

# Ocean Bacteriological Data Evaluation for City of Laguna Beach, 1999 Through 2006

## Final Report

Prepared For:

The City of Laguna Beach  
505 Forest Avenue  
Laguna Beach, CA 92651

February 2007



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**Prepared For:**

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## EXECUTIVE SUMMARY

Along the City of Laguna Beach (City) coastline, there are five water quality limited segments included in the 2006 Section (§) 303(d) list. The purpose of this report is to compile and summarize all available bacterial data for listed water body segments along the City's coastline, assess the data within those listed segments with respect to listing guidelines established by the State Water Quality Control Board (SWQCB), and identify listed segments which meet the criteria for removal from the 2008 §303(d) List.

The five water quality limited segments include fourteen (14) beach shoreline sampling sites and one estuarine sampling site. Over the last eight years, water samples from these sites have been tested weekly for total coliform, fecal coliform, and enterococcus by the Orange County Health Care Agency (OCHCA) and South Orange County Wastewater Authority (SOCWA). This comprehensive, quality assured (QA) data set was used to test all impaired water segments against the SWQCB criteria.

The process and criteria for removing a surface water segment from the §303(d) List in California is summarized in the Water Quality Control Policy for Developing California's Clean Water Act Section §303(d) List (SWRCB 2004). The criteria stipulate that water quality data must be compared to AB411 standards for bacteria to determine eligibility for de-listing. Two data consolidation methods are identified for use in the comparison. Method 1 requires compilation of all data from an impaired water body (as recommended by the San Diego Regional Water Quality Control Board (RWQCB), Appendix A), prior to comparison to the standards (RWQCB-Appendix A). Method 2 requires data from individual sampling sites to be compared to the standards. Noncompliant sampling sites may not be removed from the list. Noncompliance is determined by the number of times the bacteria level at the site exceeds the maximum allowable bacteria level as defined by the REC-1 beneficial use standard. Overall impaired water body recommendations were made based on the results of both methods (SWRCB, 2004).

The number of exceedances for a given sample size is compared against those allowed for de-listing in the SWRCB guidance using three criteria: the single sample limit, the rolling geometric mean, and the monthly geometric mean. This represents the most comprehensive approach to comparing sample data to the AB411 standards. All three methods produced similar final results with respect to de-listing consideration. The incorporation of composite and individual sample groups, combined with the use of three analysis methods in the data analysis, results in a cautious and conservative approach to de-listing.

The five impaired water bodies within the City of Laguna Beach are assessed using the methods described above. A summary of the assessment follows. The data analysis results indicate that three of the Pacific Ocean Shoreline water bodies may be considered for de-listing. Aliso HSA may not be eligible for de-listing at this time. Additionally, Aliso Creek (mouth) results indicate that this impaired water body may not be eligible for de-listing consideration at this time.

- Pacific Coast Shoreline, Dana Point HSA contains four monitoring sites within the City of Laguna Beach. Analysis results indicate that both the compiled data and individual site assessments had low percent exceedance values for all three criteria (single sample, rolling geometric mean, and monthly geometric mean). Combined single sample

exceedance data analysis resulted in an exceedance frequency of 1.97%. Individual single sample exceedance frequencies ranged from 1.15 to 2.85%. Additionally, individual site geometric mean exceedance frequencies were low, with a minimum of 0.00% and maximum individual site result of 4.69%. These results conclude that the Dana Point HSA, within the boundaries of Laguna Beach, meets the criteria for de-listing from the 2008 §303(d) List.

- The Pacific Ocean Shoreline, Aliso HSA contains four sites; Aliso Beach-North, Aliso Beach-Middle, Aliso Beach-South, and Blue Lagoon Place. Overall, results for the combined data analysis were below the allowed exceedance. There were 382 single sample exceedances, out of 10,525 analyses, and compared to an allowable 1,746 (3.63%). Geometric mean exceedances were also low, with 808 exceedances for the rolling geometric mean, compared to an allowable 1,911 (7.01%), and one monthly exceedance compared to an allowable 15 (1.04%). On an individual basis, three of the four sites within the surface water segment were below the criteria for de-listing. However, Aliso Beach-Middle (S9) did not meet all of the criteria. The site was below the single sample allowable frequency, but exceeded both 30-day geometric means (rolling and monthly). There were 631 exceedances, compared to 477 allowable exceedances for a sample size of 2,880 for the rolling geometric mean (21.91%). Additionally, there were 16 exceedances, compared to 15 allowable, for the monthly geometric mean (16.67%). These results indicate that the water segment does not meet the criteria for de-listing.
- Laguna Beach HSA: Pacific Coast Shoreline, Laguna Beach HSA contains four indicator bacteria monitoring sites. Based on the analysis of indicator bacteria from the past eight years, the combined analysis indicated that exceedance ratios for all three criteria (single sample, rolling geometric mean, and monthly geometric mean) were below the allowable levels. The single sample limit was exceeded 324 times out of 8,725, compared to an allowable 1,447 (3.71%). The rolling geometric mean was somewhat higher, with 889 exceedances out of 9,443 compared to 1,567 allowed exceedances (9.41%). Individual site analysis for the four sites also had exceedance frequencies below the number allowable by the SWRCB guidance. These results conclude that the Laguna Beach HSA meets the criteria for de-listing from the 2008 §303(d) List.
- San Joaquin Hills HSA: Pacific Coast Shoreline, San Joaquin Hills HSA was listed on the §303(d) List and contains two monitoring sites: Heisler Park North at Crescent Bay Beach and Emerald Bay. For the current analysis, there were 28 exceedances out of 2,492 weekly analyses (1.12%) from 1999 through 2006, which is below the number allowed by the SWRCB guidance using the single sample criteria. In addition, there were no exceedances based on the rolling geometric mean or the monthly geometric mean. These results conclude that the San Joaquin Hills HSA meets the criteria for de-listing from the 2008 §303(d) List.
- Aliso Creek (mouth) was also listed on the 2006 §303(d) List as an estuarine water body. At the Aliso Creek Mouth (C1) site there were 959 single sample exceedances of AB411 criteria out of 2,329 analyses (40.8%). The rolling mean exceeded criteria 100% of the time and the monthly geometric mean exceeded criteria 99% of the time at this site. Therefore, Aliso Creek (mouth) does not meet the criteria for de-listing at this time.

## **INTRODUCTION AND BACKGROUND**

To meet the requirements of the California AB411 standards, the Orange County Health Care Agency (OCHCA) and South Orange County Wastewater Authority (SOCWA) routinely monitor the ocean water quality at numerous ocean locations along the City of Laguna Beach's coastline. Fourteen of these locations are included within the five impaired water bodies listed on the State Water Resources Control Board (SWRCB) 2006 §303(d) List for impairment due to elevated levels of indicator bacteria (total coliform, fecal coliform, and enterococcus). The purpose of this document is to:

1. compile the available data on bacterial densities at the shoreline water quality monitoring sites along the City's coastline,
2. summarize the monitoring results in comparison to water quality standards and criteria, and
3. identify those impaired water bodies that can be considered for removal from the §303(d) List based on guidance documents prepared by the SWRCB.

## **METHODS OF DATA EVALUATION**

### **Data Sources**

Data for this report were compiled from raw data for all shoreline sites along the City's coastline. All of the bacteriological data available for these sites from an eight-year period (January 1999 through December 2006) are summarized and assessed in this report. Data were analyzed using two methods. Method 1 included compiling data from sites within an impaired water body. Method 2 considered each site within an impaired water body separately. Graphical representations of the data for each impaired water body on the §303(d) List are presented in the results section. Ocean water samples for most sites were typically collected and analyzed weekly by the OCHCA and the SOCWA. Samples were analyzed for three indicator bacteria: total coliform, fecal coliform, and enterococcus. Bacterial densities were determined by multiple tube fermentation (MTF), membrane filtration (MF), or the Enterolert technique (for enterococcus only). Data collected by SOCWA were collected under a SOP/QAP (SOCWA, 2006). Data for two sites were collected by OCHCA, under an Environmental Lab Accreditation Program Certificate (ELAP) issued by the State Department of Health Services. Further information on quality control and assurance can be found in the County of Orange Quality Assessment/Quality Control document (County of Orange, 2004).

### **De-listing Procedure**

For those surface water bodies listed on the SWRCB 2006 §303(d) List, an assessment was conducted to determine the number of exceedances of bacterial standards that have occurred within the water body from 1999 through 2006 and to identify those surface water bodies that can be considered for de-listing. The process for removing a water body from the §303(d) List in California is summarized in the Water Quality Control Policy for Developing California's Clean Water Act Section §303(d) List (SWRCB, 2004). Based on this process, and information from the San Diego Regional Water Quality Control Board (RWQCB) (Appendix A), data from all sites within a water body were analyzed using two methods for the analysis. Method 1,

recommended by the RWQCB (Lesley Dobalian, personal communication), required that all data from the impaired segment be compiled prior to analysis (see Appendix A). Method 2 required that all sites within an impaired segment be assessed individually. Using Method 2, if any site within the water segment did not meet the requirements, the entire water segment would not be recommended for de-listing consideration.

Table 1 is reproduced from Table 4.2 in the Water Quality Control Policy for Developing California's Clean Water Act Section §303(d) List (SWRCB, 2004) and summarizes the maximum number of exceedances allowable for de-listing for a given sample size up to 121. For sample sizes greater than 121, the maximum number of allowable exceedances is determined using a formula in Microsoft Excel. The formula provided in the Water Quality Control Policy for Developing California's Clean Water Act Section §303(d) List (SWRCB, 2004) can only be used for sample sizes up to approximately 1,000 (a limitation of Microsoft Excel). Because all of the impaired water bodies assessed in this evaluation had sample sizes greater than 1,000, the maximum number of exceedances for each site was calculated with SAS<sup>®</sup> software using the cumulative distribution function (CDF). The same parameters from the Excel function were used in the SAS program and verified with Excel results. This resulted in a maximum exceedance frequency specific to each site.

**Table 1. Maximum number of measured exceedances allowable to remove a water segment from the §303(d) List (reproduced from SWRCB 2004, Table 4.2)**

Sample Size		Maximum number of exceedances allowable for de-listing
From	To	
26	30	4
31	36	5
37	42	6
43	48	7
49	54	8
55	60	9
61	66	10
67	72	11
73	78	12
79	84	13
85	91	14
92	97	15
98	103	16
104	109	17
110	115	18
116	121	19

The minimum sample size for de-listing consideration identified by the SWRCB (2004) is 26.



## Applicable Water Quality Standards

All of the beach shoreline sites assessed in this document are considered contact recreational waters with a beneficial use designation of REC-1. The most applicable criteria for REC-1 waters are those designated under Assembly Bill 411 (AB411) for three indicator bacteria: total coliform, fecal coliform, and enterococcus. The AB411 criteria are summarized in Table 2.

**Table 2. Assembly Bill 411 (AB411) bacteriological standards.**

	30-Day Limit <sup>1</sup>	Single Sample Limit
Total Coliform	1,000 MPN <sup>2</sup> / 100 ml	1,000 MPN/ 100 ml if Fecal > 10% of Total, or 10,000 MPN/100 ml <sup>3</sup>
Fecal Coliform	200 MPN/ 100 ml	400 MPN/ 100 ml
Enterococcus	35 MPN/ 100 ml	104 MPN/ 100 ml

1 = 30 day limit is based on the geometric mean of at least five weekly samples

2 = MPN is Most Probable Number

3 = Total coliform single sample limit of 10,000 MPN decreases to 1,000 when the fecal coliform value is greater than 10% of total coliform value

There are two AB411 criteria presented in Table 2: the 30 day geometric mean of at least five samples and the single sample limit. According to the SWRCB (2004) guidance document, the method used to place a surface water body on the §303(d) list is the same method that must be used to de-list the water body. To assure that proper consideration will be given to this assessment, the data in this document were compared to the values in Tables 1 and 2 in three different ways:

1. single sample limit,
2. rolling 30 day geometric mean,
3. monthly geometric mean

The methods for each of these assessments are presented below.

**Single Sample Limit.** The AB411 single sample limits were used to determine the number of exceedances allowable for a given sample size, as listed in Table 1. Typically, a single sample is collected on a given day from a site and analyzed for three indicators: total coliform, fecal coliform, and enterococcus. Thus, a single sample usually produces three different analyses. To calculate the number of exceedances within a surface water body, the data were assessed to determine the total number of analyses for each indicator that exceeded the single sample limits at each site (Method 2). The number of exceedances and samples for each of the three indicators over the eight year period (January 1999 through 2006) was then summed for each impaired water body (Method 1). The total number of exceedances was compared to the number allowable by SWRCB (2004) for the sample size in that surface water body (Method 1 and Method 2). The results of this analysis were used to assess whether an impaired surface water segment could be recommended for de-listing consideration (i.e. removal from the §303(d) list).

The procedure discussed above provides a very conservative, or protective, approach to de-listing consideration for several reasons:

- Exceedance of standards for any of the three indicators was counted as a single exceedance even if more than one standard was exceeded in a single day. For example, if both fecal coliform and enterococcus standards were exceeded in the same sample, it was counted as two exceedances rather than one.
- All data were considered in the eight-year time frame for a given surface water body, including data collected in dry and wet seasons as dry and wet weather (within 72 hours of a rain event).
- No allowances were given for samples that may have been collected under extreme conditions, such as those taken during a sewage spill

The conservative approach provides the greatest protection of the beneficial uses for the protection of public health and the environment and generates de-listing recommendations only for those surface water bodies where bacterial contamination is minimal.

**Rolling Geometric Mean.** The rolling geometric mean is the averaging method recommended for assessing bacterial indicator exceedances within REC-1 beach areas by the San Diego Department of Health Services (DEH). If public beach areas fail to meet AB411 standards, public health officials may post warning signs or otherwise restrict use of the beach (California Ocean Plan, 2005). This method is sample-site specific, and therefore when assessing how well the impaired water bodies, as listed on the 2006 §303(d) List, compared to water quality objectives the total number of exceedances were calculated as presented below.

The 30-day geometric mean was calculated at each site for all values in the data set in chronological order starting from the date of the most recent sample. For instance, starting at the end of the data set (December 2006, in this case), the geometric mean was calculated for a given sample date using all data from the previous 30 days when at least five samples, collected weekly, were collected. The geometric mean value for that 30-day period was then compared to the AB411 Criteria in Table 2. Then the geometric mean was calculated from the next day and the data collected 30 days prior to that date. This method produces a continuous, or rolling, data set and provides an accurate chronological assessment of the bacteriological conditions at that site over time.

For this assessment, as above, two methods were used to assess whether or not the water body met the requirements for de-listing consideration. Method 1 was the composite method, and Method 2 was the site-specific, or individual site evaluation. For Method 1, the total number of exceedances was estimated as the sum of all 30-day geometric mean exceedances (given in Table 2) for all sites within a water segment. This method would allow for more than one exceedance per day, if there were multiple sites within the impaired water segment. The total number of exceedances was compared to the allowable number of exceedances listed in Table 1 for the total number of samples within that water segment. The total sample size was calculated as the sum of all 30-day geometric mean days at each site across all sites within the segment.

Method 2, as above, was a site-specific evaluation of the number of exceedances of the 30-day geometric mean at each site. The number of exceedances of the 30-day geometric mean (given in Table 2) at each site within an impaired surface water body from 1999 through 2006 was compared to the allowable number of exceedances listed in Table 1 for the sample size at that site. The number of samples was site-specific. The sample size was calculated as the total

number of 30-day geometric mean days at a site. For averaging purposes, one half the detection limit was used for all non-detect values in the data set.

The indicator for which AB411 standards were most often exceeded was enterococcus, and therefore this indicator was used as the measure of exceedance frequency for all sites.

**Monthly Geometric Mean.** The monthly geometric mean is the averaging method recommended by the SWRCB for bacteriological de-listing consideration. For this assessment, two methods were used to evaluate the data set. Method 1 included a composite of all data within an impaired water segment, and the geometric mean for all data collected within a given calendar month within an impaired water segment was calculated. Method 2 was a site-specific evaluation of the geometric mean for one calendar month. Both methods would produce a maximum of 12 values per year, or 96 values for the eight-year data set. Each of these values (for both methods) was compared to the 30-day geometric mean AB411 criteria for a given indicator (Table 2). The total number of monthly geometric mean values that exceeded the allowable number given in Table 1 was then calculated for a given sample size (96 in most cases). As with the rolling geometric mean, for averaging purposes, one half the detection limit was used for all non-detect values in the data set. In addition, only the enterococcus results are presented in the site assessments because this was the indicator which most often exceeded water quality standards.

In the water body assessment section that follows the data are presented in tabular form based on the assessment of all three methods described above.

### §303(d) LISTED WATER BODY SEGMENT RESULTS

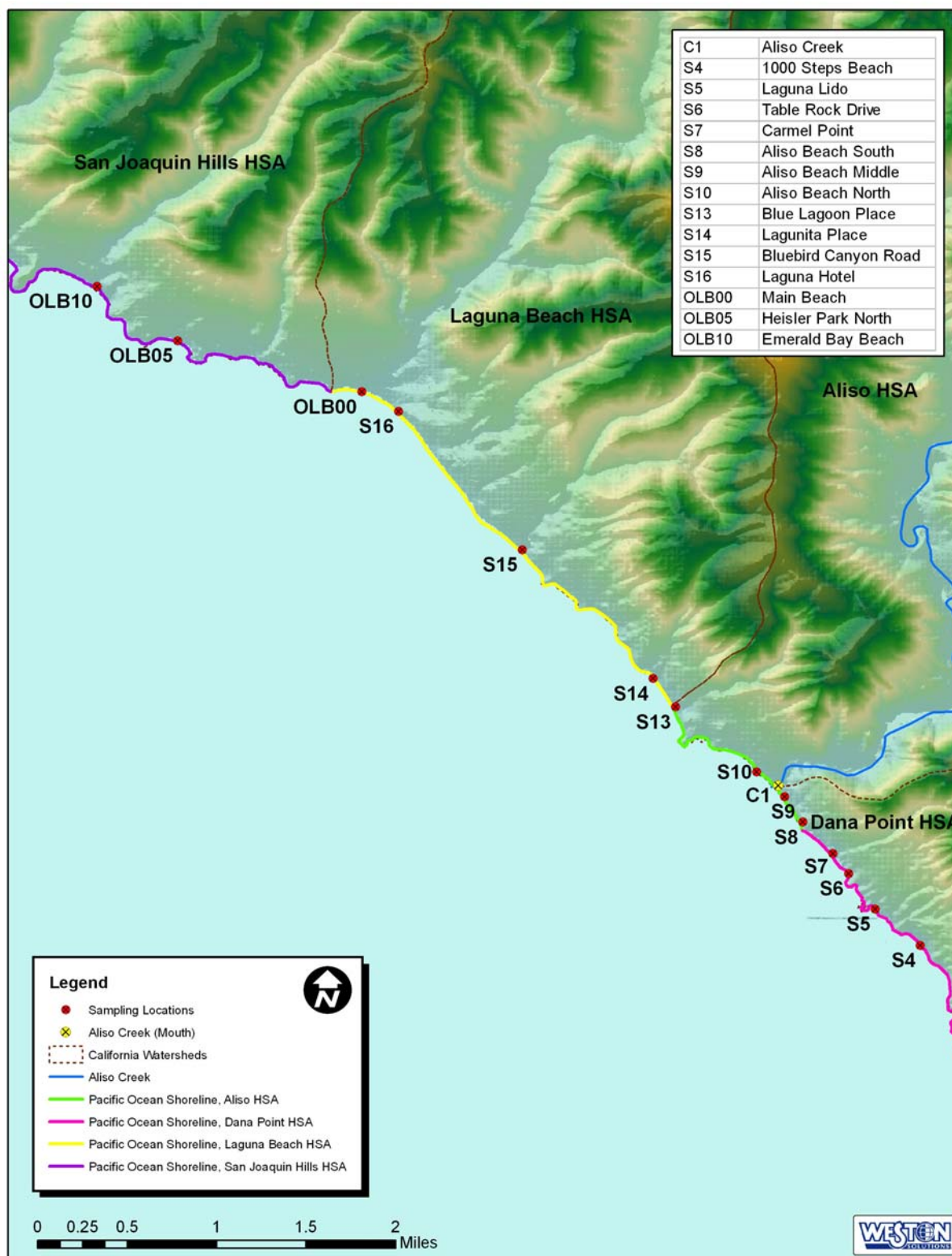
#### Water Body Segment Descriptions

The beach shoreline sites along the City of Laguna Beach's coastline included in water segments listed in the §303(d) List for exceedances of indicator bacteria are presented in Table 3. These sites are shown graphically in Figure 1 along with the corresponding §303(d) List impaired water body areas. A total of 14 beach shoreline sites included within the impaired water bodies were monitored from January 1999 through December 2006, and one estuarine site, C1 (Aliso Creek mouth), was monitored until May 31<sup>st</sup> 2006.

The shoreline sites are grouped in the §303(d) List by major hydrologic subarea (HSA) (Table 3). Of the 14 shoreline sites that are included in the analysis, four are located in the Dana Point HSA, four are located in the Aliso HSA, four are located in the Laguna Beach HSA and two are located in the San Joaquin Hills HSA. The one estuarine site, Aliso Creek (mouth), is considered separately in the analysis. Each of these sites was assessed both as part of the compiled data set (all sites within one water segment) and individually. Each assessment includes a water segment description, an evaluation of the data spatial and temporal representation, a review of the data relative to de-listing criteria (both combined and individual site analysis), water body specific information, and a graphical representation of the data showing the number of exceedances for each indicator. This assessment was designed to give a clear picture of the actual exceedance frequency over time within each water body segment. Additionally, information from individual site analysis is included in Appendix B.

**Table 3. Coastal Shoreline sites within the City of Laguna Beach contained within surface water bodies listed in the SWRCB 2006 §303(d) List for impairment due to elevated levels of indicator bacteria.**

§303(d) List Name	CALWATER Watershed	Beach Area	Location of Impairment	Site Number
Pacific Ocean Shoreline, Dana Point (HSA)	90114000	1000 Steps Beach Laguna Lido Table Rock Drive Camel Point	At Pacific Coast Hwy and 9 <sup>th</sup> Street Upcoast below Seacliff Dr. Aliso Beach at Table Rock Dr. Camel Point Dr.	S4 S5 S6 S7
Pacific Ocean Shoreline, Aliso (HSA)	90113000	Aliso Beach South Aliso Beach Middle Aliso Beach North Lagunita Place/Blue Lagoon Place	Aliso County Beach Aliso County Beach Aliso County Beach Laguna Beach at Blue Lagoon Place	S8 S9 S10 S13
Aliso Creek (mouth)	90113000	Aliso Creek	Aliso Beach at Aliso Creek mouth	C1
Pacific Ocean Shoreline, Laguna Beach (HSA)	90112000	Dumond Drive Bluebird Canyon Hotel Laguna Laguna Main Beach	Victoria Beach at Dumond Dr. Arch Cove at Bluebird Canyon Rd. Projection of Hotel Laguna Upcoast of Broadway	S14 S15 S16 OLB00
Pacific Ocean Shoreline, San Joaquin Hills (HSA)	90111000	Heisler Park North Emerald Bay	Crescent Bay Beach north of Heisler Park Emerald Bay	OLB05 OLB10



**Figure 1. Map of the City of Laguna Beach watershed HSA areas and shoreline water quality monitoring stations that are on the SWRCB 2006 §303(d) List.**

## Water Body Segment Assessments

Individual assessments of each of the surface water bodies in the 2006 §303(d) List are provided below.

### Impaired Water Body: Pacific Ocean Shore, Dana Point HSA

**Sample Sites included within the Surface Water Body:** 1000 Steps Beach (S4), Laguna Lido (S5), Table Rock (S6), and Camel Point (S7)

**Temporal Representation:** Data were available for this assessment from January 1999 through 2006 (Figure 2). Samples were taken during both the wet and dry seasons.

**Combined Analysis Results:** The number of exceedances of water quality standards within this impaired water body is presented in Table 4. A total of 10,229 analyses were performed from 1999 through 2006. Of these, there were 201 exceedances of the bacterial standards for all three indicators. There were 152 exceedances for enterococcus, 24 exceedances for total coliform and 25 exceedances for fecal coliform. The majority of exceedances at this site occurred from 1999 through the beginning of 2001. A total of 201 exceedances out of 10,229 samples was below the number of exceedances allowed by the SWRCB guidance document based on the single sample criteria. In addition, the exceedances based on the 30-day rolling geometric mean and monthly geometric mean were also low.

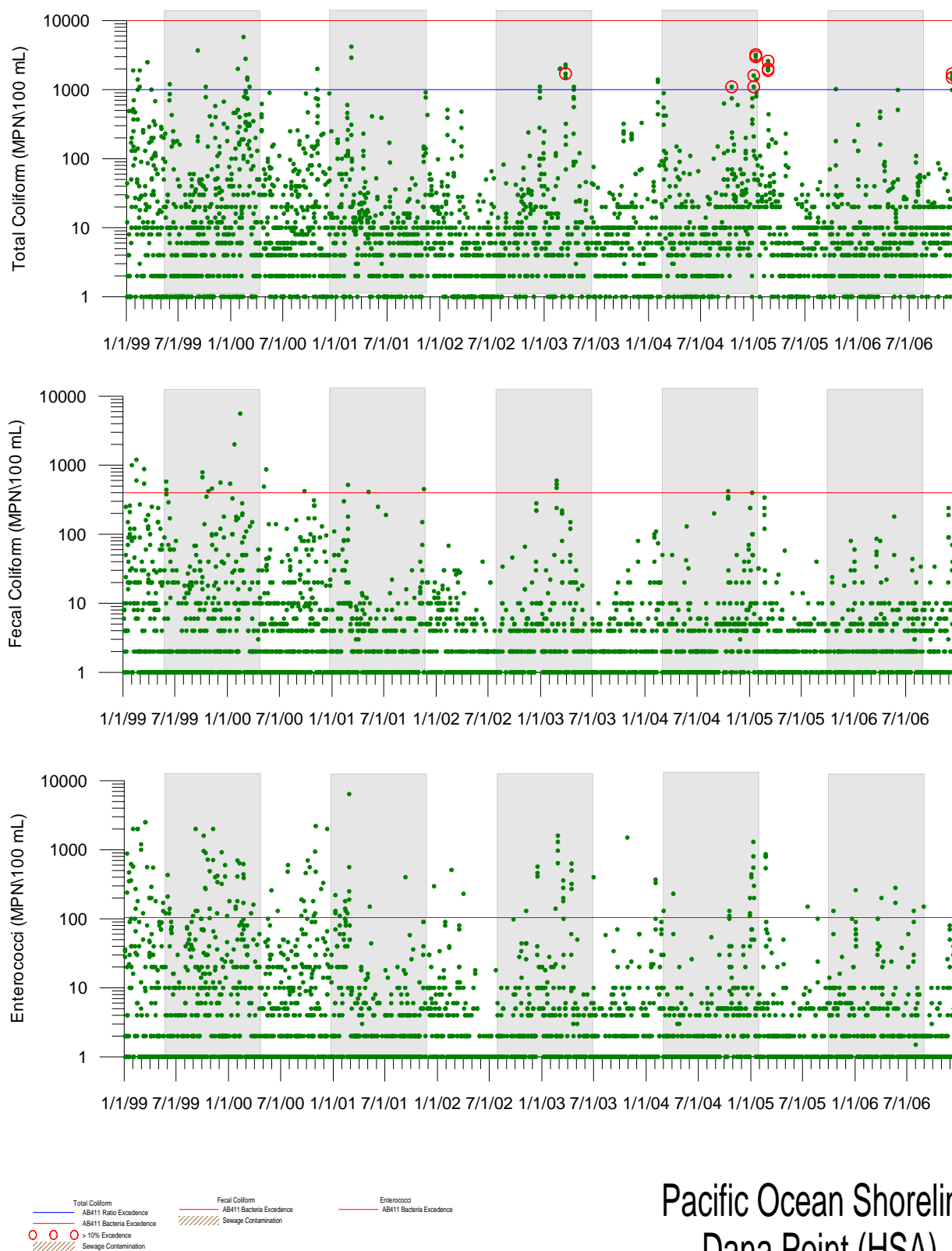
**Individual Site Analysis Results:** Individual site exceedance frequencies for the three criteria were also low. Single sample results ranged from 1.15 to 2.85%, rolling geometric mean from 0.00 to 4.69%, and monthly geometric mean from 0.00 to 3.13%. These results concur with the combined analysis results. Specific individual site assessment results can be found in Appendix B.

**Table 4. Summary of bacteriological data for Pacific Ocean Shoreline, Dana Point HSA from January 1999 through 2006**

The table includes the total number of analyses analyzed for each criterion (single sample limit, rolling geometric mean, and monthly geometric mean) from 1999 through 2006 (Total Analyses), the number that did not exceed water quality criteria (No), the number that did exceed criteria (Yes), the number of exceedances allowed by the SWRCB (Allowable), and the percentage of exceedances relative to the total number of analyses (Percent).

§303(d) List Site Name	Station(s)	Total Analyses	No	Yes	Allowable*	Percent (Yes/Total)
<b>Single Sample Limit</b>						
Pacific Ocean Shoreline, Dana Point HSA	S4, S5, S6, S7	10,229	10,028	201	1697	1.97
<b>Rolling Geometric Mean</b>						
Pacific Ocean Shoreline, Dana Point HSA	S4, S5, S6, S7	11,520	11,249	271	1,911	2.35
<b>Monthly Geometric Mean</b>						
Pacific Ocean Shoreline, Dana Point HSA	S4, S5, S6, S7	96	96	0	15	0.00





**Figure 2. Summary of bacteriological water quality data collected from Pacific Ocean Shoreline, Dana Point HSA from January 1999 through 2006.**

**Impaired Water Body: Pacific Ocean Shore, Aliso HSA**

**Sample Sites included within the Surface Water Body:** Aliso Beach-South (S8), Aliso Beach-Middle (S9), Aliso Beach-North (S10), and Lagunita Place/Blue Lagoon (S13)

**Temporal Representation:** Data were available for this assessment from January 1999 through 2006 (Figure 3). Samples were taken throughout the wet and dry seasons.

**Combined Analysis Results:** The number of exceedances of water quality standards within this impaired water body is presented in Table 5. A total of 10,525 analyses were performed from 1999 through 2006. Of these, there were 382 exceedances of the bacterial standards for all three indicators (242 for enterococci, 67 for fecal coliform, and 73 for total coliform). The total of 382 exceedances out of 10,525 analyses was below the number of exceedances allowed by the SWRCB guidance document based on single sample criteria. The percent exceedance value for the 30-day rolling geometric mean was 7.01% and the monthly geometric mean was also low at 1.04%.

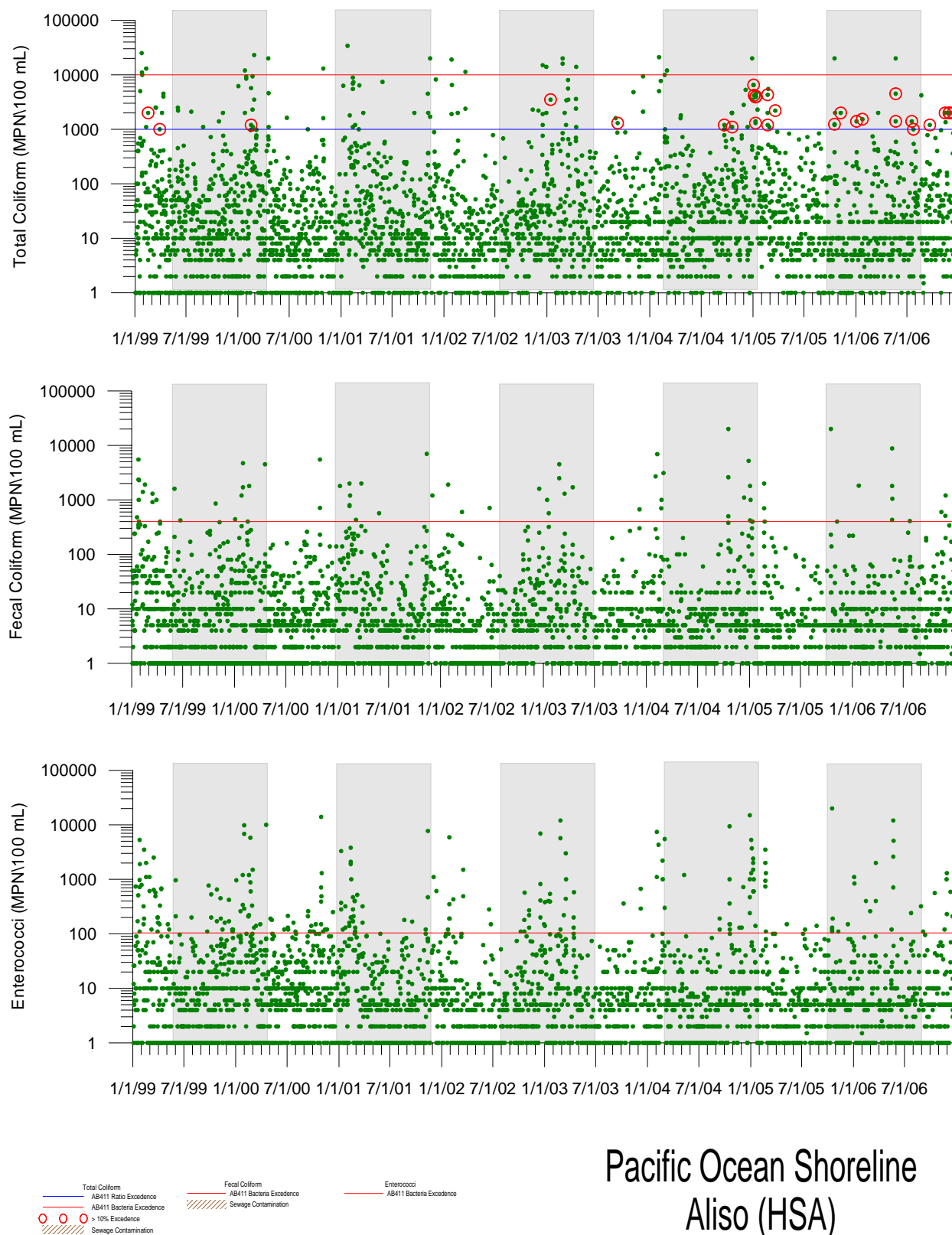
**Individual Site Analysis Results:** Three of the four sites had exceedance values below the three criteria. One site, Aliso Beach-Middle, had single sample results below the criteria (7.10%), but had rolling and monthly geometric mean results above the criteria (21.91 and 16.67%, respectively). Specific site results can be found in Appendix B.

**Table 5. Summary of bacteriological data from Pacific Ocean Shoreline, Aliso HSA from January 1999 through 2006**

The table includes the total number of analyses analyzed for each criterion (single sample limit, rolling geometric mean, and monthly geometric mean) from 1999 through 2006 (Total Analyses), the number that did not exceed water quality criteria (No), the number that did exceed criteria (Yes), the number of exceedances allowed by the SWRCB (Allowable), and the percentage of exceedances relative to the total number of analyses (Percent).

§303(d) List Site Name	Station(s)	Total Analyses	No	Yes	Allowable*	Percent (Yes/Total)
<b>Single Sample Limit</b>						
Pacific Ocean Shoreline, Aliso HSA	S8, S9, S10, S13	10,525	10,143	382	1,746	3.63
<b>Rolling Geometric Mean</b>						
Pacific Ocean Shoreline, Aliso HSA	S8, S9, S10, S13	11,520	10,712	808	1,911	7.01
<b>Monthly Geometric Mean</b>						
Pacific Ocean Shoreline, Aliso HSA	S8, S9, S10, S13	96	95	1	15	1.04





**Figure 3. Summary of bacteriological water quality data collected from Pacific Ocean Shoreline, Aliso HSA from January 1999 through 2006.**

**Impaired Water Body: Pacific Ocean Shore, Laguna Beach HSA**

**Sample Sites included within the Surface Water Body:** Dumond Dr. (S14), Bluebird Canyon Road (S15), Hotel Laguna (S16), Laguna Main Beach (OLB00)

**Temporal Representation:** Data were available for this assessment from January 1999 through 2006 (Figure 4). Samples were taken throughout the wet and dry seasons.

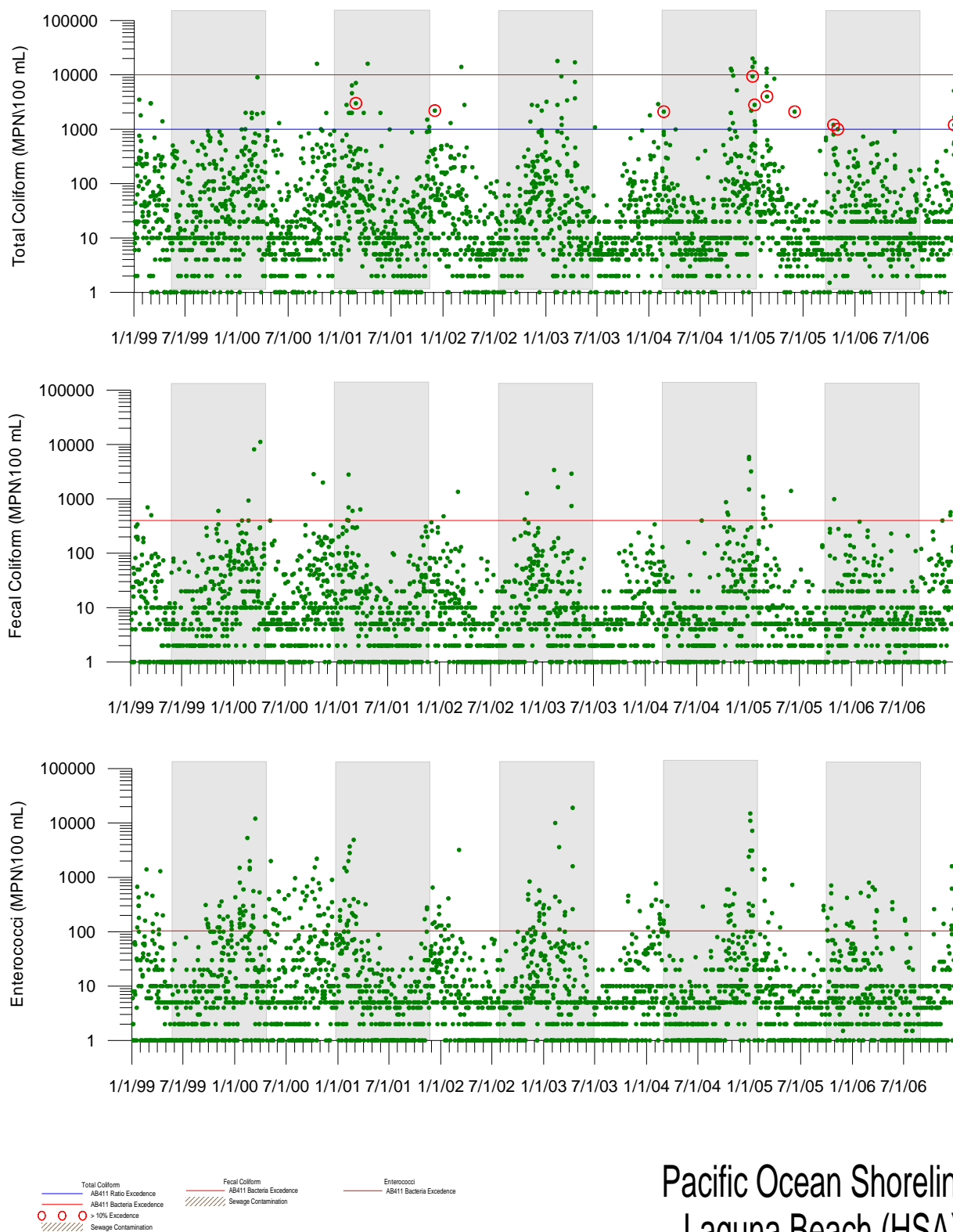
**Combined Analysis Results:** The number of exceedances of water quality standards at this site is presented in Table 6. A total of 8,724 analyses were performed from January 1999 through 2006. Of these, there were 324 exceedances of the bacterial standards for all three indicators. The majority of exceedances occurred for the enterococci indicator, which was exceeded 248 times during this period. There were 36 exceedances for fecal coliform and 40 exceedances for total coliform. A total of 324 exceedances out of 8,724 analyses was below the number of exceedances allowed by the SWRCB guidance document based on single sample criteria. The percent exceedance value for the 30-day rolling geometric mean was 9.41%, while the monthly geometric mean was 2.08%.

**Individual Site Analysis Results:** The number of exceedances for individual sites was also below all three criteria. Single sample exceedance frequencies ranged from 2.23 to 5.14%. Rolling geometric mean results ranged from 2.15 to 13.65%, and monthly geometric mean results ranged from 1.04 to 12.5%. These results concur with the combined data analysis results. Specific details can be found in Appendix B.

**Table 6. Summary of bacteriological data from Pacific Ocean Shoreline, Laguna HSA from January 1999 through 2006**

The table includes the total number of analyses analyzed for each criterion (single sample limit, rolling geometric mean, and monthly geometric mean) from 1999 through 2006 (Total Analyses), the number that did not exceed water quality criteria (No), the number that did exceed criteria (Yes), the number of exceedances allowed by the SWRCB (Allowable), and the percentage of exceedances relative to the total number of analyses (Percent).

§303(d) List Site Name	Station(s)	Total Analyses	No	Yes	Allowable*	Percent (Yes/Total)
<b>Single Sample Limit</b>						
Pacific Ocean Shoreline, Laguna Beach HSA	S14, S15, S16, OLB00	8,724	8,400	324	1,447	3.71
<b>Rolling Geometric Mean</b>						
Pacific Ocean Shoreline, Laguna Beach HSA	S14, S15, S16, OLB00	9,443	8,554	889	1,567	9.41
<b>Monthly Geometric Mean</b>						
Pacific Ocean Shoreline, Laguna Beach HSA	S14, S15, S16, OLB00	96	94	2	15	2.08



## Pacific Ocean Shoreline Laguna Beach (HSA)

**Figure 4. Summary of bacteriological water quality data collected from Pacific Ocean Shoreline, Laguna Beach HSA from January 1999 through 2006.**

**Impaired Water Body: Pacific Ocean Shoreline, San Joaquin Hills HSA**

**Sample Sites included within the Surface Water Body:** Heisler Park North (OLB05), Emerald Bay (OLB10)

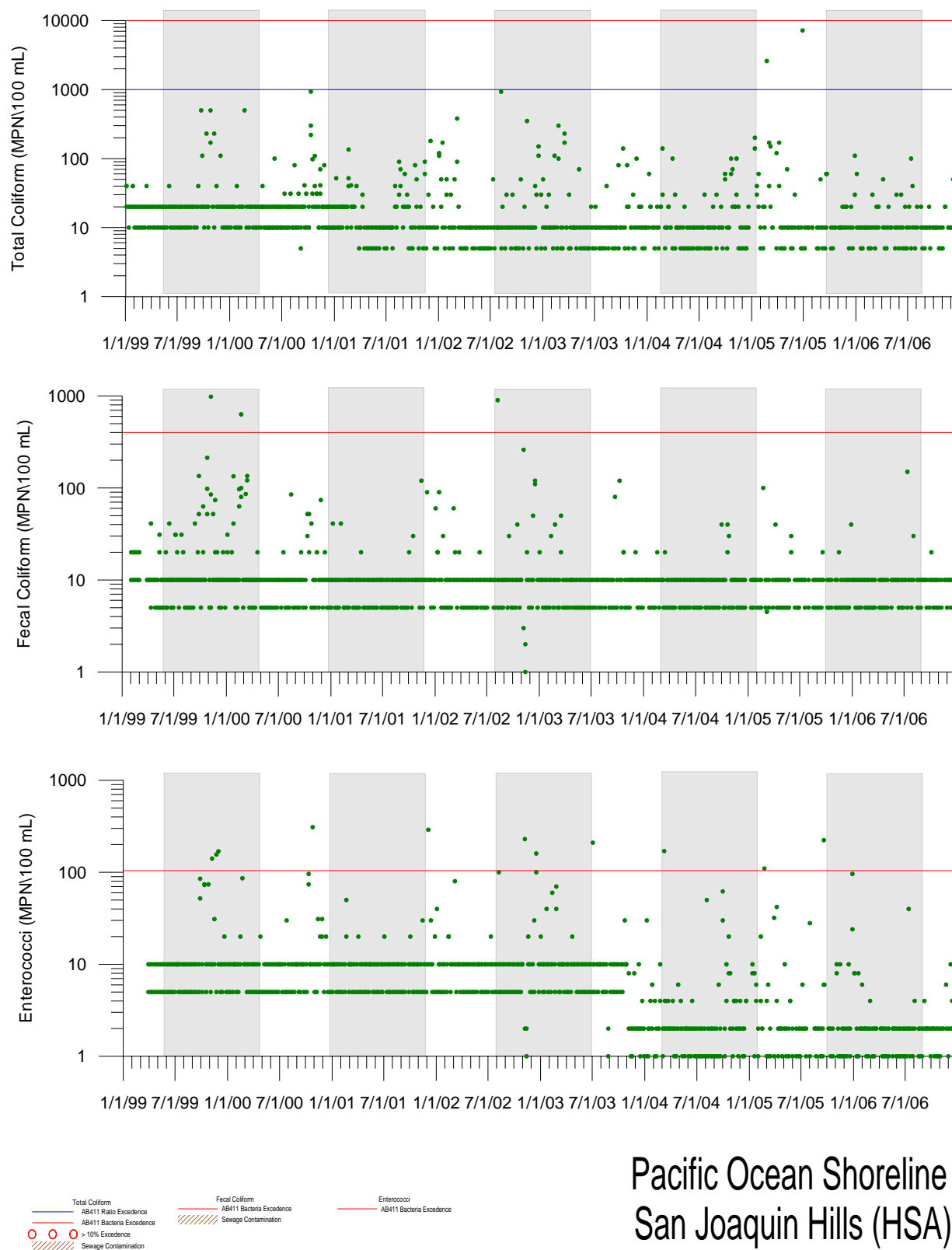
**Temporal Representation:** Data were available for this assessment from January 1999 through 2006 (Figure 5). Samples were taken throughout the wet and dry seasons.

**Analysis Results:** The number of exceedances of water quality standards in this segment is presented in Table 7. A total of 2,492 analyses were performed from 1999 through 2006. Of these, there were 28 exceedances of the bacterial standards for the fecal coliform, total coliform, and enterococci indicators. There were 23 exceedances for enterococcus, three for fecal coliform, and two for total coliform. Twenty-eight exceedances out of 2,492 analyses is below the number of exceedances allowed by the SWRCB guidance document. In addition, there were no exceedances based on the rolling geometric mean and monthly geometric mean analyses.

**Table 7. Summary of bacteriological data from Pacific Ocean Shoreline, San Joaquin Hills HSA from January 1999 through 2006**

The table includes the total number of analyses analyzed for each criterion (single sample limit, rolling geometric mean, and monthly geometric mean) from 1999 through 2006 (Total Analyses), the number that did not exceed water quality criteria (No), the number that did exceed criteria (Yes), the number of exceedances allowed by the SWRCB (Allowable), and the percentage of exceedances relative to the total number of analyses (Percent).

<b>§303(d) List Site Name</b>	<b>Station(s)</b>	<b>Total Analyses</b>	<b>No</b>	<b>Yes</b>	<b>Allowable*</b>	<b>Percent (Yes/Total)</b>
<b>Single Sample Limit</b>						
Pacific Ocean Shoreline, San Joaquin Hills HSA	OLB05 OLB10	2,492	2,464	28	413	1.12
<b>Rolling Geometric Mean</b>						
Pacific Ocean Shoreline, San Joaquin Hills HSA	OLB05 OLB10	1,399	1,399	0	232	0.0
<b>Monthly Geometric Mean</b>						
Pacific Ocean Shoreline, San Joaquin Hills HSA	OLB05 OLB10	93	93	0	15	0.0



**Figure 5. Summary of bacteriological water quality data collected from Pacific Ocean Shoreline, San Joaquin Hills (HSA) from January 1999 through 2006.**

**Impaired Water Body: Pacific Ocean Shoreline, Aliso Creek (mouth)****Sample Sites included within the Surface Water Body:** Aliso Creek-mouth (C1)

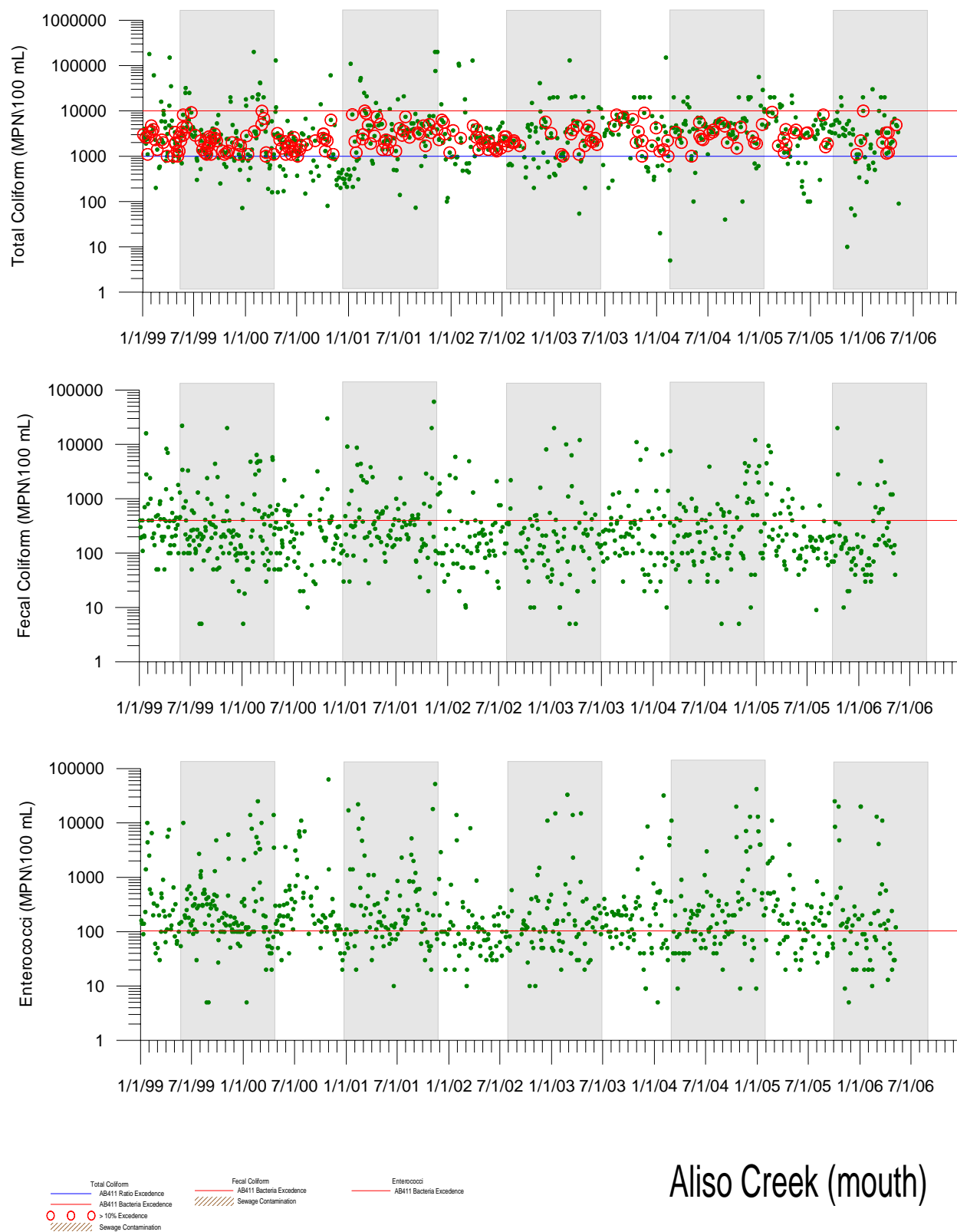
**Temporal Representation:** Data were available for this assessment from January 1999 through 2006 (Figure 6). Samples were taken throughout the wet and dry seasons.

**Analysis Results:** The number of exceedances of water quality standards at this site is presented in Table 8. A total of 2,349 analyses were performed from 1999 through 2006. Of these, there were 959 exceedances of the bacterial standards for all three indicators. The majority of exceedances occurred for enterococcus, which exceeded 491 times during this period. There were 250 exceedances for total coliform and 218 exceedances for fecal coliform. A total of 959 exceedances out of 2,349 analyses is above the number of exceedances allowed by the SWRCB guidance document. The rolling geometric mean and monthly geometric mean percent exceedance values concur with the single sample results. The percent exceedance value was 99.43% for the rolling geometric mean and 100% for the monthly geometric mean.

**Table 8. Summary of bacteriological data for Aliso Creek (mouth) from January 1999 through 2006**

The table includes the total number of analyses analyzed for each criterion (single sample limit, rolling geometric mean, and monthly geometric mean) from 1999 through 2006 (Total Analyses), the number that did not exceed water quality criteria (No), the number that did exceed criteria (Yes), the number of exceedances allowed by the SWRCB (Allowable), and the percentage of exceedances relative to the total number of analyses (Percent).

<b>§303(d) List Site Name</b>	<b>Station(s)</b>	<b>Total Analyses</b>	<b>No</b>	<b>Yes</b>	<b>Allowable*</b>	<b>Percent (Yes/Total)</b>
<b>Single Sample Limit</b>						
Aliso Creek (mouth)	C1	2,329	1,390	959	389	40.83
<b>Rolling Geometric Mean</b>						
Aliso Creek (mouth)	C1	2,645	15	2,630	438	99.43
<b>Monthly Geometric Mean</b>						
Aliso Creek (mouth)	C1	86	0	86	14	100.00



**Figure 6. Summary of bacteriological water quality data collected from Aliso Creek (mouth) from January 1999 through 2006.**

## **SUMMARY AND CONCLUSIONS**

The SWRCB 2006 §303(d) List identifies four Pacific Coast Shoreline watershed areas within the City of Laguna Beach listed due to elevated indicator bacterial levels: Dana Point HSA, Aliso HSA, Laguna Beach HSA, and San Joaquin Hills HSA. The §303(d) List also includes one estuarine impaired water body, Aliso Creek (mouth). Ocean monitoring sites within these areas were compiled and assessed in the Results sections of this report. These results are summarized by area below and in tabular form in Table 9.

### **Pacific Ocean Shoreline, Dana Point HSA**

Data from four sites were analyzed using two methods to test the exceedance frequency of bacterial indicators, 1000 Steps Beach, Laguna Lido, Table Rock, and Camel Point (Table 9). The percent exceedance value for the combined data analysis (Method 1) was less than 2.35% for all three criteria (single sample, rolling geometric mean, and monthly geometric mean). All of these values were below the number of exceedances allowed by the SWRCB de-listing guidance document. The individual site results (Method 2) were all below 4.69%, and typically below 3% for all three criteria. These results suggest that Dana Point HSA is eligible for de-listing from the §303(d) List.

### **Pacific Ocean Shoreline, Aliso HSA**

Data from four sites were analyzed using two methods to test the exceedance frequency of bacterial indicators; Aliso Beach-South, Aliso Beach-Middle, Aliso Beach-North, and Lagunita Place/Blue Lagoon Place (Table 9). Combined data analysis of all sites within the segment (Method 1) indicated that all three criteria (single sample, rolling geometric mean, and monthly geometric mean) were below the number of exceedances allowed by the SWRCB de-listing guidance document. Individual data analysis results (Method 2) differed slightly. Three of the four sites had exceedance values that were less than 3.1% for all three criteria. Only one site (Aliso Creek Middle, S9), had frequencies above the limit. The single sample limit exceedance value was 7.1%, which is less than the number of exceedances allowed by the SWRCB de-listing guidance document. However, the percent exceedance values for the rolling geometric mean and the monthly geometric mean were higher (21.9% and 16.7%, respectively). These values are greater than the number of exceedances allowed by the SWRCB de-listing guidance document. These results indicate that Aliso HSA may not be eligible for de-listing at this time.

### **Pacific Ocean Shoreline, Laguna Beach HSA**

Data from four sites were analyzed using two methods to test the exceedance frequency of bacterial indicators: Dumond Drive, Bluebird Canyon, Laguna Hotel and Laguna Main Beach (Table 9). The combined analysis results (Method 1) are below all three criteria (single sample, rolling geometric mean, and monthly geometric mean). The single sample result was 3.71%, below the criteria, and the rolling and monthly geometric means were below 9.41 and 2.08%, respectively. The single sample exceedance frequency (Method 2) percent exceedance values for Dumond Drive were less than 2.2% for all three criteria (single sample, rolling geometric mean, and monthly geometric mean). The percent exceedance values for the other three sites in this HSA were slightly higher, ranging from 3.3% to 5.1% for the single sample criterion, 11.4% to 13.7% for the rolling geometric mean, and 4.3% to 12.5% for the monthly geometric mean.



The results of both methods indicate that all of these results were below the number of exceedances allowed by the SWRCB de-listing guidance document. Therefore, Pacific Coast Shoreline, Laguna Beach HSA can be considered for de-listing from the §303(d) List.

### **Pacific Ocean Shoreline, San Joaquin Hills HSA**

There are two sites within the Pacific Coast Shoreline, San Joaquin Hills HSA: Heisler Park North and Emerald Bay (Table 9). These sites had a low percentage of exceedances for the single sample criteria (1.12%) and no exceedances based on the rolling geometric mean or the monthly geometric mean. These results are below the number of exceedances allowed by the SWRCB de-listing guidance document. Therefore Pacific Coast Shoreline, San Joaquin Hills HSA is eligible for de-listing from the §303(d) List.

### **Aliso Creek (mouth)**

There is one site within the Aliso Creek (mouth) this impaired water body, Aliso Creek-mouth (C1) (Table 9). The site with the highest number of exceedances in this area as well as the entire data set was Aliso Creek (mouth). At this site the single sample criteria were exceeded in 40.8% of the analyses and the rolling geometric mean and monthly geometric mean criteria were exceeded in 100% and 99.4% of the analyses, respectively. This site had the highest percentage of exceedances of all the sites assessed in this evaluation. Therefore, the data do not support recommendation for de-listing of this impaired water body from the §303(d) List.

**Table 9. De-listing consideration for coastal shoreline impaired water bodies in the SWRCB 2006 §303(d) List for impairment due to elevated levels of indicator bacteria (total coliform, fecal coliform, and enterococcus)**

The de-listing consideration is based on the sample size, the total number of exceedances, and the allowable exceedances identified by the SWRCB using three different criteria: the single sample limit, the rolling geometric mean, and the monthly geometric mean.

<b>§303(d) List Site Name</b>	<b>Beach Area</b>	<b>Site(s) #</b>	<b>Single Sample De-Listing Consideration</b>	<b>Rolling Geo. Mean De-Listing Consideration</b>	<b>Monthly Geo. Mean De-Listing Consideration</b>
<b>Pacific Ocean Shoreline, Dana Point HSA</b>	1000 Steps Beach Laguna Lido Table Rock Drive Camel Point	S4, S5, S6, S7	Yes	Yes	Yes
<b>Pacific Ocean Shoreline, Aliso HSA</b>	Aliso Beach South Aliso Beach Middle Aliso Beach North Blue Lagoon Place	S8, S9, S10, S13	Yes	NO	NO
<b>Pacific Ocean Shoreline, Laguna Beach HSA</b>	Lagunita Place Bluebird Canyon Hotel Laguna Laguna Main Beach	S14, S15, S16, OLB00	Yes	Yes	Yes
<b>Pacific Ocean Shoreline, San Joaquin Hills HSA</b>	Heisler Park North Emerald Bay	OLB05 OLB10	Yes	Yes	Yes
<b>Aliso Creek (mouth)</b>	Aliso Creek-Mouth	C1	NO	NO	NO

## **LITERATURE CITED**

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