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Water Monitoring Management

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TRIENNIAL REAPPRAISAL REPORT
SHARK RIVER ESTUARY
1992-1998

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TRIENNIAL REAPPRAISAL REPORT
SHARK RIVER ESTUARY

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New Jersey Department of Environmental Protection
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COMMISSIONER

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EXECUTIVE SUMMARY

The shellfish waters of the Shark River are classified as *Special Restricted*. The direct harvest and marketing of shellfish from these waters is prohibited. Shellfish harvesting is allowed under the special permit program, in compliance with the State's Relay or Depuration Programs. The last controlled harvest occurred in February 1994.

A total of 1632 water samples from the Shark River were collected and analyzed for total coliform (TC) and fecal coliform (FC) bacteria by the Bureau of Marine Water Monitoring in Leeds Point. The analytical procedures incorporated the 3-tube MPN method for total coliform and fecal coliform bacteria levels. The samples were collected from 45 stations during the period 10/01/92 to 10/01/98. This time frame was selected to comply with the classification requirement of 30 sets of data per sampling station.

The bacteriological data for each of the sampling stations complies with or supports the criteria for *Special Restricted* classification under the total coliform standard. Evaluation of the sampling data supports the current classification. No changes are recommended.

INTRODUCTION

PURPOSE

This report is part of a series of studies having a dual purpose. The first and primary purpose is to comply with the guidelines of the National Shellfish Sanitation Program (NSSP) that are established by the Interstate Shellfish Sanitation Conference (ISSC). Reports generated under this program form the basis for classifying shellfish waters for the purpose of harvesting shellfish for human consumption. As such, they provide a critical link in protecting human health.

The second purpose is to provide input to the State Water Quality Inventory Report, which is prepared pursuant to Section 305(b) of the Federal Clean Water Act (P.L. 95-217). The information contained in the growing area reports is used for the New Jersey

State Water Quality Inventory Report (305b) which provides an assessment to Congress every two years of current water quality conditions in the State's major rivers, lakes, estuaries, and ocean waters. The reports provide valuable information for the 305(b) report, which describes the waters that are attaining state designated water uses and national clean water goals; the pollution problems identified in surface waters; and the actual or potential sources of pollution. Similarly, the reports utilize relevant information contained in the 305(b) report, since the latter assessments are based on instream monitoring data (temperature, oxygen, pH, total and fecal coliform bacteria, nutrients, solids, ammonia and metals), land-use profiles, drainage basin

characteristics and other pollution source information.

From the perspective of the Shellfish Classification Program, the reciprocal use of water quality information from reports represent two sides of the same coin: the growing area report focuses on the estuary itself, while the 305(b) report describes the watershed that drains to that estuary.

The Department participates in a cooperative National Environmental Performance Partnership System (NEPPS) with the USEPA which emphasizes ongoing evaluation of issues associated with environmental regulation, including assessing impacts on waterbodies and measuring improvements in various indicators of

environmental health. The shellfish growing area reports are intended to provide a brief assessment of the growing area, with particular emphasis on those factors that affect the quantity and quality of the shellfish resource. As the Department implements a comprehensive watershed management program in conjunction with the NEPPS initiative, the shellfish growing area reports provide valuable information on the overall quality of the saline waters in the most downstream sections of each major watershed. In addition, the reports assess the quality of the biological resource and provide a reliable indicator of potential areas of concern and/or areas where additional information is needed to accurately assess watershed dynamics.

HISTORY

As a brief history, the NSSP developed from public health principles and program controls formulated at the original conference on shellfish sanitation called by the Surgeon General of the United States Public Health Service in 1925. This conference was called after oysters were implicated in causing over 1500 cases of typhoid fever and 150 deaths in 1924. The tripartite cooperative program (federal, state and shellfish industry) has updated the program procedures and guidelines through workshops held periodically until 1977. Because of concern by many states that the NSSP guidelines were not being enforced uniformly, a delegation of state shellfish officials from 22 states met in 1982 in Annapolis, Maryland, and formed the ISSC. The first annual meeting was held in 1983 and continues to meet annually at various locations throughout the United States.

The NSSP *Guide for the Control of Molluscan Shellfish* sets forth the principles and requirements for the sanitary control of shellfish produced and shipped in interstate commerce in the United States. It provides the basis used by the Federal Food and Drug Administration (FDA) in evaluating state shellfish sanitation programs. The five major points on which the state is evaluated by the FDA include:

1. The classification of all actual and potential shellfish growing areas as to their suitability for shellfish harvesting.
2. The control of the harvesting of shellfish from areas that are classified as restricted, prohibited or otherwise closed.

3. The regulation and supervision of shellfish resource recovery programs.
4. The ability to restrict the harvest of shellfish from areas in a public health emergency, and
5. Prevent the sale, shipment or possession of shellfish that cannot be identified as being produced in accordance with the

NSSP and have the ability to condemn, seize or embargo such shellfish.

FUNCTIONAL AUTHORITY

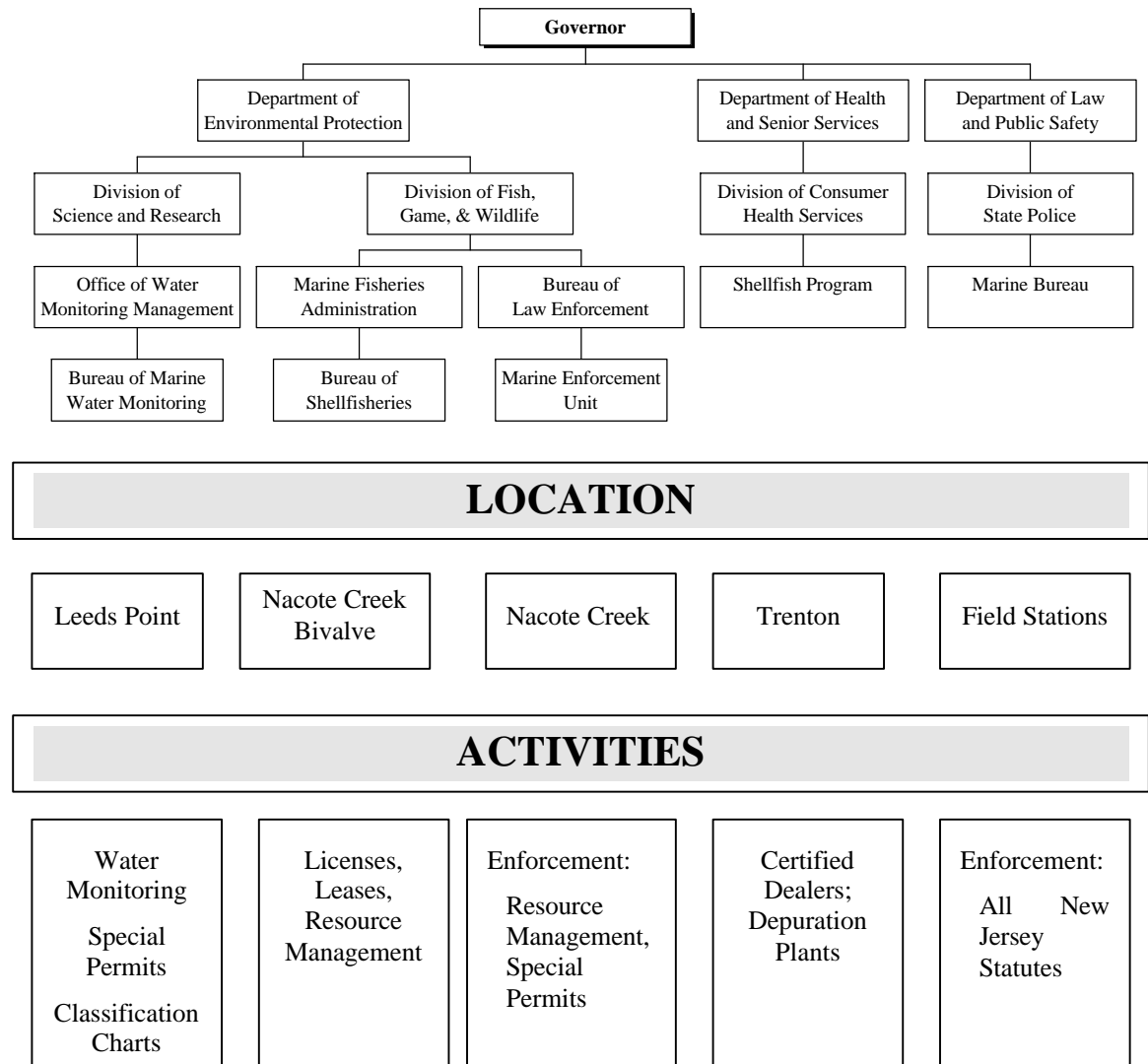
The authority to carry out these functions is divided between the Department of Environmental Protection (DEP), the Department of Health and Senior Services and the Department of Law and Public Safety. The Bureau of Marine Water Monitoring (BMWM) under the authority of N.J.S.A. 58:24 classifies the shellfish growing waters and administers the special resource recovery programs. Regulations delineating the growing areas are promulgated at N.J.A.C. 7:12 and are revised annually. Special Permit rules are also found at N.J.A.C. 7:12 and are revised as necessary.

The Department of Health and Senior Services is responsible for the certification of wholesale shellfish establishments and in conjunction with the BMWM, administers the depuration program.

The Bureau of Shellfisheries in the Division of Fish, Game and Wildlife issues harvesting licenses and leases for shellfish grounds under the Authority of N.J.S.A. 50:2 and N.J.A.C. 7:25. This bureau in conjunction with the BMWM administers the Hard Clam Relay Program.

The Bureau of Law Enforcement in the DEP (Division of Fish, Game, and Wildlife) and the Division of State Police in the Department of Law and Public Safety enforce the provisions of the statutes and rules mentioned above.

FIGURE 1: STATE OF NEW JERSEY SHELLFISH AGENCIES



IMPORTANCE OF SANITARY CONTROL OF SHELLFISH

Emphasis is placed on the sanitary control of shellfish because of the direct relationship between pollution of shellfish growing areas and the transmission of diseases to humans. Shellfish borne infectious diseases are generally transmitted via a fecal-oral

route. The pathway is complex and quite circuitous. The cycle usually begins with fecal contamination of the shellfish growing waters. Sources of such contamination are many and varied. Contamination reaches the waterways via runoff and direct discharges.

Clams, oysters and mussels pump large quantities of water through their bodies during the normal feeding process. During this process the shellfish also concentrate microorganisms, which may include pathogenic microbes, and toxic heavy metals/chemicals. It is imperative that a system is in place to reduce the human health risk of consuming shellfish from areas of contamination.

Accurate classifications of shellfish growing areas are completed through a comprehensive sanitary survey. The principal components of the sanitary survey report include:

1. An evaluation of all actual and potential sources of pollution,

2. An evaluation of the hydrography of the area and
3. An assessment of water quality. Complete intensive sanitary surveys are conducted every 12 years with interim narrative evaluations completed on a three year basis. If major changes to the shoreline or bacterial quality occur, then the intensive report is initiated prior to its 12 year schedule.

The following narrative constitutes this bureau's assessment of the above mentioned components and determines the current classification of the shellfish growing waters.

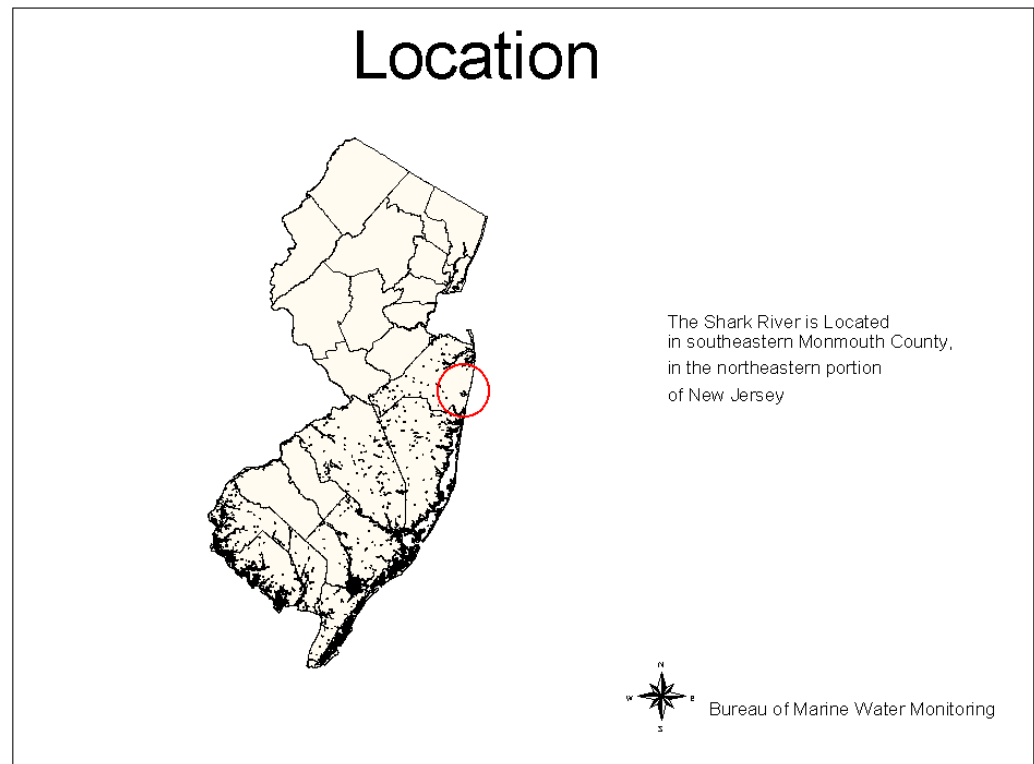
BACKGROUND & DESCRIPTION

LOCATION

The Shark River is located in Monmouth County to the north and west of Belmar Borough. This area is shown on Chart 3 of the 1998 State of New Jersey

Shellfish Growing Water Classification Charts.

FIGURE 2: LOCATION OF THE SHARK RIVER

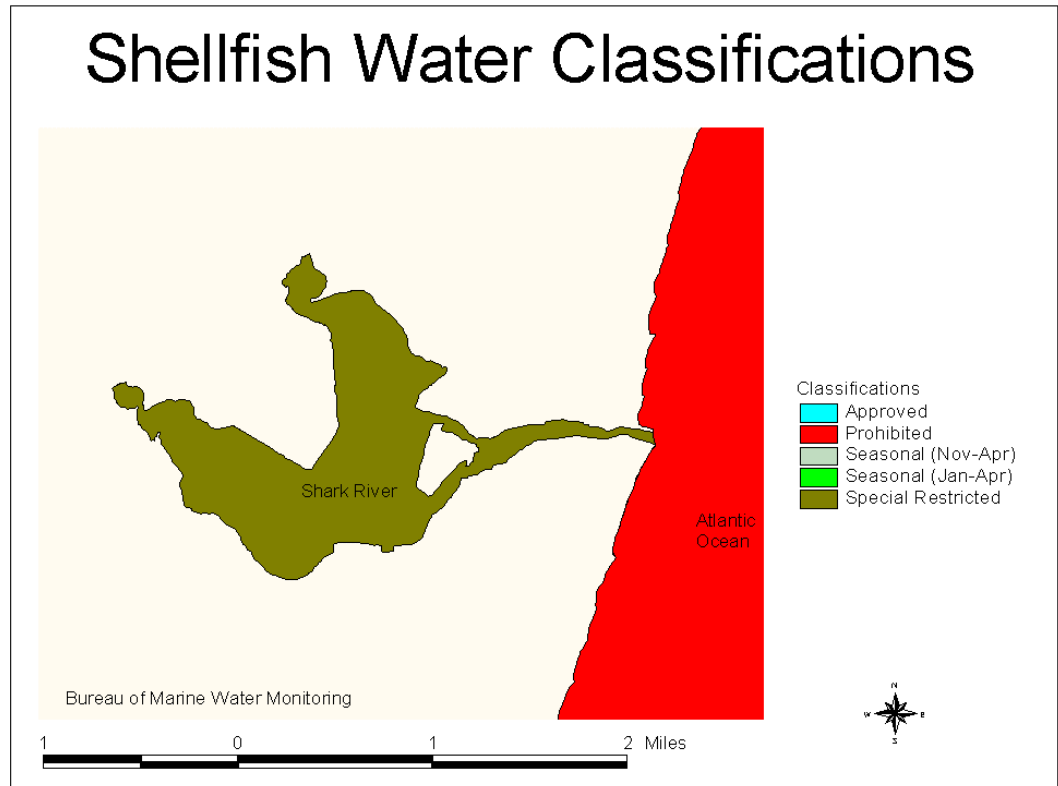


DESCRIPTION

The Shark River Estuary is an area of relatively shallow water encompassing approximately 810 acres. The shellfish waters of the river are classified as *Special Restricted*. The estuary is connected to the Atlantic Ocean through

the narrow Shark River Inlet separating the communities of Belmar and Avon By-The-Sea. The inlet is protected by rock jetties that extend into the ocean.

FIGURE 3: CURRENT CLASSIFICATION OF THE SHARK RIVER



HISTORY

Historically, the Shark River has been identified as a productive area for hard clams. Because of this characteristic, spokesmen from the shellfish industry have expressed interest in this body of water on a number of occasions. While a direct harvesting and marketing of shellfish is prohibited from these waters, the area has been successfully utilized in conjunction with New Jersey's Relay and Depuration Programs.

Relay consists of the controlled harvest of shellfish originating from *Special Restricted* waters and transfer of these shellfish to *Approved* waters. The relay allows shellfish that may contain a limited amount of bacterial contamination to purge themselves before they are utilized for human consumption.

Depuration consists of the purging or cleansing of shellfish in a controlled laboratory environment operating under

strict state guidelines. In February 1994 the state allowed a special two week long controlled harvest of shellfish from the Shark River under the state's depuration Program. The harvest was a success and permitted Monmouth County shellfisherman to remain employed during the extremely cold period that caused the Raritan and Sandy Hook Bays to freeze over.

The shellfish waters of the Shark River were *Prohibited* in their entirety until 1987 when they were reclassified as *Special Restricted* waters. This change did not necessarily reflect an improvement in water quality but rather an administrative adjustment made in compliance with definitions in the NSSP 1986 Manual of Operations. The reclassification was made in order to continue the relay program from Shark River.

Since 1987 the Shark River has shown very little variability in bacterial water quality. In 1996 the Bureau's sampling priorities were adjusted due to a staffing situation and the participation in the Commissioner's special projects. As a result, areas classified as *Special Restricted* or *Approved* waters with low variability in data were placed lower on the sampling schedule. As a result of this, the minimum sampling requirement of 5 samples were not collected. In the 1997 sampling year ten sampling runs were completed. From these ten runs, nine sampling runs were analyzed only for fecal coliform (FC) bacteria levels. A single sampling run on 7/22/97 was analyzed using the 3-tube MPN method

for total coliform and fecal coliform bacteria levels.

In the 1998 Annual Review of the Shark River, sampling data was evaluated for the period March 1994 through October 1997. During this time fourteen sampling runs were collected and analyzed using the 3-tube MPN method for total coliform and fecal coliform bacteria levels and nine sampling runs were analyzed only for fecal coliform (FC) bacteria levels. An evaluation of the fecal coliform data found that thirty-one sampling stations out of forty-five exceeded the median and/or percentage criteria for *Special Restricted* waters using the fecal coliform (FC) criteria. It was recommended that no harvesting of any kind be permitted until additional water samples could be collected and analyzed under the TC Standard using a 3-tube procedure historically used to classify the shellfish waters in New Jersey.

In 1998 the sampling strategy was modified from adverse pollution condition of rainfall to systematic random sampling. This allowed eleven sampling runs to be collected in the Shark River under this sampling plan for the year. The Systematic Random Sampling Strategy requires 30 sets of data per sampling station for classification. To obtain the 30 sets of data it was necessary to evaluate data from 1992 to 1998. The last Sanitary Survey was completed in 1994 and the last Triennial Report was in 1997.

METHODS

Water sampling was performed in accordance with the Field Procedures Manual (NJDEP, 1992).

Approximately 1600 water samples were collected for total and fecal coliform bacteria between 10/01/92 and 10/01/98 and analyzed by the three tube MPN method for total and fecal coliform bacteria according to APHA (1970). Approximately 45 stations are monitored during each sampling run.

Water quality sampling, shoreline and watershed surveys were conducted in accordance with the NSSP *Guide for the Control of Molluscan Shellfish*, 1997.

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:ARCVIEW)

BACTERIOLOGICAL INVESTIGATION AND DATA ANALYSIS

The water quality of each growing area must be evaluated before an area can be classified as *Approved*, *Seasonally Approved*, *Special Restricted*, or *Seasonal Special Restricted*. Criteria for bacterial acceptability of shellfish growing waters are provided in NSSP *Guide for the Control of Molluscan Shellfish*, 1997. Each shellfish producing state is directed to adopt either the total coliform criterion, or the fecal coliform criterion. While New Jersey bases its growing water classifications on the total coliform criterion, it does make corresponding fecal coliform determinations for each sampling station. These data are viewed as adjunct information and are not directly used for classification. The State Shellfish Control Authority also has the option of choosing one of the two water monitoring sampling strategies for each growing area.

The Adverse Pollution Condition Strategy requires that a minimum of five samples be collected each year under conditions that have historically resulted in elevated coliforms in the particular growing area. The results must be evaluated by adding the individual station sample results to the preexisting bacteriological sampling results to constitute a data set of at least 15 samples for each station. The adverse pollution conditions usually are related to tide, and rainfall, but could be from a point source of pollution or variation could occur during a specific time of the year. Under this strategy, for *Approved* waters, the total coliform median or geometric mean MPN of the water shall not exceed 70 per 100 mL and not more than 10 percent of the samples exceed an MPN of 330 per 100 mL for the 3-tube decimal dilution test. For *Special Restricted* waters, the total coliform median or geometric mean MPN of the water shall not exceed 700

per 100 mL and not more than 10 percent of the samples exceed an MPN of 3300 per 100 mL for the 3-tube decimal dilution test. Areas to be Approved under the Seasonal classification must be sampled and meet the criterion during the time of the year that it is approved for the harvest of shellfish.

The Systematic Random Sampling strategy requires that a random sampling plan be in place before field sampling begins and can only be used in areas that are not affected by point sources of contamination. A minimum of six samples per station are to be collected each year and added to database to obtain a sample size of 30 for statistical analysis. The bacteriological quality of every sampling station in *Approved* areas shall have a total coliform median or geometric mean MPN not exceeding 70 per 100 mL

and the estimated 90th percentile shall not exceed an MPN of 330 per 100 mL. For *Special Restricted* areas, the bacteriological quality shall not exceed a total coliform median or geometric mean MPN of 700 per 100 mL and the estimated 90th percentile shall not exceed an MPN of 3,300 per 100 mL.

The Shark River has been sampled under the Systematic Random Sampling strategy since March of 1998. Prior to that period it was sampled under the Adverse Pollution Condition of Rainfall.

In the 1997-1998 sampling year an extra dilution was included in the analytical procedures for most of the sampling stations in the Shark River. The additional dilution was used in order to better evaluate data listed as 2400.0L (greater than 2400) in previous years.

MARINE BIOTOXINS

The Department collects samples at regular intervals throughout the summer to determine the occurrence of marine biotoxins. This data is evaluated weekly by the Bureau of Marine Water Monitoring in accordance with the NSSP requirements. An annual report is

compiled by the Bureau of Freshwater and Biological Monitoring.

SHORELINE SURVEY

There have not been any significant changes to report in the shoreline survey since the last Sanitary Shoreline Survey Report completed in 1994. Please refer to this report for a detailed shoreline survey.

In May 1998, the Shark River was officially designated as a No Discharge Zone for marine sanitary devices. This

designation should help to improved bacteriological water quality in the Shark during the boating season.

The Shark river area has two sewage treatment plants. These plants are the Southern Monmouth Regional Sewerage Authority (9.1 MGD) and the Township of Neptune Sewerage Authority (8.5 MGD). Both of these plants discharge their effluent through separate ocean

outfalls located some distance north and south of the Shark River Inlet. There has not been any significant problems with operations at either plant. However as a precautionary measure, the NSSP requires a closed safety zone so ocean waters adjacent to the Shark River are classified as *Prohibited* for the harvesting of shellfish for a distance of 1.5 miles offshore. There are 12 sewage pump stations scattered around the Shark River. They appear to be well maintained and equipped with emergency alarms in case of a problem.

The Neptune Sewerage Authority experienced minor difficulties on several

occasions this past year with the spill of raw sewage. The spills involved very low volumes and did not impact shellfish waters.

The Department of Environmental Protection's Site Remediation Program has not alerted the Bureau of Marine Water Monitoring of any impact to the shellfish growing waters or shellfish resources of the Shark River from any sites in the area. This includes sites located at the Fort Monmouth-Evans Area and the former Belmar Coal Gasification Plant.

LAND USE

There are five communities bordering the Shark River's shoreline. The communities are Avon By-the-Sea, Belmar Borough, Neptune City

Borough, Neptune Township and Wall Township. The population, area, and population density for these municipalities are given in Table 1.

TABLE 1: POPULATION, AREA, AND DENSITY FOR COMMUNITIES

Municipality	Population (1990)	Area (Sq. Mi.)	Density
Belmar	5877	1.388	6771
Neptune Township	28148	8.817	3217
Neptune City Borough	4997	.879	5997
Avon By-the-Sea	2165	.456	5122
Wall Township	20244	32.0	633

Source: 1996 New Jersey Municipal Directory.

The land use patterns surrounding the Shark River are predominately urban in

character resulting in bacterial water quality that is impacted by storm water runoff and nonpoint pollution sources

associated with human activity (Farnsworth, 1994). Forested or wooded wetland areas line the banks upstream from the *Special Restricted* waters. See Figure 4 for land use patterns, and Figure 5 for stormwater outfall and stream locations. The Shark River does not have nonpoint source pollution problems associated with agricultural

runoff from farmland or livestock areas because of the relative lack of such activities.

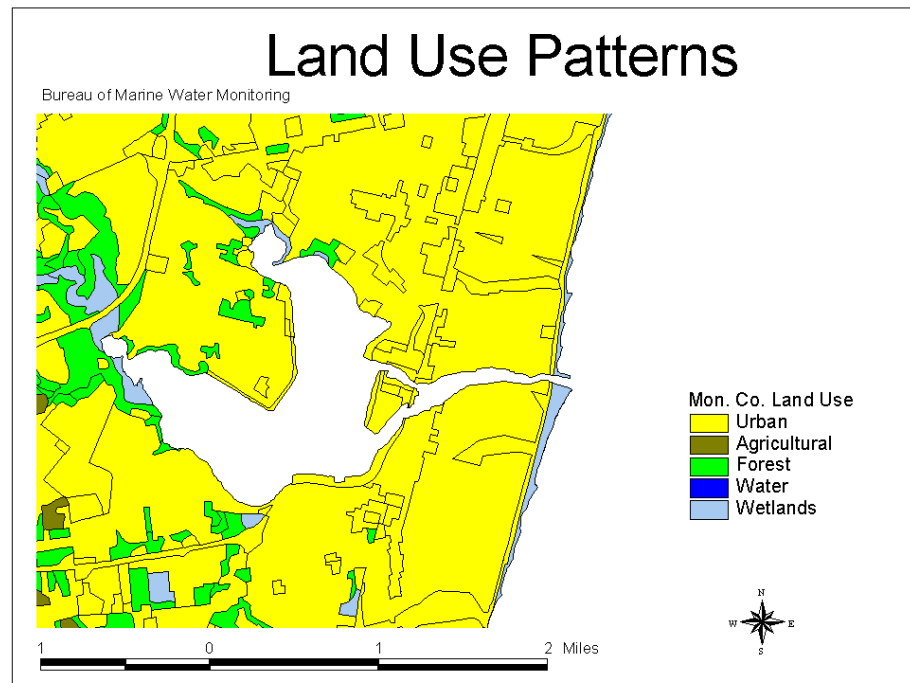
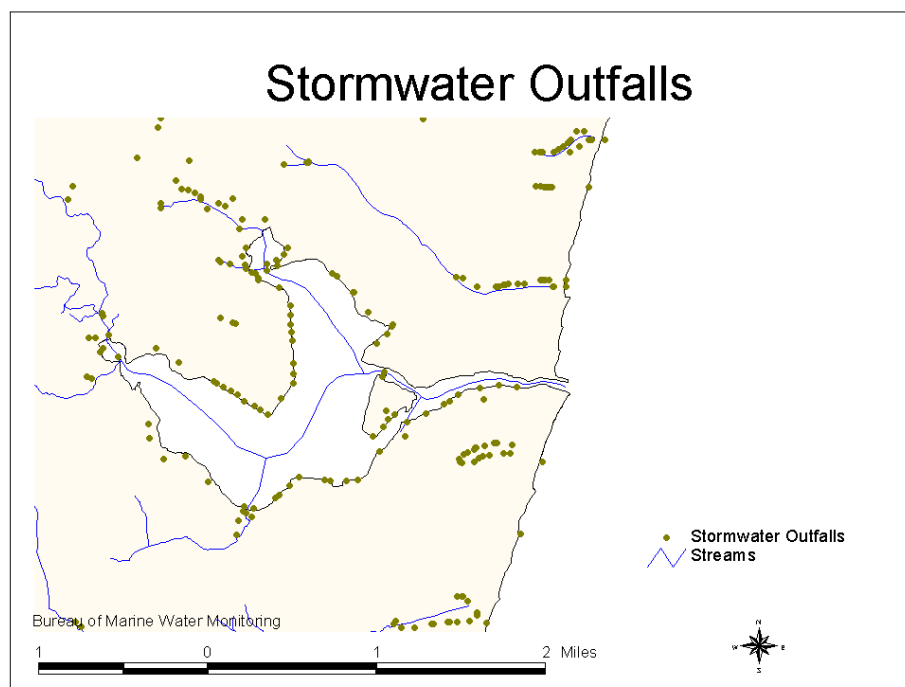


FIGURE 4: LAND USE PATTERNS FOR THE SHARK RIVER

FIGURE 5: STORMWATER OUTFALLS IN THE SHARK RIVER



MARINAS

Marina facilities have the potential to affect the suitability of shellfish growing areas for the harvest of shellfish. The biological and chemical contamination associated with marina facilities may be of public health significance. New Jersey defines a marina as "any structure (docks, piers, bulkheads, floating docks, etc.) that supports five or more boats, built on or near the water, which is utilized for docking, storing, or otherwise mooring vessels and usually but not necessarily provides services to vessels such as repairing, fueling, security or other related activities" and

designates the confines of the marina as *Prohibited* for the harvest of shellfish. Adjacent waters are classified using a dilution analysis formula.

It is recognized by the NSSP *Guide for the Control of Molluscan Shellfish*, 1997, that there are significant regional differences in all factors that affect marina pollutant loading. The manual therefore allows each state latitude in applying specified occupancy and discharge rates. The NSSP guidelines assume the worst case scenario for each factor.

EQUATION 1 :MARINA BUFFER EQUATION. (ADAPTED FROM FDA. 1989):

$$BufferRadius(ft) = \sqrt{\frac{2 \times 10^9 (FC / person / day) \times 2 (person / boat) \times [(0.25 \text{slips} \geq 24') + (0.065 \times \text{slips} < 24')] \times 2}{140000 (FC / M^3) \times depth(ft) \times 0.3048 (M / ft) \times \pi \times 2 (tides / day)}} \times 3.28 (ft / M)$$

Explanation of terms in equation:

Fecal coliform per person per day:	2 x 10 ⁹
Number of people per boat:	2
For slips able to accommodate boats > 24 feet (combination of factors yields multiplier of 0.25):	
Number of slips occupied:	50%
Number of boats occupied:	50%
For boats < 24':	6.5% discharge waste
Angle of shoreline:	180°, which results in factor of 2
Number of tides per day:	2
Depth in meters:	depth in feet x conversion factor
Water quality to be achieved:	140000 FC/meter ³
Convert meters to feet:	3.28

Marina buffer zones may be calculated using the formula above, or may be determined using a dilution analysis computer program developed by the State of Virginia and the USFDA. The computer program is used for complex configurations where the formula is unlikely to provide the needed accuracy.

There are 19 marinas on the Shark River as listed in Table 2 and Figure 6. The marinas are located adjacent to the *Special Restricted* waters of the Shark River. Marine sanitary pump-out facilities for boat holding tanks are provided at the Belmar Municipal

Marina, Seaview Marina, and the Main One Marina.

All of the waters enclosed by the marina are classified as *Prohibited*. The waters immediately adjacent to a marina may be classified as *Prohibited*, *Special Restricted*, or *Seasonally Approved* depending on the size of the marina, water quality, flushing rates and the depth of the water. Marina buffer zones were calculated using the formula above. If a marina does not have any slips that can handle a boat over 24 feet in length then an assumption of 6% failure is established (See Figure 9.).

The shellfish waters of the Shark River are classified as *Special Restricted*. Shellfish harvesting in these waters is only allowed under the Special Permit Program. There is no direct harvest and marketing in this program.

FIGURE 6: MARINAS LOCATED IN THE SHARK RIVER

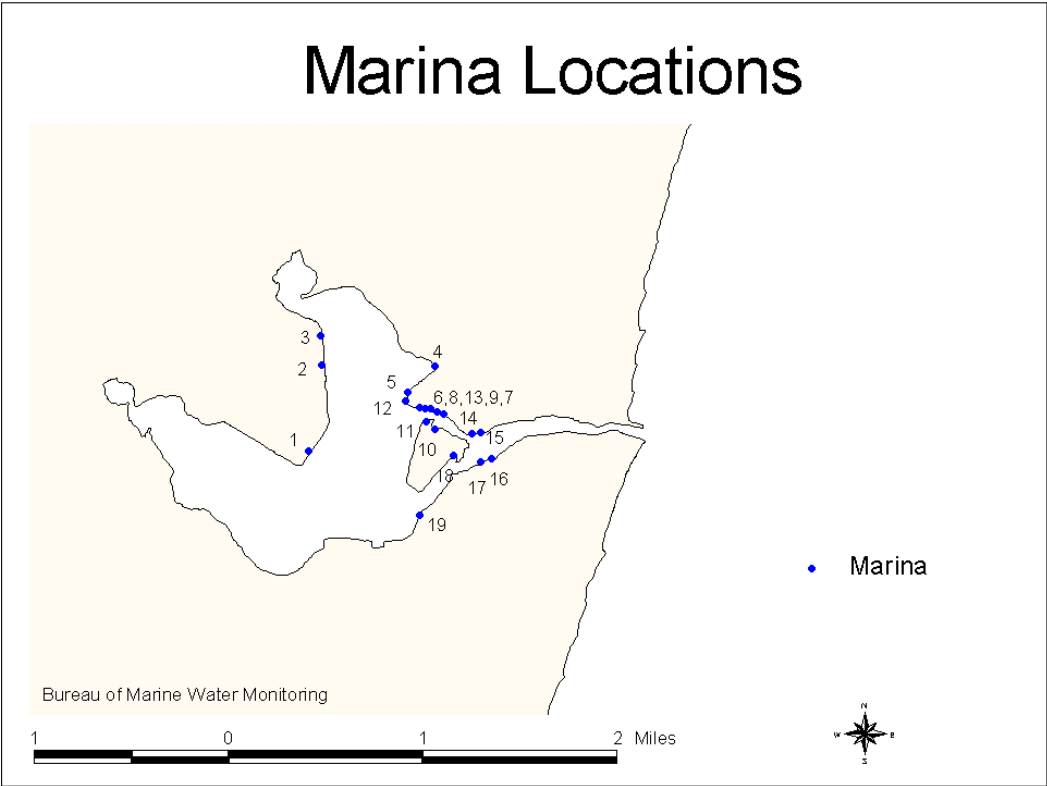




FIGURE 7: CHARTER FISHING BOATS DOCKED AT BELMAR MARINA (PHOTO: BONNIE J. ZIMMER)



FIGURE 8: VIEW OF SHARK ISLAND AND SEAVIEW MARINA (PHOTO: BONNIE J. ZIMMER)

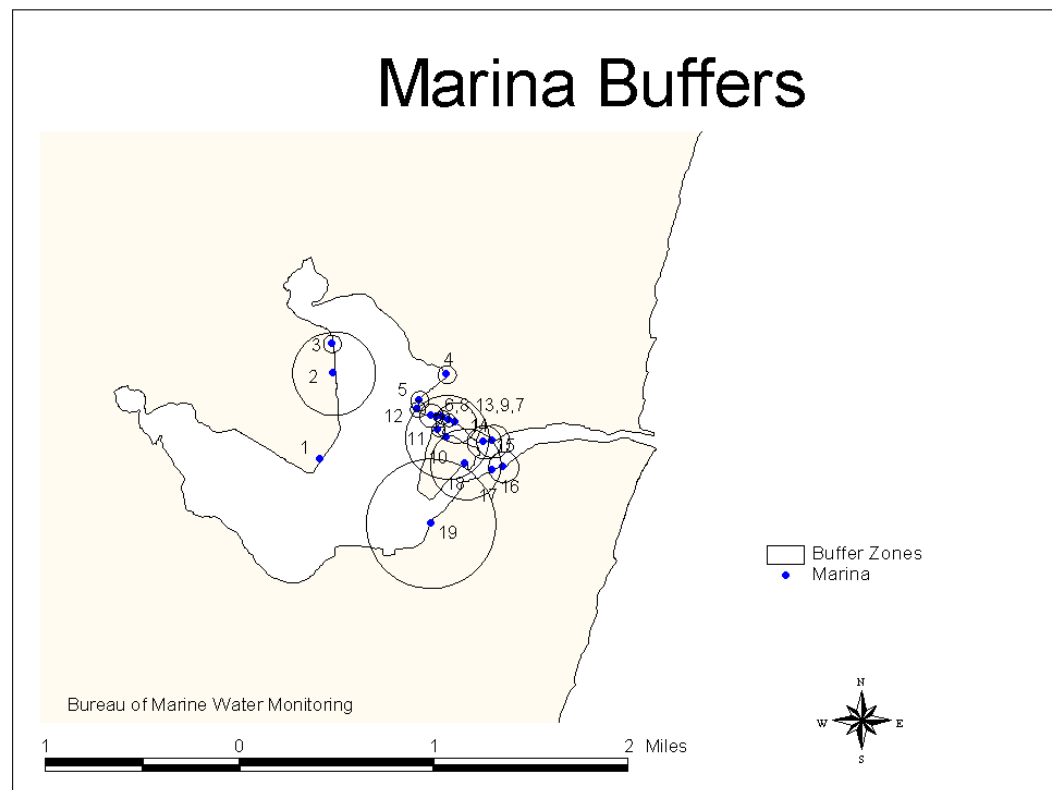
TABLE 2: MARINA FACILITIES LOCATED IN SHELLFISH GROWING AREA NE4/SHARK RIVER

MARINA NAME	MAP LOCATION	NUMBER OF SLIPS	BUFFER (FT.)
SHARK RIVER HILLS BEACH & YACHT CLUB	1	94	*
SHARK RIVER HILLS MARINA	2	150	1124
OLIVER'S COMMERCIAL DOCKS	3	5	239
CAMPBELL'S BOAT YARD	4	9	247
KELLY'S YACHT CLUB	5	9	247
BRY'S MARINA	6	23	316
REMMINGTON'S MARINA	7	40	554
CASHMAN'S DOCK	8	3	102
ZIEGLERS DOCK	9	3	174
SHARK RIVER YACHT CLUB	10	158	1137
SUNSET WATER SPORTS	11	10	186
SOUTHPORT CONDO'S	12	7	210
SHORE WATERCRAFT	13	10	186
MAIN ONE MARINA	14	54	456
AVON FISHING BASIN	15	15	448
AP'S MARINA	16	30	418
SHARK RIVER BOAT RENTAL & WATER SPORTS	17	25	*
TOTAL MARINE AT SEAVIEW	18	101	967
BELMAR MUNICIPAL MARINA	19	325	1769

Source: Monmouth County Health Department, Fran Noorchashm.

* buffer not calculated

FIGURE 9: MARINA BUFFER ZONES IN THE SHARK RIVER



HYDROGRAPHY AND METEOROLOGY

Available precipitation records for the time period covered by this report are shown in Appendix C. There has not been any significant change in the hydrography of the Shark River since the last report (Farnsworth, 1997). The primary weather station is Long Branch. The secondary weather station is Toms River. Rainfall data from both of these stations is incomplete. The Bureau of Marine Water Monitoring is looking for alternate sources for rainfall data for the Shark River area.

Normally, the Bureau determines if sampling stations show increasing MPN values with rainfall using an analysis of correlation coefficients. Correlation analysis looks at paired observations (total coliform MPN and rainfall amounts) and assesses whether, on average, one variable increases or decreases as the other variable increases. However, since most of the samples collected up to March 1998 were collected after rainfall, (i.e., there were no dry weather samples), it is unlikely that a significant correlation between

precipitation and coliform MPN value would be found. Typically such a correlation can be demonstrated only when samples are obtained under varying conditions, including dry

weather, after storms of low intensity and/or duration and after storms of high intensity and/or duration

WATER QUALITY STUDIES

BACTERIOLOGICAL QUALITY

A total of 1632 water samples were analyzed for total coliform (TC) and fecal coliform (FC) bacteria during the period 10/01/92 through 10/01/98. See Figure 10 for sampling station locations. The data for this report was collected during 41 sampling runs from 45 sampling stations in The Shark River.

Sampling data for the period March 1994 through October 1997 had 9 out of 23 sampling runs analyzed only for fecal coliform (FC) bacteria levels. The other 14 runs were analyzed for total and fecal coliform bacteria levels. Evaluation of this fecal coliform data for the 1998 Annual Review found that 31 of 45 sampling stations exceeded the median and/or percentage criteria for *Special Restricted* waters using fecal coliform (FC) criteria as the standard.

Samples collected during the period October 1992 through October 1997 were collected under the Adverse Pollution Condition of rainfall. For the sampling year 1997-1998 the sampling strategy was modified to Systematic Random Sampling. A total of 11 sampling runs were made under the Systematic Random Sampling strategy in the Shark River since March 1998.

The *Special Restricted* waters of The Shark River were classified based on 28 sampling stations having a minimum of 30 samples. The remaining 17 sampling stations with less than 30 samples support the *Special Restricted* classification.

Evaluation of the bacteriological data indicates that the *Special Restricted* waters are correctly classified and that no change in classification is necessary. Each of the 28 sampling stations meet the total coliform (TC) bacteria criteria in the NSSP Model Ordinance (1997 Revision) for *Special Restricted* classification. See Figure 11 for stations meeting *Special Restricted* criteria.

Six of the 28 sampling stations (1200A, 1201A, 1202A, 1202D, 1215A, and 1215E) evaluated on a year-round basis during the period covered by this report meet *Approved* water criteria. Five of these stations are located between Shark Island and the ocean inlet. See Figure 12 for stations not meeting *Approved* water criteria.

During this time period there were five sampling runs with many of the sampling stations in the Shark River with high total coliform counts (>2400). The fecal counts were also high.

FIGURE 10: SAMPLING STATIONS IN THE SHARK RIVER

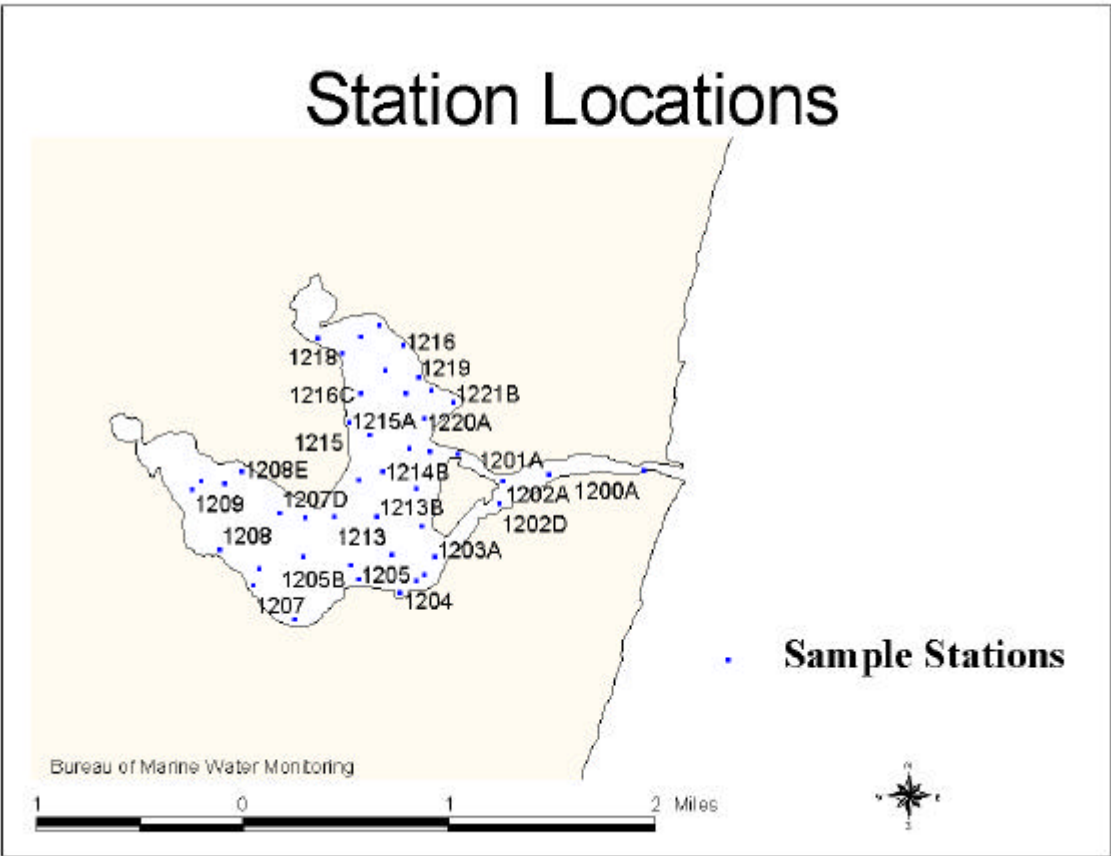


FIGURE 11: NO SAMPLING STATIONS IN THE SHARK RIVER EXCEEDED THE *SPECIAL RESTRICTED* WATER QUALITY CRITERIA

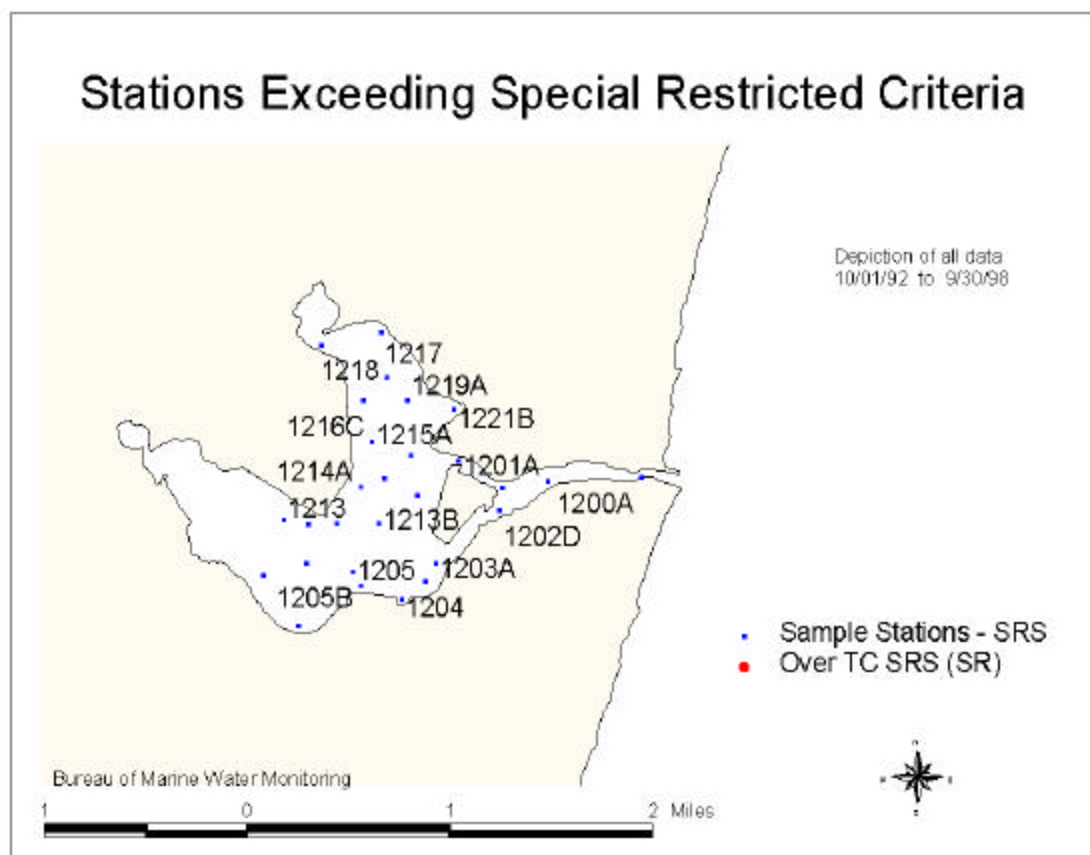
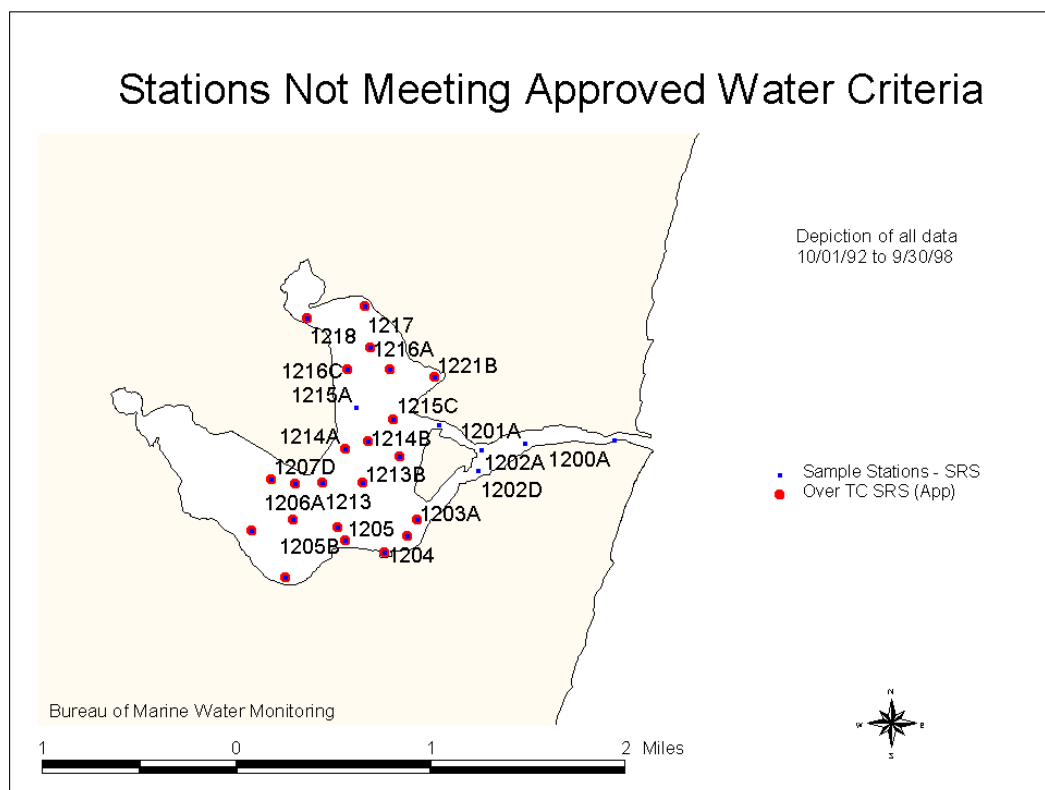


FIGURE 12: STATIONS LOCATED EAST OF SHARK ISLAND MEET *APPROVED* CRITERIA



INTERPETATION AND DISCUSSION OF DATA

Analysis of the bacteriological data collected during the period 10/01/92 through 10/01/98 is listed in Appendices A-E. A review of the data collected in the Shark River shows no significant change in total coliform water quality and supports the existing shellfish growing water classification for this area (*Special Restricted*). All 45 sampling stations either meet or support the *Special Restricted* standard.

Evaluation of seasonal data (November 1 through April 30) going back to 1985

found that, although none of the sampling stations had the minimum number of 30 samples for classification, 18 out of 53 sampling stations supported the median and/or 90th percentile criteria for the *Approved* classification. In comparison, during the summer season (May 1 through October 31) during the same time period (1985-1998) only 5 out of 53 sampling stations met or supported *Approved* water criteria. These stations are located in the channel between the ocean inlet and Shark Island.

In the 1998 Annual Review, sampling data was evaluated for the period March 1994 through October 1997. During this time fourteen sampling runs were collected and analyzed using the 3-tube MPN method for total coliform and fecal coliform bacteria levels and nine sampling runs were analyzed only for fecal coliform (FC) bacteria levels. An evaluation of the fecal coliform data indicated that 31 of 45 sampling stations exceeded the median and/or percentage criteria for *Special Restricted* waters using the fecal coliform (FC) Standard. It was recommended that no harvesting be permitted until additional water samples could be collected and analyzed under the TC Standard.

An evaluation of fecal coliform data from June 1997 to October 1998 indicates that 12 of 41 sampling stations would fail the median and/or percentage criteria for *Special Restricted* classification if the state were using the fecal coliform (FC) Standard under the Adverse Pollution Condition sampling

strategy. These stations meet the criteria for the *Special Restricted* classification using total coliform bacteria.

A closer examination of these data indicates that fecal coliform data collected during 1996 and 1997 were generally elevated when compared to samples collected in 1998. Although it is possible that some of this decrease may be attributed to shifting the sampling strategy from Adverse Pollution Condition (rainfall as adverse condition) to Systematic Random Sampling, it should be noted that the sampling events in 1996-1997 were after unusually high levels of precipitation.

However, in the data evaluation for this report, the 30 data sets of total coliform bacteria levels from October 1992 to October 1998 confirm that the water quality is consistent with the *Special Restricted* classification.

CONCLUSIONS

CLASSIFICATION

The Shark River complies with the requirements for *Special Restricted* classification. The area was classified using the Systematic Random Sampling Strategy. This strategy is appropriate for the Shark River because there are no direct impacts from point sources in the area. Each of the 45 sampling stations meet or support the criteria for this classification. The bacteriological data for each of the 28 sampling stations with 30 or more sets of data meet the NSSP *Special Restricted* shellfish water classification criteria under the total

coliform classification standard used by the State of New Jersey. The 17 sampling stations with less than 30 sets of data support the *Special Restricted* classification.

The data supports the current *Special Restricted* classification. The area is correctly classified, no changes are necessary. Shellfish are allowed to be harvested only under special circumstances in compliance with the state's relay or depuration programs.

POTENTIAL FOR UPGRADE

The bacteriological data does not meet the total coliform criteria under the Systematic Random Sampling Strategy for a seasonal harvest period. Therefore, an upgrade to a *Seasonal* status is not appropriate.

Six sampling stations in the Shark River meet *Approved* water criteria. Five of these stations (1200A, 1201A, 1202A, 1202D, and 1215A) are located between Shark Island and the ocean inlet. The

bacteria levels at these stations are associated with the better water quality of the ocean water entering the estuary, since there is a significant difference between the water quality on the incoming tide versus that on the ebbing tide. The sixth sampling station (1215E) is isolated and surrounded by other sampling stations that comply only with the *Special Restricted* criteria.

SHORELINE SURVEY

There are no changes to report for the Shark River shoreline since the last Sanitary Survey in 1994. The Shark River was designated as a No Discharge Zone in May, 1998. The communities bordering the Shark River can be

characterized as urban in nature and pollution sources attributed to nonpoint source discharges.

RECOMMENDATIONS

CLASSIFICATION

No change in the present shellfish water classification for the Shark River is recommended. The shellfish waters should remain classified as *Special Restricted* with harvesting allowed only under special permit in compliance with the State's relay or depuration program.

Although the 1997 Annual Report summarizing fecal coliform data collected during 1997 indicated that fecal coliform levels were elevated at 31 sampling stations, evaluation of data collected during 1998 indicates an improvement with only 12 stations showing somewhat elevated fecal coliform values. Based on the fecal coliform trend observed in the 1997 fecal coliform data, the 1997 Annual

Report recommended that no harvesting under the Special Permits Program should be permitted in this area until further data had been evaluated. Data collected in 1998 indicate that fecal coliform levels have not continued to rise.

Based on the Total Coliform Standard used to classify the shellfish waters in New Jersey, it is recommended that it is not necessary to downgrade this water body to *Prohibited* status or to suspend Special Permit harvesting in this area.

A meeting with Monmouth County Health Department officials is recommended to discuss fecal coliform levels and potential sources.

SAMPLING

The sampling strategy in the Shark River should remain under the Systematic Random Sampling Strategy.

Twelve sampling runs should be scheduled for the 1998-1999 sampling year. Samples should be collected from the 45 established sampling stations.

ANALYSIS

Additional dilutions should be used in the analytical procedures to better evaluate data listed as greater than 2400 MPN/100mL in previous years. It is

recommended that all samples collected in the Shark River be processed with an extra dilution.

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APPENDICES

- A. Statistical Summaries
 - A1 Year-round
 - A2 Winter Only
 - A3 Summer Only
- B. Seasonal Evaluation
- C. Precipitation
 - C1 Rainfall Correlation
 - C2 Cumulative Rainfall
- D. Tidal Evaluation
- E. Data Listing - 1992 through 1998