



## San Diego County 2006 Beach Closure & Advisory Report



Imperial Beach pier

Beach water quality contamination events and days posted  
for beaches within San Diego County, California, USA

Prepared by the County of San Diego  
Department of Environmental Health  
Land & Water Quality Division  
Ocean & Bay Recreational Water Program

# San Diego County 2006 Beach Closure & Advisory Report

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- Encina Wastewater Authority
- City of Oceanside Water Utilities Laboratory
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### SPECIAL THANKS

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*This report format is adapted from the County of Orange Health Care Agency, Ocean Water Protection Program, 2003 Annual Ocean and Bay Water Quality Report.*

Photographs courtesy of Mario Covic ([www.sandiegosurfpics.com](http://www.sandiegosurfpics.com)) and Frank Lupena unless otherwise noted

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Figure A: Dry weather flow from a storm drain outlet at Windansea Beach in La Jolla. Photo: P. Neubauer

# THE OCEAN & BAY RECREATIONAL WATER PROGRAM

As part of the County of San Diego Department of Environmental Health (DEH), the Ocean & Bay Recreational Water Program is responsible for the protection of public health along the County's 52 miles of ocean and bay recreational waters. (52 of the 154 total shoreline miles {73 ocean and 81 bay} are considered recreational shoreline). Ocean and bay waters used for full body-contact recreational activities such as swimming, surfing and diving must meet specific bacteriological standards to be considered safe for such purposes. Every day the Ocean & Bay Recreational Water Program staff reviews the latest bacteriological water sample results from six different laboratories, receives reports of sewage releases, and other information needed to determine the safety of water contact at beaches within San Diego County. The California Health and Safety Code and Title 17 of the California Code of Regulations require the local health officer (the DEH Ocean & Bay Recreational Water Program) to make public notifications as soon as it has information that indicates contamination of ocean or bay recreational waters and a possible increased health risk to users. Sources of ocean and bay water contamination can include sewage releases, sewage contaminated runoff, urban runoff in both dry and wet weather, and unknown sources when results from beach water quality monitoring indicate levels of fecal indicator bacteria that violate state standards. DEH will issue a water contact Closure or Advisory (signs are posted at the beach, hotline and Web page are updated) until additional sampling results indicate bacterial levels are within state standards and/or the source of contamination is eliminated.

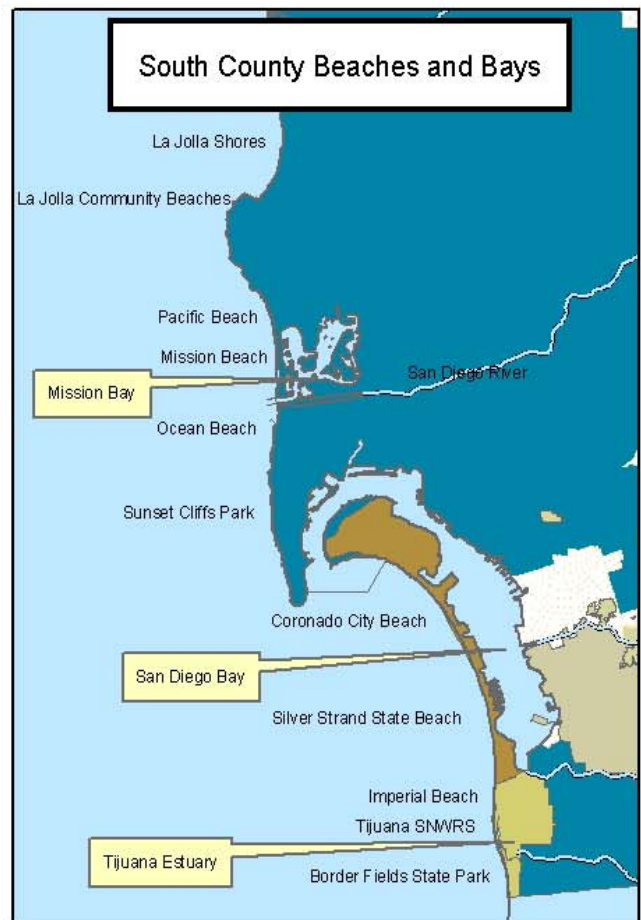
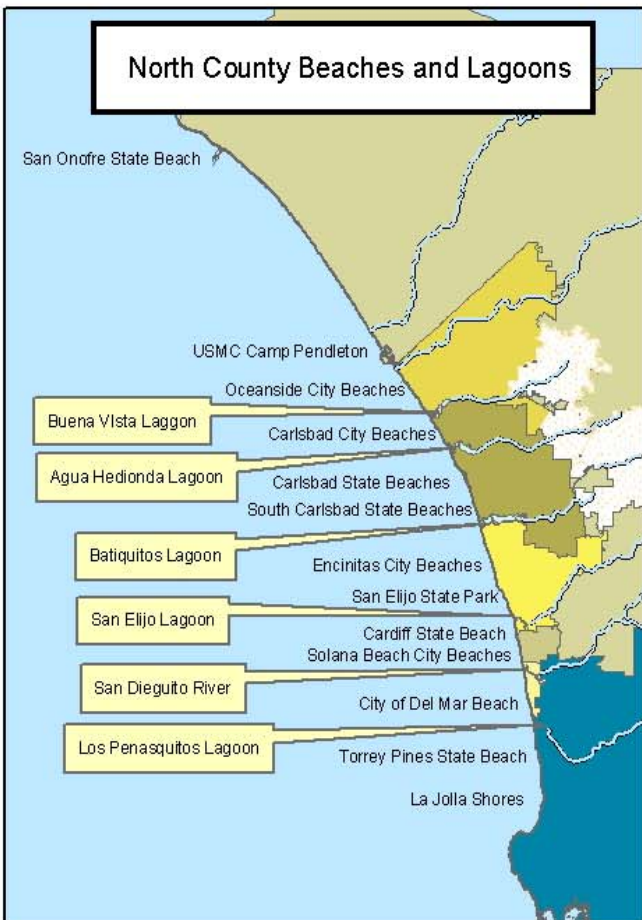
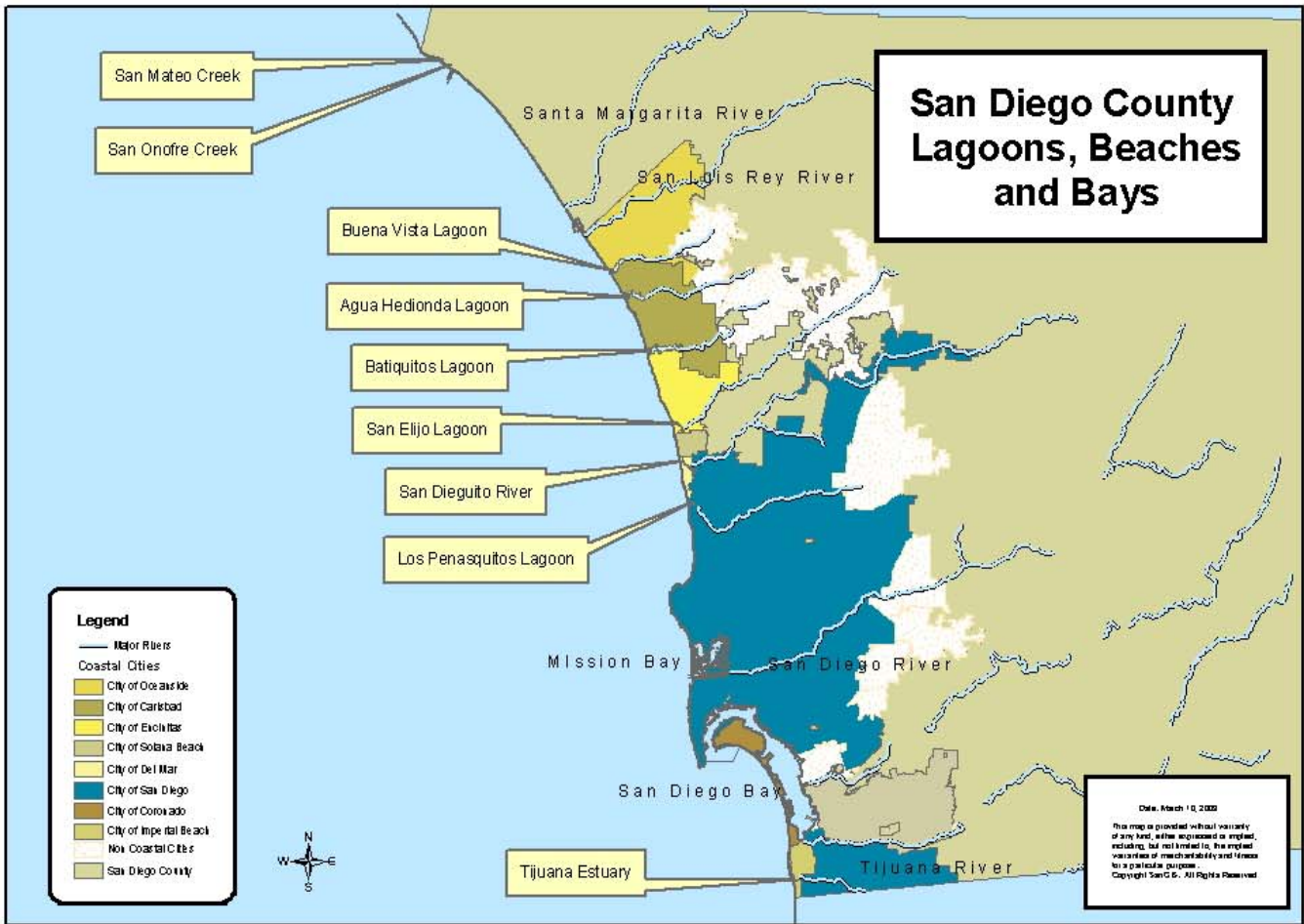
The Ocean & Bay Recreational Water Program staff maintains a daily Beach Water Quality Report Hotline **619-338-2073** and internet podcast - [www.sdcdeh.org/multimedia/podcast/podcast.html](http://www.sdcdeh.org/multimedia/podcast/podcast.html)

The same information is shown on maps on the [www.beaches911.org](http://www.beaches911.org) real time web site. Select "San Diego County".

Annual DEH Beach Closure & Advisory reports and other information can be found at [www.sdcounty.ca.gov/deh/lwq/beachbay/index.html](http://www.sdcounty.ca.gov/deh/lwq/beachbay/index.html)



Figure 1 : Surfer at a San Diego County beach. Photo: M. Covic



## ***Beach Mile Days***

The term “Beach Mile Days” is used to represent the measurement of the number of days and the distance of ocean or bay shoreline waters that are closed due to a sewage spill or under advisory for a violation of the AB 411 Ocean Water-Contact Sports Standards.

Using BMDs is a more meaningful measurement of recreational loss than using the number of events or the number of days posted since BMDs take into account both the length of beach posted and the duration of the event. The California State Water Resources Control Board and all California coastal counties use BMDs for reporting closures and postings which provides a standardized measure allowing comparison of different areas (beach to beach or county to county) or assessing trends over time.

Beach Mile Days (BMDs) are calculated by multiplying the number of days of a closure or posting by the number of miles of beach closed or posted:

$$(\text{Number of Days}) \times (\text{Miles of beach closed or posted}) = \text{Beach Mile Days}$$

For example, if a sewage spill resulted in the closure of  $\frac{1}{2}$  mile of beach for 7 days then:

$$(7 \text{ days}) \times (0.5 \text{ mile}) = 3.5 \text{ closure Beach Mile Days}$$

The total number of available Beach Mile Days for the county as a whole and for individual beaches (see page 17) can be used to calculate the amount of recreational loss due to water contact warnings. For example, Mission Bay beaches had 5.2 closure BMDs in 2006. This represents a 0.7% loss of the 730 available BMDs for that year.



Figure 2: Leisure Lagoon in Mission Bay. Photo: City of San Diego

## EXECUTIVE SUMMARY

The 2006 Beach Closure and Advisory Report provides an analysis of beach water quality advisories and closures for the 52 miles of recreational ocean and bay beaches in San Diego County for the years 2000 through 2006.

### ***Major findings of the San Diego County 2006 Beach Closure & Advisory Report:***

#### **Closures due to Sewage Contamination**

- The number of closure events due to sewage contamination decreased 14% [31 in 2006 from 36 in 2005], and the number of closure Beach Mile Days (BMDs) decreased 57% to 114 in 2006 from 263 in 2005. Analysis of closure data since 2000 indicates several trends in beach closures in San Diego County:
  1. The biggest contributors to closure BMDs are the closures issued for south county beaches due to sewage-contaminated runoff from the Tijuana River. These closures are often for several miles of beach shoreline (compared to several hundred yards for other closures) and can last from a few days to over two weeks at a time. Closures related to the Tijuana River are a function of rainfall frequency and intensity, which cause river flows to enter the U.S. and the Tijuana Estuary. The low amount of rainfall in the 2005/ 2006 rainy season resulted in less sewage contaminated runoff in the river entering the U.S. and estuary.
  2. When closure events related to the Tijuana River are excluded, the number of closure events caused by sewage spills (SSOs) has decreased 74% since 2001. [Down from 39 in 2001 to 10 in 2006. See page 16].



Figure 3: Plume from the Tijuana Estuary flowing south to Border Field State Park and Playas De Tijuana in Baja California, Mexico. Photo: Ocean Imaging, Inc. [www.sdcoastview.oceani.com](http://www.sdcoastview.oceani.com)

## EXECUTIVE SUMMARY (cont'd)

### Advisories due to bacterial exceedances in monitoring (unknown source of contamination)

- The number of advisory BMDs due to bacterial exceedances in monitoring during the AB 411 period (April 1 – October 31) decreased to 32 in 2006 from 41 in 2005. This represents a 61% decrease in advisory Beach Mile Days since 2000.
- The 11.76 advisory BMDs for Mission Bay beaches in 2006 were likely artificially inflated due to false positive *E. coli* data for multiple locations in east Mission Bay during July and August. For more information on monitoring data for east Mission Bay beaches and the suspension of the Colilert 18™ analytical test method, see page 24.
- The location with the most advisory days posted due to bacterial exceedances for the AB 411 period in 2006 was P.B. Point in Pacific Beach (77 days). A summary of a source identification study of bacterial contamination at P.B. Point is on page 22. The locations with the most days posted under advisory in previous years were:
  - 2005 - San Luis Rey River outlet/ south jetty in Oceanside (117 days).
  - 2004 - P.B. Point in Pacific Beach (121 days)
  - 2003 - P.B. Point in Pacific Beach (80 days)
  - 2002 - Shelter Island shoreline park in San Diego Bay (210 days)
  - 2001 - P.B. Point in Pacific Beach (129 days)
  - 2000 - P.B. Point in Pacific Beach (141 days)



Figure 4: San Luis Rey River outlet at the south jetty in Oceanside

# OCEAN AND BAY WATER QUALITY AND PUBLIC HEALTH

## ***Disease-causing microorganisms***

Polluted runoff and untreated sewage may contain pathogenic bacteria, viruses or protozoa. When polluted runoff or sewage is released into ocean or bay waters these disease-causing organisms may be present near the sites where polluted discharges enter the water, or farther away depending upon ocean currents. Swimming, surfing or other exposure to contaminated waters increases the risk of illness from pathogens found in contaminated water.

The following table lists some of the pathogens found in sewage-contaminated water and possibly in runoff, and the diseases (or symptoms) they cause.

Table 1: Disease- causing microorganisms

<b>Pathogenic Agent</b>	<b>Disease</b>
<b>Bacteria</b>	
<i>Escherichia coli</i> ( <i>E. coli</i> )	Gastroenteritis
<i>Salmonella</i> (not typhi)	Gastroenteritis, usually with fever; less commonly septicemia
<i>Shigella</i>	Gastroenteritis, usually with fever
<b>Protozoa (intestinal parasites)</b>	
<i>Cryptosporidium</i>	Diarrhea – Cryptosporidiosis
<i>Giardia lamblia</i>	Diarrhea – Giardiasis
<b>Viruses</b>	
Rotavirus	Gastroenteritis
Enteroviruses	Respiratory infection, rash, fever; meningitis
Norwalk and Norwalk-like viruses	Gastroenteritis
Adenovirus	Respiratory infection and gastroenteritis

The levels of bacteria, viruses and protozoa decrease in recreational waters over time by the following processes:

- Die off due to sun (ultraviolet exposure), salt water or age.
- Predation by other organisms
- Dilution

## ***Indicator bacteria testing methods***

The detection and enumeration of disease-causing organisms (pathogens) identified with waterborne illness is difficult, time-consuming and costly. Thus, state law and regulations require permitted dischargers and local environmental health departments to test for fecal indicator bacteria (i.e., total coliforms, fecal coliforms and enterococci) as a means to ascertain the likelihood that human pathogens may be present in recreational waters. Fecal indicator bacteria are found in the intestines of all warm-blooded animals, and are excreted in high numbers in feces, but can also be found in soils and decaying vegetation. The methods most commonly used to detect fecal indicator bacteria in ocean waters include:

- **Membrane Filtration (MF)**: This test method produces results in 24 hours. The City of San Diego, Environmental Monitoring and Technical Services Division and the Encina Wastewater Authority use the MF method for the analyses of total coliforms, fecal coliforms and enterococci in ocean waters.
- **Multiple-tube Fermentation (MTF)**: This test method produces results from 24 to 96 hours. The City of Oceanside Water Utilities Laboratory and the County of San Diego, Public Health Laboratory use the MTF method for the analyses of total coliforms and fecal coliforms in ocean waters. The San Elijo Water Reclamation Facility uses the MTF method for the analyses of total coliforms, fecal coliforms and enterococci in ocean waters.
- **Colilert 18 ®**: This test method produces results in 18 hours. The County of San Diego, Public Health Laboratory used the Colilert 18 method for the analyses of total coliforms and *E. coli* from June 2005 until September 2006.
- **Enterolert®**: This test method produces results in 24 hours. The County of San Diego Public Health Laboratory and City of Oceanside Water Utilities Laboratory use the Enterolert® technique for the analyses of enterococci bacteria in ocean waters.

All of the methods are culture based, which means that the indicator bacteria present in water must be allowed to grow in order to be detected. Differences between the methods include how the bacteria are detected and counted, how soon the results become known, and cost. Detailed descriptions for these methods are available in the latest edition of *Standard Methods for the Examination of Water and Wastewater*.



Samples are collected in ankle to knee-deep water, 4 - 6 inches below the surface

Figure 5: Beach water sample collection.

## ***Locations and frequency of bacterial monitoring***

Over the past 20 years, the County of San Diego Department of Environmental Health and local sanitation agencies (City of San Diego, San Elijo Water Reclamation Facility, Encina Wastewater Authority, and the City of Oceanside) have been conducting bacterial monitoring of the coastal waters in San Diego County for the protection of public health and for regulatory permit requirements.

In 1997, Assembly Bill 411 amended the California Health and Safety Code (Sections 115880-115915) to require the standardization of bacterial monitoring of water quality at public beaches in California and public notification by the local health agency when results indicate bacterial levels exceed (violate) state standards [see next page]. To fulfill these requirements (called “AB 411”) the DEH Ocean & Bay Recreational Water Program collects beach water samples from 60 locations per week between April and October. Several high use beaches next to flowing storm drains or lagoons are sampled twice a week during this time. Between November and March, DEH collects samples at 13 popular surfing beaches every week. In addition to the samples collected by DEH, the county’s five dischargers of treated wastewater effluent collect beach water samples as part of their discharge permit requirements. The Cities of Oceanside and Coronado also collect beach water samples voluntarily. The results from all of these monitoring efforts are shared with DEH. The total number of beach water samples collected in San Diego County is over 100 per week between April and October, and over 50 per week between November and March.

Table 2 below and Figure 6 on page nine show the distribution of the weekly beach water quality monitoring in San Diego County between April and October. The numbers shown are the number of routine samples collected per week. Follow-up sampling by DEH can add an additional five to fifteen samples per week.

For a detailed map of sampling locations at San Diego County beaches, go to [www.beaches911.org](http://www.beaches911.org) and select ‘San Diego County’.

Table 2: Number of weekly sampling stations between April 1 and October 31, 2006

San Onofre. <i>State Beach that includes San Mateo Creek outlet</i>	1	
Camp Pendleton. <i>USMC beaches that include San Onofre Creek outlet and Camp Del Mar</i>	2	
Oceanside. <i>From Harbor Beach south to St. Malo. Includes Buccaneer Beach</i>	12	<i>includes one station sampled 2x week</i>
Carlsbad. <i>Includes Buena Vista Lagoon outlet, municipal beach, and Carlsbad State beaches</i>	10	
Encinitas. <i>From Leucadia south through Cardiff State Beach. Includes Moonlight Beach.</i>	10	<i>includes two stations sampled 2x week</i>
Solana Beach. <i>Includes Tide Beach Park, Fletcher Cove, and Seascape Beach Park</i>	4	<i>includes one station sampled 2x week</i>
Del Mar. <i>From San Dieguito River Beach south through Anderson Canyon</i>	3	<i>includes one station sampled 2x week</i>
San Diego, Mission Bay. <i>Includes 18 swimming, sailing and PWC areas</i>	18	
San Diego, ocean coast. <i>From Torrey Pines State Beach south through Sunset Cliffs Park. Includes La Jolla, Windansea, Pacific Beach, Mission Beach, and Ocean Beach</i>	20	<i>includes two stations sampled 2x week</i>
San Diego Bay. <i>Includes seven locations on San Diego Bay</i>	7	
Coronado. <i>Includes Coronado municipal beach and Silver Strand State Beach</i>	9	<i>includes four stations sampled 2x week</i>
Imperial Beach. <i>From Camp Surf south through End of Seacoast Drive</i>	4	
BF, TJSNWRs. <i>Border Field State Park and Tijuana Slough National Wildlife Refuge Shoreline</i>	4	
<b>Total Weekly Samples</b>	<b>104</b>	

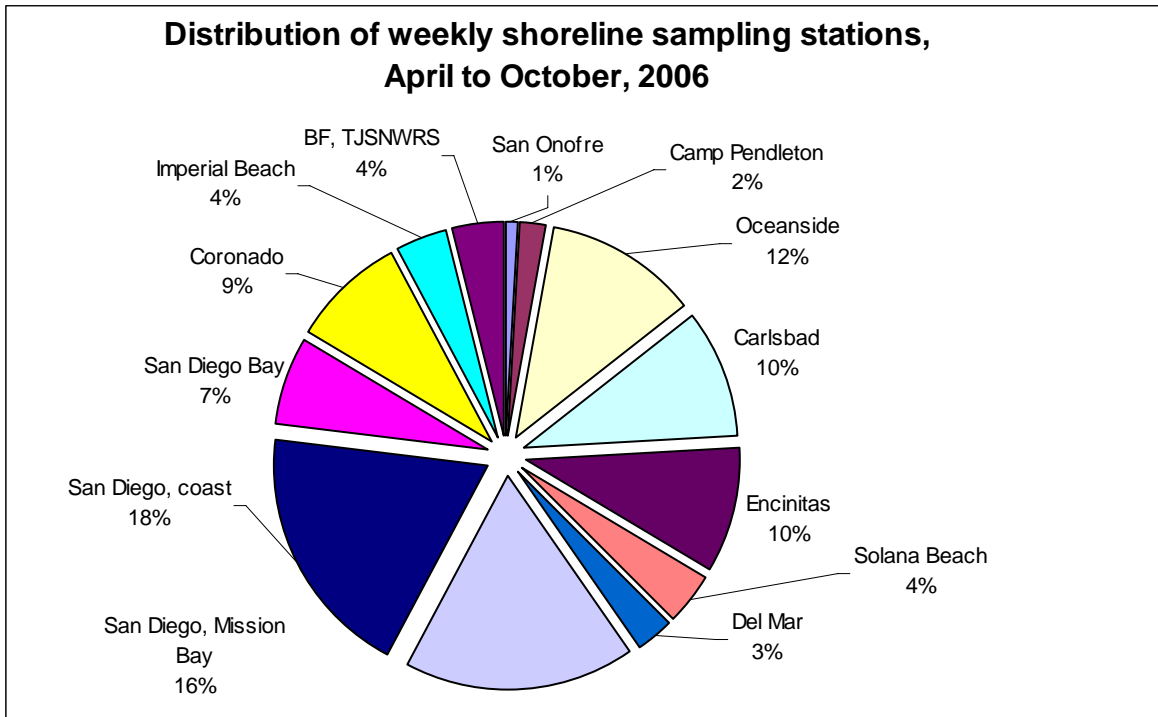


Figure 6: Weekly sampling at San Diego County Beaches (April - October).

Sampling is conducted by the following agencies: County of San Diego Department of Environmental Health (DEH), City of Oceanside, Encina Wastewater Authority, San Elijo Water Reclamation Facility, City of San Diego, and the City of Coronado.

### ***Bacterial Standards for Ocean Water Contact***

The California Department of Health Services established the following bacterial standards for ocean water contact in the California Code of Regulations, Title 17 (Sections 7956-7962) to implement AB 411. These are often referred to as the “AB 411 Standards”. These standards and the other requirements of AB 411 became effective in July 1999.

**Single sample standards** for total coliforms, fecal coliforms and enterococci bacteria shall not exceed:

- Total Coliforms: 10,000 organisms per 100 milliliter sample.
- Fecal Coliforms: 400 organisms per 100 milliliter sample.
- Enterococci: 104 organisms per 100 milliliter sample.
- Fecal: Total ratio: >1,000 total coliforms if ratio exceeds 0.1.

**30-day geometric mean standards** (of five weekly samples) for total coliforms, fecal coliforms and enterococci bacteria shall not exceed:

- Total Coliforms: 1,000 organisms per 100 milliliter sample.
- Fecal Coliforms: 200 organisms per 100 milliliter sample.
- Enterococci: 35 organisms per 100 milliliter sample.

Potential sources of the indicator bacteria used to test for fecal contamination of beach water quality include:

Environment: soils, decaying vegetation  
Storm water/ urban runoff: sources vary

Animal wastes: birds, dogs, cats, seals  
Humans: sewage, kids with diapers, shedding from body

# OCEAN AND BAY WATER QUALITY ADVISORIES DUE TO STANDARDS VIOLATIONS

When a bacteriological water sample from a beach next to a coastal outlet (storm drain, river, lagoon mouth, etc.) fails to meet the AB 411 Single Sample Standards (see page 9), the following occurs:

- Warning signs are posted at the beach indicating that bacterial levels in ocean or bay waters have exceeded health standards.
- All the information regarding the posted areas is updated on the DEH Beach Water Quality podcast, phone hotline (619-338-2073) and [www.beaches911.org](http://www.beaches911.org) web page.
- Additional bacteriological water samples are collected at the posted areas and the results are evaluated daily to determine if the areas posted with warning signs should be increased, reduced, shifted or removed.



The DEH Ocean & Bay Recreational Water Program recommends avoiding water contact at areas posted with the warning sign shown above.

## ***Advisories for San Diego County beaches 2000 - 2006 (April - October)***

The information provided in this section is the data reported to the California State Water Resources Control Board beginning with the year 2000, the first calendar year that the AB 411 Ocean Water-Contact Sports Standards were in place. Comparisons for days posted under advisory are limited to the April to October time period due to changes in monitoring frequencies at some locations between November and March.

The following charts and graphs depict the total number of advisory Beach Mile Days due to exceedances of standards [Figure 8], the total number of routine samples collected and the number of those samples causing advisories (exceedances) [Figure 9], and the total days posted [Figure 10] between April 1 and October 31 each year.

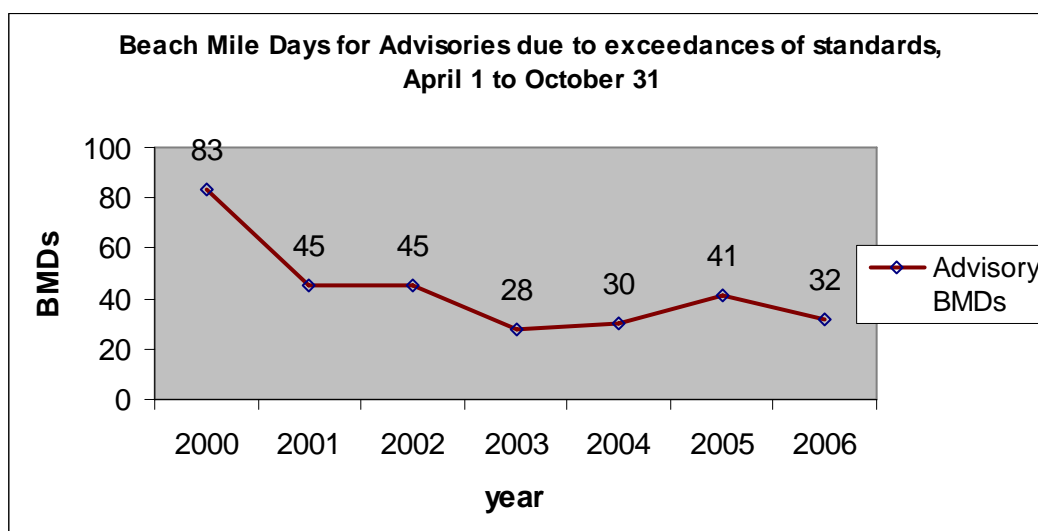


Figure 7: Advisory beach mile days due to bacterial exceedances

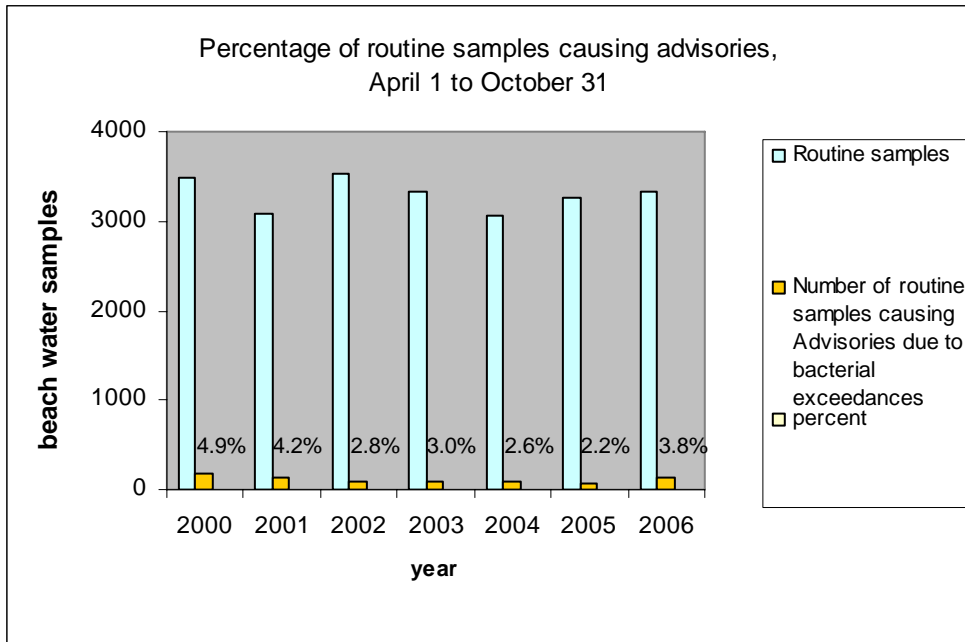
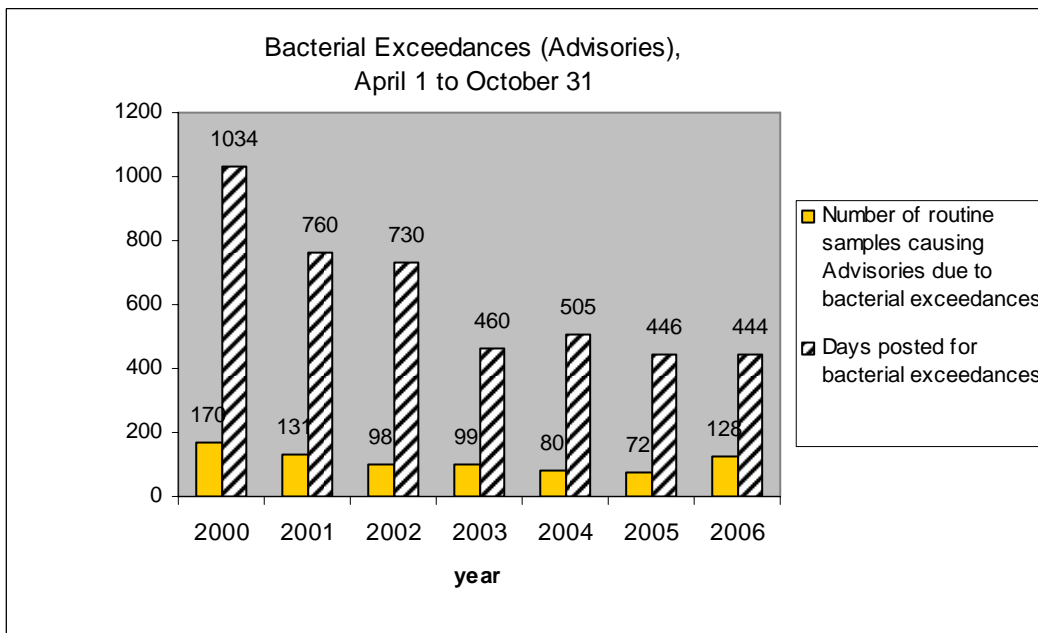


Figure 8: Number of routine samples and exceedances



These graphs do not include chronic advisory days (Children's Pool). See page 13.

Figure 9: Advisory events (exceedances) and days posted

Overall, water quality at most beaches in San Diego County is very good during dry weather. Weekly bacterial monitoring data is sent to Heal The Bay (HTB), which provides a water quality grade for each location based upon the last four weeks of monitoring data. In its 2005-2006 Annual Beach Report Card, HTB assigned 89% of monitored locations in San Diego County with a grade of 'A' or 'B' for year-round dry weather water quality. The annual, summer, and weekly grades can be viewed at [www.healthebay.org](http://www.healthebay.org). For most locations, the annual [dry weather] grade assigned by HTB agrees with the assessment by DEH of health risk from water contact. The weekly report card provides beach goers with the recent trend in water quality at a beach, but does not provide the current status assigned by DEH. For the current status, check the DEH Beach Water Quality Report Hotline (619-338-2073) or web page ([www.beaches911.org](http://www.beaches911.org)).

## Advisory BMDs by coastal jurisdiction 2000 – 2006 (April – October)

The number of advisory Beach Mile Days due to bacterial exceedances for each coastal jurisdiction is shown below.

Table 3: BMDs for bacterial exceedances (Advisories) between April 1 and October 31

	2000	2001	2002	2003	2004	2005	2006
San Onofre	0.06	0.74	0.23	0.63	0	3.3	0
Camp Pendleton	0	0	0	0	0	0	0
Oceanside	0.81	0.45	1.23	1.82	3.24	6.8	1.76
Carlsbad	0.28	0.23	0.06	0.23	0.11	0.23	0.34
Encinitas	3.92	1.25	0.28	1.48	0.91	1.27	6.31
Solana Beach	0	0.28	0.11	0.4	0.11	1.25	0
Del Mar	0.17	0	0.23	0.11	0.63	1.17	0.23
San Diego, Mission Bay	29.86	21.7	19.49	7.22	11.25	3.75	11.76
<i>Mission Bay Epi study</i>	x	x	x	4.67	X	x	x
San Diego, ocean coast	12.3	10.1	4.39	7.37	10.45	9.86	7.42
San Diego Bay	4.38	9.43	18.13	2.84	3.47	1.65	4.09
Coronado	0.46	0.28	0.23	0.11	0	6.85	0.11
Imperial Beach	0.4	0.34	0	0.28	0	2.76	0
BF, TJSNWRS	30.06	0.57	0.51	1.19	0.11	1.99	0
	83	45	45	28	30	41	32

For a detailed map of sampling locations at San Diego County beaches, go to [www.beaches911.org](http://www.beaches911.org) and select San Diego County.

Changes in sampling procedures by DEH: In April 2001, DEH moved its routine sample collection point at locations with outlets (storm drains, rivers, or lagoons) to 25 yards downcoast from the mixing zone, except in Mission Bay due to inadequate signage at drain outlets there. This change was made to conform to the State's and other agencies recommendations. This change in the routine sample collection procedure was applied to Mission Bay locations in June 2003.



Figure 10: Cottonwood Creek outlet at Moonlight Beach, Encinitas

## ***Beaches under a chronic advisory or closure***

Analysis of water quality advisory and closure data in the *2006 Beach Closure and Advisory Report* does not include locations posted or closed under a chronic status (i.e., Children's Pool, and the Tijuana Slough and Border Field State Park shorelines). Although sample results at chronic locations may occasionally be within state standards, the presence of known, on-going sources of contamination require these beaches to remain under a water quality advisory or closure status to protect public health.



Figure 11: Children's Pool in La Jolla, San Diego. Photo: P. Neubauer

# OCEAN AND BAY WATER CLOSURES DUE TO SEWAGE SPILLS

Whenever a sewage release is reported to the DEH that may impact water quality at a recreational beach, staff immediately issues a water contact closure for the affected ocean or bay beach. The closure area is based on many factors, including type of sewage (e.g., untreated, secondary treated, sewage sludge), volume of discharge, location of spill, ocean currents and tides, historical sewage spills in the area, and any other pertinent information. After a water contact closure is issued:

- Closure signs are posted at the affected ocean or bay shoreline indicating sewage contamination has occurred.
- A press release is sent to the media and appropriate agencies are notified.
- All the information regarding the closure area is updated on the DEH Beach Water Quality podcast, phone hotline (619-338-2073), and [www.beaches911.org](http://www.beaches911.org) web page.
- Bacterial sampling of the affected shoreline is initiated. Closed recreational beaches will be reopened or reduced in size when the contamination source has been eliminated and after two daily consecutive sampling results indicate the water quality meets the AB 411 Single Sample Standards (see page 9).



The DEH Ocean & Bay Recreational Water Program strongly recommends avoiding water contact within the closure area and where closure signs are posted.



A 100 gallon /minute spill through a sewer manhole. Overflows are typically caused by blockages (grease, tree roots, debris) or rain infiltration of sewer lines. Spills often flow into the street and then into storm drains, which transport flows directly to the ocean or into rivers or creeks, which flow to the ocean. The storm drain system is not connected to the sewer system in San Diego County.

Figure 12: Sanitary sewer overflow (SSO)

## Closures due to sewage contamination 2000 – 2006 (calendar year)

The following charts and graphs depict the total number of closure events and known volume of sewage spilled to recreational waters in San Diego County from 2000 to 2006 [Table 4], and total number of closure Beach Mile Days (BMDs) [Table 6]. 2006 saw a reduction in the number of closure events (down 14% for all closures from 2005, and down 74% for just SSOs from 2001) [Figure 13, Table 5], and the impact of closures as measured by BMDs (down 57% from 2005). Likewise, in 2006 the volume of sewage spills from SSOs impacting recreational waters was the lowest in the six year period as shown in Table 4.

Table 6 on page 17, closure Beach Mile Days due to sewage contamination, shows the extent of loss of recreational beach use by the county as a whole and by coastal jurisdiction for every year since 2000. Fewer SSOs and better containment of spills that did occur, and a drier rainy season, contributed to the reduction of closure BMDs.

The yearly contribution by the Tijuana River to the total number of closure BMDs is shown in Table 7 and Figure 14 [page 18]. It is noteworthy that the closures caused by the Tijuana River account for 70% or more of closure BMDs for every year except 2002. Closures caused by sewage-contaminated runoff from the Tijuana River are seasonal because the river flow is diverted to the U.S. International Boundary & Water Commission (IBWC) treatment plant during low flow conditions (flows less than 15 million gallons per day). Therefore, years with lower amounts of rainfall tend to have fewer beach closures at south county beaches.

Table 4: Beach closures and gallons spilled

	2000	2001	2002	2003	2004	2005	2006
Beach closure events	44	50	35	39	42	36	31
Volume (gal) of sewage spilled to recreational waters (does not include Tijuana River flows)	36,673,012	1,952,453	11,704,314	2,066,355	7,359,373	575,928	53,973

Figure 13: Graph of beach closure events

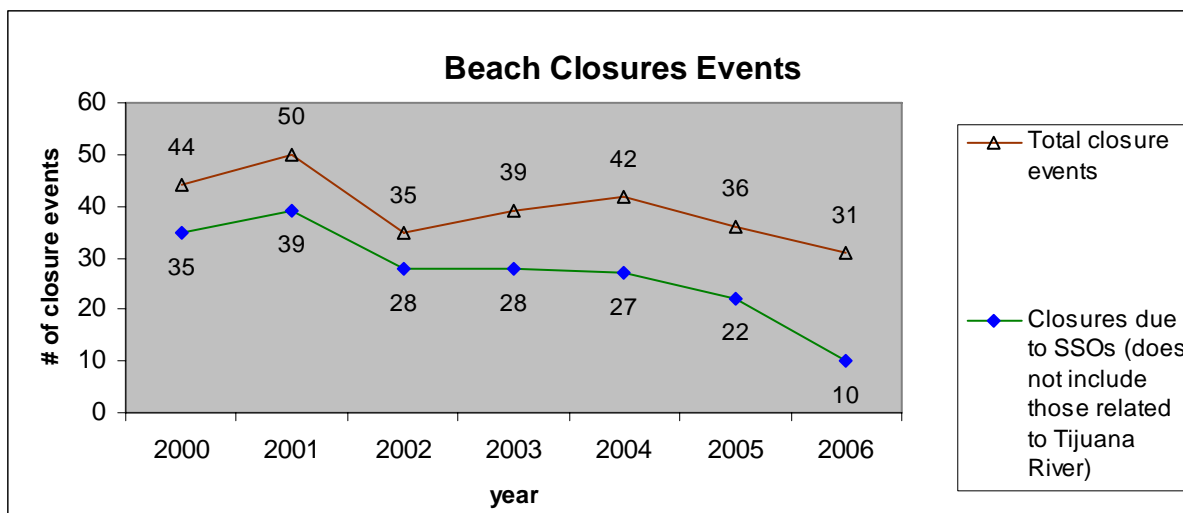


Table 5: Closure events caused by sewage spills

**Closure events caused by sewer spills (SSOs). Does not include closures caused by sewage-contaminated runoff from the Tijuana River**

<b>coastal jurisdiction</b>	2000	2001	2002	2003	2004	2005	2006
<b>San Onofre SB</b> (includes MCB Camp Pendleton)	2	1	0	2	0	1	0
<b>Oceanside</b> (Harbor Beach, Oceanside pier, and Buccaneer Beach)	1	0	1	1	2	1	2
<b>Carlsbad</b> (Carlsbad State and South Carlsbad State Beaches and Aqua Hedionda Lagoon)	5	4	4	2	3	5	0
<b>Encinitas</b> (Leucadia/ Grandview, Stone Steps, Moonlight, Swami's, San Elijo State Park and Cardiff State Beach)	2	4	2	6	5	4	0
<b>Solana Beach</b> (Tide Beach, Fletcher Cove, Seascape Park)	1	1	0	0	1	0	0
<b>Del Mar</b> (San Dieguito River Beach to Andersen Canyon)	1	1	2	2	0	0	1
<b>City of San Diego, coastal beaches</b> (Torrey Pines State Beach, La Jolla, Pacific Beach, Mission Beach, Ocean Beach, and Sunset Cliffs) and Mission Bay	17	21	11	11	10	6	6
<b>San Diego Bay</b> (can include Coronado, San Diego, and Chula Vista jurisdictions)	5	7	6	3	3	2	1
<b>Coronado</b> (includes Silver Strand SB)	0	0	0	0	0	0	0
<b>Imperial Beach</b>	0	0	1	1	3	3	0
<b>Border Field State Park and TJSNWRS</b> (non-chronic closures)	1	0	1	0	0	0	0
<b>Yearly event totals</b>	<b>35</b>	<b>39</b>	<b>28</b>	<b>28</b>	<b>27</b>	<b>22</b>	<b>10</b>

By removing the closure events related to sewage-contaminated runoff from the Tijuana River (closures in Coronado and Imperial Beach) in Table 5, a decreasing trend in closures caused by sewage spills can be observed in San Diego County since 2001. The lower number of closures caused by sewage spills in recent years can be attributed to better maintenance of sewer lines and better containment of spills by some municipal wastewater agencies.

Table 6: Recreational loss due to sewage contamination as measured by BMDs

Closure BMDs in San Diego County. Extent of closure measured by length of shoreline and number of days closed to water contact.								
coastal jurisdiction	available BMDs [beach miles x 365 days]	2000	2001	2002	2003	2004	2005	2006
		<b>San Onofre SB</b> (includes MCB Camp Pendleton)	4.3 x 365 = 1569	1.3	0.5	0.0	1.0	0.0
<b>Oceanside</b> (Harbor Beach, Oceanside pier, and Buccaneer Beach)	3.7 x 365 = 1351	1.2	0.0	1.2	0.3	3.0	1.7	0.5
<b>Carlsbad</b> (Carlsbad State and South Carlsbad State Beaches and Aqua Hedionda Lagoon)	6.5 x 365 = 2372	1.3	3.5	1.8	4.7	1.0	18.0	0.0
<b>Encinitas</b> (Leucadia/ Grandview, Stone Steps, Moonlight, Swami's, San Elijo State Park and Cardiff State Beach)	5.9 x 365 = 2153	0.4	2.1	4.9	4.8	10.5	13.2	0.0
<b>Solana Beach</b> (Tide Beach, Fletcher Cove, Seascape Park)	1.3 x 365 = 475	0.1	0.1	0.0	0.0	1.5	0.0	0.0
<b>Del Mar</b> (San Dieguito River Beach to Andersen Canyon)	2.2 x 365 = 803	0.3	0.2	0.9	0.6	0.0	0.0	0.2
<b>City of San Diego</b> , coastal beaches (Torrey Pines State Beach, La Jolla, Pacific Beach, Mission Beach, Ocean Beach, and Sunset Cliffs)	17.9 x 365 = 6533	8.3	5.9	4.1	11.3	31.0	7.0	3.8
<b>City of San Diego</b> , Mission Bay	2.0 x 365 = 730	0.3	20.3	8.0	11.0	12.0	11.5	5.2
<b>San Diego Bay</b> (can include Coronado, San Diego, and Chula Vista jurisdictions)	1.0 x 365 = 365	1.6	1.5	3.7	1.0	5.5	0.3	0.3
<b>Coronado</b> (and Silver Strand SB) Includes closures due to sewage contamination from Tijuana R.	3.7 x 365 = 1351	18.2	93.4	0.0	81.3	79.5	102.4	35.0
<b>Imperial Beach</b> Includes closures due to sewage contamination from Tijuana R.	1.4 x 365 = 511	32.0	76.9	22.0	72.0	81.0	106.3	68.9
<b>Border Field State Park and TJSNWRS</b> (non-chronic closures)	2.3 x 365 = 839	27.6	0.0	8.9	0.0	0.0	0.0	0.0
<b>Yearly total BMDs</b>	52.2 x 365 = 19053	<b>93</b>	<b>204</b>	<b>56</b>	<b>188</b>	<b>225</b>	<b>263</b>	<b>114</b>
+								
<b>Border Field State Park and TJSNWRS BMDs</b> (chronic closures)		225	372	322	311	456	369	383

Chronic closures: See page 13.

Table 7: Contribution by Tijuana River to closure Beach Mile Days

Tijuana River contribution to closure Beach Mile Days							
Year	2000	2001	2002	2003	2004	2005	2006
Total closure BMDs*	93	204	56	188	225	263	114
SSO closure BMDs, does NOT include those due to Tijuana River	15	34	31	35	67	54	10
% contribution of BMD closures due to the Tijuana River	84	83	45	81	70	79	91

\*non-chronic closures

Figure 14: Graph of Table 7 data

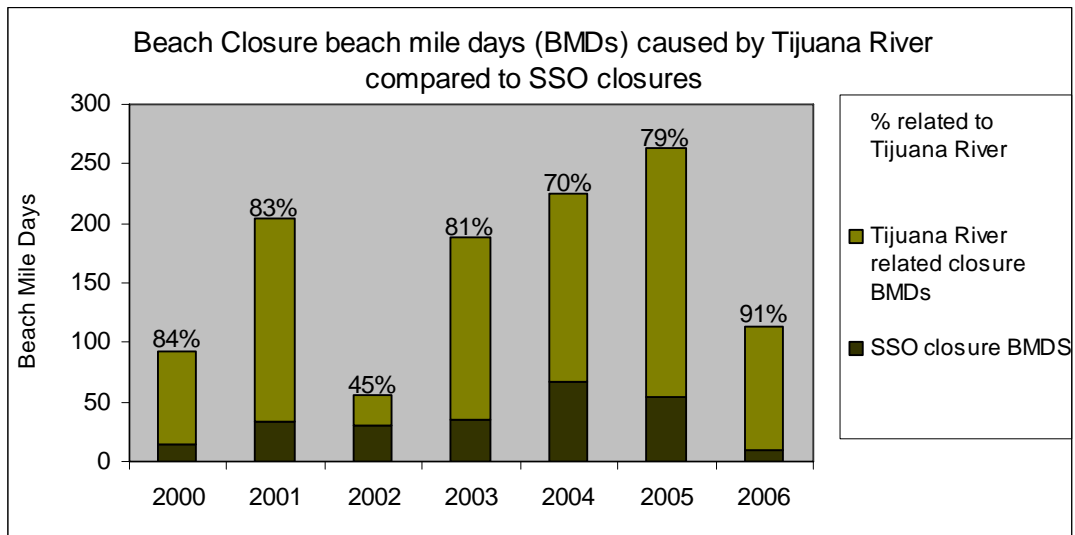


Figure 15: Water contact closure sign at the south end of Seacoast Dr.



To the south is the Tijuana Slough National Wildlife Refuge Shoreline. This area typically re-opens in early summer every year until the next significant rain the following winter.

## OCEAN AND BAY GENERAL ADVISORIES 2000 - 2006

During and after a significant rainstorm event, storm drains, creeks and rivers carry floodwaters and urban runoff (which may include fertilizers, road oils, litter and large amounts of bacteria from a variety of sources such as animal waste and decomposing vegetation) directly to ocean and bay waters.

The levels of bacteria can rise significantly in ocean and bay waters, especially near storm drains, creeks, rivers and lagoon outlets that discharge urban runoff during and after rainstorms. To ensure that public health is protected, the DEH Ocean & Bay Recreational Water Program staff issue a General Advisory to avoid all ocean or bay water contact for 72 hours (three days) after a significant rain (greater or equal to 0.20"). Elevated bacterial levels in the coastal ocean waters may continue for a period of three days depending on the intensity of the rain and the volume of runoff.

The General Advisory issued by the Ocean & Bay Recreational Water Program consists of a press release to the media, and listing on the Beach & Bay Water Quality podcast, phone hotline and the [www.beaches911.org](http://www.beaches911.org) web page. Temporary advisory signs are not posted for General Advisories.

The following is a list of significant coastal outlets in San Diego County based upon the volume or quality of flow during wet weather, or year round flow to ocean waters. Locations with low flow diversions (LFD) to sewer treatment plants or other treatment are noted. Many of these outlets are posted with the permanent health risk warning signs shown here, or older versions of this sign.



Camp Pendleton and San Onofre State Beach: San Mateo Creek outlet, San Onofre Creek outlet, and Santa Margarita River outlet

Oceanside: San Luis Rey River outlet, Wisconsin Street storm drain, and Loma Alta Creek outlet (LFD)

Carlsbad: Buena Vista Lagoon outlet, Carlsbad Village Drive storm drain, Pine Ave storm drain, Aqua Hedionda Lagoon outlet (north – Tamarack; south- Warm Water Jetty), Encina Creek outlet, Batiquitos Lagoon outlet

Encinitas: Cottonwood Creek outlet /Moonlight Beach (Ultra Violet light treatment), San Elijo Lagoon outlet

Solana Beach: storm drains at Fletcher Cove (LFD) and Seascape Beach Park

Del Mar: San Dieguito River Beach, 15<sup>th</sup> Street storm drain, storm drain between 12<sup>th</sup> and 15<sup>th</sup> Street, Sea Orbit Lane storm drain, and Andersen Canyon storm drain

City of San Diego coastal beaches: Los Peñasquitos Lagoon outlet, Torrey Pines Golf Course drainage at Black's, Scripps Institute of Oceanography permitted discharge on south side of Scripps pier, storm drains at El Paseo Grande, Vallecitos, Avenida Del La Playa (LFD), La Jolla Cove (LFD), Coast BI gazebo, north Nicholson Pt/ Hospitals, Ravina/ Horseshoes (LFD), Bonair (LFD), Playa Del Norte, P.B. Point, Tourmaline (LFD), Law Street, San Diego River outlet / Dog Beach, storm drains at Narragansett Ave, Pescadero Ave, Point Loma Ave, Osprey Street, Hill Street, Monaco Street, and Ladera Street.

City of San Diego Mission Bay beaches: Tecolote Creek outlet (LFD), Tecolote Shores (LFD), Leisure Lagoon, Cuddahy Creek outlet, Visitor's Center storm drain (LFD), De Anza Cove storm drains (LFD), Rose Creek outlet (LFD), north Crown Point (LFD), south Crown Point (LFD), La Cima (LFD), Santa Clara Cove (LFD), Santa Barbara Cove (LFD), Bonita Cove, and Balboa Court (LFD).

San Diego Bay beaches: Lawrence Street, Spanish Landing, Bayside Park, and Tidelands Park.

City of Coronado: storm drain at north beach (LFD)

Tijuana Slough National Wildlife Refuge Shoreline: Tijuana River outlet (LFD)



Figure 16: Plume from the San Diego River outlet following heavy rains in January 2005. Photo: Ocean Imaging, Inc.

The dates that DEH issued a General Advisory for San Diego County ocean and bay waters due to contamination by urban runoff following rain during 2000 – 2006 are listed below.

**YEAR 2000** (38 Total General Advisory Days)

January 25 – January 28, February 11 – February 29  
March 5 – March 9, April 18 – April 23  
October 27 – November 1,  
November 11 – November 14

**YEAR 2001** (49 Total General Advisory Days)

January 9 – January 15, January 26 – January 29  
February 13 – February 17  
February 24 – March 2, March 6 – March 9  
March 10 – March 12, April 7 – April 13  
November 13 – 16, November 25 – 28  
November 29 – December 6,  
December 10 – 13, December 21 – 24

**YEAR 2002** (35 Total General Advisory Days)

January 28 – February 1  
March 8 – 11, March 18 - 21  
March 24 – 27  
April 24 – 29, September 6 – 10  
November 8 – November 12  
December 17 – 24, December 29 – 31

**YEAR 2003** (32 Total General Advisory Days)

February 11 – February 18  
February 25 – March 2  
March 16 – 20, April 14 – 18  
May 3 – 6, November 1 – 4  
November 12 – 15, December 26 – 29

**YEAR 2004** (48 Total General Advisory Days)

January 3 – 6, February 3 – 6  
February 19 – 29, March 2 – 5  
April 2 – 5, April 17 – 20  
October 17 – 23, October 27 – 30  
November 9 – 10, November 21 – 24  
November 28 – December 1  
December 5 – 9, December 28 – 31

**YEAR 2005** (47 Total General Advisory Days)

December 28, 2004 – January 14  
January 28 – 31  
February 11 – 15, February 18 – 26  
March 5 – 8, March 19 – 26  
April 28 – May 1  
October 16 – 20  
December 31

**YEAR 2006** (43 Total General Advisory Days)

December 31, 2005 – January 5  
February 19 – 22, Feb 28 – Mar 3  
March 11 – 14, March 21 – 24  
Mar 29 – Apr 1, April 5 – 8, April 14 – 17  
May 22 – 25  
October 14 – 17, November 27 - 30  
December 10 – 13, December 17 – 20  
December 27 – 30

# WATER QUALITY STUDIES

## ***Bacteria Source Identification Study at P.B. Point***

In May 2005, the City of San Diego City Council allocated \$250,000 for a 12-month study to identify the source(s) of bacterial contamination in ocean waters at the inside cove of P.B. Point in north Pacific Beach. A total of 40 surveys (with sampling at 10 shoreline sites within the cove during each survey) were conducted between June 1, 2005 and March 31, 2006 to determine the spatial and temporal extent of bacterial densities in the waters of P.B. Point.<sup>1</sup> In addition to analysis of ocean and storm drain water by traditional test methods, PCR (polymerase chain reaction) and ribotyping genetic methods were employed as DNA finger printing techniques to track the source (human, bird, etc.) of bacteria measured in water quality samples. The major findings of the study are:

- Poor water circulation and the accumulation of decaying kelp in the inside cove during summer months are important factors for the high bacterial densities in adjacent ocean waters. Dry weather runoff from one of three storm drains and bird fecal matter can act as bacterial “seed” in the piles of decaying kelp on the beach.
- The kelp on the beach acts as a reservoir for bacteria. Bacterial re-growth also occurs in the kelp, and brine flies can transfer bacteria from contaminated kelp to uncontaminated kelp.
- Fecal coliform and enterococci bacterial levels are highest along the shoreline of P.B. Point cove during spring tides in summer and early fall. (Spring tides occur during new and full moons.) Bacteria are pulled into ocean waters during spring high tides when waves wash over the kelp and ponded storm drain water.
- There were no enterococci or fecal coliform exceedances measured in offshore waters (~100 – 200 yards from the beach) during any of the surveys.
- Results for PCR analysis of 182 samples (108 ocean water and 74 storm drain) indicated fecal bacteria from warm-blooded animals in 78% of the samples. However, only 2 samples (1%) from storm drains were positive for bacteria of human origin.
- Analysis by ribotyping for the three most frequently contaminated shoreline sites indicated 71% of the bacterial contamination comes from birds, 18% from dog, raccoon and rodents, 9% unknown, and 2% from sewage.
- Analysis by ribotyping for the most problematic storm drain in the cove indicated 48% of the bacterial contamination comes from birds, 43% from dog, raccoon and rodents, 4% unknown, and 5% from human and sewage.

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<sup>1</sup> Final Report: Bacterial Source Tracking for Pacific Beach Point. June 2006. Prepared for the Metropolitan Wastewater Department, City of San Diego. Prepared by Weston Solutions, Inc.



Figure 17: The inside cove at P.B. Point during summer months with kelp accumulation. Photo: City of San Diego

## ***Bacterial Exceedances in east Mission Bay During July and August, and the July 25<sup>th</sup> Closure Due to a Sewage Spill***

Beginning on July 5<sup>th</sup>, routine water quality monitoring by DEH at several east Mission Bay beaches revealed bacterial exceedances. Similar patterns of exceedances occurred at many of the same locations through-out July and August, 2006. DEH issued advisories for water contact at these locations beginning on July 6 (see events 101, 103, 107, 108, 109, 110, 112, 116, 117, 125, and 126 in the *2006 Beach Closure & Advisory Report, Appendix*).

On July 25<sup>th</sup>, an unknown volume sewage spill to the bay from the DeAnza Cove RV trailer park was reported to DEH. The start date of the spill was reported as July 5<sup>th</sup> and it was unknown if the spill had stopped. Lacking any other information at the time, DEH assumed a worse case scenario - a large, on-going spill to the bay for the last 20 days that was responsible for widespread bacterial exceedances, and issued a water contact closure for most recreation areas in east Mission Bay (event 102). Subsequent investigations determined the spill occurred for one day, July 5<sup>th</sup>, for a total volume of 10 – 20 gallons, thereby discounting this sewage spill as the source of bacterial exceedances at east Mission Bay beaches since July 5.

After conducting split sample investigations with the City of San Diego at several of the east Mission Bay beaches on August 29<sup>th</sup>, DEH learned that the test method used by the County Public Health Laboratory, Colilert 18<sup>TM</sup>, may not always provide an accurate measurement of *E. coli* bacteria concentrations. On September 1<sup>st</sup>, DEH suspended the use of the IDEXX Colilert 18<sup>TM</sup> test method for the analysis of total coliform and *E. coli* bacteria in ocean and bay water quality samples. A review of published research supported the split sample findings - false positive *E. coli* results are possible when using Colilert 18<sup>TM</sup> in marine waters warmer than normally experienced in Southern California.<sup>2</sup> [A series of heat waves early in the summer of 2006 raised ocean and bay waters to unusually high temperatures. DEH and County Public Health Laboratory conducted the required correlation study between a traditional test method and Colilert 18<sup>TM</sup> in the winter of 2004 to validate this faster test method as an acceptable alternative, so this limitation with the Colilert 18<sup>TM</sup> method was not identified at that time. Nor did the use of Colilert 18<sup>TM</sup> in the summer of 2005 suggest any problem with this test method.]

Taken together, this information suggests that some of the elevated bacterial levels (*E. coli*) observed in east Mission Bay during July and August of 2006 may have been false positives and not true measurements of the *E. coli* / fecal coliform indicator bacteria that are used in state law and regulations to make determinations about the safety of water contact. While other test method data confirms bacterial contamination did occur during this time at some east Mission Bay locations, DEH does not believe it was at the same frequency and extent that the Colilert 18<sup>TM</sup> data indicated. It should also be noted that both the Colilert 18<sup>TM</sup> data and other test method data (including non-split samples) showed great variability, and it cannot be said that all the Colilert 18<sup>TM</sup> *E. coli* results were false positives. The published research indicated that the main reason for the false positive results in their study was the presence of non-coliform bacteria such as *Vibrio* and *Aeromonas*. These genera of bacteria are widely found in the environment and some species are known to be pathogenic.

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<sup>2</sup> Pisciotta, et al; Marine Bacteria Cause False Positive Results in Colilert-18 Rapid Identification Test for Escherichia coli in Florida Waters, Applied and Environmental Microbiology, Vol. 68, No 2, Feb 2002

## ***Quantitative Assessment of Relationship between Bacterial Indicators and Viral Pathogens at South County Beaches***

Between 2003 and 2005, researchers at San Diego State University collected and analyzed ocean water samples from the Tijuana Estuary mouth and Imperial Beach pier using culture based tests for bacterial indicators of fecal contamination and genetic tests for human specific viral pathogens.<sup>3</sup> The genetic test method used was quantitative reverse transcription- polymerase chain reaction (qRT-PCR). (The qRT-PCR method is not able to discriminate between infectious and noninfectious viral particles.) Samples were collected during wet weather (within 72 hours of significant rain) and during dry weather (May to early October). The major findings of the study are:

- Twelve of fourteen (86%) wet weather samples (seven from the estuary mouth and seven from the IB pier) exceeded state health standards for one or both bacterial indicators, enterococci and *E. coli*. None of the dry weather samples exceeded state health standards for the two indicators.
- Analysis of viral densities and bacterial indicators show a significant correlation between elevated levels of bacterial indicators and Hepatitis A virus and enterovirus.
- Hepatitis A and enterovirus levels were positively related to levels of indicator bacteria, one another, Tijuana River flow rates, and rainfall amounts.
- Wet weather samples from the Tijuana Estuary mouth showed Hepatitis A virus and enterovirus in 86 and 100% of the samples, respectively.
- Wet weather samples from the Imperial Beach pier showed Hepatitis A virus and enterovirus in 71 and 86% of the samples, respectively.

The results of this study verify the increased health risk from ocean water contact at south county beaches during times when sewage contaminated flows from the Tijuana River are entering ocean waters. The study also validates the traditional bacterial indicators for measuring contamination in beach water samples impacted by sewage. (However, due to the time lag in obtaining sample results from traditional test methods, DEH has been using the real time coastal ocean observing system [[www.sdcoos.ucsd.edu](http://www.sdcoos.ucsd.edu)] data to make more timely and accurate decisions for issuing water contact closures at south county beaches since 2003. See page 25 of the San Diego County 2004 Beach Closure & Advisory Report Summary.)

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<sup>3</sup> Gersberg, et al. Quantitative Detection of Hepatitis A Virus and Enteroviruses Near the United States – Mexico Border and Correlation with Levels of Fecal Indicator Bacteria. Applied and Environmental Microbiology, Vol. 72, No 12, Dec 2006