marina Buffer Equation or the Virginia Model (i.e., computer model developed by the State of Virginia). Both equations are approved by the US Food and Drug Administration. For more information on marinas and marina buffers, see the Shellfish Growing Area Report Guidance Document.

Location of Marinas and Marina Buffers for Shellfish Growing Area BB3 - Westecunk Creek to Sunrise Beach - South - Central Ocean County, New Jersey

| Marina Map Key | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Map ID | Name | Location | # of Slips | Slips > 24 ft | slips < 24 ft | Depth (ft) | Buffer (radius, ft) | VA Model | Onsite Pumpout |
| 1 | Haven Beach Club | Little Egg Harbor | 50 | 30 | 20 | 3 | 971.00 | - | - |
| 2 | Beach Haven Park Yacht Club | Little Egg Harbor | 20 | 20 | 0 | 3 | 15.00 | Yes | - |
| 3 | Brant Beach Yacht Club | Little Egg Harbor | 65 | 65 | 0 | 3 | 1319.0 | - | - |
| 4 | Marine Max Brant Beach | Little Egg Harbor | 40 | 15 | 25 | 4 | 657.00 | - | - |
| 5 | Haglers Marina | Little Egg Harbor | 50 | 50 | 0 | 3 | 1157.0 | - | - |
| 6 | Sunset Marina | Little Egg Harbor | 105 | 84 | 21 | 3 | 1547.0 | - | Yes |
| 7 | Ship Bottom Maine Center LLC | Manahawkin Bay | 16 | 3 | 13 | 3 | 413.00 | - | - |
| 8 | BB3 Unknown1 | Manahawkin Bay | 30 | 20 | 10 | 5 | 602.00 | - | - |
| 9 | Hochstrassers Marina | Manahawkin Bay | 70 | 70 | 0 | 9 | 790.00 | - | - |
| 10 | BB3 Unknown10 | Manahawkin Bay | 50 | 50 | 0 | 9 | 668.00 | - | - |
| 11 | BB3 Unknown 3 | Manahawkin Bay | 20 | 20 | 0 | 3 | 732.00 | - | - |
| 12 | Dukes Bayside Dock | Manahawkin Bay | 20 | 20 | 0 | 3 | 732.00 | - | - |
| 13 | Ducks Inn Marina | Manahawkin Bay | 50 | 50 | 0 | 3 | 1157.0 | - | - |
| 14 | Causeway Marine | Manahawkin Bay | 200 | 200 | 0 | 3 | 22.00 | Yes | - |
| 15 | Surf City Marina | Manahawkin Bay | 71 | 71 | 0 | 10 | 755.00 | - | - |
| 16 | Surf City Yacht Club | Manahawkin Bay | 70 | 70 | 0 | 3 | 1369.0 | - | - |
| 17 | BB3 Private Property 2 | Manahawkin Bay | 5 | 5 | 0 | 5 | 283.00 | - | - |
| 18 | Harvey Cedar Marina | Barnegat Bay | 10 | 10 | 0 | 3 | 517.00 | - | - |
| 19 | Boat Yard | Barnegat Bay | 5 | 5 | 0 | 3 | 366.00 | - | - |
| 20 | BB3 Unknown 4 | Barnegat Bay | 10 | 0 | 10 | 5 | 204.00 | - | - |
| 21 | BB3 Unknown 5 | Barnegat Bay | 18 | 10 | 8 | 5 | 440.00 | - | - |
| 22 | BB3 Private Property1 | Barnegat Bay | 5 | 2 | 3 | 5 | 211.00 | - | - |
| 23 | Loveladies Marina Inc. | Barnegat Bay | 50 | 50 | 0 | 5 | 896.00 | - | Yes |
| 24 | Barnegat Light Yacht Basin | Barnegat Bay | 52 | 52 | 0 | 3 | 1180.0 | - | - |
| 25 | Marina At Barnegat Light | Barnegat Bay | 40 | 40 | 0 | 3 | 1035.0 | - | - |
| 26 | Bayview Marina | Barnegat Bay | 50 | 50 | 0 | 3 | 1157.0 | - | Yes |
| 27 | High Bar Harbour Marina | Barnegat Bay | 170 | 170 | 0 | 3 | 71.00 | Yes | Yes |
| 28 | Erics Boat | Barnegat Bay | 35 | 35 | 0 | 3 | 968.00 | - | - |
| 29 | Kellys Boat Rental | Barnegat Bay | 10 | 10 | 0 | 3 | 517.00 | - | - |
| 30 | Bobbies Boat | Barnegat Bay | 6 | 6 | 0 | 3 | 401.00 | - | - |
| 31 | Lighthouse Marina | Barnegat Bay | 80 | 80 | 0 | 3 | 671.00 | Yes | - |
| 32 | Southwinds Harbour Marina | Forked River | 150 | 150 | 0 | 6 | 1417.0 | - | - |
| 33 | BB3 Condo1 | Forked River | 50 | 50 | 0 | 5 | 896.00 | - | - |
| 34 | Captains Inn | Forked River | 40 | 40 | 0 | 5 | 801.00 | - | - |
| 35 | Rivers Edge Marina | Forked River | 25 | 25 | 0 | 5 | 634.00 | - | - |
| 36 | Tides End Marina | Forked River | 90 | 90 | 0 | 5 | 1202.0 | - | - |
| 37 | Townsend's Marina | Forked River | 70 | 70 | 0 | 5 | 1060.0 | - | - |
| 38 | Ricks Marina | Forked River | 30 | 30 | 0 | 5 | 694.00 | - | - |
| 39 | Ted & Sons Forked River Marina | Forked River | 50 | 50 | 0 | 5 | 896.00 | - | - |
| 40 | Grant Boat Works | Forked River | 27 | 27 | 0 | 5 | 658.00 | - | - |
| 41 | Forked River Yacht Sales | Forked River | 100 | 100 | 0 | 5 | 1267.0 | - | - |
| 42 | Bara Marine | Forked River | 17 | 17 | 0 | 5 | 522.00 | - | - |
| 43 | River Lights Marina | Forked River | 30 | 30 | 0 | 5 | 694.00 | - | - |
| 44 | Silver Cloud Harbor Marina | Forked River | 40 | 40 | 0 | 5 | 801.00 | - | - |
| 45 | Wilberts Marina | Forked River | 20 | 20 | 0 | 5 | 567.00 | - | - |
| 46 | Forked River State Marina | Forked River | 125 | 115 | 10 | 5 | 1374.0 | - | - |
| 47 | Elks Point Club | Forked River | 100 | 50 | 50 | 8 | 795.00 | - | - |
| 48 | BB3 Unknown | Forked River | 57 | 57 | 0 | 14 | 582.00 | - | - |
| 49 | Holiday Harbor Marina | Barnegat Bay | 200 | 200 | 0 | 3 | 2314.0 | - | - |
| 50 | BB3 Unknown 2 | Waretown Creek | 40 | 40 | 0 | 3 | 1035.0 | - | - |
| 51 | Long Key Yacht Club | Waretown Creek | 130 | 40 | 90 | 3 | 1303.0 | - | - |
| 52 | Boathouse Grill | Barnegat Bay | 18 | 18 | 0 | 3 | 694.00 | - | - |
| 53 | South Harbor Marine | South Harbor | 32 | 32 | 0 | 3 | 925.00 | - | - |
| 54 | Sanborn Marine Center | South Harbor | 42 | 30 | 12 | 3 | 942.00 | - | - |
| 55 | Stans Marine Center | South Harbor | 130 | 130 | 0 | 3 | 1865.0 | - | Yes |
| 56 | BB3 Condo 2 | Liberty Harbor | 80 | 80 | 0 | 3 | 1463.0 | - | - |
| 57 | Lagoon View Yacht Club | Barnegat Bay | 30 | 30 | 0 | 3 | 896.00 | - | - |
| 58 | Leamings Marina | Barnegat Bay | 76 | 31 | 45 | 3 | 1069.0 | - | - |
| 59 | Cape Island Marina | Barnegat Bay | 265 | 187 | 78 | 3 | 2355.0 | - | - |
| 60 | Mystic Sailing Port | Barnegat Bay | 8 | 8 | 0 | 3 | 463.00 | - | - |
| 61 | BB3 Condo 3 | Barnegat Bay | 60 | 60 | 0 | 3 | 1267.0 | - | - |
| 62 | BB3 Unknown 9 | Barnegat Bay | 15 | 15 | 0 | 3 | 634.00 | - | - |
| 63 | BB3 Condo 4 | Barnegat Bay | 40 | 40 | 0 | 3 | 1035.0 | - | - |
| 64 | Sun Harbor Marina | Barnegat Bay | 60 | 60 | 0 | 3 | 1267.0 | - | Yes |
| 65 | Bobs Bay Marina | Barnegat Bay | 90 | 90 | 0 | 3 | 1552.0 | - | Yes |
| 66 | Mariners Marina | Barnegat Bay | 150 | 150 | 0 | 3 | 2004.0 | - | Yes |
| 67 | Dirb Boat | Double Creek | 20 | 20 | 0 | 3 | 732.00 | - | - |
| 68 | BB3 Unknown 8 | Double Creek | 14 | 14 | 0 | 3 | 612.00 | - | - |

| Marina Map Key | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Map ID | Name | Location | # of Slips | Slips > 24 ft | slips < 24 ft | Depth (ft) | Buffer (radius, ft) | VA Model | Onsite Pumpout |
| 69 | Captain Brownies Seafood | Double Creek | 15 | 15 | 0 | 3 | 634.00 | - | - |
| 70 | Bobs Dockage | Double Creek | 9 | 9 | 0 | 3 | 491.00 | - | - |
| 71 | Barnegat Boat Basin | Double Creek | 13 | 13 | 0 | 3 | 590.00 | - | - |
| 72 | East Bay Marina | Double Creek | 29 | 29 | 0 | 3 | 881.00 | - | - |
| 73 | Sherers Boat Basin | Double Creek | 60 | 60 | 0 | 3 | 1267.0 | - | - |
| 74 | Hance & Smythe | Manahawkin Creek | 18 | 18 | 0 | 3 | 694.00 | - | - |
| 75 | Margos Inn Marina | Manahawkin Bay | 40 | 40 | 0 | 3 | 9.00 | Yes | - |
| 76 | Marina Russos | Cedar Run | 15 | 15 | 0 | 3 | 634.00 | - | - |
| 77 | BB3 Unknown 7 | Little Egg Harbor | 8 | 8 | 0 | 5 | 358.00 | - | - |
| 78 | West Creek Marina | Westecunk Creek | 50 | 50 | 0 | 5 | 896.00 | - | - |
| 79 | Nottes Landing | Westecunk Creek | 18 | 18 | 0 | 5 | 538.00 | - | - |
| 80 | Ernies Marina | Westecunk Creek | 10 | 10 | 0 | 5 | 401.00 | - | - |
| 81 | Toms Marine | Westecunk Creek | 10 | 10 | 0 | 5 | 401.00 | - | - |
| 82 | Nolans Marina | Westecunk Creek | 10 | 10 | 0 | 5 | 401.00 | - | - |
| 83 | BB3 Unknown 6 | Westecunk Creek | 15 | 15 | 0 | 5 | 491.00 | - | - |

## SPILLS, UNPERMITTED DISCHARGES, AND CLOSURES

With the exception of Hurricane's Irene (August 2011) and Superstorm Sandy (October 2012), which brought about the interim closure of all State shellfish growing waters as a precaution for public health and safety, there have been no spills or unpermitted discharges that resulted in the closure of waters in shellfish growing area BB3.

Leaks or spills that do take place within New Jersey's shellfish growing waters are often the result of a variety of circumstances such as boats sinking, issues with sewage treatment plants such as pump station failure, broken sewer lines, sewer line back up, manhole overflow, broken pipes in commercial or residential locations, improper run off from commercial or residential locations, construction, and road runoff.

Often, the spills or unpermitted discharges noted above have limited impact on the chemical or bacteriological water quality in a shellfish growing area like BB3. Generally, the spills and discharges are rather small, and their distance to these shellfish growing waters is such that impact is reduced from dilution, percolation, and absorption. From the perspective of this report, which is generally founded on bacteriological results for fecal coliform, Bureau monitoring locations for BB3 continue to show relatively good water quality. Again, no specific spill or discharge brought about the closure of shellfish growing waters for BB3 during this reporting period.

## STORM WATER DISCHARGES

Environmental pressures on shellfish beds in New Jersey can originate in materials that enter growing waters via stormwater. These materials include bacteria, as well as other waste that enters the stormwater collection system.

Deriving information on the location and nature of stormwater inputs is partially accomplished by conducting shoreline surveys of shellfish growing area waterways, contributing waterways (e.g., rivers, creeks, etc.), and nearby communities. Shoreline surveys have provided evidence of two ways that storm runoff enters the estuarine waters of BB3. Stormwater delivered to these shellfish growing waters can be derived from non-directed runoff/input. Stormwaters also arrive by more specific means of drainage such as outfalls.
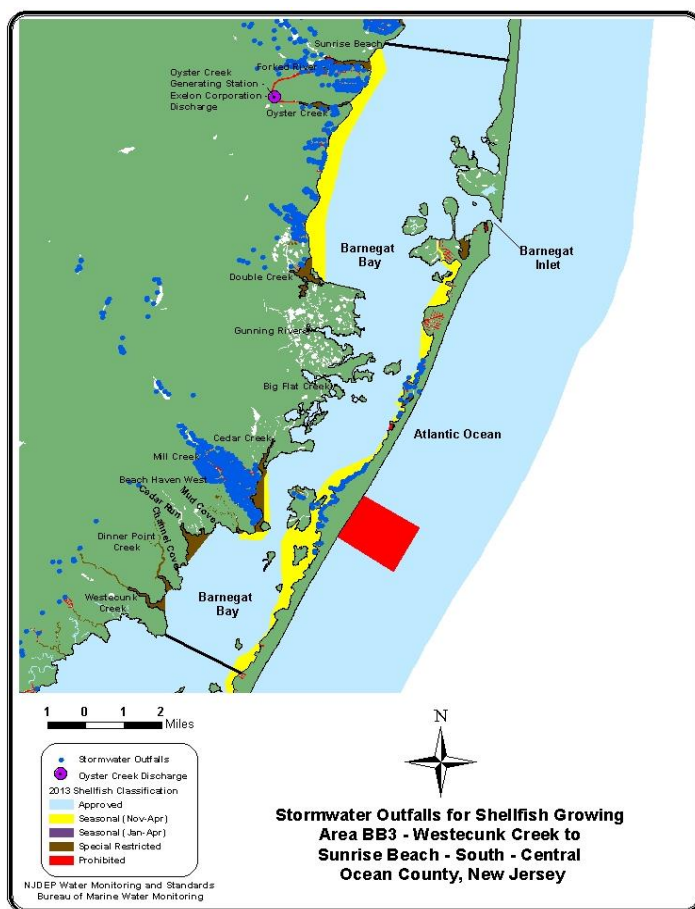
For BB3, non-directed runoff/input flows over land into streams, creeks, rivers, marina basins, and lagoon/bayfront community areas. Non-directed runoff then can occur in both developed community locations and more natural environs.

Stormwater outfalls are generally found near more developed areas. Examples of such locations would include lagoon/bayfront communities or marina basins that surround Shellfish Growing Area BB3.

Stormwater can especially impact lagoon communities and marina basins where pollutants can be concentrated for some time depending on rain, wind, and tide. Numerous stormwater outfalls can generally be found in lagoonfront communities. The pollutants that gather in lagoon communities and the basins of marinas are often more prevalent during summer when populations and utilization increase.

Lagoons, like marina basins are always classified as *Prohibited* waters. Further, the water's outside most lagoons have been classified as *Seasonally Approved* or *Special Restricted*, which provide additional buffers.

The eventual conveyance of pollutants from stormwater drains can be concentrated too. Pollutants within these systems have often been held for some time before receiving enough water to flush or purge the infrastructure.



Stormwater Outfalls for Shellfish Growing Area BB3 - Westecunk Creek to Sunrise Beach - South - Central Ocean County, New Jersey

Inputs found in stormwater such as petrochemicals, cleaning materials, paints, wood preservatives, animal waste or remains, and fertilizers come from a variety of sources. These sources again include lagoon/bayfront communities, marinas, creeks, streams, and rivers. Sources can also include boats, cars, birds, and domesticated/non-domesticated animals. The locations of stormwater outfalls for Shellfish Growing Area BB3 are shown in the figure on this page.

# WATER QUALITIES STUDIES

## SAMPLING STRATEGY

Shellfish growing area BB3 was sampled using the Systematic Random Sampling (SRS) strategy. Utilization of the SRS strategy requires using a minimum of the most recent thirty samples collected

for each sampling station, which brought about an analysis of data from January 2009 to October 2013.

With the SRS strategy, the 30 sample composite of data is supported by a minimum requirement of six samples per year. The SRS strategy is frequently used in areas where precipitation, seasonality, or tide play important roles. New Jersey commonly uses SRS strategy for back bay waters.

Each shellfish producing state is directed to adopt either the total coliform or fecal coliform criterion to classify its waters. The criteria were developed to ensure that shellfish harvested from designated waters would be free of pathogenic (disease-producing) bacteria. Combinations of these criterion may also be used. While New Jersey had been using fecal coliform analysis (direct 3-tube, A-1) and criteria for its ocean waters and total coliform analysis (3-tube, 3-dilution) and criteria for its back bay areas, BMWM/WM&S switched all State shellfish growing areas over to the criteria for fecal coliform in February, 2012, and the method for analysis changed as well.

BMWM/WM&S now use mTEC agar plating to facilitate the fecal coliform bacteriological analysis for samples taken within New Jersey shellfish growing areas, and had been acquiring adjunct mTEC data for its growing areas for some time in order to statistically facilitate the transition to mTEC. Statistical facilitation, in the case of Shellfish Growing Area BB3 refers to converting past, 3-tube TC data to 3-tube FC data, then combining that data in a conversion process with current mTEC data in order to obtain statistically valid measurements during the transition.
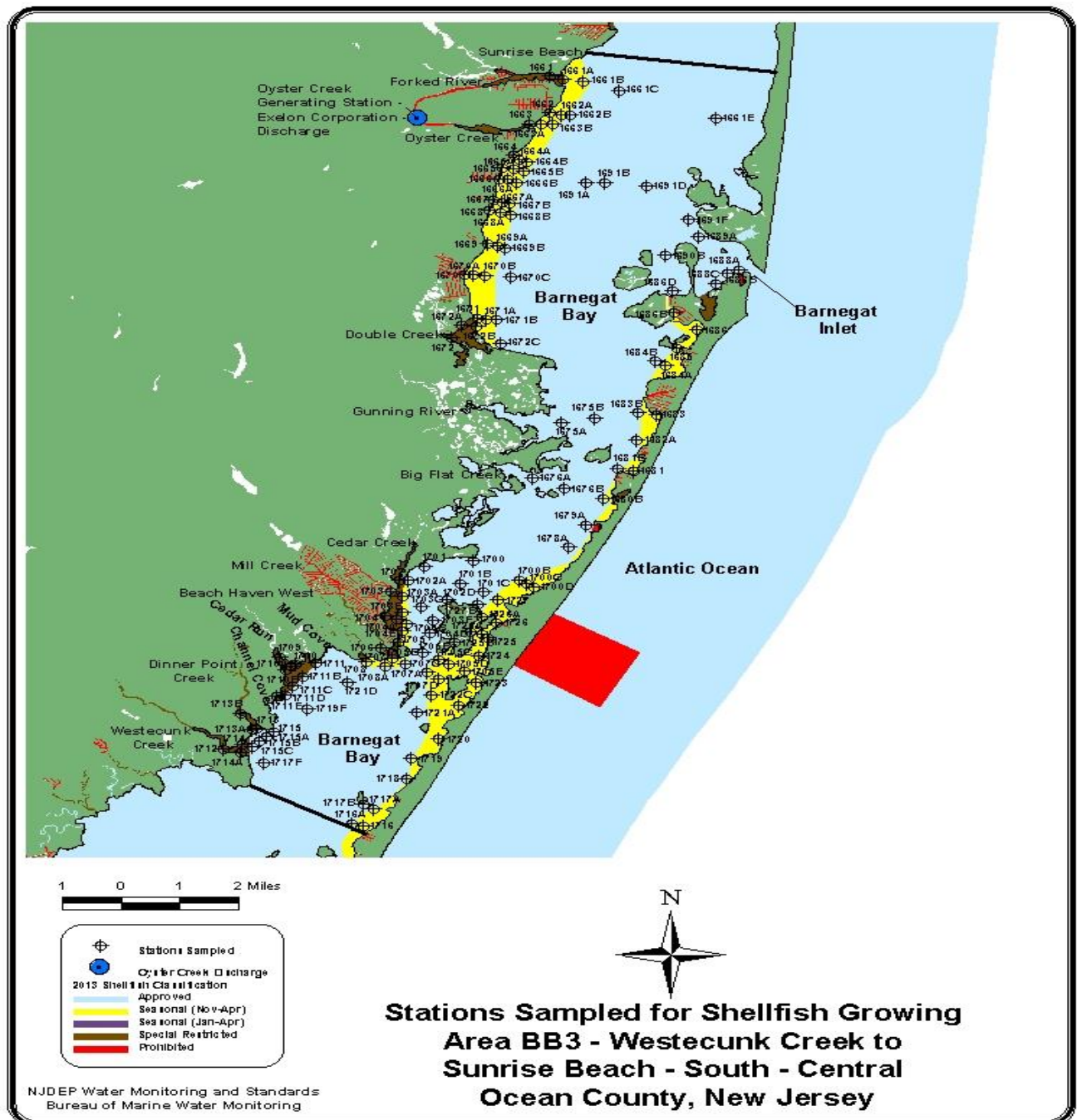
Each classification criterion is composed of a measure of the statistical 'central tendency' (geometric mean) and the relative variability of the data set. For the Systematic Random Sampling (SRS) strategy, variability is expressed utilizing the estimated 90th percentile. An area to be approved under the *Seasonal* classification must be sampled and meet the criterion during the time of year that it is approved for the harvest of shellfish. The table below shows the statistical criteria for the SRS strategy.

| Statistical Criteria for SRS Strategy | | | | | |
|---|---|---|---|---|---|
| | Total Coliform Criteria | | Fecal Coliform Criteria | | |
| | Geometric mean (MPN/100 mL) | Maximum 90th percentile (MPN/100 mL) | Geometric mean (MPN/100 mL) | Maximum 90th percentile (MPN/100 mL) | |
| Approved Water Classification | 70 | 330 | 14 | 49 w/ direct 3-tube, A1 | 31 w/ mTEC Agar |
| Special Restricted Water Classification | 700 | 3300 | 88 | 300 w/direct 3-tube, A1 | 163 w/ mTEC Agar |

Data management and analysis was accomplished using database applications developed for the Bureau. Mapping of pollution data was performed with the Geographic Information System (GIS: ARCMAP).

Water sampling was performed in accordance with the Field Sampling Procedures Manual (NJDEP, 2005). Water quality sampling, analysis, and shoreline/watershed surveys were conducted in accordance with the NSSP *Guide for the Control of Molluscan Shellfish,* 2011.

The results for this Reappraisal were compiled from Assignments 107, 114, 117, 121 and 122. A review of the records suggests that 5049 water samples were collected from 141 surface stations between 2009 and 2013 and analyzed using the combination of analyses described in this section. The BB3 shellfish growing water monitoring stations are presented below. Additional information on lab methodology and sampling strategy can be found in the Shellfish Growing Area Report Guidance Document.
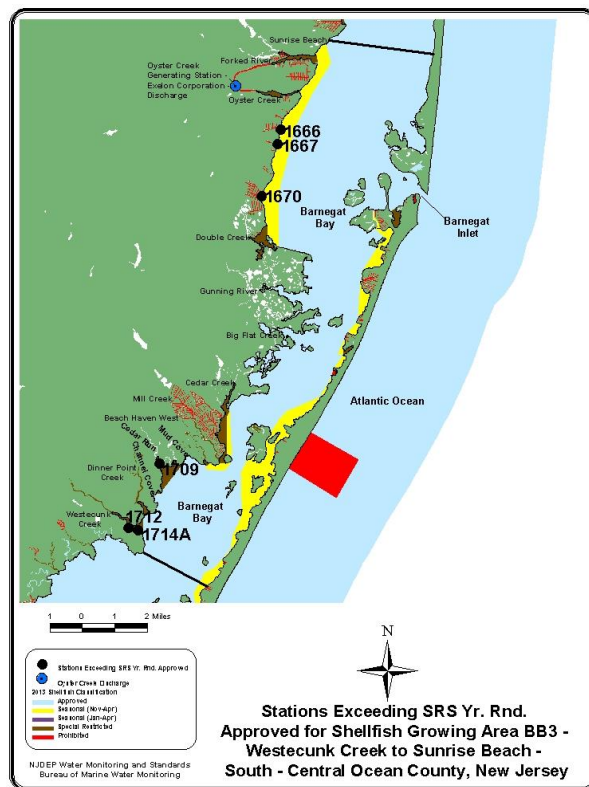


Stations Sampled for Shellfish Growing Area BB3 - Westecunk Creek to Sunrise Beach - South - Central Ocean County, New Jersey

# BACTERIOLOGICAL QUALITY

## Compliance with NSSP SRS Approved Criteria

The map to the right shows six stations (1666 – SNA, 1667 – SNA, 1670 – SNA, 1709 - SR, 1712 – SR, and 1714A – SR) that did not meet SRS year round criteria for *Approved* water (FC w/ 30 or more samples). The NSSP - SRS criterion for *Approved* waters suggests the geometric mean shall not exceed 14 MPN/ 100 mL, which remains the same with the statistical combinations used in this report.

According to NSSP criteria, FC analysis for three tube, A-1 provides that the estimated 90th percentile shall be no greater than 49 MPN/100 mL. With the combinations of data used in this report (i.e., three – tube TC and FC in combination with mTEC for FC), the statistical criteria now provides that the estimated 90th percentile shall be no greater than 39 MPN/100 mL w/ 35/36 samples. This would also be the same criteria for a station located in *Seasonal* waters during the Nov-Apr time frame when harvesting would be allowed for that classification.



Stations Exceeding SRS Yr. Rnd.
Approved for Shellfish Growing Area BB3 -
Westecunk Creek to Sunrise Beach -
South - Central Ocean County, New Jersey

Three of the above mentioned stations (1666 – SNA, 1667 – SNA, 1670 – SNA) are located in *Seasonal* waters, and three stations (1709 – SR, 1712 – SR and 1714A – SR) are located in *Special Restricted* waters. All of these stations are located along the northwestern and southwestern shoreline. Although these stations exceeded SRS yr. rnd. *Approved* criteria, they did not statistically exceed the criteria for their location within *Seasonal* (Nov-Apr) and *Special Restricted* waters.

Year round NSSP and SRS FC analysis for three tube, A-1 requires a station located in *Special Restricted* waters to have a geo-mean no higher than 88 MPN/100 mL, and the estimated 90th percentile should not exceed 300 MPN/100 mL w/ 30 or more samples. With the combinations of data used in this report (i.e., three – tube TC and FC in combination with mTEC for FC), the statistical criteria now provides that the geo-mean remains the same at 88 MPN/100 mL, and the estimated 90th percentile is to be no greater than 221 MPN/100 mL w/ 36 samples for *Special Restricted* waters.

The year round geometric means (FC) for all of these stations were no higher than 13.0 MPN/100 mL, which was acceptable. *Special Restricted* stations 1709, 1712 and 1714A had yr. rnd. est. 90th percentiles that were no higher than 82.4 MPN/100 mL. So stations 1709 - SR, 1712 – SR and 1714A – SR did not exceed the criteria for their *Special Restricted* classification with their geo-means and est. 90th percentiles.

With 35/36 samples, stations 1666 - SNA, 1667 – SNA, and 1670 - SNA had yr. rnd. estimated 90th percentiles of 42.7, 50.6 and 105.1 MPN/100 mL, respectively. These numbers exceed NSSP-SRS year round *Approved* criteria regarding estimated 90th percentiles (all three stations).

Statistically, with 15 samples, stations 1666 - SNA, 1667 – SNA and 1670 - SNA were worse during the summer but these stations are *Seasonal* (Nov - Apr). With an extended data pull of 34/35 samples during the winter, stations 1666 - SNA, 1667 – SNA and 1670 - SNA showed the following: geo-means were no higher than 6.1 MPN/100 mL and estimated 90th percentiles were no higher than 37.3 MPN/100 mL.

For a sample set of 34/35, the estimated 90th percentile should not exceed 43 MPN/100 mL with regard to the statistically combined analysis used in this report. With the extended data set, representing the appropriate number of samples (30 or more), stations 1666 - SNA, 1667 – SNA, and 1670 - SNA were found to be statistically acceptable with regard to their *Seasonal* (Nov-Apr) classifications.

Although stations 1666 - SNA, 1667 – SNA, and 1670 - SNA are located in *Seasonal* (Nov-Apr) waters, they also sit very closely to the borders of *Prohibited* waters, which are attributed to the lagoon areas that are located in close proximity. During every annual reporting year, the data for these stations shows fairly high year round estimated 90th percentiles. As they are Seasonal stations, it is most important that their data represents the appropriate criteria during the November – April time frame. With fewer than 30 samples during this time frame [(20 - 21 in this year's annual report)], these stations always show the higher percentiles discussed above. When pulling in enough data to satisfy the SRS criteria of 30 or more samples, the stations always show better criteria [within *Approved* criteria during harvest period (Nov-Apr)], and this is fine.

During this year's shoreline survey (08/20/13), we wanted to observe the attributes of the areas where these stations are located in order to better understand the higher counts perceived yearly, in the first data pull. The lagoon areas (described above) near the locations of these stations are obvious from our maps. We have been curious though, about the general components of these lagoon areas so we used this year's shoreline survey to learn more.

During the shoreline survey, we observed that stations 1666 and 1667 have marinas located just inside the lagoon complexes, immediately to the west of their locations. Station 1670, has no marina's located within the Pebble Beach lagoon complex to its west. Interestingly though, it shows the worst counts of the three stations. All of these lagoon complexes have stormwater outfalls and there is no shortage of larger vessels with waste holding tanks onboard. Marinas, larger marine vessels, and stormwater outfalls could be contributing higher coliform counts to the data for these stations. This type of bacteriological and shoreline survey review, can provide insight as to where further monitoring could take place in order to isolate and deter bacteriological influences within State waters.

## Rainfall Effects

Precipitation patterns in the coastal areas of New Jersey are typical of the Mid-Atlantic coastal region. Summer storms are localized and often associated with thunder and lightening activity. Winter storms are frequently associated with northeasters. Hurricanes can occur during the summer and early fall. Additional information on annual storm averages, duration, intensity, and event volume is provided in the Shellfish Growing Area Report Guidance Document.

The reporting period for this Reappraisal encompasses the time frames when Hurricane Irene, and Superstorm Sandy took place (08/2011 and 10/2012, respectively). In addition, 2013 proved to be a year of substantial rainfall for the State. From a bacteriological standpoint, the rainfall accumulations seen during these storm events or this past year did not seem to drastically affect the bacterial data for this reporting period. Those areas where expectations for higher or lower bacteriological results were fairly replicative in regard to previous reporting time frames, geometric means, and estimated 90th percentiles relating to FC. Some short term effects were obvious though with regard to storms and FC counts shown in the data.



Stations w/ Rain Components for
Shellfish Growing Area BB3 -
Westecunk Creek to Sunrise Beach -
South - Central Ocean County, New Jersey

Superstorm Sandy had a greater effect on viral counts within these waters due to precipitation, subsequent runoff, flooding, and infrastructural damage to stormwater and wastewater systems. These impacts caused some waters within shellfish growing area BB3 to remain closed through mid-April 2013.

Classification of State waters is generally associated with ongoing bacteriological results as opposed to occasional viral influence, although viral influence can certainly cause a State to close waters, as noted above. In the case of "Sandy", bacterial levels generally went down fairly quickly within the shellfish and surrounding waters of Shellfish Growing Area BB3. Following Sandy, water temperatures remained above 50 degrees Fahrenheit for short while. This duration of time, allowed for bacterial die off, and gave shellfish enough time to purge the bacteriological effects of the storm, as bi-valves are more actively pumping at temperatures that are 50 degrees Fahrenheit or greater.
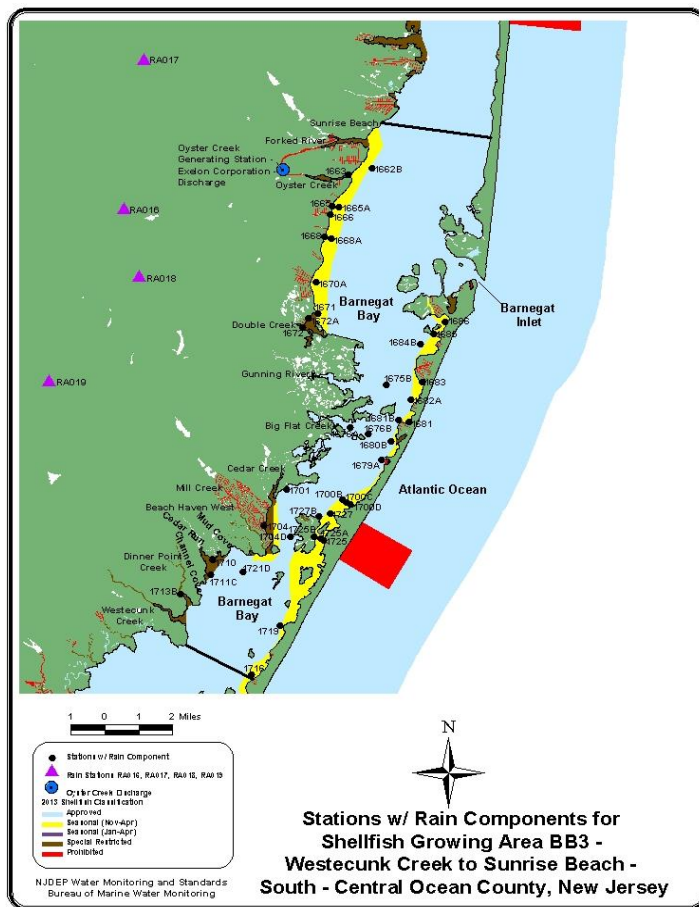
Once water temperatures dropped below 50 degrees, shellfish were less active and pumping was minimalized. As the duration of time before water temperature drop was fairly short, our monitoring and analysis suggested shellfish require longer periods of pumping to purge viruses from their tissue and guts. With this, WM&S/BMWM found that viral retention by shellfish in BB3 and other State waters remained evident for some time in various bi-valves such as the eastern oyster and the hard clam, after Sandy.

Precipitation data for BB3 was provided by the National Oceanic and Atmospheric Administration (NOAA) with WM&S'/BMWM's use of stations RA016, RA017, RA018 and RA019 for shellfish growing area BB3.

Based on Wet/Dry statistics, there were 40 stations that showed a rainfall component in relation to water quality for BB3, as shown on the previous page. Fourteen of those stations were in *Approved* waters, 20 were in *Seasonal* (Nov - Apr) waters, and six were in *Special Restricted* waters.

Rainfall components must register a t-statistical probability less than 0.05. The Wet/Dry Statistics were calculated based on an impact time of 24 hours prior to the day of sampling and a wet/dry cutoff of 0.25 inch of rain, as these criteria produced the most results for impact.

Rain component stations were found throughout most of this shellfish growing area with the exception of the western shoreline of Island Beach State Park. Stations with rain components showed a higher geometric mean during wet conditions as opposed to dry.

The highest geo-means (those above 14 MPN/100 mL) for wet conditions in the wet/dry data sheets were found for seven stations (1666 – SNA, 1672 – SR, 1685 – SNA, 1700D – SNA, 1710 – SR, 1713B – SR, 1725 – SNA) with 4/5/8 wet counts. Four of those stations were in waters classified as *Seasonal* (SNA), and three were in *Special Restricted* (SR) waters. The wet/dry geo-means for those stations were found between 15.3 – 44.6 MPN/100 mL (again with wet counts of 4/5/8).

In the Statistical Summary, the highest year round geometric mean recorded for any rain component station was 6.2 MPN/100mL (station 1672 - SR) which does not exceed criteria, and the highest estimated 90th percentile was 42.7 MPN/100 mL (station 1666 –SNA). All other rain component stations had year round est. 90th percentiles that were no greater than 37.3 MPN/100 mL. As stated in previous sections, station 1666 – SNA is a *Seasonal* (Nov- Apr) station. When extending the data pull to show at least 30 samples for the winter, station 1666 – SNA showed acceptable statistics during the winter season w/ a 3.2 MPN/100 mL geo-mean and an est. 90th percentile of 14.9 MPN/100 mL. With this, the water quality in this shellfish growing area report suggests that impact occurred from rainfall but this impact did not affect shellfish classifications.

**Seasonal Effects**

Many urban developed lands in this area experience significant seasonal fluctuations in population. During the summer months, increased population can result in increased impacts to the waters of BB3. However, impacts to back bay waters are not necessarily isolated as warmer month occurrences. Various circumstances such as storm activity can create impact during the winter. When impacts are observed as seasonally specific, monitoring programs are arranged to provide the

best seasonally designed monitoring. For the five assignments (107, 114, 117, 121 and 122), 114, 117 and 121 are sampled with *Seasonal* priorities by design.

Fifty-two stations, which are presented in the map to the right, showed a seasonal component. Thirteen stations were in *Approved* waters, 20 stations were in waters classified as *Seasonal* (Nov-Apr), and 19 were in water's classified as *Special Restricted*.

Seasonal components must register a t-statistical probability less than 0.05. There are clusters of stations with seasonal components located outside Beach Haven West, Cedar Run, Dinner Point Creek, Westecunk Creek, Ship Bottom, Harvey Cedars, Barnegat Light, Double Creek, Oyster Creek, and Forked River Beach.

Seasonal components were more apparent on the western side of the growing area. There are lagoon sections, marinas, and public docks within the areas where many of the seasonal components were observed. This could account for variation in the seasonal data for summer as these areas are more heavily used during that time frame.



Stations w/ Seasonal Component for Shellfish Growing Area BB3 - Westecunk Creek to Sunrise Beach - South - Central Ocean County, New Jersey

NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring

All stations showed higher statistical geometric means during the summer months. For the stations with seasonal components, the highest geometric means in the seasonal data sheets (above 14 MPN/100 mL – 12 - 22 samples) were 26.7, 18.9, 21.0, and 15.4 MPN/100 mL (stations 1670 – SNA, 1709 – SR, 1712 – SR and 1714A - SR), which did not exceed *Special Restricted* criteria for the classified waters where three of these stations are located. Station 1670 – SNA did have a higher geo-mean at 26.7 MPN/100 mL suggesting, with 15 samples it showed a potential to exceed SRS *Approved* criteria. However, 1670 – SNA is a *Seasonal* station, and with 35 samples during the winter, its geo-mean was only 6.1 MPN/100 mL, as suggested already. All other stations in the seasonal data sheets had geo-means that were ≤ 13.4 MPN/100 mL.

When comparing the year round data in the statistical summary for all stations with seasonal components, the station with the highest geo-mean was station 1670 – SNA at 13.0 MPN/100 mL. This did not exceed *Approved* criteria for geo-mean.

Seasonal component stations with the highest estimated 90th percentiles (those exceeding 39 MPN/100 mL w/ 35/36 samples) in the statistical summary were 1670 – SNA, 1709 – SR, 1712 – SR and 1714A – SR at 105.1, 65.3, 82.4 and 49.8 MPN/100 mL, respectively. All other seasonal
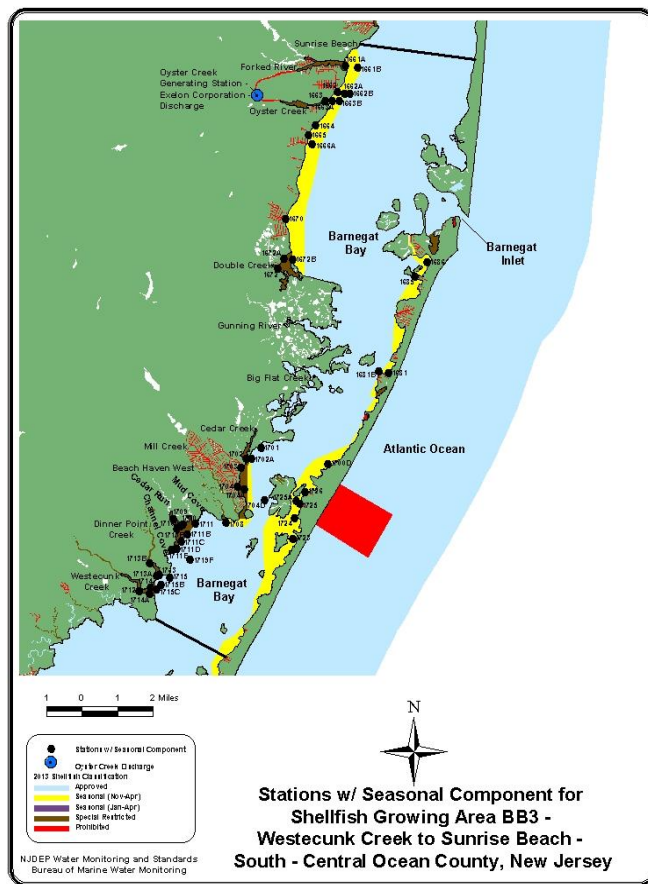
component stations had est. 90th percentiles ≤ 37.3 MPN/100 mL. Stations 1709 – SR, 1712 – SR and 1714A – SR had est. 90th percentiles that were within the criteria for their *Special Restricted* classification. Extending the data pull, as was discussed in previous sections, in order to get at least 30 seasonal samples for station 1670 – SNA, showed that it had an estimated 90th percentile of 37.3 MPN/100 mL during the winter when shellfish harvest is allowed w/ regard to that stations *Seasonal* classification. With that, no stations with seasonal components exceeded their classification criteria for geometric mean or est. 90th percentile. Seasonality did have impact on this growing area with special emphasis placed on the summer months. Impact did not cause any change in classifications though from a bacteriological standpoint.

# RELATED STUDIES

## Nutrients

WM&S/BMWM perform additional water quality studies related to the bacteriological monitoring program. Nutrient monitoring and the collection of nutrient data as part of the NJ Coastal Monitoring Network is an example of one of those studies.

Nutrient stations are sampled on a quarterly basis. There are approximately 250 nutrient sampling stations within the coastal and inner coastal waters of New Jersey. Twenty-four of those stations are located within the ocean waters off the New Jersey coast. The 226 remaining nutrient stations are spread throughout the back bay waters of the State. The Bureau compiles the results of nutrient levels from such stations and then prepares a separate report.

Shellfish growing area BB3 has the following nutrient sampling stations: 1661F, 1674B, 1707C and 1712. The locations for these four stations are shown to the right.



Nutrient Sampling Stations for Shellfish Growing Area BB3 - Westecunk Creek to Sunrise Beach - South - Central Ocean County, New Jersey
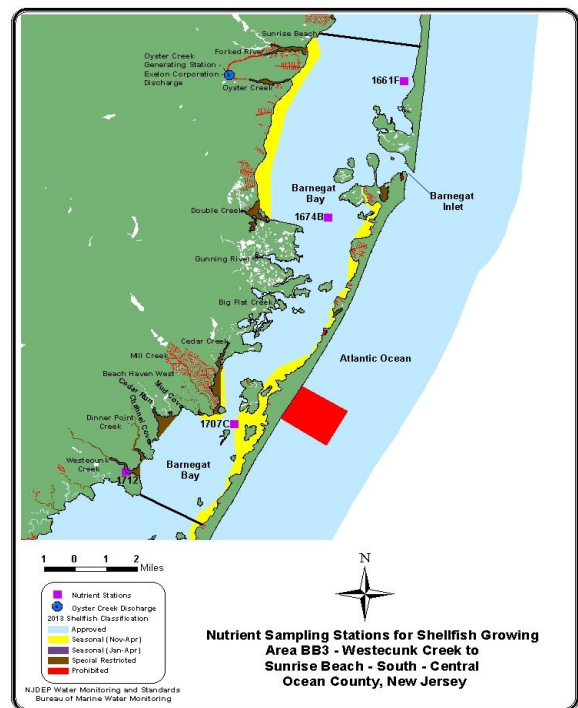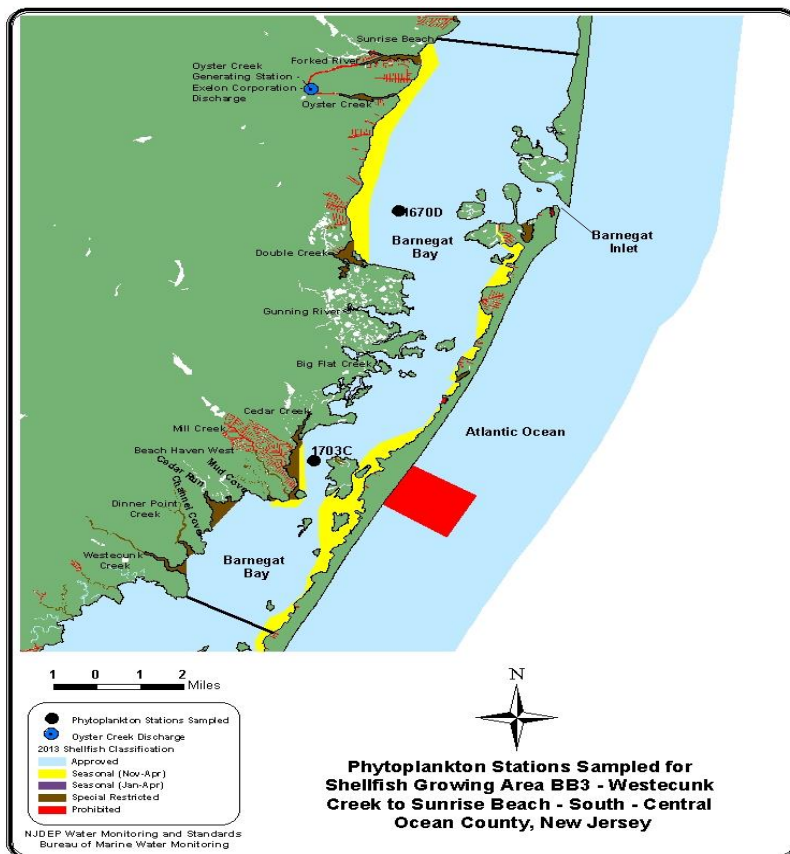
Chlorophyll data are also contained within the nutrient data. As such, WM&S'/BMWM is able to maintain a quarterly picture of algal activity within State waters. This chlorophyll data also proves to be useful as adjunct information to the Bureau's phytoplankton monitoring program. Further information on nutrients within State waters is available at *www.state.nj.us/dep/wms/bmw* in sections such as those referring to Estuarine and Coastal Water Quality.

## Phytoplankton Monitoring

In the WM&S/BMWM phytoplankton monitoring program, data are collected from samples which are gathered bi-weekly from May through August (Memorial Day through Labor Day). The data are evaluated by the Bureau of Marine Water Monitoring in order to determine the presence of marine biotoxins in accordance with NSSP requirements. Reports denoted as Summary of Phytoplankton Blooms have been compiled and are available electronically at *www.state.nj.us/dep/wms/bmw*.

There are 16 phytoplankton stations within the waters of New Jersey. Of those 16, four are located off the coast from the southerly portion of Sandy Hook down to Cape May. The other 12 phytoplankton stations are situated within New Jersey's back bay waters.



Phytoplankton Stations Sampled for Shellfish Growing Area BB3 - Westecunk Creek to Sunrise Beach - South - Central Ocean County, New Jersey

Stations 1670D and 1703C are phytoplankton stations in shellfish growing area BB3. Their locations can be observed in the map on this page. Current research (again see *www.state.nj.us/dep/wms/bmw*) suggests that populations of phytoplankton are generally found in low concentrations in these waters.

During this reporting period, the toxic species *Dinophysis acuminata* was detected from Manahawkin Bay to Little Egg Harbor in bloom concentrations (360 - 480 cells/mL). If concentrated by filter feeders like shellfish, *Dinophysis accuminata* can cause diarrhetic shellfish poisoning. This bloom was extremely short in duration, and shellfish showed little to no toxicity with regard to the shortened conditions of the bloom. A review of reports for over 12 years will show that this bloom occurrence represents something unusual, as toxic species have been rarely seen during that time frame for these waters (BB3).

There are occasional occurrences of algal blooms in all back bay waters in New Jersey, and these can occur throughout the year. The warmer months of spring and summer provide a very common period for algal growth, though.
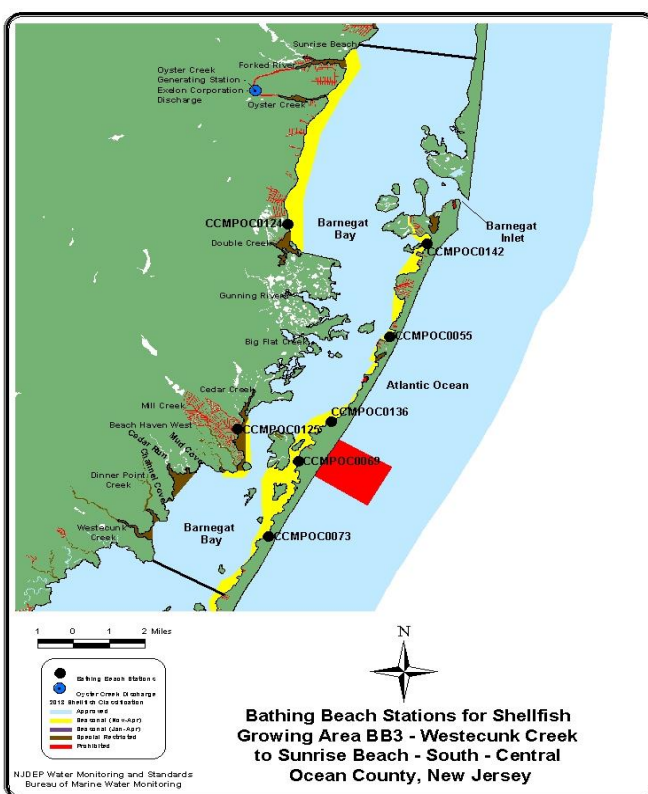
It is more frequently the discoloration of the water from algal blooms that causes issues along New Jersey's coastal waters rather than the toxicity of the phytoplankton. For example, brown tides

resulting from one of New Jersey's more frequent algal blooms can be spotted in back bay waters, inlets, and occasionally the ocean, near inlet passageways. This generally occurs during May and June. However, aside from the bloom causing discoloration of the water, there are no known threats to human health from brown tides. For this reason, they are not considered in classifying waters for shellfish harvest.

**Cooperative Coastal Monitoring**

This Bureau also oversees the Cooperative Coastal Monitoring Program (CCMP). CCMP involves coastal water quality assessments and pollutant source investigation. There are two components to this program. These are recreational water quality monitoring at New Jersey bathing beaches and aerial surveillance of State coastal waters.

Water quality monitoring for the bathing beach component is administered by NJDEP, the Department of Health, and local environmental health agencies interacting within their regions of coastal New Jersey. The local health agencies collect water samples each week at 175 ocean and 43 bay monitoring stations from mid-May through mid-September. Samples are taken on Monday and continued sampling through the week is performed as required. Samples are analyzed for enterococci bacteria concentrations at these monitored stations.



Bathing Beach Stations for Shellfish Growing Area BB3 - Westecunk Creek to Sunrise Beach - South - Central Ocean County, New Jersey

Enterococci are used as a fecal coliform indicator in marine recreational waters (US EPA, 1986). The acceptable rate for the "steady state geometric mean indicator density" for enterococci in the waters of marine bathing beaches is 35 MPN/100 mL or less, and 104 enterococci/100 mL is also considered acceptable as a one time exposure (Cabelli, 1983).

BB3 has seven bathing beach stations (CCMPOC0055, CCMPOC0069, CCMPOC0073, CCMPOC0124, CCMPOC0125, CCMPOOC0136 and CCMPOC0142) as shown in the map to the above right. Data for these stations is available at http://www.njbeaches.org.

The other component of the CCMP program, aerial surveillance, is conducted six days a week, weather permitting, during May - September. Having this component provides an evaluative tool to aerially observe coastal water quality and potential pollution reports.

Flight paths are coordinated to observe the eastern coastal and inter-coastal waters of the State during the week. The aerial component of the CCMP program works in conjunction with the

United States Army Corps of Engineers. It is part of the NY/NJ Harbor Estuary Program Floatables Action Plan. If floating solid waste and debris are spotted by aerial surveillance, the Army Corps attempts to respond with water-skimming vessels.

## CONCLUSIONS

The results of the water quality data collected from sampling in this shellfish growing area indicated all stations were within NSSP, SRS criteria (fecal coliform) for the classification of waters in which they were located.

Impacts represented by statistical variation, also referred to as components from rainfall/precipitation and season were present. However, the data did not exceed NSSP criteria with regard to rain or season. Such impacts are generally minimized within shellfish growing area BB3 due to the dilution and mixing processes mentioned earlier in this report. As such, there is no reason to suggest that the sampling strategy or parameters for classification should be altered for this growing area as per precipitation or seasonal influence.

Statistical components or variation in the data can provide useful information that presents a guideline for the classification of waters. As mentioned earlier in this report, the Bureau of Marine Water Monitoring utilizes seasonal priorities for sampling in three of the five assignments related to the shellfish growing waters of BB3.

These priorities are aligned with the *Seasonally Approved* (Nov - Apr) time frame and similar classifications that comprise BB3. The significant portion of waters in BB3 classified as *Seasonally Approved,* dictates prioritized WM&S/BMWM sampling during that period, as it coincides with the period when shellfishing is allowed in such waters.

For the purpose of public health and safety, the sampling strategy and classification for most back bay waters is also based on the location of stormwater outfalls, marinas, and lagoon sections that exist within New Jersey's intercoastal waters. With BB3, the existence of potential contributors to coliform bacteria such as marinas, lagoons, and stormwater outfalls provides the primary reason for utilization of SRS Sampling Strategy. These influences also dictate the degree to which portions of the growing area are classified. Buffers of *Seasonal*, *Special Restricted,* or *Prohibited* waters are then most useful as protective zones in areas with the above influences. Buffers are most frequent in more densely populated areas where the occurrence of marinas, lagoons, and stormwater outfalls (water quality influences) are more common.

## RECOMMENDATIONS

With regard to the summarizations presented in this report, there are no changes proposed for BB3, Assignments 107, 114, 117, 121, and 122 monitoring stations, or sampling strategy (SRS) planned at this time. The area's current shellfish growing water classifications are satisfactory with regard to the bacteriological data presented in this report. The confirmation of acceptable water quality levels and the continued positive nature of shoreline surveys supports the current shellfish growing water classifications in effect for these waters. With BB3, there are no changes recommended for classification or monitoring in this shellfish growing area for this reporting period.

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# SUPPORTING DOCUMENTATION

Data Sheets - Reappraisal Report for Shellfish Growing Area BB3 (Westecunk Creek to Sunrise Beach), December 2013 (see the Shellfish Growing Area Reports section at *www.state.nj.us/dep/wms/bmw*).

Shoreline survey field notes and pictures - Reappraisal Report for Shellfish Growing Area BB3 (Westecunk Creek to Sunrise Beach), December 2013 (see the Shellfish Growing Area Reports section at *www.state.nj.us/dep/wms/bmw*).