

**Reconsideration of Certain Technical Matters of the Santa Monica Bay Beaches Bacteria TMDLs; the Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL; and the Los Angeles Harbor Inner Cabrillo Beach and Main Ship Channel Bacteria TMDL**

STAFF REPORT

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## Acronyms

|             |   |
|-------------|---|
| 303(d) list | State of California Clean Water Act Section 303(d) List of Water Quality Limited Segments |
| AB411       | State Assembly Bill No. 411 (1997)  |
| CEQA        | California Environmental Quality Act  |
| CWA         | Clean Water Act   |
| LA          | Load Allocation   |
| ml          | Milliliter  |
| mpn         | Most probable number  |
| MS4         | Municipal Separate Storm Sewer System   |
| NPDES       | National Pollution Discharge Elimination System   |
| OAL         | Office of Administrative Law  |
| REC-1       | Water Contact Recreation  |
| REC-2       | Non-contact Water Recreation  |
| SCCWRP      | Southern California Water Research Project  |
| SWRCB       | State Water Resources Control Board   |
| TMDL        | Total Maximum Daily Load  |
| USEPA       | United States Environmental Protection Agency   |
| WLA         | Waste Load Allocation   |

## Table of Contents:

|   |    |
|---|----|
| 1. Overview and current status of bacterial indicator TMDLs .....                                   | 5  |
| 2. Purpose of this reconsideration .....  | 6  |
| 3. Technical Matters to be Re-considered.....   | 9  |
| 3.1 Reference: single sample exceedance rates.....  | 9  |
| 3.1.1 Additional reference beaches .....  | 9  |
| 3.1.2 Reference: new exceedance levels at point zero sampling locations.....                        | 10 |
| 3.2 New beach calculations.....   | 12 |
| 3.2.1 New calculations: point zero and “anti-degradation” beaches.....                              | 12 |
| 3.2.2 Interannual variability at the reference beach.....   | 21 |
| 3.3 Reference year (critical condition) .....   | 21 |
| 3.3.1 Updated critical year .....   | 21 |
| 3.3.2 Reference year or annually adjusted exceedance rates .....                                    | 22 |
| 3.4 Geometric means.....  | 23 |
| 3.4.1 Calculation of rolling geometric means .....  | 24 |
| 3.4.2 Geometric means calculated with dry weather data only (Santa Monica Bay Beaches TMDL).....    | 27 |
| 3.4.3 Geometric means calculated with the <i>enterococcus</i> detection limit .....                 | 28 |
| 3.4.4 Calculation of non-rolling geometric means.....   | 31 |
| 3.4.5 Application of Rolling geometric mean calculation or discrete geometric mean calculation..... | 35 |
| 3.5 Natural Sources Exclusion .....   | 36 |
| 3.6 Schedules.....  | 37 |
| 3.6.1 SMBB and Mdr TMDLs Integrated Approach .....  | 37 |
| 3.6.2 Inner Cabrillo Beach TMDL schedule.....   | 38 |
| 3.7 Implementation .....  | 38 |
| 3.8 CEQA Analysis.....  | 39 |

## List of Tables

|  |    |
|--|----|
| Table 1 Summary of Reconsideration Elements Specified in the Beach TMDLs.....                          | 6  |
| Table 2 Comparison of Exceedance Rates at Leo Carrillo Beach (pre 2004 and 2004-2010 beach data) ..... | 11 |
| Table 3 New beach data: point zero, open, and “anti-degradation” beaches.....                          | 12 |
| Table 4 Allowable (pre 2004) vs. Observed (2004-2010) Exceedance Days.....                             | 16 |
| Table 5: <b>Santa Monica Bay Beaches Bacteria TMDL Implementation Schedule:</b> ....                   | 18 |
| Table 6 Percent of Exceedances of Geometric Mean, at Selected Shoreline Monitoring Sites.....          | 25 |
| Table 7 Geometric Means Calculated with New Point Zero Data at Leo Carrillo Beach                      | 29 |
| Table 8 Seasonal Geometric Means at Leo Carrillo Beach, Alternative 1 .....                            | 32 |
| Table 9 Seasonal Geometric Means at Leo Carrillo Beach, Alternative 2 .....                            | 33 |
| Table 10 Seasonal Geometric Means at Leo Carrillo Beach, Alternative 3 .....                           | 34 |

**List of Figures**

Figure 1. Leo Carrillo Beach, enterococcus, single sample and geometric means  
calculated with different substitutes for detection limit data November 2004 - October  
2010..... 30

**Appendices**

- A. Critical year (reference year) table
- B. Geometric mean analyses for comparison of calculation methods
- C. Monthly Precipitation Day Charts and Tables
- D. TMDL Implementation Plans

## 1. Overview and current status of bacterial indicator TMDLs

This staff report presents technical analyses in support of recommendations to reconsider aspects of three bacterial indicator TMDLs established by the Los Angeles Regional Water Quality Control Board (Regional Board). All three of these TMDLs include swimming beaches so the health of swimmers and surfers and sizeable revenues to the local economy are at stake. Fecal indicator bacteria (including total coliform, fecal coliform, and *enterococci*) are used to monitor the water quality of beaches designated for water contact recreation because local and national epidemiological studies have documented a linkage between elevated bacterial densities and adverse human health effects.

The three TMDLs to be re-considered in this action are the Santa Monica Bay Beaches bacteria TMDL, both wet and dry weather elements (SMBB TMDL); the Marina del Rey Harbor Mothers' Beach and Back Basins bacterial TMDL (MdR TMDL); and the Los Angeles Harbor Inner Cabrillo Beach and Main Ship Channel bacteria TMDL (ICB TMDL). The regulatory background, beneficial uses to be protected, geographical extent and complete TMDL elements along with supporting analysis are described in the respective staff reports and amendments to the Los Angeles Region Water Quality Control Plan (Basin Plan) (LARWQCB, 2002a, 2002b, 2003 and 2004) at ([http://www.waterboards.ca.gov/losangeles/water\\_issues/programs/tmdl/tmdl\\_list.shtml](http://www.waterboards.ca.gov/losangeles/water_issues/programs/tmdl/tmdl_list.shtml)) and are not repeated, herein.

The first bacteria TMDL adopted by the Los Angeles Water Board (and only the third TMDL for any pollutant) was the Santa Monica Bay Beaches bacteria TMDL, adopted first for dry weather on January 24, 2002 and then for wet weather December 12, 2002 (both in effect on July 15, 2003). This TMDL was also the first bacteria TMDL in California.

Since this was the first bacteria TMDL, several new approaches for regulating bacteria were developed. A 2-year work plan was conducted to support the TMDL, including an intensive wet weather monitoring effort, watershed modeling, and various special studies (e.g., a bacteria degradation study and bacteria dispersion study). Based on these studies, new implementation provisions for bacteria were incorporated into Chapter 3 of the Basin Plan. The SMBB TMDL used these new approaches, including the reference beach/antidegradation approach and the corresponding exceedance day approach to expressing TMDL allocations. These approaches have been used in bacteria TMDLs in the region since then.

The Marina del Rey bacteria TMDL, building on work of the Santa Monica Bay bacteria TMDL, was adopted August 7, 2003 (in effect on March 18, 2004).

The Inner Cabrillo Beach and Main Ship Channel bacteria TMDL was adopted July 1, 2004 (in effect on March 10, 2005).

## 2. Purpose of this reconsideration

While the Regional Board can amend the Basin Plan to adjust a TMDL at any time, implementation schedules for TMDLs in the Los Angeles Region have often included scheduled “reconsiderations” by the Regional Board at a specific point during implementation. Specific reconsiderations have been included so that aspects of the TMDL, or the TMDL implementation schedule, could be adjusted based on anticipated new information or methods. This approach has allowed the Regional Board to establish TMDLs with all the required elements, including numeric targets, allocations, and implementation schedules, so that responsible parties could begin implementing the TMDL to improve water quality, while acknowledging the potential benefit to refining certain technical elements of the TMDL or the implementation schedule after additional study and data collection were completed.

This reconsideration is not a general reconsideration of all the elements of the TMDLs but a re-examination of certain technical issues which, as recognized at the time of TMDL adoption, might need revision upon further data collection and analysis, study or experience. Table 1 outlines the technical matters to be reconsidered as specified in the beach TMDLs.

**Table 1 Summary of Reconsideration Elements Specified in the Beach TMDLs**

| <b>Santa Monica Bay Beaches Dry-Weather TMDL</b><br><br><b>4 years after effective date of July 15, 2003</b> | Re-consider TMDL to re-evaluate allowable winter dry weather exceedance days based on additional data on bacterial indicator densities in the wave wash, a reevaluation of the reference system selected to set allowable exceedance levels, and a re-evaluation of the reference year used in the calculation of allowable exceedance days. |  |  |
|--|--|--|--|
| <b>Santa Monica Bay Beaches Wet-Weather TMDL</b><br><br><b>4 years after effective date of July 15, 2003</b> | Refine allowable wet weather exceedance days based on additional data on bacterial indicator densities in the wave wash and an evaluation of site-specific variability in exceedance levels,   |  |  |
|  | Re-evaluate the reference system selected to set allowable exceedance levels, including a reconsideration of whether the allowable number of exceedance days should be adjusted annually dependent on the rainfall conditions and an evaluation of natural variability in exceedance levels in the reference system(s),                      |  |  |
|  | Re-evaluate the reference year used in the calculation of  |  |  |

|   |   |  |
|---|---|--|
|   | allowable exceedance days, and  |  |
|   | Re-evaluate whether there is a need for further clarification or revision of the geometric mean implementation provision.   |  |
| <b>Marina del Rey Back Basins</b><br><b>4 years after effective date of March 18, 2004</b>  | Refine allowable winter dry-weather and wet-weather exceedance days based on additional data on bacterial indicator densities, an evaluation of site-specific variability in exceedance levels, and the results of the study of relative bacterial loading from sources including but not limited to storm drains, boats, birds, and other nonpoint sources,  |  |
|   | Re-evaluate the reference system selected to set allowable exceedance levels, including a reconsideration of whether the allowable number of exceedance days should be adjusted annually dependent on the rainfall conditions and an evaluation of natural variability in exceedance levels in the reference system(s), and if an appropriate reference system cannot be identified for this enclosed harbor, evaluate using the ‘natural sources exclusion approach subject to antidegradation policies’ rather than the ‘reference system/antidegradation’ approach , |  |
|   | Re-evaluate the reference year used in the calculation of allowable exceedance days, and  |  |
|   | Re-evaluate whether there is a need for further clarification or revision of the geometric mean implementation provision.   |  |
| <b>Inner Cabrillo Beach and Main Ship Channel</b><br><b>4 years after effective date of March 10, 2005 or at the time of Santa Monica Bay Beaches Reopener</b><br>7 | Refine allowable wet weather exceedance days based on additional data on bacterial indicator densities in the wave wash and an evaluation of site-specific variability in exceedance levels,  |  |
|   | Re-evaluate the reference system selected to set allowable exceedance levels, including a reconsideration of whether the allowable number of exceedance days should be adjusted annually dependent on the rainfall conditions and an evaluation of natural variability in exceedance levels in the reference system(s), and if an appropriate reference system cannot be identified for this enclosed harbor, evaluate using the ‘natural sources exclusion approach subject to antidegradation policies’ rather than the ‘reference system/antidegradation’ approach , |  |
|   | Re-evaluate the reference year used in the calculation of allowable exceedance days, and  |  |

|  |   |  |  |
|--|---|--|--|
|  |   |  |  |
|  | Re-evaluate whether there is a need for further clarification or revision of the geometric mean implementation provision. |  |  |
|  | Evaluate the feasibility of a natural sources exclusion for the non-swimming portion of ICB                               |  |  |
|  | Re-evaluate the implementation schedule.  |  |  |

The geographical extent, principal structure and approach of the three TMDLs are not being reconsidered in this action. The principal structure and approach includes:

Use of the Reference beach/antidegradation approach: The three TMDLs being reconsidered in this action use a reference beach/anti degradation approach to establish allocations. The number of allowable exceedance days is based on two criteria: (1) bacteriological water quality at any site is required to be at least as good as at a designated reference site, and (2) there is no degradation of existing bacteriological water quality allowed, if historical water quality at a particular site is better than the designated reference site. This approach is not being considered for change in this reconsideration.

The alternative to the reference system/antidegradation approach is the natural sources exclusion approach, which provides that after all anthropogenic sources of bacteria have been controlled such that they do not cause an exceedance of the single sample objectives, a certain frequency of exceedance of the single sample objectives shall be permitted based on the residual exceedance frequency in the specific waterbody. Documentation has not been provided for either the MdR TMDL or the ICB TMDL indicating that all anthropogenic sources of bacteria have been controlled; therefore, it is premature to consider the application of the natural sources exclusion approach in these two TMDLs.

Exceedance Days: The WLAs and LAs for the three TMDLs being reconsidered in this action are expressed as allowable exceedance days, that is, the number of days when any one or more of the single sample bacteria objectives may be exceeded. The frequency of exceedances of the bacteria indicator objectives is most relevant to public health. This approach is not being considered for change in this reconsideration.

Allocations for summer dry, winter dry and wet weather: Each of these TMDLs established allocations for three time periods. These three periods are (1) winter dry weather (November 1 to March 31), (2) summer dry weather (April 1 to October 31) and (2) wet weather (defined as days of 0.1 inch of rain or more plus three days following the rain event). This approach is not being considered for change in this reconsideration.



### **3. Technical Matters to be Re-considered**

#### **3.1 Reference: single sample exceedance rates**

These TMDLs use a reference/antidegradation approach and calculate an allowable number of exceedance days for each beach. The number of exceedance days is the number of days on which any of the single sample objectives are exceeded and the corresponding exceedance rate is the percentage of days that exceed.

Exceedances of single sample objectives are allowed in these TMDLs, not because there is no risk associated with exceedances of the objectives, but because it was not the Regional Board's intention to hold a non-reference beach to a higher standard than a reference beach.

The Basin Plan objectives for single sample limits for marine waters designated for Water Contact Recreation (REC-1) are as follows:

- a. Total coliform density shall not exceed 10,000/100 ml.
- b. Fecal coliform density shall not exceed 400/100 ml.
- c. Enterococcus density shall not exceed 104/100 ml.
- d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

##### **3.1.1 Additional reference beaches**

Each of these TMDLs used Leo Carrillo Beach as the reference beach to set the allowable number of exceedance days. Arroyo Sequit Canyon, which drains to Leo Carrillo Beach, is approximately 12 square miles in size and is almost entirely undeveloped open space (98% of land use). This beach and corresponding drainage system was selected for three reasons: (1) Arroyo Sequit is the most undeveloped subwatershed in the Santa Monica Bay watershed management area, (2) there is a freshwater outlet (creek), which drains to the beach, and (3) a sufficient historical shoreline monitoring dataset for this system was available.

However, it was recognized that Leo Carrillo might not be the most representative reference site for all beaches in the Region. A study to examine other reference systems throughout Southern California coastal beaches, conducted by the Southern California Water Research Project (SCCWRP), "Microbiological water quality at non-human impacted reference beaches in southern California during wet weather" (SCCWRP, 2006) examined reference beaches in regards to the size of the watershed among other factors. This study focused on wet weather, the critical condition.

The SCCWRP 2006 study found that exceedances of water quality objectives for bacterial indicators in wet weather occurred more frequently in large (> 100 km<sup>2</sup>) watersheds (~30%) than in medium (28-56 km<sup>2</sup>) watersheds (~12%) or small (3-12 km<sup>2</sup>) watersheds (~7%).

Staff examined the study data for the large reference watersheds, which were higher than the Leo Carrillo beach data. Staff also examined the study data available for the small and medium reference watersheds. In the Santa Monica Bay watershed, only two beaches at mouth of the Ballona Creek and Malibu Creek watersheds meet the SCCWRP definition of a large watershed. These two beaches are Surfrider Beach and Dockweiler Beach. With the exception of Surfrider and Dockweiler beaches, the beaches under consideration in this reconsideration are all within the size of medium or small watersheds. In the SCCWRP 2006 study, there was not a great difference in the exceedance rates from the medium and small watershed beaches and the Leo Carrillo Beach.

### 3.1.1 RECOMMENDATION

Continued use of Leo Carrillo Beach as the reference beach for these bacteria TMDLs. Staff finds that it is most appropriate to continue to use Leo Carrillo Beach as the reference beach for all Santa Monica Bay beaches given that it is within the Santa Monica Bay watershed management area; it provides a much larger and longer, database than the data considered in the SCCWRP 2006 study; and ensures equal protection across Santa Monica Bay beaches.

#### **3.1.2 Reference: new exceedance levels at point zero sampling locations**

The TMDL targets and allocations in these TMDLs apply in the “mixing zone” or “point zero.” The mixing zone is the volume of water into which the storm drain or creek empties and where the effluent from the storm drain initially mixes with the receiving water. In these TMDLs, the mixing zone is the same as the “wave wash” or “point zero.”

At the time of the development of the Santa Monica Bay bacteria TMDL, most beach data had been collected not at point zero from the storm drains or streams, but at a distance up to 50 yards above or below the mixing zone of the discharge. Since it was the intention of the TMDL to require compliance with the TMDL at point zero, it was necessary to collect some years of data at the reference beach point zero to set appropriate exceedance rates to apply to the subject beaches at their point zero compliance locations. In addition, it was necessary to calculate the exceedance rates at the subject beaches again to determine if the beach should be subject to the reference beach exceedance rates or, if the beach has fewer exceedances than the reference beach, be subject to “antidegradation” and required to not exceed its current rate of exceedance at the new location.

#### **3.2.2.1 Wet weather reference exceedance rates**

An examination of the data collected at Leo Carrillo Beach from the years data was collected at point zero, 2004 to 2010, shows the wet weather rates to be about the same as the non point zero exceedance rates, pre-2004. See Table 2.

**3.2.2.2 Winter dry reference exceedance rates**

An examination of the data collected at Leo Carrillo Beach from point zero during the years 2004 to 2010 shows the winter dry weather exceedance rates to be higher than the pre-2004, non point zero, exceedance rates. See Table 2. Options for adjusting reference exceedance rates to be required at other beaches include:

- 1) Retain previous allowable exceedance rate for winter dry weather.
- 2) Allow exceedances of the single sample objectives at the same rate as the reference beach as reflected in the post-2004 data set.

**3.2.2.3 Summer dry reference exceedance rates**

An examination of the data collected at Leo Carrillo Beach from point zero during the years 2004 to 2010 shows the summer dry weather exceedance rates to be higher than the pre-2004 non point zero exceedance rates. See Table 2. Options for adjusting reference exceedance rates to be required at other beaches include:

- 1) Do not allow exceedances of the single sample objectives in summer dry weather.
- 2) Allow exceedances of the single sample objectives at the same rate as the reference beach.

An examination of the summer dry weather data reveals that the exceedances, which brought the exceedance rate to 10%, happened primarily in the summer season during a single year (2006), as well as some exceedances in 2005 and 2008. The rest of the years of data showed no exceedances in summer dry weather. In addition, the summer period in the Los Angeles Region typically experiences the highest usage rate for beaches. The County of Los Angeles estimated the total number of beach visitors in 2011 to the county (~71 miles of shoreline) to be just over 61 million (County of Los Angeles, 2012). Of the estimated 61 million visitors, more than 52 million visited during the summer months (April – October), and especially during the peak months of June to August (~37 million).

**Table 2 Comparison of Exceedance Rates at Leo Carrillo Beach (pre 2004 and 2004-2010 beach data)**

| <b>Sampling Location</b> | <b>Summer Dry</b> | <b>Winter Dry</b> | <b>Wet</b> |
|--------------------------|-------------------|-------------------|------------|
| pre 2004                 | 0%                | 3%                | 22%        |
| 2004-2010 (Point zero)   | 10%               | 10%               | 22%        |

**3.1.2 RECOMMENDATION**

Continued use of the current wet weather exceedance rate of **22%** (unchanged in the new data analysis) and adjustment of the winter dry weather exceedance rate to mirror the current point zero exceedance rate at Leo Carrillo Beach, **10%**, consistent with the Regional Board’s intention in applying a reference system approach in the TMDL. No change in the summer dry weather exceedance rate, **0%**, consistent with the Regional Board’s recognition that summer dry weather is the period of highest recreational use and staff’s evaluation of data from 2004-2010, indicating that in five out of the six years there were no exceedances at Leo Carrillo Beach during summer dry weather.

**3.2 New beach calculations**

**3.2.1 New calculations: point zero and “anti-degradation” beaches**

New bacteria exceedance rates were calculated for those Santa Monica Bay beaches where the point of compliance was changed to point zero, for one beach which represented a new sampling station, and for beaches which were previously identified as anti-degradation beaches. New calculations were made using data collected from 2004 to 2010. See Table 3, below. Data for beach sites which did not move to point zero or which were not anti-degradation sites were not re-analyzed.

Data shown in Table 3 was collected by the City of Los Angeles, Bureau of Sanitation and the City of Redondo Beach. For sites that were sampled by both municipalities, the overlapping data sets were combined. Samples taken on the same day at the same sampling location by both municipalities were not temporally independent and the arithmetic mean was use for those samples.

Staff notes that at some locations, exceedance rates increased due to higher bacteria counts at point zero but others, decreased, presumably due to implementation actions taken by municipalities.

**Table 3 New beach data: point zero, open, and “anti-degradation” beaches**

| Sample Station | Type<br>(M=Moved<br>N=New<br>E=Existing) | Location                         | Single Sample<br>November 2004 to October 2010<br>Exceedance % (Exceed Count/Sample Count) |   |                               |
|----------------|--|----------------------------------|--|---|-------------------------------|
|                |  |                                  | Summer Dry<br>Weather<br>Exceedance Day  | Winter Dry<br>Weather<br>Exceedance Day | Wet Weather<br>Exceedance Day |
| SMB 1-1        | Point Zero (M)                           | Leo Carrillo Beach, at 35000 PCH | 10%<br>(19/187)  | 10%<br>(10/96)                          | 22%<br>(11/49)                |
| SMB 1-2        | Point Zero (N)                           | El Pescador State Beach          | 0%<br>(0/169)  | 1%<br>(1/92)                            | 6%<br>(3/52)                  |
| SMB 1-3        | Point Zero (N)                           | El Matador State Beach           | 0%<br>(0/169)  | 1%<br>(1/91)                            | 4%<br>(2/52)                  |
| SMB 1-4        | Point Zero (M)                           | Trancas Creek at Broad Beach     | 3%<br>(5/177)  | 22%<br>(22/102)                         | 43%<br>(20/47)                |

| Sample Station | Type<br>(M=Moved<br>N=New<br>E=Existing) | Location  | Single Sample<br>November 2004 to October 2010<br>Exceedance % (Exceed Count/Sample Count) |   |                               |
|----------------|--|---|--|---|-------------------------------|
|                |  |   | Summer Dry<br>Weather<br>Exceedance Day  | Winter Dry<br>Weather<br>Exceedance Day | Wet Weather<br>Exceedance Day |
|                |  |   | SMB 1-5  | Point Zero (M)                          | Zuma Creek at Zuma Beach      |
| SMB 1-6        | Point Zero (N)                           | Walnut Creek in Paradise Cove                                       | 3%<br>(6/173)  | 12%<br>(12/98)                          | 27%<br>(14/52)                |
| SMB O-1#       | Point Zero (N)                           | Paradise Cove   | 2%<br>(1/62)   | 13%<br>(2/16)                           | 20%<br>(3/15)                 |
| SMB 1-7        | Point Zero (M)                           | Ramirez Creek at Paradise Cove Pier                                 | 21%<br>(44/214)  | 39%<br>(46/118)                         | 56%<br>(32/57)                |
| SMB 1-8        | Point Zero (N)                           | Escondido Creek, just east of Escondido State Beach                 | 37%<br>(88/237)  | 40%<br>(50/126)                         | 48%<br>(31/64)                |
| SMB 1-9        | Point Zero (M)                           | Latigo Canyon Creek, adjacent the Trivoli Bay Villa Treatment Plant | 15%<br>(30/195)  | 19%<br>(20/105)                         | 42%<br>(22/52)                |
| SMB 1-10       | Point Zero (N)                           | Solstice Creek at Dan Blocker County Beach                          | 19%<br>(40/208)  | 6%<br>(6/95)                            | 33%<br>(18/54)                |
| SMB O-2#       | Point Zero (N)                           | Puerco Canyon storm drain   | 3%<br>(2/59)   | 0%<br>(0/13)                            | 7%<br>(1/14)                  |
| SMB 1-11       | Point Zero (M)                           | Wave wash of unnamed creek on Puerco Beach                          | 8%<br>(15/183)   | 9%<br>(8/94)                            | 37%<br>(18/49)                |
| SMB 1-12       | Point Zero (N)                           | Marie Canyon Storm Drain at Puerco Beach                            | 50%<br>(139/278)   | 44%<br>(58/133)                         | 58%<br>(36/62)                |
| SMB 1-13       | Point Zero (N)                           | Sweetwater Creek on Carbon Beach                                    | 12%<br>(23/187)  | 10%<br>(10/98)                          | 44%<br>(23/52)                |
| SMB 1-14       | Point Zero (N)                           | Las Flores Creek at Las Flores State Beach                          | 8%<br>(15/181)   | 7%<br>(6/91)                            | 38%<br>(21/55)                |
| SMB 1-15       | Open Beach                               | Big Rock Beach at 19948 Pacific Coast Hwy                           | 11%<br>(21/190)  | 24%<br>(26/107)                         | 30%<br>(16/53)                |
| SMB 1-16       | Point Zero (N)                           | Pena Creek at Las Tunas County Beach                                | 2%<br>(3/173)  | 3%<br>(3/91)                            | 18%<br>(10/55)                |
| SMB 1-17       | Point Zero (N)                           | Tuna Canyon Creek at Las Tunas County Beach                         | 7%<br>(7/94)   | 8%<br>(5/60)                            | 15%<br>(4/26)                 |
| SMB 1-18       | Point Zero (M)                           | Topanga Creek at Topanga County Beach                               | 24%<br>(203/859)   | 28%<br>(134/480)                        | 60%<br>(152/252)              |
| SMB 2-1        | Point Zero (N)                           | Castlerock (Parker Mesa) Storm Drain Topanga County Beach           | 50%<br>(124/248)   | 64%<br>(87/135)                         | 65%<br>(40/62)                |
| SMB 2-2        | Point Zero (N)                           | Santa Ynez Storm Drain at Will Rodgers State Beach                  | 32%<br>(45/140)  | 46%<br>(48/105)                         | 59%<br>(29/49)                |
| SMB 2-3        | Open Beach                               | Will Rogers State Beach at 17200 Pacific Coast Hwy.                 | 4%<br>(8/178)  | 1%<br>(1/90)                            | 33%<br>(17/51)                |
| SMB 2-4        | Point Zero (M)                           | Pulga Canyon storm drain at Will Rodgers State Beach                | 13%<br>(30/236)  | 17%<br>(30/172)                         | 48%<br>(44/91)                |
| SMB 2-5        | Point Zero (M)                           | Bay Club Storm Drain  | 10%<br>(18/185)  | 13%<br>(13/99)                          | 40%<br>(21/53)                |
| SMB 2-6        | Point Zero (M)                           | Temescal Storm Drain  | 7%<br>(13/185)   | 34%<br>(40/116)                         | 46%<br>(26/56)                |
| SMB 2-7        | Point Zero (M)                           | Santa Monica Canyon, Will Rodgers State Beach                       | 17%<br>(147/860)   | 66%<br>(316/481)                        | 80%<br>(202/252)              |

| Sample Station | Type<br>(M=Moved<br>N=New<br>E=Existing) | Location  | Single Sample<br>November 2004 to October 2010<br>Exceedance % (Exceed Count/Sample Count) |   |                               |
|----------------|--|---|--|---|-------------------------------|
|                |  |   | Summer Dry<br>Weather<br>Exceedance Day  | Winter Dry<br>Weather<br>Exceedance Day | Wet Weather<br>Exceedance Day |
|                |  |   | SMB 2-8  | Open Beach                              | Venice Pier, Venice           |
| SMB 2-9        | Open Beach                               | Topsail Street extended at Venice Beach                   | 9%<br>(16/185)   | 4%<br>(4/91)                            | 39%<br>(20/51)                |
| SMB 2-10       | Point Zero (M)                           | Culver Bl. Storm Drain at Dockweiler State Beach          | 2%<br>(5/230)  | 4%<br>(6/166)                           | 37%<br>(34/91)                |
| SMB 2-11       | Point Zero (N)                           | North Westchester Storm Drain at Dockweiler State Beach   | 1%<br>(1/170)  | 0%<br>(0/90)                            | 26%<br>(14/53)                |
| SMB 2-12       | Open Beach                               | World Way extended at Dockweiler State Beach              | 2%<br>(4/173)  | 5%<br>(5/92)                            | 28%<br>(14/50)                |
| SMB 2-13       | Point Zero (M)                           | Imperial Highway storm drain at Dockweiler State Beach    | 7%<br>(16/230)   | 5%<br>(8/167)                           | 34%<br>(31/90)                |
| SMB 2-14       | Open Beach                               | Opposite Hyperion Plant at Dockweiler State Beach         | 2%<br>(3/173)  | 3%<br>(3/91)                            | 22%<br>(11/49)                |
| SMB 2-15       | Point Zero (E)                           | Grand Avenue Storm Drain at Dockweiler State Beach        | 3%<br>(6/175)  | 5%<br>(5/91)                            | 26%<br>(13/50)                |
| SMB 3-1        | Point Zero (M)                           | Montana Storm Drain at Santa Monica State Beach           | 13%<br>(25/192)  | 12%<br>(12/98)                          | 37%<br>(19/51)                |
| SMB 3-2        | Point Zero (M)                           | Wilshire Storm Drain at Santa Monica State Beach          | 10%<br>(20/191)  | 18%<br>(19/103)                         | 47%<br>(25/53)                |
| SMB 3-3        | Point Zero (M)                           | Santa Monica Pier Storm Drain at Santa Monica State Beach | 41%<br>(352/860)   | 45%<br>(215/481)                        | 57%<br>(145/253)              |
| SMB 3-4        | Point Zero (M)                           | Pico-Kenter Storm Drain at Santa Monica State Beach       | 9%<br>(73/856)   | 22%<br>(105/481)                        | 64%<br>(163/253)              |
| SMB 3-5        | Point Zero (M)                           | Ashland Storm Drain at Venice Beach                       | 1%<br>(10/859)   | 6%<br>(30/481)                          | 37%<br>(93/253)               |
| SMB 3-6        | Point Zero (N)                           | Rose Ave. Storm Drain at Venice Beach                     | 5%<br>(8/175)  | 7%<br>(7/96)                            | 44%<br>(25/57)                |
| SMB 3-7        | Point Zero (M)                           | Brooks Storm Drain at Venice City Beach                   | 3%<br>(6/178)  | 11%<br>(10/95)                          | 42%<br>(22/52)                |
| SMB 3-8        | Point Zero (M)                           | Windward Storm Drain at Venice City Beach                 | 6%<br>(15/236)   | 10%<br>(17/163)                         | 30%<br>(27/89)                |
| SMB 3-9        | Open Beach                               | Strand Street extended at Santa Monica Beach              | 3%<br>(5/176)  | 8%<br>(8/95)                            | 38%<br>(19/50)                |
| SMB 4-1        | Point Zero (M)                           | San Nicholas Canyon Creek at Nicholas Beach               | 2%<br>(3/173)  | 4%<br>(4/93)                            | 13%<br>(6/48)                 |
| SMB 5-1*       | Open Beach                               | Manhattan State Beach at 40th Street                      | 2%<br>(4/234)  | 2%<br>(2/124)                           | 11%<br>(7/65)                 |
| SMB 5-2        | Point Zero (M)                           | 28th Street Drain at Manhattan State Beach                | 7%<br>(56/811)   | 14%<br>(57/402)                         | 44%<br>(96/216)               |
| SMB 5-3*       | Point Zero (M)                           | Manhattan Beach Pier at Manhattan State Beach             | 2%<br>(5/256)  | 3%<br>(4/138)                           | 8%<br>(6/75)                  |
| SMB 5-4        | Open Beach                               | Hermosa Beach at 26th Street                              | 1%<br>(1/187)  | 1%<br>(1/87)                            | 21%<br>(10/48)                |
| SMB 5-5*       | Open Beach                               | Hermosa Beach Pier at Hermosa Beach                       | 11%<br>(29/273)  | 5%<br>(5/110)                           | 22%<br>(15/67)                |
| SMB 6-1        | Point Zero (M)                           | Herondo Storm Drain at Redondo Beach                      | 3%<br>(26/807)   | 9%<br>(35/384)                          | 46%<br>(99/213)               |
| SMB 6-2*       | Open Beach                               | Redondo Municipal Pier - 100 yards south at Redondo Beach | 12%<br>(35/303)  | 18%<br>(30/169)                         | 32%<br>(35/108)               |

| Sample Station | Type<br>(M=Moved<br>N=New<br>E=Existing) | Location  | Single Sample<br>November 2004 to October 2010<br>Exceedance % (Exceed Count/Sample Count) |   |  |
|----------------|--|---|--|---|--|
|                |  |   | Summer Dry<br>Weather<br>Exceedance Day  | Winter Dry<br>Weather<br>Exceedance Day | Wet Weather<br>Exceedance Day          |
|                |  |   | SMB 6-3  | Point Zero (N)                          | Sapphire Street Drain at Redondo Beach |
| SMB 6-4        | Open Beach                               | 120' north of Topaz groin at Redondo Beach          | 5%<br>(9/181)  | 14%<br>(13/94)                          | 24%<br>(12/51)                         |
| SMB 6-5*       | Point Zero (M)                           | Avenue I Storm Drain at Redondo Beach               | 6%<br>(15/261)   | 5%<br>(7/139)                           | 14%<br>(10/74)                         |
| SMB 6-6*       | Open Beach                               | Malaga Cove, Palos Verdes Estates                   | 2%<br>(4/196)  | 5%<br>(5/110)                           | 11%<br>(7/64)                          |
| SMB 7-1        | Open Beach                               | Malaga Cove   | 0%<br>(0/175)  | 0%<br>(0/96)                            | 15%<br>(8/55)                          |
| SMB 7-2        | Open Beach                               | Bluff Cove  | 0%<br>(0/176)  | 1%<br>(1/97)                            | 4%<br>(2/52)                           |
| SMB 7-3        | Open Beach                               | Long Point  | 0%<br>(0/374)  | 0%<br>(0/273)                           | 9%<br>(14/160)                         |
| SMB 7-4        | Open Beach                               | Abalone Cove  | 0%<br>(1/374)  | 0%<br>(1/273)                           | 4%<br>(7/160)                          |
| SMB 7-5        | Open Beach                               | Portuguese Bend Cove                                | 0%<br>(1/375)  | 1%<br>(4/275)                           | 4%<br>(7/160)                          |
| SMB 7-6        | Open Beach                               | Royal Palms   | 0%<br>(0/374)  | 0%<br>(0/273)                           | 9%<br>(14/160)                         |
| SMB 7-7        | Point Zero (N)                           | At storm drain between White Point and Wilder Annex | 5%<br>(7/152)  | 3%<br>(3/93)                            | 33%<br>(16/48)                         |
| SMB 7-8        | Open Beach                               | Wilder Annex  | 0%<br>(0/374)  | 1%<br>(4/275)                           | 8%<br>(13/159)                         |
| SMB 7-9        | Open Beach                               | Outer Cabrillo Beach                                | 1%<br>(4/378)  | 1%<br>(3/277)                           | 7%<br>(11/160)                         |
| SMB BC-1       | Point Zero (M)                           | Ballona Creek at Dockweiler State Beach             | 21%<br>(180/857)   | 17%<br>(80/481)                         | 62%<br>(155/251)                       |
| SMB MC-1       | Open Beach                               | Malibu Point, Malibu State Beach                    | 11%<br>(21/187)  | 14%<br>(14/102)                         | 25%<br>(12/48)                         |
| SMB MC-2       | Point Zero (M)                           | Surfrider Beach (breach point of Malibu Lagoon)     | 29%<br>(246/857)   | 46%<br>(222/481)                        | 68%<br>(171/250)                       |
| SMB MC-3       | Open Beach                               | Malibu Pier at Carbon Beach                         | 15%<br>(29/196)  | 19%<br>(20/104)                         | 52%<br>(27/52)                         |

# Monitoring began in 2010 and data was examine from April 2010 to November 2011

\* Two different data were available for the sampling site and subsequently combined

Data in Table 4 compares the allowable exceedances as established in the TMDL in 2002 to the observed numbers of exceedances for the period 2004-2010.

**Table 4 Allowable (pre 2004) vs. Observed (2004-2010) Exceedance Days**

| Station        | Beach Monitoring Location                         | Winter Dry Weather                  |                 |                                    |                 | Wet Weather                         |                 |                                    |                 |
|----------------|---|-------------------------------------|-----------------|------------------------------------|-----------------|-------------------------------------|-----------------|------------------------------------|-----------------|
|                |   | Allowable Number of Exceedance Days |                 | Observed Number of Exceedance Days |                 | Allowable Number of Exceedance Days |                 | Observed Number of Exceedance Days |                 |
|                |   | Daily Sampling                      | Weekly Sampling | Daily Sampling**                   | Weekly Sampling | Daily Sampling                      | Weekly Sampling | Daily Sampling**                   | Weekly Sampling |
| <b>SMB 1-1</b> | <b>Leo Carrillo Beach, at 35000 PCH</b>           | <b>3</b>                            | <b>1</b>        | <b>9</b>                           | <b>2</b>        | <b>17</b>                           | <b>3</b>        | <b>17</b>                          | <b>3</b>        |
| SMB 1-4        | Trancas Creek at Broad Beach                      | 0                                   | 0               | 18                                 | 3               | 17                                  | 3               | 32                                 | 5               |
| SMB 1-5        | Zuma Creek at Zuma Beach                          | 0                                   | 0               | 14                                 | 2               | 17                                  | 3               | 20                                 | 3               |
| SMB 2-13       | Imperial storm drain                              | 2                                   | 1               | 4                                  | 1               | 17                                  | 3               | 26                                 | 4               |
| SMB 3-8        | Venice City Beach at Windward Av.- 50 yards north | 2                                   | 1               | 9                                  | 2               | 13                                  | 2               | 23                                 | 4               |
| SMB 4-1        | Nicholas Beach- 100 feet west of lifeguard tower  | 0                                   | 0               | 4                                  | 1               | 14                                  | 2               | 10                                 | 2               |
| SMB 5-1*       | Manhattan State Beach at 40th Street              | 1                                   | 1               | 2                                  | 1               | 4                                   | 1               | 8                                  | 2               |
| SMB 5-2        | 28th Street storm drain at Manhattan Beach        | 0                                   | 0               | 12                                 | 2               | 17                                  | 3               | 34                                 | 5               |
| SMB 5-3*       | Manhattan Beach Pier- 50 yards south              | 1                                   | 1               | 3                                  | 1               | 5                                   | 1               | 6                                  | 1               |
| SMB 5-4        | Hermosa City Beach at 26th St.                    | 3                                   | 1               | 1                                  | 1               | 12                                  | 2               | 16                                 | 3               |
| SMB 5-5*       | Hermosa Beach Pier- 50 yards south                | 2                                   | 1               | 4                                  | 1               | 8                                   | 2               | 17                                 | 3               |
| SMB 6-2*       | Redondo Municipal Pier- 50 yards south            | 3                                   | 1               | 15                                 | 3               | 14                                  | 2               | 25                                 | 4               |
| SMB 6-5*       | Redondo State Beach at Avenue I                   | 3                                   | 1               | 4                                  | 1               | 6                                   | 1               | 11                                 | 2               |
| SMB 6-6*       | Malaga Cove, Palos Verdes Estates-daily           | 1                                   | 1               | 4                                  | 1               | 3                                   | 1               | 9                                  | 2               |
| SMB 7-1        | Malaga Cove, Palos Verdes Estates-weekly          | 1                                   | 1               | 0                                  | 0               | 14                                  | 2               | 11                                 | 2               |
| SMB 7-2        | Palos Verdes (Bluff) Cove, Palos Verdes Estates   | 1                                   | 1               | 1                                  | 1               | 0                                   | 0               | 3                                  | 1               |
| SMB 7-3        | Long Point, Rancho Palos Verdes                   | 1                                   | 1               | 0                                  | 0               | 5                                   | 1               | 7                                  | 1               |
| SMB 7-4        | Abalone Cove Shoreline Park                       | 0                                   | 0               | 1                                  | 1               | 1                                   | 1               | 4                                  | 1               |
| SMB 7-5        | Portuguese Bend Cove, Rancho Palos Verdes         | 1                                   | 1               | 2                                  | 1               | 2                                   | 1               | 4                                  | 1               |
| SMB 7-6        | Royal Palms State Beach                           | 1                                   | 1               | 7                                  | 1               | 6                                   | 1               | 15                                 | 3               |
| SMB 7-8        | Wilder Annex, San Pedro                           | 1                                   | 1               | 2                                  | 1               | 2                                   | 1               | 7                                  | 1               |
| SMB 7-9        | Cabrillo Beach, oceanside                         | 1                                   | 1               | 1                                  | 1               | 3                                   | 1               | 6                                  | 1               |

Notes: The allowable number of exceedance days was based on existing shoreline monitoring data and was calculated for both daily sampling and weekly sampling.

\* Two different data sets were available for the sampling site and subsequently combined

\*\* Observed number of daily exceedances days were calculated based on the observed exceedance rate per sampling station and the number wet and or dry days observed in the critical year.



Table 4 includes the allowable and observed exceedances for sampling locations that have moved to point zero or were listed as antidegradation sites in the Santa Monica Bay Bacteria TMDL. Certain sites that were previously listed as antidegradation sites have been observed to exceed bacteria objectives in excess of their previous rate due to more elevated bacteria levels due to point zero monitoring in both winter dry and wet weather.

### 3.2.1 RECOMMENDATION

The final allowable exceedance days shall be updated for the Santa Monica Bay beaches TMDL according to the new calculations (see Table 5 which includes all beach sites).

| <b>Table 5: Santa Monica Bay Beaches Bacteria TMDL Implementation Schedule:<br/>Allowable Number of Days that May Exceed Any Single Sample Bacterial Indicator Target for Existing Shoreline Monitoring Stations</b> |   |                             |   |                               |  |                               |                              |                               |
|--|---|-----------------------------|---|-------------------------------|--|-------------------------------|------------------------------|-------------------------------|
| <b>Compliance Deadline</b>   |   |                             | <b>15-Jul-06</b>                                  |                               | <b>1-Nov-09</b>                                    |                               | <b>15-Jul-21</b>             |                               |
| Station ID   | Location Name                                       | Subwatershed                | Summer Dry Weather <sup>^</sup><br>Apr. 1-Oct. 31 |                               | Winter Dry Weather <sup>^*</sup><br>Nov. 1-Mar. 31 |                               | Wet Weather<br>Year-round    |                               |
|  |   |                             | Daily sampling<br>(No. days)                      | Weekly sampling<br>(No. days) | Daily sampling<br>(No. days)                       | Weekly sampling<br>(No. days) | Daily sampling<br>(No. days) | Weekly sampling<br>(No. days) |
| <b>SMB 1-1</b>   | <b>Leo Carillo Beach (REFERENCE BEACH)</b>          | <b>Arroyo Sequit Canyon</b> | <b>0</b>  | <b>0</b>                      | <b>9</b>   | <b>2</b>                      | <b>17</b>                    | <b>3</b>                      |
| SMB 1-2  | El Pescador State Beach                             | Los Alisos Canyon           | 0   | 0                             | 1  | 1                             | 5                            | 1                             |
| SMB 1-3  | El Matador State Beach                              | Encinal Canyon              | 0   | 0                             | 1  | 1                             | 3                            | 1                             |
| SMB 1-4  | Trancas Creek                                       | Trancas Canyon              | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 1-5  | Zuma Creek  | Zuma Canyon                 | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 1-6  | Walnut Creek  | Ramirez Canyon              | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB O-1#   | Paradise Cove                                       | Ramirez Canyon              | 0   | 0                             | 9  | 2                             | 15                           | 3                             |
| SMB 1-7  | Ramirez Creek                                       | Ramirez Canyon              | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 1-8  | Escondido Creek                                     | Escondido Canyon            | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 1-9  | Latigo Canyon Creek                                 | Latigo Canyon               | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 1-10   | Solstice Creek                                      | Solstice Canyon             | 0   | 0                             | 5  | 2                             | 17                           | 3                             |
| SMB 1-11   | Wave wash of unnamed creek on Puerco Beach          | Corral Canyon               | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 1-12   | Marie Canyon Storm Drain on Puerco Beach            | Corral Canyon               | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB O-2#   | Puerco Canyon storm drain                           | Corral Canyon               | 0   | 0                             | 0  | 0                             | 6                            | 1                             |
| SMB 1-13   | Sweetwater Creek on Carbon Beach                    | Carbon Canyon               | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 1-14   | Las Flores Creek                                    | Las Flores Canyon           | 0   | 0                             | 6  | 1                             | 17                           | 3                             |
| SMB 1-15   | Big Rock Beach at 19948 Pacific Coast Hwy           | Piedra Gorda Canyon         | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 1-16   | Pena Creek  | Pena Canyon                 | 0   | 0                             | 3  | 2                             | 14                           | 3                             |
| SMB 1-17   | Tuna Canyon Creek                                   | Tuna Canyon                 | 0   | 0                             | 7  | 1                             | 12                           | 2                             |
| SMB 1-18   | Topanga Creek                                       | Topanga Canyon              | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 4-1  | San Nicholas Canyon Creek                           | Nicholas Canyon             | 0   | 0                             | 4  | 1                             | 14                           | 2                             |
| SMB 2-1  | Castlerock (Parker Mesa) Storm Drain                | Castlerock Canyon           | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 2-2  | Santa Ynez Storm Drain                              | Santa Ynez Canyon           | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 2-3  | Will Rogers State Beach at 17200 Pacific Coast Hwy. | Santa Ynez Canyon           | 0   | 0                             | 9  | 2                             | 17                           | 3                             |

| Table 5: Santa Monica Bay Beaches Bacteria TMDL Implementation Schedule:<br>Allowable Number of Days that May Exceed Any Single Sample Bacterial Indicator Target for Existing Shoreline Monitoring Stations |   |                     |   |                               |  |                               |                              |                               |
|--|---|---------------------|---|-------------------------------|--|-------------------------------|------------------------------|-------------------------------|
| Compliance Deadline  |   |                     | 15-Jul-06   |                               | 1-Nov-09   |                               | 15-Jul-21                    |                               |
| Station ID   | Location Name   | Subwatershed        | Summer Dry Weather <sup>^</sup><br>Apr. 1-Oct. 31 |                               | Winter Dry Weather <sup>^*</sup><br>Nov. 1-Mar. 31 |                               | Wet Weather<br>Year-round    |                               |
|  |   |                     | Daily sampling<br>(No. days)                      | Weekly sampling<br>(No. days) | Daily sampling<br>(No. days)                       | Weekly sampling<br>(No. days) | Daily sampling<br>(No. days) | Weekly sampling<br>(No. days) |
| SMB 2-4  | Pulga Canyon storm drain  | Pulga Canyon        | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 2-5  | Temescal Storm Drain  | Pulga Canyon        | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 2-6  | Bay Club Storm Drain  | Santa Ynez Canyon   | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 2-7  | Santa Monica Canyon, Will Rogers State Beach                        | Santa Monica Canyon | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 2-8  | Venice Pier, Venice   | Ballona             | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 2-9  | Topsail Street extended   | Ballona             | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 2-10   | Dockweiler State Beach at Culver Bl. Storm Drain                    | Dockweiler          | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 2-11   | North Westchester Storm Drain                                       | Dockweiler          | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 2-12   | World Way extended  | Dockweiler          | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 2-13   | Imperial Highway storm drain (Dockweiler)                           | Dockweiler          | 0   | 0                             | 4  | 2                             | 17                           | 3                             |
| SMB 2-14   | Opposite Hyperion Plant, 1 mile                                     | Dockweiler          | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 2-15   | Grand Avenue Storm Drain  | Dockweiler          | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 3-1  | Montana Ave. Storm Drain  | Santa Monica        | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 3-2  | Wilshire Blvd., Santa Monica  | Santa Monica        | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 3-3  | Santa Monica Municipal Pier at storm drain                          | Santa Monica        | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 3-4  | Santa Monica Beach at Pico/Kenter storm drain                       | Santa Monica        | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 3-5  | Ashland Av. storm drain (Venice)                                    | Santa Monica        | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 3-6  | Rose Ave. Storm Drain on Venice Beach                               | Santa Monica        | 0   | 0                             | 6  | 1                             | 17                           | 3                             |
| SMB 3-7  | Venice City Beach at Brooks Storm Drain (projection of Brooks Ave.) | Ballona             | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 3-8  | Venice Pavilion at projection of Windward Av.                       | Ballona             | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 3-9  | Strand Street extended  | Santa Monica        | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 5-1  | Manhattan State Beach at 40th Street (El Porto Beach)               | Hermosa             | 0   | 0                             | 1  | 1                             | 4                            | 1                             |
| SMB 5-2  | Terminus of 28th Street Drain in Manhattan Beach                    | Hermosa             | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 5-3  | Manhattan Beach Pier  | Hermosa             | 0   | 0                             | 3  | 1                             | 6                            | 1                             |

| Table 5: Santa Monica Bay Beaches Bacteria TMDL Implementation Schedule:<br>Allowable Number of Days that May Exceed Any Single Sample Bacterial Indicator Target for Existing Shoreline Monitoring Stations |   |               |   |                               |  |                               |                              |                               |
|--|---|---------------|---|-------------------------------|--|-------------------------------|------------------------------|-------------------------------|
| Compliance Deadline  |   |               | 15-Jul-06   |                               | 1-Nov-09   |                               | 15-Jul-21                    |                               |
| Station ID   | Location Name                                   | Subwatershed  | Summer Dry Weather <sup>^</sup><br>Apr. 1-Oct. 31 |                               | Winter Dry Weather <sup>^*</sup><br>Nov. 1-Mar. 31 |                               | Wet Weather<br>Year-round    |                               |
|  |   |               | Daily sampling<br>(No. days)                      | Weekly sampling<br>(No. days) | Daily sampling<br>(No. days)                       | Weekly sampling<br>(No. days) | Daily sampling<br>(No. days) | Weekly sampling<br>(No. days) |
| SMB 5-4  | Near 26th Street on Hermosa Beach               | Hermosa       | 0   | 0                             | 3  | 1                             | 12                           | 2                             |
| SMB 5-5  | Hermosa Beach Pier                              | Hermosa       | 0   | 0                             | 2  | 1                             | 8                            | 2                             |
| SMB 6-1  | Herondo Storm Drain                             | Redondo       | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 6-2  | Redondo Municipal Pier - 100 yards south        | Redondo       | 0   | 0                             | 3  | 1                             | 14                           | 2                             |
| SMB 6-3  | 4' x 4' outlet at projection of Sapphire Street | Redondo       | 0   | 0                             | 5  | 1                             | 17                           | 3                             |
| SMB 6-4  | 120' north of Topaz groin                       | Redondo       | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB 6-5  | Storm Drain at Projection of Avenue I           | Redondo       | 0   | 0                             | 4  | 1                             | 11                           | 2                             |
| SMB 6-6  | Malaga Cove, Palos Verdes Estates               | Redondo       | 0   | 0                             | 1  | 1                             | 3                            | 1                             |
| SMB 7-1  | Malaga Cove                                     | Palos Verdes  | 0   | 0                             | 1  | 1                             | 14                           | 2                             |
| SMB 7-2  | Bluff Cove                                      | Palos Verdes  | 0   | 0                             | 1  | 1                             | 0                            | 0                             |
| SMB 7-3  | Long Point                                      | Palos Verdes  | 0   | 0                             | 1  | 1                             | 5                            | 1                             |
| SMB 7-4  | Abalone Cove                                    | Palos Verdes  | 0   | 0                             | 0  | 0                             | 1                            | 1                             |
| SMB 7-5  | Portuguese Bend Cove                            | Palos Verdes  | 0   | 0                             | 1  | 1                             | 2                            | 1                             |
| SMB 7-6  | Royal Palms                                     | Palos Verdes  | 0   | 0                             | 1  | 1                             | 6                            | 1                             |
| SMB 7-8  | Wilder Annex                                    | Palos Verdes  | 0   | 0                             | 1  | 1                             | 2                            | 1                             |
| SMB 7-9  | Outer Cabrillo Beach                            | Palos Verdes  | 0   | 0                             | 1  | 1                             | 3                            | 1                             |
| SMB MC-1   | Malibu Point, Malibu Colony Dr.                 | Malibu Canyon | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB MC-2   | Surfrider Beach (breach point of Malibu Lagoon) | Malibu Canyon | 0   | 0                             | 9  | 2                             | 17                           | 3                             |
| SMB MC-3   | Malibu Pier on Carbon Beach                     | Malibu Canyon | 0   | 0                             | 9  | 2                             | 17                           | 3                             |

Notes: The allowable number of exceedance days during winter dry weather is calculated based on the 10th percentile year in terms of non-wet days at the LAX meteorological station. The number of allowable exceedances during winter dry weather is based on the lesser of (1) the reference system or (2) existing levels of exceedance based on historical shoreline data.

<sup>^</sup>Dry weather days are defined as those with <0.1 inch of rain and those days not less than 3 days after a rain day. Rain days are defined as those with >=0.1 inch of rain. Detailed descriptions of the sampling locations are provided in the Santa Monica Bay Beaches Bacteria TMDLs Coordinated Shoreline Monitoring Plan.

### **3.2.2 Interannual variability at the reference beach**

An element of the reconsideration of the Santa Monica Bay Beaches and Marina del Rey bacteria TMDLs was also to examine the natural variability of the reference beach, itself, so that if some years have very different frequencies of exceedance from other years, the application of reference beach exceedance rates to other beaches subject to the TMDLs could be adjusted to account for the variability. Figure 1, shown in section 3.4.3, shows six years of data collected since 2004 and provides an illustration of the variability at Leo Carrillo Beach.

While the reference system does exhibit variability in exceedances, the six years of data collected since 2004 encompass a sufficient range of the variability to ensure the calculation of the reference exceedance rate is appropriate. This, in combination with the use of the 90<sup>th</sup> percentile year in terms of wet weather, adequately addresses the variability in the reference system in setting allocations. In addition, an allowable exceedance rate which varies year to year may make the design of stormwater and runoff controls more difficult.

### **3.2.2 RECOMMENDATION**

No changes to the TMDLs based on the evaluation of interannual variability at the reference beach with the exception of updating the reference exceedance rates based on the more recent data (2004-2010) as previously discussed.

### **3.3 Reference year (critical condition)**

The critical condition in these bacteria TMDLs was determined to be wet weather and the 90th percentile wet weather year (1993) was used to define the critical condition in calculating allocations (75 wet days in 1993). Allowable exceedance days at an impaired beach, therefore, are calculated with the exceedance probability at the reference beach *multiplied* by the number of wet or dry days during the critical year.

The critical year therefore has 75 wet days, and the remaining 290 dry days are split between summer dry and winter dry.

#### **3.3.1 Updated critical year**

Staff, in developing these TMDLs, determined the critical condition to be wet weather and determined that the 90th percentile wet year was an appropriate definition of the critical condition. Precipitation data from 1948 to 2000 at the LAX rain gage was evaluated for these TMDLs and the year 1993, with 75 wet days, was found to be the 90th percentile wet year. For this reconsideration, staff evaluated additional rain data,

1948 to 2008 (Appendix B) and found that the 90th percentile year in this expanded dataset is 1958.

The year 1958 storm year had 74 wet days in comparison to the 75 wet days of 1993.

Staff finds that the number of allowable exceedance days during wet weather, as calculated using the exceedance rate from the reference Leo Carrillo Beach, would not change using 74 wet days instead of 75 wet days. Data for Leo Carrillo Beach show that the wet-weather exceedance probability is 0.22. This exceedance probability multiplied by 75 wet days results in 17 exceedance days (16.5 rounded to the next whole integer) and multiplied by 74 wet days results in 16 exceedance days (16.28 rounded to the next whole integer).

### 3.3.1 RECOMMENDATION

Due to the value of continuity for planning and design of BMPs, and the lack of impact on allowable exceedance days, staff does not recommend changing the reference year of 1993 as the critical condition.

The critical condition and number of wet days (or dry days) in calculations of allowable exceedances will stay the same.

### **3.3.2 Reference year or annually adjusted exceedance rates**

Regional Board staff recognizes that the number of dry-weather and wet-weather days will change from year-to-year and, therefore, the exceedance probabilities will not always equate to the same number of exceedance days.

Allowable exceedance days were set using the exceedance rates for summer and winter dry weather and wet weather at the reference beach and the number of days of summer and winter dry weather and wet weather in the reference year. An alternative method that could be used to set allowable exceedance days, is to use the actual number of wet and dry days from the current year and not a reference year.

This approach would use the actual number of wet and dry days or a rolling average of wet and dry days over several years. This approach would be more tailored to the unique conditions during each year, but would not provide as much certainty with regard to addressing the critical wet-weather condition.

This approach may be considered more protective during wet weather as it would allow fewer wet weather exceedances in years with less precipitation (most years would have fewer wet weather days than the 90th percentile year). On the other hand, under drier conditions, the approach would allow a greater number of exceedances during dry weather. Generally, it is expected that the reference year conditions will be used for

implementation planning, therefore, while fewer wet weather exceedances might be allowed under this approach, measures to address the 90th percentile reference year conditions should be adequate to address wet weather in drier years, too.

### 3.3.2 RECOMMENDATION

Staff does not recommend adjusting the allowable number of exceedance days annually based on the number of dry- and wet-weather days in a particular year. This is because it would be difficult to design BMPs and diversion or treatment facilities to address such variability from year to year. Staff expects that by designing facilities for the 90th percentile year, during drier years there will most likely be fewer exceedance days than the maximum allowable. Therefore, staff proposes no change to the approach of setting the allowable number of exceedance days based on the 90th percentile year.

In addition, responsible jurisdictions have expressed a preference for a fixed number of allowable exceedances for these reasons (Jurisdictional Groups, 2009).

## 3.4 Geometric means

The geometric mean, or geomean, is a method of calculating a mean which uses the log-transformation of the bacteria concentration data. A geometric mean, unlike an arithmetic mean, tends to dampen the effect of very high or low values. Because bacterial concentrations can often vary by orders of magnitude, this calculation returns a parameter which is a better representation of the central tendency of the data and more meaningful in statistical evaluations than an arithmetic mean.

The geometric mean criteria for bacteria is usually a more reliable measure of long term water quality than single sample criteria. It is also linked to the underlying epidemiological studies upon which the bacteria water quality objectives were based.

The Basin Plan geometric mean objectives for marine waters designated for Water Contact Recreation (REC-1) are as follows:

- a. Total coliform density shall not exceed 1,000/100 ml.
- b. Fecal coliform density shall not exceed 200/100 ml.
- c. Enterococcus density shall not exceed 35/100 ml.

In addition, the Basin Plan includes an implementation provision for geometric means: *“The geometric mean values should be calculated based on a statistically sufficient number of samples (generally not less than 5 samples equally spaced over a 30-day period).”*

US EPA’s 1986 Ambient Water Quality Criteria for Bacteria (USEPA, 1986) also specifies “...a statistically sufficient number of samples (generally not less than 5 samples equally spaced over a 30-day period)...”. USEPA’s draft Recreational Water Criteria

(USEPA, 2011) does not specify the number of samples but recommends periods of 30 to 90 days.

Each of the TMDLs include the same re-consideration task for geometric means: “Re-evaluate whether there is a need for further clarification or revision of the geometric mean implementation provision.”

The following is a discussion of the analysis regarding number of samples required and rolling calculations versus discrete calculations to provide further clarification or revision of the geometric mean implementation provision.

### **3.4.1 Calculation of rolling geometric means**

The standard method used in these TMDLs is:

The rolling 30-day geometric mean is calculated on a daily basis. All data including wet-weather data, is included in the geometric mean calculations. The calculation is rolled forward on a daily basis and geometric mean value is computed given 5 samples or more within that 30-day time frame.

Sampling data as analyzed in the laboratory may typically include both an upper and lower bound sample detection limit depending on the testing method used or the limitations of the testing laboratory. Where the sample exceeded the method upper limit, that data point is taken as the method upper limit; where the sample result fell below the method lower detection limit, that data point is taken as the lower detection limit. (Other alternative values to the lower detection limit are discussed in the next section.)

In some cases, geometric means have been calculated just for the summer or winter weather period for comparison. In that case, the first geometric mean value has been calculated on April 30th for the summer period in order to include only data collected during the defined summer period, which begins April 1.

In this re-consideration, six alternative methods of calculating geometric means were evaluated and are presented in detail in Appendix B. Four alternative methods are contrasted in the following discussion.

Method 1) Calendar month (30 day periods, any number of samples per period, one calculation every month). In this calculation method, a discrete calendar month is used for the time period and 4 or 5 samples are used to calculate one geometric mean result for the month. Geometric means do not roll forward and each calculated geometric mean is independent of others. However, information regarding increases or decreases during the month is lost. This method is the same as is usually applied for 303(d) listing purposes under the Water Quality Control Policy for Developing California’s Clean Water Act Section 303(d) list (SWRCB, 2004).



Method 2) Standard method (rolling 30 day period, 5 or more samples per 30 days, a calculation every day). This is the method used in the development of these TMDLs and that is in use, currently, for compliance.

Method 3) Calculation only on sampled days (rolling 30 day period, 5 or more samples per 30 days, a calculation every *sampled* day).

Method 4) Four samples/calculation only on sampled days (rolling 30 day period, 4 or more samples per 30 days, a calculation every *sampled* day).

Data from five different sites were used in the analysis. In addition, data from Dockweiler Beach were compiled in two different ways:

- CL) County Line Beach, one day per week sampled, 54 months
- SP) Surfers Point, one day per week sampled, 54 months
- SK) Surfers Knoll, one day per week sampled, 54 months
- LB) Long Beach-Mothers Beach, one day per week sampled, 30 months
- D5) Dockweiler, 5 days a week sampled, 49 months
- DW) Dockweiler, one day of sampling per week analyzed, i.e. Wednesdays only, 49 months

**Table 6 Percent of Exceedances of Geometric Mean, at Selected Shoreline Monitoring Sites**

| Site: | 1          | 2           | 3           | 4           |
|-------|------------|-------------|-------------|-------------|
| CL    | <b>1.9</b> | 0.0         | 0.0         | 0.0         |
| SP    | 39.6       | <b>45.3</b> | 30.5        | 30.3        |
| SK    | 18.9       | <b>28.2</b> | 15.1        | 15.8        |
| LB    | 63.3       | 69.6        | <b>70.3</b> | 66.2        |
| D5    | 59.2       | 61.1        | <b>63.1</b> | 63.0        |
| DW    | 57.1       | 58.7        | 58.7        | <b>59.6</b> |

The highest percent geometric mean exceedance per site is in bold

The calculation method does not result in largely different estimations of exceedance percentages. While Surfers Knoll differs by 13% (15.1% to 28.2%) depending on the method of geometric mean calculation, Dockweiler Beach has very similar exceedance percentages for each method (57.1% to 59.6%). Additionally, the discrete, calendar month method, resulted in similar exceedance percentages as the rolling methods. This conclusion is in keeping with the comparison of rolling averages or calendar month averages for compliance determination conducted by the State Water Resources Control Board for several contaminants other than bacteria (Saiz, 2005).

Any of these calculation methods could be used to measure long term water quality.

The standard method is conservative. The Regional Board standard method often results in the highest or second highest exceedance percentage.

As observed before, the number and percentage of single sample exceedances are fewer and less than the number and percentage of geometric mean exceedances (data not shown in this summary, see Appendix B).

Any method that curtails the frequency with which the geometric mean is calculated such as a method where the geometric mean is calculated on sampled days only (Method 3), lowers the total number of exceedances in comparison to methods where the geometric mean is calculated everyday (Method 2) even where the exceedance *rate* of the different methods is virtually the same (data not shown in this summary, see Appendix B). Therefore, if the method of calculation of geomeans includes calculating geomeans only on sampled days, the method may disincentivize more frequent sampling, especially on beaches with a high geometric mean exceedance rate where the high exceedance rate ensures that more calculations means more exceedances/violations.

One way to reduce the disincentive for more frequent sampling when using a calculation method which calculates on only sampled days would be to calculate at the same frequency as regular sampling without adding additional calculations for additional or accelerated samples. For example, Method 3 (calculation only on sampled days (rolling 30 day period, 5 or more samples per 30 days, a calculation every *sampled* day), would be instead **Method 3a**, calculation weekly (rolling 30 day period, 5 or more samples per 30 days, a calculation every *week*). Additional samples would be included in the geometric mean calculations, but no additional calculations would be made. A weekly calculation is many fewer calculations than a daily calculation, but there is no disincentive for accelerated samples or disadvantage to beaches which conduct daily samples routinely.

It is common when examining beach bacteria data in Southern California to divide the data into summer dry-, winter dry- and wet-weather data. Heal the Bay uses these ‘seasons’ to calculate and present beach grades in their Beach Report Card. In addition, these seasons are used in a regulatory fashion by this Regional Board to determine compliance with allowable exceedance days of the bacteria single sample objectives, as discussed in Section 3.1 of this report.

For the single sample objectives, there are different allowable exceedance rates in summer dry, winter dry and wet weather. However, unlike the single sample objectives, there is no allowable exceedance rate for the geometric mean objectives and therefore, no difference between seasons. The rolling geometric mean rolls through the calendar or seasonal boundaries and is held to the same standard (zero exceedances) in all seasons. In addition, as the geometric means expresses the overall risk of exposure during a 30-day period including dry and wet weather, if any, a dry weather-only calculation is artificial. USEPA’s draft Recreational Water Criteria (USEPA, 2011) recommends use

of both wet and dry weather, stating, “Sampling of waterbodies should be representative of meteorological conditions (e.g., wet and dry weather).”

While the rate of exceedance of the geometric mean standards does not change very much depending on method, the number of exceedances, and, potentially, violations of a permit requirement, may differ greatly depending on the geometric mean calculation method. For example, in this 2.5 year data set, at Dockweiler Beach, a beach which has a high exceedance rate of the geometric mean, the standard method (Method 2) resulted in 252 exceedances of the geometric mean objective for the three bacterial indicators; the sample days only method (Method 3) resulted in 126 exceedances; and the non-rolling calendar month method (Method 1) resulted in 49 exceedances. See Appendix B.

The Basin Plan Chapter 3, Implementation Provisions for Water Contact Recreation Bacteria Objectives specifies “*generally not less than 5 samples equally spaced over a 30 day period...*” The standard method used by his Regional Board has explicitly required at least 5 samples. When 5 samples are required under a weekly sampling regime, the occasional missed sampling day or sample lost during analysis may mean that a geometric mean cannot be calculated at all for that 30-day period because there are fewer than 5 samples to include in the calculation. Requiring only 4 samples increases the ability to consistently calculate geometric means, but, also, results in some loss of the accuracy of the calculation. Alternatively, using a longer than 30 day period for the calculation of the geometric mean can also ensure sufficient samples for a minimum 5 sample geometric mean under a weekly sampling regime.

It is important to note that some beaches do not exceed the geometric mean criteria. County Line beach, for example, had zero exceedances of the geometric mean criteria by the standard method.

Dockweiler Beach data was compiled two different ways before analysis; the full data set with 49 months of five-day-a-week data was analyzed and also a data set of one-day-a-week data (just Wednesday data) was analyzed. Little difference was found, suggesting that with sufficient data, weekly sampling is sufficient to characterize the exceedance rates and variability in a beach.

#### 3.4.1 RECOMMENDATION

To calculate *rolling* geometric means, calculate a geometric mean weekly using 5 or more samples (Method 3a) for rolling six week periods. For consistency, start all calculation weeks on Sunday.

#### **3.4.2 Geometric means calculated with dry weather data only (Santa Monica Bay Beaches TMDL)**

The Santa Monica Bay Beaches bacteria TMDL and the Marina del Rey bacteria TMDL required that responsible jurisdictions and agencies attain geometric mean objectives, calculated using dry weather data, three years after the effective date of the TMDL.

Geometric means express the overall risk of exposure during a 30-day period including dry and wet weather, if any, and a dry weather-only calculation is artificial. USEPA's draft Recreational Water Criteria (USEPA, 2011) recommends use of both wet and dry weather, stating, "Sampling of waterbodies should be representative of meteorological conditions (e.g., wet and dry weather)."

Staff finds that the single sample maximums objective is a sufficient protective requirement for evaluation of dry weather only. Staff recommends that geometric means be calculated with all data in the 30 day period (wet weather and dry).

### 3.4.2 RECOMMENDATION

Delete reference to a dry weather-only geometric mean from the Santa Monica Bay Beaches bacteria TMDL and Marina del Rey Bacteria TMDL requirements.

### 3.4.3 Geometric means calculated with the *enterococcus* detection limit

There are several USEPA-approved methods to measure the number of *enterococcus* bacteria in a water sample including membrane filtration and the chromogenic method, Enterolert by IDEXX. Enterolert is usually preferred because it is much faster, allowing a beach to be posted as soon as the next day, if necessary. However, the Enterolert method has a higher method detection limit than the membrane filtration method.

The calculation method for the geometric mean requires the use of the detection limit as a substitute for the sample result when the sample result shows that the sample is at, or below, the detection limit (a non-detect). The resulting geometric mean is higher than it might be if the actual sample result was known. This is the conservative calculation method. However, because the enterococcus geometric mean of 35 mpn/100ml is close to the Enterolert detection limit of 10 mpn/100ml and because the results of many water samples are at, or below, the detection limit, the difference between calculating the geometric mean using the detection limit for non-detect samples and using another substitute, such as zero or half the detection limit, may be meaningful.

The City of Los Angeles Environmental Monitoring Division evaluated data from seven beach monitoring sites of Jurisdictional Groups 5 and 6 (the northern border of Manhattan Beach to southern border of Torrance). The data, collected between January 1, 1996 and October 31, 2004 and was analyzed by membrane filtration (detection limit: 1 mpn/100ml), included 3179 samples of which 2135 had a concentration between 1 and 9 mpn/100ml. Assuming a normal distribution of the log results, 90% of results reported as less than 10, would be less than 3.7. Therefore, the Jurisdictional Groups have suggested using 3.7 mpn/100ml as the result in geometric mean calculations when the

Enterolert result is less than the detection limit of 10mpn/100ml (Jurisdictional Groups, 2009).

The Table 7 and Figure 1 show the difference between calculating the rolling geometric mean using the method detection limit of 10 mpn/100 ml in calculations when the actual result is below the detection limit and using 3.7 mpn/100 ml as a substitute for 10 in the calculation. The percent of exceedances of the rolling geometric mean at Leo Carrillo Beach decreased from 23.47% to 20.64%. Because no exceedance of the geometric mean is allowed, the recalculation of the geometric mean does not affect any allowable exceedance rate.

**Table 7 Geometric Means Calculated with New Point Zero Data at Leo Carrillo Beach**

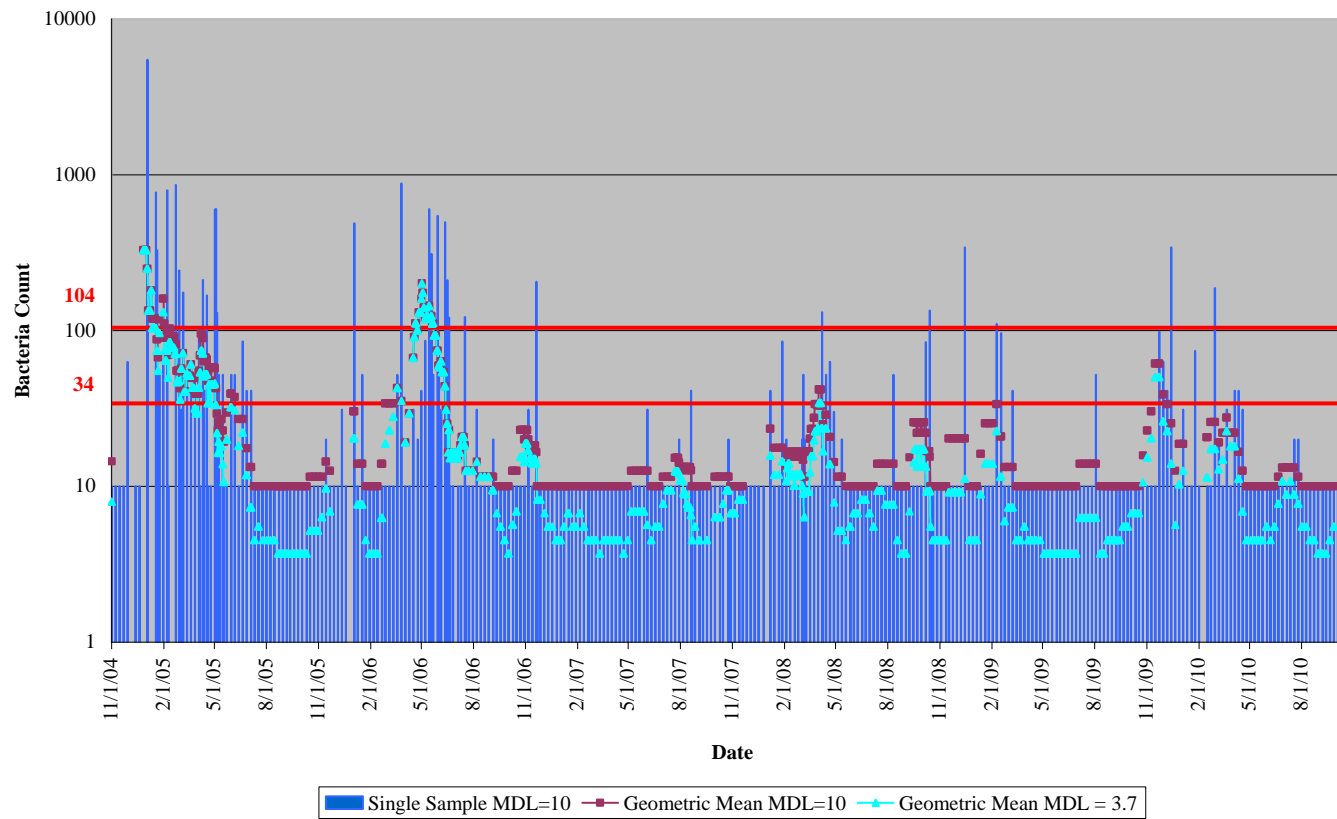
| Leo Carrillo Beach<br>November 2004 - October 2010<br>Exceed % (Exceed Count/Sample Count) |                   |  |   |
|--|-------------------|--|---|
| Total Coliform   | Fecal Coliform    | <i>enterococcus</i> MDL10 <sup>1</sup> | <i>enterococcus</i> MDL3.7 <sup>2</sup> |
| 21.93%<br>(186/848)  | 1.18%<br>(10/848) | 23.47%<br>(199/848)                    | 20.64%<br>(175/848)                     |

\*Geometric Means were calculated based on a rolling 30-day with 5 or more samples

<sup>1</sup>MDL 10 refers to *enterococcus* calculated with a method detection limit of 10

<sup>2</sup>MDL 3.7 refers to *enterococcus* calculated assuming a method detection limit of 3.7

**Figure 1. Leo Carrillo Beach, enterococcus, single sample and geometric means calculated with different substitutes for detection limit data November 2004 - October 2010**



The City of Los Angeles also examined the consequences of using 3.7 mpn/day as a substitute for 10 mpn/day with data from a number of beaches. Similar to staff's finding with the data from Leo Carrillo Beach, very few beaches showed a meaningful difference.

Although this change in how the enterococcus geometric mean is calculated could allow for a small reduction in the number of exceedances of the geometric mean, it does not change any target, allowed exceedance rate or allocation. Therefore, it does not represent a need for significantly greater or smaller reductions in bacterial densities and will not require greater or lesser implementation actions on the part of responsible parties.

### 3.4.3 RECOMMENDATION

No additions or modifications to the TMDL. Responsible jurisdictions and agencies subject to the TMDL may conduct special studies for individual beaches to determine the appropriate value for usage when samples results are below the detection limit. These studies should then be included in an updated monitoring plan for Executive Officer consideration. Detection limit substitutes will be subject to change if a different testing method with a different method detection limit is used.

### **3.4.4 Calculation of non-rolling geometric means**

Previously, the Regional Board has required the use of rolling 30-day geometric means. This was due in part to USEPA's stated expectation that most states will calculate the geometric mean as a rolling average. However USEPA has given states discretion to consider discrete calendar or seasonal geometric means. USEPA's draft Recreational Water Criteria (USEPA, 2011) does not specify rolling or discrete geometric means. In addition, USEPA, through their current re-evaluation of the Recreational Waterbody standards, has explored the application of non-rolling, seasonal geometric means.

Non-rolling or discrete calculations such as a monthly or seasonal calculation are temporally independent of each other. With a rolling calculation, one calculation will use much the same data as the previous calculation which used much the same data as the calculation previous to that. The State Water Resources Control Board's Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List. (SWQCB, 2004) (Listing Policy).requires that data used for listing decisions be temporally independent.

Staff considered assessing the geometric mean objectives on a purely seasonal basis (winter and summer for southern California), but found that given the length of the southern California summer season (April through October) and the difference in precipitation and flow patterns between months within the seven-month summer season in particular, it was justifiable to assessing geometric means on a more frequent, sub-season, basis. Since the exceedances are largely driven by precipitation and/or flow from

streams or storm drains onto a beach, staff considered several sub-seasonal alternatives which group the months into subseasons on the basis of precipitation.

Tables 8, 9, and 10 below, show the number of exceedances of geometric means at Leo Carrillo Beach based on different seasonal and monthly periods.

These alternatives split the seasons differently. These values were also compared to the number of monthly precipitation days at the LAX rain gage. The monthly precipitation day charts and tables for the LAX rain gauge are included the Appendix C.

This analysis used 6 years of data in discrete (i.e. non-rolling) calculations; therefore for each period considered, there were 6 calculations for each objective, total coliform, fecal coliform and *enterococcus*. For example, in Alternative 1, Table 8, there were 6 April-May periods in the 6 years of data, so the geometric means for total coliform, fecal coliform and *enterococcus* were calculated 6 times each revealing two exceedances of the *enterococcus* geometric mean standard.

Alternative One includes two summer “shoulder” sub-seasons of early summer: April - May and late summer: September - October, a midsummer sub-season of June through August, and one winter season.

**Table 8 Seasonal Geometric Means at Leo Carrillo Beach, Alternative 1**

| <b>Leo Carrillo Beach Seasonal Geometric Mean<br/>November 2004 to October 2010</b> |                       |                       |  |   |  |
|---|-----------------------|-----------------------|--|---|--|
| <b>Month</b>  | <b>Total Coliform</b> | <b>Fecal Coliform</b> | <b><i>enterococcus</i> MDL10<sup>1</sup></b> | <b><i>enterococcus</i> MDL3.7<sup>2</sup></b> | <b>Sum of Number of Precipitation days<sup>3</sup></b> |
| April - May   | 0                     | 0                     | 2  | 2   | 15   |
| June-August   | 0                     | 0                     | 0  | 0   | 1  |
| September - October   | 0                     | 0                     | 0  | 0   | 14   |
| November - March  | 0                     | 0                     | 1  | 1   | 101  |

<sup>1</sup>MDL 10 refers *enterococcus* calculated with a method detection limit of 10 Most Probable Number per 100 milliliters

<sup>2</sup>MDL 3.7 refers *enterococcus* calculated assuming a method detection limit of 3.7 Most Probable Number per 100 milliliters

<sup>3</sup>Precipitation day refers to any day with 0.1 inch of rain or greater



Alternative Two includes two summer “shoulder” sub-seasons of early summer; April - May and late summer: September - October, includes a separate geometric mean for the mid-summer months of June, July and August and two winter seasons.

**Table 9 Seasonal Geometric Means at Leo Carrillo Beach, Alternative 2**

| <b>Leo Carrillo Beach Seasonal Geometric Mean<br/>November 2004 to October 2010</b> |                       |                       |   |  |  |
|---|-----------------------|-----------------------|---|--|--|
| <b>Month</b>  | <b>Total Coliform</b> | <b>Fecal Coliform</b> | <i>enterococcus</i><br><b>MDL10<sup>1</sup></b> | <i>enterococcus</i><br><b>MDL3.7<sup>2</sup></b> | <b>Sum of<br/>Number of<br/>Precipitation<br/>days<sup>3</sup></b> |
| April - May   | 0                     | 0                     | 2   | 2  | 15   |
| June  | 1                     | 1                     | 2   | 1  | 0  |
| July  | 0                     | 0                     | 0   | 0  | 1  |
| August  | 0                     | 0                     | 0   | 0  | 0  |
| September - October   | 0                     | 0                     | 0   | 0  | 14   |
| November –<br>December  | 0                     | 0                     | 0   | 0  | 30   |
| January - March   | 2                     | 0                     | 1   | 1  | 71   |

<sup>1</sup>MDL 10 refers *enterococcus* calculated with a method detection limit of 10 Most Probable Number per 100 milliliters

<sup>2</sup>MDL 3.7 refers *enterococcus* calculated assuming a method detection limit of 3.7 Most Probable Number per 100 milliliters

<sup>3</sup>Precipitation day refers to any day with 0.1 inch of rain or greater

Alternative Three includes a separate geometric mean for all-summer months and three winter subseasons. In this alternative, April is treated as a winter month.

**Table 10 Seasonal Geometric Means at Leo Carrillo Beach, Alternative 3**

| <b>Leo Carrillo Beach Seasonal Geometric Mean<br/>November 2004 to October 2010</b> |                       |                       |   |  |                                     |
|---|-----------------------|-----------------------|---|--|-------------------------------------|
| <b>Month</b>  | <b>Total Coliform</b> | <b>Fecal Coliform</b> | <i>enterococcus</i><br><b>MDL10<sup>1</sup></b> | <i>enterococcus</i><br><b>MDL3.7<sup>2</sup></b> | <b>Number of Precipitation days</b> |
| May   | 1                     | 0                     | 2   | 2  | 5                                   |
| June  | 1                     | 1                     | 2   | 1  | 0                                   |
| July  | 0                     | 0                     | 0   | 0  | 1                                   |
| August  | 0                     | 0                     | 0   | 0  | 0                                   |
| September   | 0                     | 0                     | 0   | 0  | 3                                   |
| October   | 0                     | 0                     | 0   | 0  | 11                                  |
| November – December   | 0                     | 0                     | 0   | 0  | 30                                  |
| January – February  | 1                     | 0                     | 1   | 1  | 65                                  |
| March – April   | 1                     | 0                     | 1   | 0  | 16                                  |

<sup>1</sup>MDL 10 refers enterococcus calculated with a method detection limit of 10 Most Probable Number per 100 milliliters

<sup>2</sup>MDL 3.7 refers enterococcus calculated assuming a method detection limit of 3.7 Most Probable Number per 100 milliliters

Seasonal geometric means are consistent with the intent of the reference system/antidegradation approach and USEPA’s current thinking on the expression of the recreational water quality criteria. USEPA’s draft Recreational Water Criteria (USEPA, 2011) recommends geometric mean calculation periods of 30 to 90 days. Both Alternatives Two and Three include periods between 30 and 90 days and no greater than 90 days.

Higher concentrations of bacteria are associated with wet weather and winter months experience wet weather more frequently. In many cases, the higher levels of bacteria experienced in wet weather are *much* higher than typical dry-weather concentrations (e.g. 100 times more or 1,000 times more). For that reason, calculating the geometric mean over the longer periods (i.e. the 60 day or 90 day periods) during winter will express the overall risk of exposure during the period more accurately and will be a more appropriate calculation for geometric mean compliance.

This Region’s reference beach approach allows more frequent exceedances of the single sample objective during winter and during wet weather (principally in winter). Using a longer period for geometric mean calculation during the times when more excursions above the single sample objective are allowed, corresponds, then, to the approach taken for compliance with the single sample objectives.

Alternative Three differs from Alternative Two in that no period of calculation is longer than 60 days and that April, a summer month for single sample exceedance day allowances, is grouped with March, a winter month. Staff has included April with the winter periods in Alternative Three because of the frequent wet-weather events and resulting higher exceedance day frequency in April.

This comparison of calculation methods used data from the reference beach, so it was expected that the geometric mean exceedance rate would be low and exceedances infrequent. Depending on the method, the exceedance rate of the geometric mean (including potential exceedances of total coliform, fecal coliform and *enterococcus*) varied between 4 and 6 percent.

Staff continues to recommend allowing no exceedances of the geometric mean objectives as calculated for these seasons/sub-seasons.

Use of seasonal geometric means would not change any target, allowed exceedance rate or allocation and would not represent a need for significantly greater or smaller reductions in bacterial densities and would not require a greater or lesser implementation actions on the part of responsible parties.

#### 3.4.4 RECOMMENDATION

Include consideration of seasonal and monthly geometric means in the Basin Plan, Chapter 3 “Water Quality Objectives.”

To calculate discrete geometric means, calculate a seasonal geometric mean such that a separate geometric mean is calculated for all summer months and for three winter subseasons where April is included as a winter month consistent with Alternative Three.

Staff continues to recommend allowing no exceedances of the geometric mean objectives as calculated for these seasons/sub-seasons.

#### **3.4.5 Application of Rolling geometric mean calculation or discrete geometric mean calculation.**

Two principal types of error are possible when determining whether a beach is meeting the geometric mean standard: 1) determining the beach *does not* meet water quality standards when it *does* and 2) determining the beach *does* meet water quality standards when it *does not*.

A rolling geometric mean may, in some cases, determine a beach does not meet standards when it does. For example, a single very high sample can influence the geometric mean calculation week after week into a period where the water quality is, in fact, meeting standards.

Alternatively, a discrete geometric mean can, in some cases, arbitrarily split a period of low water quality such that the geometric mean calculation determines the beach does meet water quality standards when there was a period when it did not. While a discrete geometric mean calculation may adjust the periods of calculation according to seasons and weather or rainfall patterns in an appropriate manner, the exact boundaries between seasons may be arbitrary. Using seasonal Alternative Three of Section 3.4.4, above, as an example, low water quality results from the last week in October, would be separated from low water quality results in the beginning of November and since the late October-early November time period is never assessed on its own, the period of low water quality is not identified.

In the superior interest of not failing to identify water quality impairment, the rolling geometric mean calculation is preferred. This is consistent with the discussion of listing and delisting decisions in the Functional Equivalent Document for the State Water Resources Control Board (SWRCB) 2004. Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) list. Sept. 30, 2004.

### 3.4.5 RECOMMENDATION

For these three beach TMDLs, calculate *rolling* geometric means; calculate a geometric mean weekly using 5 or more samples (calculation Method 3a from Section 3.4.1, above) for rolling six week periods. For consistency, start all calculation weeks on Sunday.

The revised method for assessing compliance with the geometric means should be reflected in updated monitoring plans, which should be submitted for Executive Officer consideration.

## 3.5 Natural Sources Exclusion

The Natural Sources Exclusion approach is an alternative method for determining allowable exceedances days.

Chapter 3 of the Basin Plan, Water Quality Objectives, Bacteria, Coliform, includes implementation provisions for the bacterial objectives including a "Natural Sources Exclusion" approach:

Under the natural sources exclusion implementation procedure, after all anthropogenic sources of bacteria have been controlled such that they do not cause or contribute to an exceedance of the single sample objectives and natural sources have been identified and quantified, a certain frequency of exceedance of the single sample objectives shall be permitted based on the residual exceedance frequency in the specific water body. The residual exceedance frequency shall define the background level of exceedance due to natural sources. The 'natural sources exclusion' approach may be used if an appropriate reference system cannot be

identified due to unique characteristics of the target water body. These approaches are consistent with the State Antidegradation Policy (State Board Resolution No. 68-16) and with federal antidegradation requirements (40 CFR 131.12).

TMDLs in this region have all used the reference system/antidegradation approach and none yet have used a natural sources exclusion approach. The natural sources exclusion approach requires that anthropogenic sources be controlled and natural contributions be quantified.

Both the Marina del Rey bacteria TMDL and the Inner Cabrillo Beach bacteria TMDL (for the Northern Beach at Inner Cabrillo Beach) specify that a natural sources exclusion approach may be developed for those beaches.

The alternative to the reference system/antidegradation approach is the natural sources exclusion approach, which provides that after all anthropogenic sources of bacteria have been controlled such that they do not cause an exceedance of the single sample objectives, a certain frequency of exceedance of the single sample objectives shall be permitted based on the residual exceedance frequency in the specific waterbody. Documentation has not been provided for either the MdR TMDL or the ICB TMDL indicating that all anthropogenic sources of bacteria have been controlled; therefore, it is premature to consider the application of the natural sources exclusion approach in these two TMDLs.

### 3.5 RECOMMENDATION

Continue with the reference system/antidegradation approach for these TMDLS.

### 3.6 Schedules

#### 3.6.1 SMBB and MdR TMDLs Integrated Approach

The Santa Monica Bay beaches TMDL for wet weather allows for an extended wet-weather schedule if the Jurisdictional Groups pursue an Integrated Water Resources Approach. All Jurisdictional Groups have indicated that they would be pursuing an Integrated Water Resources Approach to implementation in their implementation plans submitted to the Regional Board in 2005. These plans have been accepted by the Regional Board by resolution.

Jurisdictional Group 1 and 4 Resolution No. 2006-005 (County of Los Angeles, 2005)

Jurisdictional Group 2 and 3 Resolution No. 2006-006 (City of Los Angeles, 2005)

Jurisdictional Group 5 and 6 Resolution No. 2006-007 (City of Manhattan Beach and Redondo Beach, 2005)

Jurisdictional Group 7 Resolution No. 2006-008 (City of Rancho Palos Verdes, 2005)

The Marina del Rey TMDL also allows for an extended wet-weather schedule if the responsible parties pursue an Integrated Water Resources Approach. The responsible parties have indicated that they would be pursuing an Integrated Water Resources Approach to implementation in their implementation plan submitted to the Regional Board in 2006. This plan was accepted by the Regional Board by Resolution No. 2006-009 (County of Los Angeles, 2005).

Since approval of the implementation plans, the Santa Monica Bay Beaches Jurisdictional Groups and the Marina del Rey Harbor TMDL responsible parties have continued to pursue integrated approaches. In addition, through implementation of the Los Angeles County MS4 permit, the Regional Board can ensure that responsible parties are implementing the integrated approaches that they have outlined in their implementation plans. For example, if a responsible party intends to pursue action-based interim limits in the MS4 permit, they must submit and obtain approval of a reasonable assurance plan, and then they must implement that plan, subject to enforcement and/or numeric effluent limits. Through this process, the Regional Board can ensure that responsible parties are making timely progress towards achieving TMDLs.

Based on the fact that responsible parties submitted implementation plans outlining integrated approaches, that they are continuing to pursue integrated approaches, and that the Regional Board can ensure the integrated approaches are implemented through the MS4 permitting process, an extended wet-weather schedule for the Santa Monica Bay and Marina del Rey Bacteria TMDLs is justified. Staff finds that all responsible parties should receive the same extended schedule because the TMDLs were developed with the understanding that it would take a collective effort to achieve waste load allocations. This is evident in the fact that the TMDLs combine responsible parties into Jurisdictional Groups for implementation planning and the fact that the waste load allocations are expressed as receiving water limits. By assigning all responsible jurisdictions the same implementation schedule, continued collaborative implementation efforts are encouraged.

### **3.6.2 Inner Cabrillo Beach TMDL schedule**

The Inner Cabrillo Beach, Main Ship Channel bacteria TMDL reconsideration includes a provision to “re-evaluate” the implementation schedule. While the TMDL targets have not yet been achieved at Inner Cabrillo Beach, and implementation deadlines have passed, failure to achieve targets per the original implementation schedule alone is insufficient to justify extending the schedule.

### **3.6 RECOMMENDATION**

Confirm the Integrated Water Resources Approach for all Jurisdictional Groups in the Santa Monica bay Beaches TMDL and for the MdR Bacteria TMDL. No change to the schedule for the Inner Cabrillo Beach, Main Ship Channel bacteria TMDL.

### **3.7 Implementation**

Additional language is proposed for the TMDL implementation that clarifies the requirements for Phase II Municipal Separate Storm Sewer System (MS4) permits. The existing TMDL assigns waste load allocations (WLAs) to MS4 permits. Staff proposes to clarify these WLAs apply to Phase II MS4 permits as well as Phase I MS4 permits.

### 3.8 CEQA Analysis

Pursuant to Public Resources Code section 21080.5, the Resources Agency has approved the Regional Water Boards' basin planning process as a "certified regulatory program" that adequately satisfies the California Environmental Quality Act (CEQA) (Public Resources Code section 21000 et seq.) requirements for preparing environmental documents. (14 Cal. Code Regs. § 15251(g); 23 Cal. Code Regs. § 3782.)

"Substitute environmental documents" were prepared for each of these TMDLs and the revision of the bacteria objectives and were adopted by the Regional Board by resolution:

|                      |                        |
|----------------------|------------------------|
| SMBB dry weather     | Resolution No. R02-004 |
| SMBB wet weather     | Resolution No. R02-022 |
| MdR                  | Resolution No. R03-012 |
| ICB                  | Resolution No. R04-011 |
| Bacterial objectives | Resolution No. R01-018 |

Those documents contained the required environmental documentation under the State Water Board's CEQA regulations (23 Cal. Code Regs § 3777.) In preparing the previous substitute environmental documents, the Regional Board considered the requirements of Public Resources Code section 21159 and California Code of Regulations, Title 14, section 15187, and intended those documents to serve as a tier 1 environmental review. The previous substitute environmental documents contained environmental analysis and findings related to the reasonably foreseeable methods of compliance, the impacts of the methods of compliance, feasible mitigation measures, and alternative means of compliance.

Staff has determined that these TMDL revisions do not alter the environmental analysis that was previously prepared for the establishment of the TMDLs because the TMDL revisions will not result in different implementation actions than those previously analyzed for the TMDLs, or different effects upon the environment. Moreover, no additional reasonably foreseeable methods of compliance warrant environmental analysis pursuant to Public Resources Code section 21159 and California Code of Regulations, Title 14, section 15187. As such, this amendment is consistent with the prior CEQA documentation.

Further, consistent with California Code of Regulations, title 14, section 15162, the Regional Board has determined that no subsequent environmental documents shall be prepared because these TMDL revisions do not involve new significant environmental effects, a substantial increase in the severity of previously identified significant effects, or

mitigation measures or alternatives that are considerably different from those analyzed in the previous substitute environmental documentation.



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