SANTA MONICA BAY SHORELINE MONITORING
MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) REPORT
(June 1, 2014 – May 31, 2015)
Monitoring and Assessment by the City of Los Angeles Environmental Monitoring Division

I. INTRODUCTION

The EPA established a municipal storm water management program known as the Municipal Separate Storm Sewage System (MS4) Program, which is intended to improve the nation's waters by reducing the quantities of pollutants that urban runoff and storm water transport into the storm water systems from normal or routine urban activities and during storm events. An MS4 is a conveyance system made up of catch basins, curbs, gutters, ditches, and storm drains owned by a state, county, city, town, or other public body, that is designed to collect or convey storm water and urban runoff to waters of the United States (CRWQCB 2001). Unless diverted to treatment plants or other treatment facilities, these untreated discharges carry pollutants to local water bodies. The City of Los Angeles (CLA), as a co-permitee of the Los Angeles County MS4 Program, is responsible for storm water discharged into local waterways. The permit for the MS4 Program requires the City to design a storm water management program that reduces the discharge of pollutants to the maximum extent practicable, that protects water quality, and that satisfies the water quality requirements of the Clean Water Act (CRWQCB 2001).

The Santa Monica Bay Beaches were designated as impaired and included on California's 1998 Clean Water Act 303(d) list of impaired waters due to excessive amounts of coliform bacteria. The California Regional Water Quality Control Board, Los Angeles Region (Regional Board) released a first draft of the Santa Monica Bay Beaches Bacterial TMDL (SMBBB TMDL) on November 9, 2001. Regional Board staff bifurcated the SMBBB TMDL into two TMDLs, one for dry-weather and one for wet-weather. Both the SMBBB Dry- and Wet-Weather TMDLs were approved by EPA in June 2003 and became effective on July 15, 2003. The SMBBB TMDLs divide the year into three separate periods for compliance purposes: summer-dry weather (April 1 – October 31), winter-dry weather (November 1 – March 31), and wet weather (rain events of $\geq$ 0.1 inch of precipitation and the following three days). A single Coordinated Shoreline Monitoring Plan (CSMP) was developed by the TMDL's responsible agencies to comply with the monitoring requirements of both the Dry- and Wet-Weather TMDLs; monitoring of SMBBB TMDL compliance monitoring stations began November 1, 2004. In addition to bacterial monitoring sites, the CSMP established multiple shoreline observation sites for dry-weather flow observations. One year from the initiation of the monitoring program, the Regional Board was to evaluate the accumulated flow observation data to determine whether any of the observation sites warranted inclusion to the list of compliance monitoring sites. Because of the re-evaluation (approved by the Regional Board December 3, 2009), two observation sites began being monitored as compliance water quality sites starting January 5, 2010.

Four years after the effective date of the TMDLs, the Regional Board re-opened the TMDLs to reconsider certain provisions based on new data, including waste load allocations. Waste load allocations (WLA) are the number of sample days at a shoreline-sampling site that may exceed a

single-sample target. WLAs are expressed as allowable exceedance days because the bacterial density and frequency of single-sample exceedances are the most relevant to public health protection (CRWQCB 2004).

Current state water-quality standards require the use of bacteria as indicators of human fecal contamination. Their presence in water, especially fecal coliform/*E. coli* and enterococci, is considered to be an indication of recent fecal contamination, which is the major source of many waterborne diseases (Csuros and Csuros 1999).

The SMBBB TMDLs establish multi-part numeric targets based on three bacteriological analytical parameters: Total coliform density, fecal coliform/*E. coli* density, and *Enterococcus* density, with density reported in bacterial counts per 100 milliliters. The targets instituted by the TMDLs have been established based on the Los Angeles Basin Plan water quality objectives for water contact recreation (REC-1) beneficial use for marine water and are equivalent to the State bacteriological standards pursuant to Assembly Bill 411. Basin Plan objectives include both single-sample limits and geometric mean limits (Table 1). EMD evaluates and reports data relative to marine water REC-1 water quality standards for bacterial densities.

Table 1. Los Angeles Basin Plan bacteriological water quality standards (REC-1)

Single-sample Limits shall not exceed	**Rolling 6-Week Geometric Mean Limits shall not exceed**
10,000 total coliform bacteria/100 ml; or	1,000 total coliform bacteria/100 ml; or
400 fecal coliform/*E.coli* bacteria/100 ml; or	200 fecal coliform/*E.coli* bacteria/100 ml; or
104 *Enterococcus* bacteria/100 ml; or	35 *Enterococcus* bacteria/100 ml
1,000 total coliform bacteria/100 ml, if the ratio of fecal/total coliform exceeds 0.1	

Monitoring indicator bacteria, currently, is one of the most efficient means of predicting the presence of pathogens in marine waters. These indicators are used because the methods for their detection are comparatively rapid, relatively inexpensive, and easy to perform. The current quantification method used by CLA to quantify indicator bacterial densities for all SMB shoreline stations, the chromogenic substrate method (CS), depends on approximately an 18 to 24-hour incubation and bacterial growth period to obtain results. The turnaround time of this and other currently employed, culture-based, quantification methods does not allow for early, same-day notification of potential public health risks and identification of the source of contamination.

As part of the Annual Report for the MS4 NPDES Permit, CLA had been submitting a Santa Monica Bay Shoreline Monitoring Annual Report that included water quality analysis at eighteen (18) MS4 monitoring stations over the period from July 1 through June 30. The time between the end of the reporting period date June 30 and the submittal deadline was not sufficient for lab analysis, data compilation, data analysis, and preparation of the final report. CLA requested and received approval from the Regional Board to modify the reporting period from July 1 through June 30 to June 1 thru May 31. With the approval of the 2012 MS4 Permit, the past annual report submittal date of August 15 was changed; each Permittee or group of Permittees is now required to submit an annual report by December 15 of each year beginning with 2013. This

report summarizes the City of Los Angeles EMD's Santa Monica Bay shoreline bacteriological data for the Reporting Year 2014-2015 (June 1, 2014 through May 31, 2015).

The Santa Monica Bay shoreline bacterial data collected by CLA are reported daily to the Los Angeles County Department of Public Health (LACDPH). Subsequently, LACDPH takes steps (such as posting health hazard warning signs) to notify beach users whenever an exceedance of bacterial standards occurs.

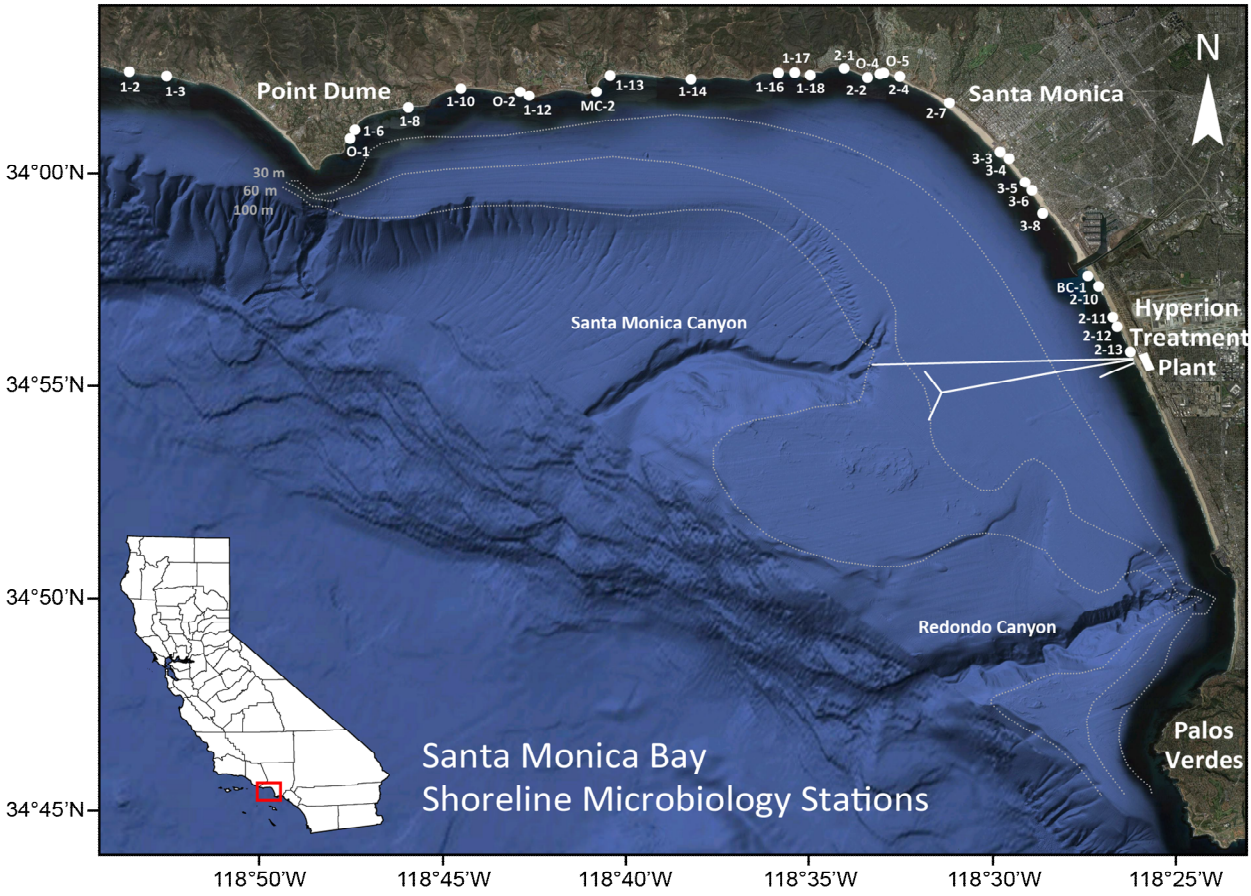


Figure 1. Map of EMD monitored shoreline-sampling locations in Santa Monica Bay, including storm drains and piers. Table 2 provides a complete list of station identifications and their corresponding locations.

II. MATERIALS AND METHODS

Sample Collection

Historically, EMD monitored eighteen MS4, SMB shoreline stations ranging from Surfrider Beach (S1, Malibu Lagoon) in Malibu southward to Malaga Cove (S18, Palos Verdes Estates; Figure 1). On November 1, 2004, CLA EMD began participating in the Coordinated Shoreline Monitoring Plan (CSMP) for the Santa Monica Bay Beaches Bacterial TMDLs (SMBBB TMDL), monitoring 25 SMBBB TMDL compliance stations ranging from El Pescador State Beach in Malibu (1-2) southward to Dockweiler State Beach (stations BC-1 through 2-13). In addition to the compliance sampling sites, the CSMP established that CLA EMD would record weekly, dry-weather flow observations at five observation sites with the caveat that after a year of observations, the Regional Board would determine whether these sites would warrant being added to the list of compliance water quality sites, based on observations of persistent dry-weather runoff.

The CSMP and the Memoranda of Agreement reached between CLA and the other SMBBB TMDL responsible agencies established that CLA was responsible for monitoring 16 compliance stations solely as SMBBB TMDL stations, and 11 compliance stations as both MS4 and SMBBB TMDL sites, e.g., Malibu Creek at Surfrider Beach is both S1 and MC-2 for MS4 and SMBBB TMDL compliance monitoring, respectively (Table 2). MS4 and SMBBB TMDL stations are monitored either daily (Monday – Saturday) or weekly. In addition to adopting some MS4 stations as TMDL stations, some TMDL monitoring requirements were incorporated into the MS4 permit. Accelerated monitoring of weekly monitored TMDL stations is conducted 48 hours after the initial sample exceeds bacterial standards and 96 hours for sites that again exceed bacterial limits. With the approval of the 2012 MS4 Permit, the TMDLs were moved under the authority of the permit, consequently, there is no longer a difference between an MS4 and a TMDL site.

CLA submitted a request to the Regional Board in September of 2009 recommending the upgrade of two observation stations with persistent runoff and either the removal or re-location of sampling locations that were consistently inaccessible to sampling and/or observations. In December 2009, the Regional Board approved CLA's proposed changes. Observation stations O-1 (Zumirez Dr, Point Dume) and O-2 (Puerco Canyon SD, Puerco Beach) were upgraded to bacterial water quality monitoring stations based on persistent runoff to sampling stations and accessibility; station O-3 (Pierda Gorda, 36" SD) was removed as an observation site due to its continued inaccessibility. In addition, as a consequence of constant inaccessibility and a safety concern to field personnel, 2-1 (Castlerock SD) was relocated from point zero to just north of the storm drain where it is accessible and safe to sample. It was re-designated 2-1a to reflect the change in sampling point. The approved changes became effective January 2010, and EMD began sampling 27 SMBBB TMDL compliance monitoring stations and continued recording dry-weather flow observations at the two remaining observation sites: O-4 and O-5.

In March 2012, the California Water Quality Control Board Los Angeles Region released proposed amendments to the Basin Plan for the revision of bacterial TMDLs for five watersheds. The approval of the Amendments to the Basin Plan on July 2, 2014 brought about many changes to the monitoring of the various bacterial TMDLs. Proposed changes include the removal of a Ballona Creek estuary-monitoring site and a change in the rolling-30-day geometric mean

calculation. Station SMB-BC-1 (BC-1) has been monitored as a Santa Monica Bay Beaches Bacterial (SMBBB) TMDL site since November 2004. In response to the City of Los Angeles, Bureau of Sanitation, *Technical Comments on the Proposed Amendment to the Water Quality Control Plan for the Los Angeles Region to Revise TMDLS for Bacteria for (1) Santa Monica Bay Beaches, (2) Marina del Rey Harbor, Mothers' Beach, and Back Basins, and (3) Los Angeles Harbor, Inner Cabrillo Beach, and Main Ship Channel,* Comment #15, "Please strike the site BC-1 from Table 7-4.2a. Compliance determination for site BC-1 should be linked to the Ballona Creek TMDL and not the Santa Monica Bay TMDL…", the Los Angeles Regional Board granted approval (June 2012) to the City to remove SMB-BC-1 as a SMBBB TMDL monitoring site, and the EPA subsequently granted approval to the RB for this action on July 2, 2014. Consequently, the City ceased monitoring site BC-1 effective August 24, 2014.

With the exception of a few sites, all shoreline stations are sampled at point zero, which is defined as the point at which the discharge from a storm drain or creek initially mixes with the receiving water. A station having no storm drain or creek associated with it is referred to as an open beach site and is sampled at the midpoint of the beach (CSMP 2004).

Station Location	Station Name	Frequency	Station Location	Station Name	Frequency
El Pescador SB	1-2	Weekly	Santa Ynez SD, Will Rogers SB	2-2	Weekly
El Matador SB	1-3	Weekly	Pulga Cyn SD, Will Rogers SB	2-4	Weekly
Zumirez Dr, Point Dume	O-1	Weekly	Santa Monica Cyn SD, Santa Monica SB	2-7	Daily
Walnut Creek, Paradise Cove	1-6	Weekly	Santa Monica Pier SD, Santa Monica SB	3-3	Daily
Escondido Crk, Escondido SB	1-8	Weekly	Pico-Kenter SD, Santa Monica SB	3-4	Daily
Solstice Crk, Dan Blocker County Bch	1-10	Weekly	Ashland SD, Santa Monica SB	3-5	Daily
Marie Cyn SD, Puerco Bch	1-12	Weekly	Rose Ave SD, Venice Bch	3-6	Weekly
Puerco Canyon SD, Puerco Bch	O-2	Weekly	Windward Ave SD, Venice Bch	3-8	Weekly
Malibu Crk, Malibu Lagoon County Bch	MC-2	Daily	Ballona Creek, Dockweiler SB	BC-1	Daily
Sweetwater Cyn SD, Carbon Bch	1-13	Weekly	Culver SD, Dockweiler SB	2-10	Weekly
Las Flores Crk, Las Flores SB	1-14	Weekly	North Westchester SD, Dockweiler SB	2-11	Weekly
Pena Crk, Las Tunas County Bch	1-16	Weekly	Imperial Hwy SD, Dockweiler SB	2-13	Weekly
Tuna Cyn, Las Tunas County Bch	1-17	Weekly			
Topanga Cyn, Topanga County Bch	1-18	Daily	24" corrugated metal pipe near O-5	O-4	Weekly
Castlerock SD, Topanga County Bch	2-1	Weekly	Marquez SD, Santa Ynez subwatershed	O-5	Weekly

Table 2. Summary of CLA EMD's bacterial compliance monitoring stations in Santa Monica Bay with corresponding MS4 and/or SMBBB TMDL station identification. Sampling frequency is daily or weekly; NS = not sampled. Sampling at El Pescador State Beach (1-2) ceased due to safety concerns; sampling will resume when safety issues are resolved. Stations SMB-O-4 and O-5 are monitored only as dry-weather flow observation sites. August 24, 2014: Ceased monitoring of BC-1 (mouth of Ballona Creek estuary); RB approved removal from monitoring July 2014.

All samples were collected at ankle-depth during daylight hours, with the exception of station 2-2. Accessing 2-2 is difficult; there is a tall fence surrounding the storm drain, large boulders in both directions, and a "Keep off Rocks" sign. Sampling is attainable from the top of the storm drain, but a point zero (mixed) sample can be collected only at high tide. The location of station 1-17 poses an accessibility obstacle as it is reachable only through a very narrow stretch of private beach; during high tide and/or when rocks pose a safety risk to field personnel, this site is inaccessible. In September 2011, sampling at El Pescador State Beach (1-2) ceased due to safety concerns to field personnel; sampling will resume when safety issues, such as eroding and unstable terrain, are resolved.

Because of spatial, logistical, and time constraints, simultaneous sample collection (within a 3 – 4 hour period) of SMB TMDL and MS4 stations is divided into northern stations, from 1-2 (El Pescador State Beach) to 1-16 (Pena Creek), central stations, from 1-17 (Tuna Canyon) to 3-8 (Windward Ave) in Venice Beach, and southern stations, BC-1 (Ballona Creek) to 2-13 (Imperial Hwy) in Dockweiler State Beach, for Tuesday, weekly monitoring. Samples collected daily are collected north from Venice Beach to Malibu Creek and south from Hyperion to Hermosa Beach. For FY2014-2015, CLA EMD collected 2,373 MS4 permit samples.

Sample Analysis

Total coliform (TC) and *E. coli* (EC) bacterial densities were determined by the chromogenic substrate method following Standard Methods section 9223B and *Enterococcus* (ENT) densities were determined by Standard Methods 9230D (APHA 2012). Fecal indicator bacterial analyses totaling 7119 were performed during the 2014 – 2015 fiscal year.

Visual field observations for shoreline stations were made along a 20-foot stretch of shoreline up and down coast of each station. This area around each station was observed for the presence of materials of sewage and non-sewage origin, any unusual odors of sewage and non-sewage origin, plankton color, and the presence of flow and flow rate (visual rating only) from storm drains and creeks. Storm drain flow-data and Low-Flow Diversion structures operation information is available upon request. Materials of sewage origin include plastic goods, rubber goods, and grease particles. Non-sewage origin materials include ocean debris, seaweed, refuse, tar, and dead marine animals. Station 3-5 (Ashland SD, Santa Monica State Beach) was used as the shoreline weather station for observations of air and water temperature, weather conditions, wind speed and direction, wave height, and sea conditions.

Quality assurance and quality control procedures were conducted to confirm the validity of the analytical data collected. All areas affecting reported data were subjected to standard microbiological quality control procedures in accordance with Standard Methods (APHA 2012). These areas include sampling techniques, sample storage and holding time, facilities, personnel, equipment, supplies, media, and analytical test procedures. Duplicate analyses also were performed on ten percent of all samples. When quality control results were not within acceptable limits, corrective action was taken. This quality assurance program helped ensure the production of uniformly high quality and defensible data. In addition, EMD participates annually in the performance evaluation program managed by the California State Department of Public Health (CSDPH) as part of its Environmental Laboratory Accreditation Program (ELAP); CSDPH biennially certifies EMD.

Data Analysis

The results obtained from microbiological samples do not generally exhibit a normal distribution. To compensate for a skewed distribution and to obtain a nearly normal distribution, data was log-normalized prior to analysis. Geometric means (GM) are the best estimate of central tendency for log-normalized data and were calculated for each bacterial indicator group for all sampling sites. Geometric means were categorized into summer-dry, winter-dry, and wet-weather to examine the effects of runoff from storm drains on indicator bacterial concentrations.

The geometric mean criteria for bacteria are usually a more reliable measure of long-term water quality than single sample criteria (CRWQCB, 2012). The standard rolling geometric mean method used for the SMBBB TMDL from November 2004 until June 30, 2015, included all wet- and dry-weather data and was calculated using 5 or more samples per 30 days with a calculation each day; a rolling 30-day geometric mean. As a result of re-opened bacteria TMDLs (*Reconsideration of Certain Technical Matters of the Santa Monica Bay Beaches Bacteria TMDLs; the Marina del Rey Harbor Mother's Beach and Back Basins Bacteria TMDL; and the Los Angeles Harbor Inner Cabrillo Beach and Main Ship Channel Bacteria TMDL*, 2012) the rolling geometric mean calculation was changed to allow for the calculation of a rolling 6-week geometric mean (GM); the geometric mean is calculated using 5 or more samples, for six-week periods, starting all calculation weeks on Sunday to allow for consistency. The geometric mean WQO for CLA EMD bacterial data collected in June of 2014 was calculated using the original method and the WQO for bacterial data collected from July 1, 2014 – May 31, 2015 was calculated using the rolling 6-week calculation.

The SMBBB TMDLs define wet-weather as days with rain events of ≥ 0.1 inch of precipitation and the three days following the end of the rain event. Rain data were obtained from the National Weather Service's Downtown Los Angeles, University of Southern California (USC) records.

III. RESULTS

Rainfall

The Southern California region is still under drought conditions, although the FY14-15 year had more rainfall than the previous one. Rainfall recorded during Fiscal Year 2014-2015 totaled 8.5 inches, which was 2.42 inches more than FY 2013-2014, but still well below the seasonal average of 15.14 inches for the Los Angeles area. December 2014 to May 2015 were the primary months of rainfall for the FY 2014-2015. December received the highest rainfall (3.58 inches) and August had the lowest measureable precipitation (0.04 inch) for this reporting period. Note, however small, there was measurable rainfall every month for eight consecutive months. No rain was recorded for the summer months June, July, or September 2014 (Figure 2).

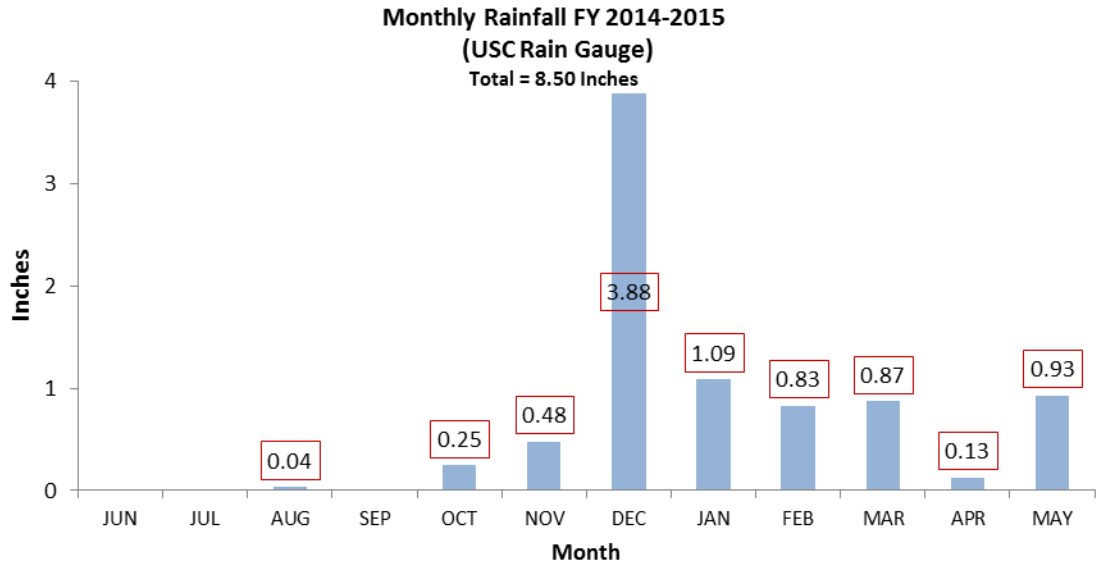


Figure 2. Monthly rainfall at Downtown Los Angeles, USC rain gauge, June 2014 – May 2015.

Shoreline Monitoring Stations

Sample collection from Santa Monica Bay compliance monitoring stations is conducted year round to assess water quality. Bacterial densities obtained from fiscal year 2014-2015 were computed and graphed for geometric mean values for summer-dry, winter-dry, and wet-weather periods. Graphical representations of geometric mean values per monitoring site for each time period are illustrated in Figures 3, 4, and 5. The data summary and analyses for CLA EMD monitored MS4 stations, with geometric mean and visual observations are presented below. Graphs depict the ten sites with the highest geometric means.

Summer-Dry Weather (Jun 2014 – Oct 2014; Apr 2015 – May 2015)

The highest geometric means, overall, for indicator bacteria during summer-dry periods were recorded at stations 3-3 (Santa Monica Pier), 1-12 (Marie Canyon), and BC-1 (Ballona Creek) (Figure 3). The southern bay station BC-1 (Ballona Creek) registered the highest total coliform geometric mean, and although there was limited data (2.5 months), based on past performance in previous years' monitoring, it is safe to assume this site would have had one of the higher geometric means throughout the year. The site with the highest *E. coli* densities, 3-3 (also the highest for FY13-14), is located in central Santa Monica Bay. Central bay station 3-3 also recorded the highest *Enterococcus* geometric mean along with station 1-12, one of two sites with total coliform geometric means far above the other sites. These were the same sites with the higher geometric means during the past FY. Compared to FYs 12-13 and 13-14 summer-dry periods, FY 14-15 summer-dry weather recorded equal to or lower densities for all three fecal indicator bacteria.

Winter-Dry Weather (November 1, 2014 to March 30, 2015)

High geometric means of bacterial indicators measured for the winter-dry weather were predominantly at stations MC-2 (Malibu Creek) and 3-3 (Santa Monica Pier) (Figure 4). These two stations registered higher geometric means for total coliform and *E. coli* densities. Stations MC-2 and 3-8 (Windward Ave SD) had the highest geometric mean for *Enterococcus* densities. Malibu Creek had the highest GM for all three indicators. Geometric means for all other stations were relatively low. Except for total coliform means, winter-dry geometric means were in general greater than summer-dry geometric means. In comparison to the last FY, FY14-15 had higher geometric means over all three bacterial indicators.

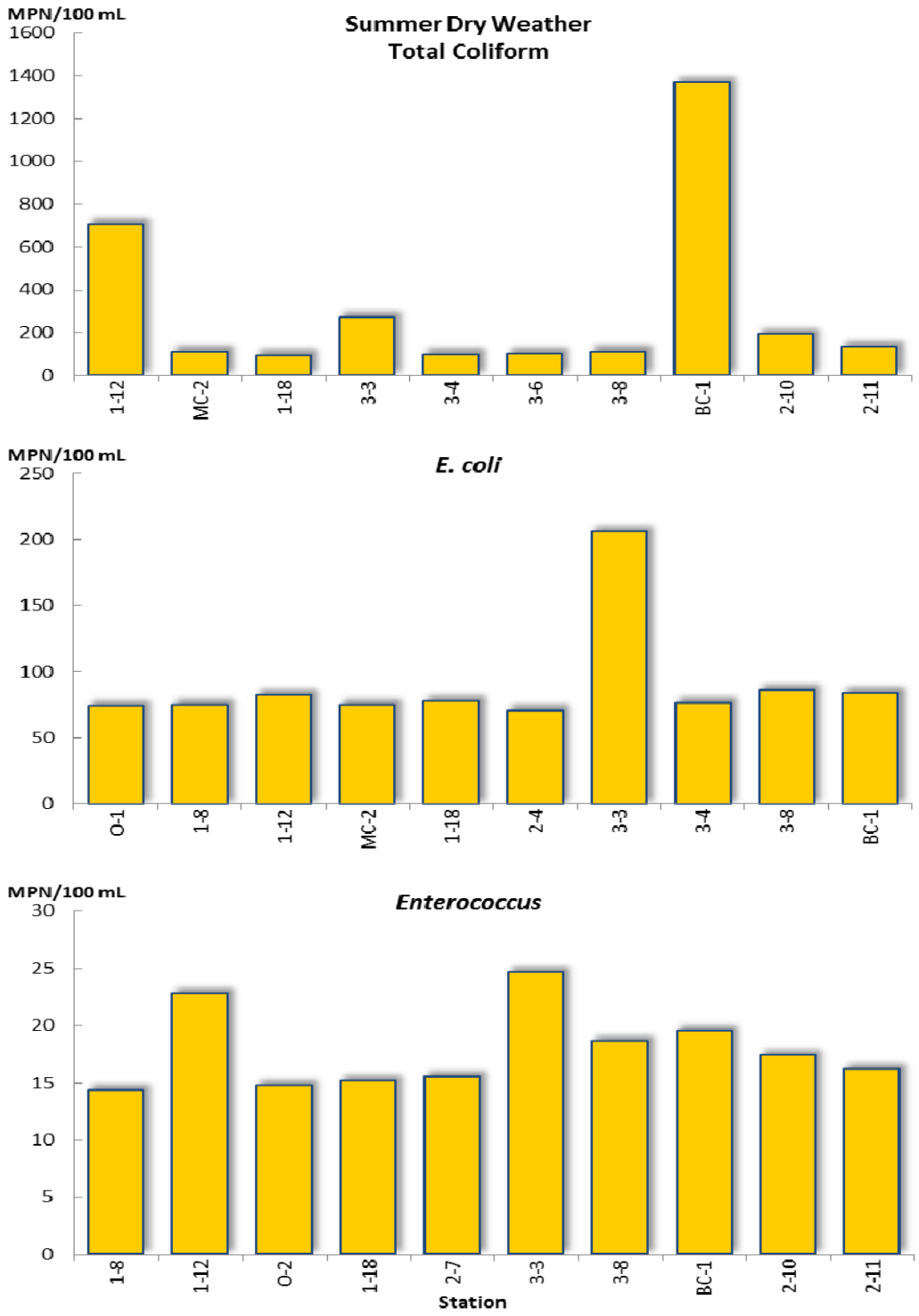


Figure 3. Summer-dry weather geometric means for indicator bacteria at compliance monitoring stations in Santa Monica Bay, FY 2014-2015.

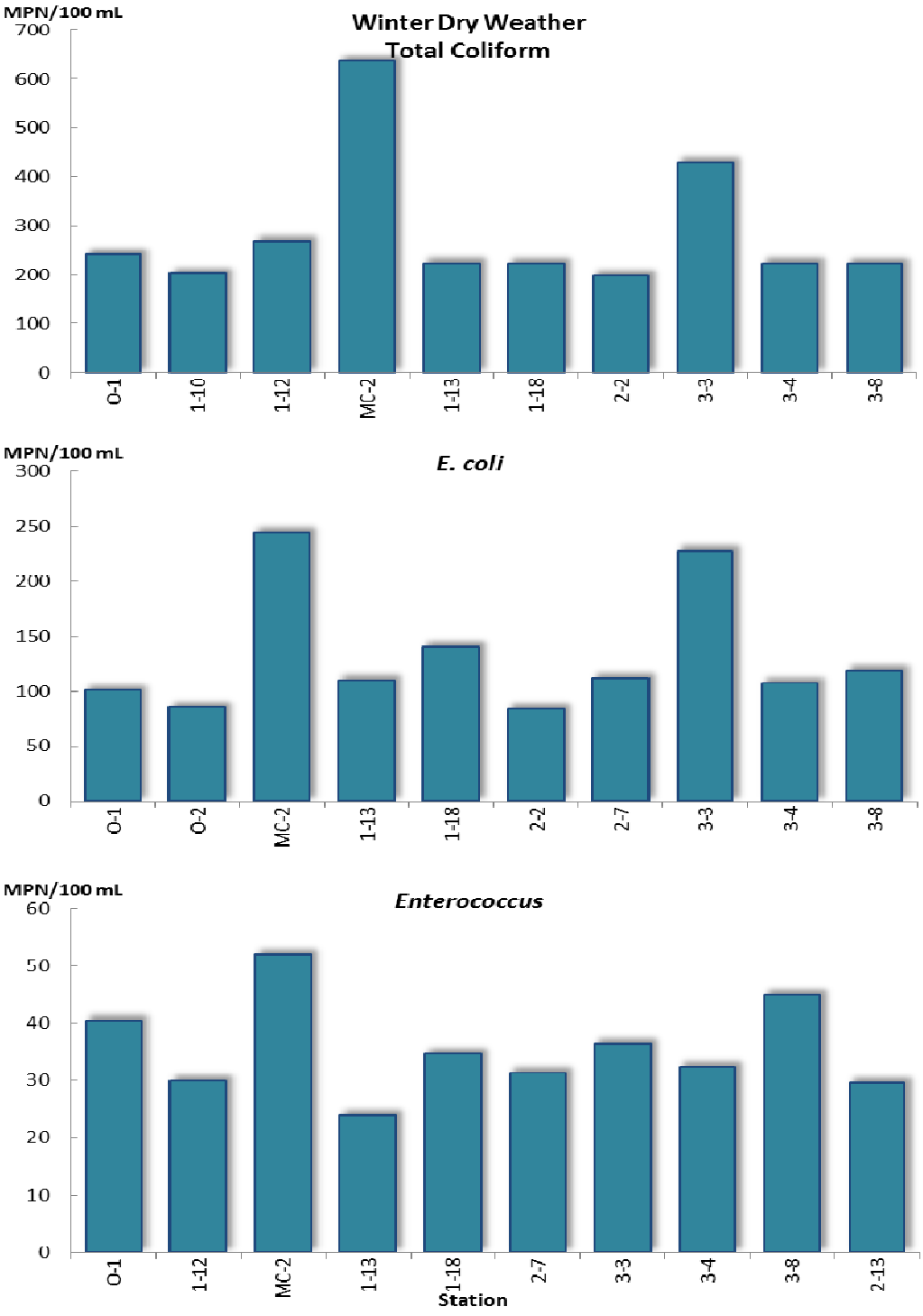


Figure 4. Winter-dry weather geometric means for indicator bacteria at compliance monitoring stations in Santa Monica Bay, FY 2014-2015.

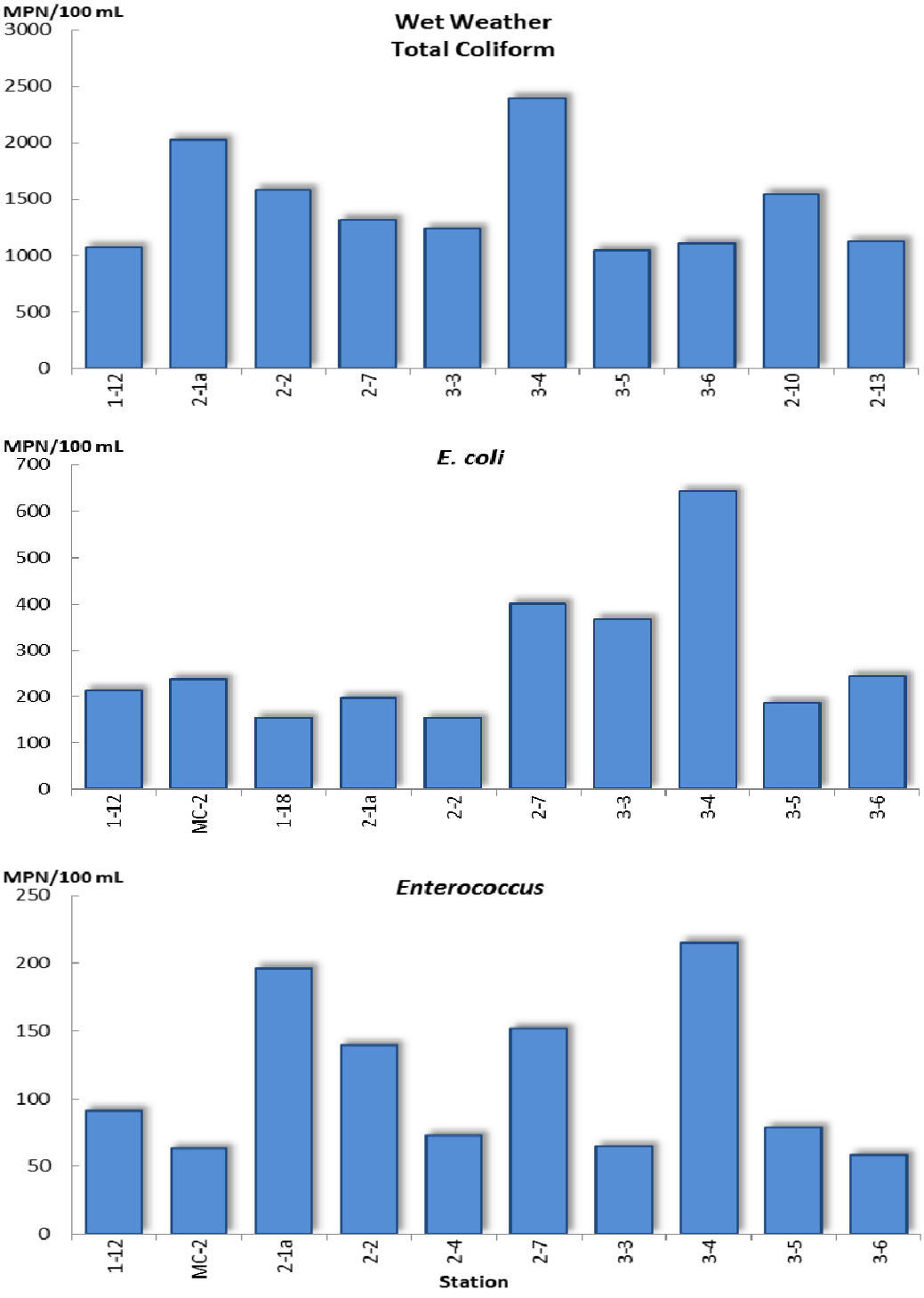


Figure 5. Wet-weather geometric means for indicator bacteria at compliance monitoring stations in Santa Monica Bay, FY 2014-2015.

Wet-Weather (Day of rain with at least 0.1 inches of rainfall plus three succeeding days)

The top 10 compliance stations with the highest GM values during wet-weather are graphically illustrated in Figure 5. Station 3-4 (Pico-Kenter) had the highest GM values for all three indicators; SMB 2-1a (Castlerock) had second highest densities, for total coliform and *Enterococcus*; and stations 2-7 (Santa Monica Cyn) and 3-3 (Santa Monica Pier) were close for second highest *E. coli* GMs during wet-weather periods. Stations 2-2 (Santa Ynez) and 2-7 were sites with moderate to high geometric mean levels compared to the remaining stations.

The overall geometric means recorded for wet-weather periods (Figure 5) were typically higher compared to the dry-weather periods. The majority of high bacterial indicator concentrations were detected in the central region of the Bay. The remaining stations had low geometric mean levels for the wet-weather periods. GMs for FY14-15 were lower in comparison to FY13-14.

Water Quality Standards Compliance

Per the Santa Monica Bay Beaches Bacteria TMDL, allowable exceedance days assigned to each station is adjusted on the basis of the monitoring frequency; fewer exceedances are allocated for sites monitored weekly, compared to those that are monitored daily. During dry-weather periods when a *weekly* monitored station exceeds one of the water quality objectives (Table 1), accelerated monitoring is triggered, in which an additional sample is collected 48 hours after the initial sampling event, and if the 48-hour sample also exceeds, another sample is collected after another 48 hours (or 96 hours after the initial weekly collection). No additional exceedance allowances are allocated for accelerated samples, and accelerated sample exceedances are not counted against the allowable exceedances. All exceedance days for *daily* monitored SMBBB TMDL sites are counted against the allowable exceedance days (Table 2).

The purpose of collecting shoreline samples and reporting bacterial densities is to determine compliance with the state bathing water standards. In addition, when an exceedance of bacterial water quality standards occurs, the LACDPH takes steps to notify beach goers, such as posting health hazard warning signs. Los Angeles Basin Plan bacteriological objectives for REC-1 designation for FY 2014-2015 Santa Monica Bay shoreline stations collected by CLA EMD were examined and evaluated (Tables 3 to 6).

Summer-Dry Weather (Jun 2014 – Oct 2015; Apr 2015 – May 2015)

Of the 26 shoreline stations monitored for MS4 compliance (Station BC-1 is included here, because it was monitored for 2.5 months of the summer-dry period), 17 stations surpassed the single-sample waste load allocation (WLA) of zero allowable exceedances during the summer-dry period (Table 3), whereas only 9 stations surpassed the rolling, 6-week geometric mean limit of zero allowable exceedance days. Stations 3-3, BC-1, and MC-2, 1-18 had the highest number of single-sample exceedance days amongst the stations monitored daily; station 1-12 had the highest number of single-sample exceedance days for weekly monitored stations. Overall, 65 percent of stations monitored exceeded their WLA. As expected, aforementioned sites, stations

3-3 and 1-12 had the highest rolling 6-week geometric-mean exceedance days (GM); the only two sites with double digit GM. Assessing the data in terms of single-sample exceedance rate (%

exceedance), only two daily monitored stations had an exceedance rate greater than 10%; stations 3-3 at 34% and BC-1 at 22%. Weekly station, 1-12, had a 21% exceedance rate; this was an increase for stations BC-1 and 1-12, with a small decrease in rate for station 3-3; these are the same problem sites from FY13-14 monitoring.

Table 3. Summer-Dry Weather, FY 2014-2015[1] Exceedance Days

Station & Frequency[2]	TMDL Sample Days	TMDL Single-Sample Exceedance Days	WLA[3]	TMDL Single-Sample Exceedance Rate(%)	Geometric Mean[4] Exceedance Days
1-3 (W)	29	1	0	3%	0
O-1 (W)	**29**	**2**	**0**	**7%**	**4**
1-6 (W)	29	0	0	0%	0
1-8 (W)	29	1	0	3%	0
1-10 (W)	29	0	0	0%	0
1-12 (W)	**29**	**6**	**0**	**21%**	**22**
O-2 (W)	**29**	**2**	**0**	**7%**	**0**
MC-2 (D)	**142**	**11**	**0**	**8%**	**2**
1-13 (W)	29	0	0	0%	0
1-14 (W)	29	0	0	0%	0
1-16 (W)	29	1	0	3%	0
1-17 (W)	8	0	0	0%	0
1-18 (D)	**140**	**11**	**0**	**8%**	**3**
2-1a (W)	7	0	0	0%	1
2-2 (W)	23	0	0	0%	0
2-4 (W)	**29**	**2**	**0**	**7%**	**0**
2-7 (D)	**142**	**6**	**0**	**4%**	**0**
3-3 (D)	**143**	**48**	**0**	**34%**	**27**
3-4 (D)	143	6	0	4%	0
3-5 (D)	143	3	0	2%	0
3-6 (W)	29	1	0	3%	2
3-8 (W)	**29**	**2**	**0**	**7%**	**1**
BC-1[5] (D)	**60**	**13**	**0**	**22%**	**0**
2-10 (W)	29	0	0	0%	1
2-11 (W)	29	1	0	3%	0
2-13 (W)	29	0	0	0%	0

[1] The periods covered in this table are June-October 2014 and April-May 2015

[2] Sampling frequency: Weekly (W) or Daily (D)

[3] WLA: Waste Load Allocation is defined as allowable number of exceedance days.

[4] Geometric Mean is derived from a rolling 6-Week geometric mean calculation

[5] Monitoring of BC-1 ceased August 24, 2014 by Regional Board approval.

The bacterial indicator limits exceeded most often were *E. coli* and *Enterococcus* (Table 6). Station 3-3 (Santa Monica Pier) was by far the leader in WQO exceedances; 183 summer-dry exceedances of WQOs, with 45% of these at station 3-3 (the *E. coli* limit was exceeded 44 days).

Winter-Dry Weather (November 1 – March 31)

MS4 compliance stations monitored during winter-dry weather are allocated higher allowable exceedances days compared to summer-dry periods (Table 4). Fifteen stations exceeded their WLA during winter-dry periods. Stations MC-2, 3-3, and 1-18 had the highest number of single-sample exceedance days, whereas stations 1-8, 1-16, 1-17, and 3-6 did not exceed on any winter-dry monitoring day; sites that were monitored daily had the highest exceedances as opposed to weekly monitored sites having the lowest or no exceedances. Station 3-3 had the highest rolling 6-week geometric mean exceedance days, followed by sites 3-4, 2-7, and 1-12; station 1-12 (Marie Cyn) exceeded the GM standard more often than any other weekly monitored site. Two weekly sites, 1-16 (Pena Crk) and 3-6 (Rose SD), did not exceed any single-sample limit, but exceeded the GM, 2 and 8 days, respectively. The single-sample exceedance rate computed for station MC-2 (48%) was the highest rate observed for this winter dry-weather period and station 3-3 had the second highest single-sample exceedance rate at 35%. Stations 3-8 (Windward SD), and O-1 (Zumirez Dr) had the highest single-sample exceedance rate of the weekly monitored stations. Stations 1-8, 1-16, 1-17, and 3-6 did not exceed on any winter-dry monitoring day. Of the top-ten sites highest for single-sample exceedance rates, five were weekly-monitored and five were daily-monitored sites. There were only 2 stations in summer-dry weather that exceeded the GM WQO with double digits; seven sites exceeded the GM WQO with double digits in winter-dry weather.

Exceedances per indicator evaluated for winter-dry weather are summarized in Table 6. Stations 3-3 and MC-2 had the highest total number of indicator exceedances, corresponding to the high exceedance days and exceedance rates observed at these sites. Station 3-3 and MC-2 both exceeded more often for *E. coli* than any other indicator. *E. coli* and *Enterococcus* were generally the indicators that exceeded most frequently and a combined total of 347 indicator exceedances for this winter-dry period (Table 6).

Table 4. Winter-Dry Weather, FY 2014-2015[1] Exceedance Days

Station & Frequency[2]	TMDL Sample Days	TMDL Single-Sample Exceedance Days	WLA[3]	TMDL Single-Sample Exceedance Rate(%)	Geometric Mean[4] Exceedance Days
1-3 (W)	16	2	1	13%	0
O-1 (W)	**17**	**5**	**2**	**29%**	**9**
1-6 (W)	17	2	2	12%	0
1-8 (W)	15	0	2	0%	0
1-10 (W)	17	2	1	12%	4
1-12 (W)	**17**	**3**	**2**	**18%**	**16**
O-2 (W)	16	1	0	6%	0
MC-2 (D)	**79**	**38**	**9**	**48%**	**15**
1-13 (W)	**17**	**3**	**2**	**18%**	**7**
1-14 (W)	16	1	1	6%	0
1-16 (W)	15	0	1	0%	2
1-17 (W)	4	0	1	0%	0
1-18 (D)	**80**	**22**	**9**	**28%**	**12**
2-1a (W)	10	1	2	10%	8
2-2 (W)	13	1	2	8%	8
2-4 (W)	16	1	2	6%	6
2-7 (D)	**80**	**18**	**9**	**23%**	**16**
3-3 (D)	**80**	**28**	**9**	**35%**	**20**
3-4 (D)	**80**	**18**	**9**	**23%**	**18**
3-5 (D)	80	8	9	10%	8
3-6 (W)	15	0	1	0%	8
3-8 (W)	**17**	**4**	**2**	**24%**	**14**
BC-1[5] (D)	-	-	-		-
2-10 (W)	**17**	**3**	**2**	**18%**	**8**
2-11 (W)	17	1	0	6%	3
2-13 (W)	17	2	1	12%	6

[1] The period covered in this table is November 2014-March 2015

[2] Sampling frequency: Weekly (W) or Daily (D)

[3] WLA: Waste Load Allocation is defined as allowable number of exceedance days.

[4] Geometric Mean is is derived from a rolling 6-Week geometric mean calculation

[5] Monitoring of BC-1 ceased August 24, 2014 by Regional Board approval.

Wet Weather

TMDL stations 3-4 (Pico-Kenter), 3-3, 2-7 and MC-2 had the highest single-sample exceedance days among daily-sampled stations during the wet-weather period (Table 5). Six stations exceeded their wet-weather WLAs; two of which were weekly sites, O-2 (Puerco Cyn) and 3-8 (Windward Ave). Highest single-sample exceedance rates of 70%, 62%, and 54% were recorded at daily monitored stations 3-4, 3-3, and 2-7, respectively. Weekly monitored TMDL stations with the highest single-sample exceedance rates were stations 2-1a (Castlerock) and 2-2 (Santa Ynez) with exceedance rates of 75% and 67%, respectively (Table 5). Only two weekly stations had exceedance rates of 0%, as opposed to the previous FY in which the majority of weekly sites had no wet-weather exceedances; there were also fewer wet-weather days in FY14-15.. Overall,

single-sample exceedance rates are lower during this wet-weather period than previous wet-weather periods, which is consistent with the observed lower rainfall for this period.

Table 5. Wet-Weather, FY 2014-2015 Exceedance Days

Station & Frequency[1]	TMDL Sample Days	TMDL Single-Sample Exceedance Days	WLA[2]	TMDL Single-Sample Exceedance Rate(%)
1-3 (W)	8	0	1	0%
O-1 (W)	8	1	3	13%
1-6 (W)	8	2	3	25%
1-8 (W)	8	1	3	13%
1-10 (W)	8	2	3	25%
1-12 (W)	**8**	**3**	**3**	**38%**
O-2 (W)	8	2	1	25%
MC-2 (D)	**37**	**18**	**17**	**49%**
1-13 (W)	8	2	3	25%
1-14 (W)	8	1	3	13%
1-16 (W)	**8**	**3**	**2**	**38%**
1-17 (W)	3	0	2	0%
1-18 (D)	37	12	17	32%
2-1a (W)	**4**	**3**	**3**	**75%**
2-2 (W)	**6**	**4**	**3**	**67%**
2-4 (W)	**8**	**4**	**3**	**50%**
2-7 (D)	**37**	**20**	**17**	**54%**
3-3 (D)	**37**	**23**	**17**	**62%**
3-4 (D)	**37**	**26**	**17**	**70%**
3-5 (D)	**37**	**15**	**17**	**41%**
3-6 (W)	**8**	**3**	**3**	**38%**
3-8 (W)	8	1	3	13%
BC-1[3] (D)	**-**	**-**	**-**	**-**
2-10 (W)	**8**	**3**	**3**	**38%**
2-11 (W)	8	1	3	13%
2-13 (W)	8	2	3	25%

[1] Sampling frequency: Weekly (W) or Daily (D)

[2] WLA: Waste Load Allocation is defined as allowable number of exceedance days.

[3] Monitoring of BC-1 ceased August 24, 2014 by Regional Board approval.

In recognition that urban and stormwater runoff conveyed by storm drains and creeks are primary sources of elevated bacteria, the SMBBB TMDL allocates a greater number of single-sample exceedance days during wet-weather (Table 5) compared to dry-weather periods, acknowledging higher runoff volume during wet weather. Eight TMDL stations, compared to fifteen and seventeen for winter-dry and summer-dry periods, respectively, exceeded their WLA. Sampling sites collected during wet-weather are not subject to the rolling 6-week geometric mean compliance requirement.

There were more exceedances during wet weather than summer- or winter-dry periods, although wet weather was just slightly more than winter-dry weather, by 30 exceedances. Compared to the

last reporting period, there was a decrease in the number of total coliform exceedances, but 3- to 2-fold increases in the number of *E. coli* and *Enterococcus* exceedances, respectively.

Table 6. Exceedances Per Water Quality Objectives (WQO), FY 2014-2015

	Summer-Dry					Winter-Dry					Wet-Weather				
	Exceedances Per WQO[1]					Exceedances Per WQO[1]					Exceedances Per WQO[1]				
Station	TC[2]	EC[3]	ENT[4]	EC/TC[5]	Total WQO[1] Exceedances	TC[2]	EC[3]	ENT[4]	EC/TC[5]	Total WQO[1] Exceedances	TC[2]	EC[3]	ENT[4]	EC/TC[5]	Total WQO[1] Exceedances
1-3	0	0	1	0	1	1	0	1	0	2	0	0	0	0	0
O-1	0	1	2	1	4	1	3	6	3	13	0	0	1	0	1
1-6	0	0	0	0	0	0	0	2	1	3	0	0	2	0	2
1-8	0	0	1	1	2	0	0	0	0	0	0	0	1	0	1
1-10	0	0	0	0	0	1	1	1	0	3	0	0	2	1	3
1-12	**5**	2	5	1	13	1	0	3	0	4	2	2	3	2	9
O-2	0	0	2	0	2	0	0	1	0	1	0	0	2	0	2
MC-2	**1**	**3**	**8**	**4**	**16**	**9**	**33**	**25**	**29**	**96**	7	12	**15**	**12**	**46**
1-13	0	0	0	0	0	0	2	2	2	6	1	1	2	1	5
1-14	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1
1-16	0	0	1	0	1	0	0	0	0	0	0	1	3	0	4
1-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-18	0	**6**	**6**	**3**	15	**3**	**16**	**20**	**15**	**54**	3	8	12	7	30
2-1a	0	0	0	0	0	0	1	1	1	3	1	2	3	1	7
2-2	0	0	0	0	0	0	1	0	0	1	1	0	4	0	5
2-4	0	1	2	0	3	0	0	1	0	1	2	2	4	1	9
2-7	0	1	**6**	0	7	**7**	10	15	6	**38**	**14**	**16**	**20**	**14**	**64**
3-3	0	**44**	**15**	**23**	**82**	1	**24**	13	**16**	**54**	4	**18**	10	11	43
3-4	0	**3**	3	2	8	**3**	6	**18**	6	**33**	**17**	**20**	**26**	**18**	**81**
3-5	0	1	2	0	3	2	2	7	2	13	**9**	7	**15**	6	37
3-6	0	0	1	0	1	0	0	0	0	0	3	3	3	2	11
3-8	0	2	4	0	6	1	3	5	3	12	1	1	1	0	3
BC-1[6]	**12**	**3**	2	1	**18**	-	-	-	-	-	-	-	-	-	-
2-10	0	0	0	0	0	0	0	4	0	4	2	2	3	0	7
2-11	0	0	1	0	1	0	0	2	0	2	1	1	0	0	2
2-13	0	0	0	0	0	1	0	2	0	3	2	1	1	0	4

[1]Water quality objectives (WQO) per indicator bacteria as established by the Basin Plan:

[2] *TC - Total coliform limit is 10,000 MPN/mL*

[3] *EC - E. coli limit is 400 MPN/mL*

[4] *ENT - Enterococcus limit is 104 MPN/mL*

[5] *EC/TC - Ratio of E. coli/Total coliform is greater than 0.1 when total coliform level is greater than 1,000 org./100mL*

[6] Monitoring of BC-1 ceased August 24, 2014 by Regional Board approval.

Field Observations

Field observations were recorded for each sampling location and normally were rated using an EMD historical standard rating system, 1=low, 2 =moderate, and 3 =high. Observations include the materials of sewage origin (MOSOs) or non-sewage origin, any unusual odors of sewage or non-sewage origin, and flow and flow rate (visual rating only) from storm drains, streams, debris, seaweed, tar, and plankton, among others.

Materials of Sewage Origin

Observations of materials of sewage origin (MOSOs), such as plastic goods (tampon inserts), rubber goods (prophylactic rings), and grease particles were recorded during Fiscal Year 2014-2015. There were two incidences of observed MOSOs found at CLA EMD monitored Santa Monica Bay shoreline site for FY2014-2015; one observation each for stations 3-3, Santa Monica Pier and 3-4, Pico-Kenter storm drain.

Storm Drain Flows

Non-point source pollution has been estimated to be the leading cause of water quality deterioration (EPA 2010). Originating from inland, these pollutants are washed into creeks, streams, rivers, and storm drains, which eventually reach the ocean during heavy rains. Storm drains are designed to receive urban and storm water runoff from paved streets, parking lots, sidewalks, and roofs. Urban and storm water runoff, carried to the Bay through the region's massive storm drain systems and few remaining streams, is a serious, year-round concern (Santa Monica Bay Restoration Commission 2010). For the 25 EMD-monitored sampling stations along the Santa Monica Bay shoreline, 15 stations are associated with storm drain outfalls; 1 station is located at a pier; 6 stations are associated with creeks; 1 station is an open beach site; and 2 sites are associated with a lagoon (Stations 1-2 and BC-1 are no longer monitored due to safety concerns and removal from the SMBBB TMDL, respectively). A summary of storm drain flow data obtained from CLA EMD Santa Monica Bay monitoring sites during FY 2014-5 is presented in Table 7.

Low-Flow Diversion Devices (LFDs):

Twelve SMB compliance stations and one observation site, O-5, monitored by CLA EMD, are associated with low-flow diversion devices (LFDs). The cities of Los Angeles and Santa Monica and the County of Los Angeles operate a total of 23 LFDs along the Santa Monica Bay shoreline from Castlerock to Dockweiler State Beach, which as of November 1, 2009, began operating during year-round dry weather. These devices are installed at the major storm drain outfalls to prevent dry-weather runoff from reaching the Santa Monica Bay beach shoreline by diverting the flows to the sanitary sewer collection system for treatment at the Hyperion Wastewater Treatment Plant (Table 7 and Figure 6).

Stations O-1 (Zumirez Crk) and 1-12 (Marie Cyn SD) had consistent year-round flow (Table 7); 94% summer-dry, 100 % winter-dry; 86% summer-dry, 89% winter-dry, respectively. Neither of these sites is associated with a low-flow diversion device (LFD). Twelve sites are associated with LFD devices, seven of which had observed flow during summer- and/or winter-dry periods. Stations 2-1, 2-2, 2-4, 3-8, and 2-13 are all associated with LFD devices that are operational year round (WPD, 2015). Station 2-2 flowed 48% in summer-dry and 8% during winter-dry; Station 2-4 6% during winter-dry with an average flow of 3 (heavy); Station 3-8 flowed 100% of days sampled during winter-dry, with an average flow of 3 (heavy); and Station 2-13 flowed 7% of observed time during summer-dry. Most interesting to note is that, station 3-3 had high numbers of exceedance days for both single-sample and GM, for all weather periods, but no observable dry-weather storm drain flow and only 3% observed flow days during wet-weather.

Table 7. Storm Drain flow data for SMB TMDL stations FY 2014-2015.

Station	Location	LFD In Place	Summer Dry		Winter Dry		Wet Weather	
			% Observed Flow Days	Avg. Flow[1]	% Observed Flow Days	Avg. Flow[1]	% Observed Flow Days	Avg. Flow[1]
1-3	Open Beach	-	0%	0	0%	0	0%	0
O-1	Creek	-	94%	1	100%	1	100%	1
1-6	Creek	-	0%	0	6%	2	25%	1
1-8	Creek	-	0%	0	0%	0	0%	0
1-10	Creek	-	3%	1	53%	1	50%	1
1-12	Storm Drain	-	86%	2	89%	2	88%	2
O-2	Storm Drain	-	23%	1	44%	1	50%	1
MC-2	Lagoon	-	9%	3	68%	3	59%	3
1-13	Storm Drain	-	3%	1	41%	1	50%	1
1-14	Creek	-	0%	0	0%	0	50%	1
1-16	Creek	-	3%	1	7%	1	0%	0
1-17	Canyon	-	100%	1	50%	1	0%	0
1-18	Lagoon	-	0%	0	19%	1	24%	2
2-1	Storm Drain	Yes	0%	0	10%	2	50%	3
2-2	Storm Drain	Yes	48%	1	8%	2	50%	2
2-4	Storm Drain	Yes	0%	0	6%	3	22%	3
2-7	Storm Drain[2]	Yes	0%	0	6%	3	46%	2
3-3	Pier	Yes	0%	0	0%	0	3%	3
3-4	Storm Drain	Yes	0%	0	6%	2	57%	2
3-5	Storm Drain	Yes	0%	0	4%	2	22%	2
3-6	Storm Drain	Yes	0%	0	0%	0	25%	3
3-8	Storm Drain[2]	Yes	0%	0	5%	3	0%	0
BC-1	Storm Drain[3]	-	100%	3	-	0	-	-
2-10	Storm Drain	Yes	0%	0	0%	0	0%	0
2-11	Storm Drain	Yes	0%	0	0%	0	0%	0
2-13	Storm Drain[2]	Yes	7%	2	0%	0	0%	0

[1] *Average Flow Rate: (0)= no flow (1)=low (2)=moderate (3)=heavy*

[2] *Low Flow Diversion (LFD) owned and operated by the City of Los Angeles*

[3] *Monitoring ceased August 24, 2014.*

IV. DISCUSSION

Data presented herein, indicates stations 3-3 (Santa Monica Pier), MC-2 (Surfrider Beach, Malibu), BC-1 (Ballona Creek), and to a lesser extent sites 1-18 (Topanga Cyn), 3-4 (Pico-Kenter), and 2-7 (Santa Monica Cyn), and 1-12 (Marie Cyn) are the sites, overall, that are the most impacted by bacterial pollution and consequently, the most problematic.

Santa Monica Pier (3-3) houses several food concession stands, restrooms, and parking facilities, as well as a small marine aquarium, and attracts thousands of local visitors and tourists. This location is one of the ten most polluted beaches in the state for multiple consecutive years according to Heal the Bay's 2014 Annual Report Card (HTB 2014) and was the only Santa Monica Bay beach to appear on the HTB 2015 Beach Bummer List (HTB, 2015). Data from fiscal years 2010-2011 and 2011-2012 demonstrated a considerable improvement in water quality near the pier compared to previous reporting periods. The improvement in water quality was the result of multiple

implementation projects by the City of Santa Monica to reduce fecal bacterial levels near the pier. These projects included the replacement of a faulty storm drain under the pier to reduce runoff flows onto the beach; upgrades to the pier's storm drain dry-weather runoff diversion system (LFD);, and several measures to reduce excessive bird populations at the pier - an effort to mitigate bird feces as a contributing source of bacterial contamination (HTB 2014; CSM 2010a and 2010b). Netting under the pier was installed to keep pigeons and other birds from nesting underneath the pier. These improvements were completed under the Santa Monica Pier improvement projects, funded by Clean Beaches Initiative and/or by Santa Monica voter-approved Measure V. Increases in dry-weather exceedance days during FY 2013-2014, however, suggest a reversal of this trend (CLA EMD 2014). The discovery of tears within the netting suggests birds were re-nesting under the pier and may be the cause of the increased exceedances. After several attempts to repair the netting, it was eventually replaced in February of 2014 (HTB 2014). This may have contributed to a small improvement in water quality over the next year, based on the decrease in the number of dry-weather water quality exceedances and the exceedance rate at 3-3 during FY14-15; however, there was an increase in wet-weather exceedances. Ultimately, the improvement was not enough to keep the site from being listed on the Beach Bummer list.

In January 2015, the City of Santa Monica (CSM) applied for a $3.7 million grant from the State Water Resources Control Board. CSM will use about $1.3 million in matching funds from Measure V to pay for its Clean Beaches Project, estimated to cost about $5.1 million. The project is set to capture all wet-weather runoff from the 90-acre Pier Drainage Area following a major storm, and capture a portion of 'first flush' storm water discharges to the beach at the Pico-Kenter Outfall. Captured storm water and/or dry-weather runoff from both locations will be piped to the CSM's nearby SMURRF plant for treatment and recycled for non-potable use (Santa Monica Lookout, 2015).

Station MC-2, one of the sites with the poorest water quality, is located at Surfrider Beach at the outlet of the Malibu Creek watershed and is mainly affected by flows from Malibu Lagoon. Past monitoring data has shown that higher exceedance rates normally occur in the winter and wet-weather seasons when the berm of the Lagoon is breached and flows from the Lagoon mix with the wave wash at the shoreline. FY14-15 seasonal bacterial densities were no exception to this trend; the winter-dry and wet-weather exceedance rates were 48% and 49%, respectively - the summer-dry rate was 8%, although dry-weather flow was 30%. The watershed where this site is located covers a large area, approximately 105 square miles. There is considerable local activity at this beach, and the lagoon serves as a habitat for numerous bird species, an added source of bacterial pollutants. Surfrider Beach previously has been identified as one of the most polluted beaches in Santa Monica Bay (CLA, EMD 2003). The U.S. Geological Survey (USGS) published results of a study to identify the distribution and sources of FIB in coastal Malibu waters (Izbicki et al., 2012). Onsite wastewater treatment systems (OWTS) in Malibu were suspected as potential sources of FIB to Malibu Lagoon and the near-shore ocean at and around Surfrider Beach; however, results from the USGS study did not support this presupposition. The authors speculated that high FIB concentrations in the Lagoon may originate from non-human fecal sources such as birds and the extended survival or regrowth of indicator bacteria. Higher FIB concentrations and a higher occurrence of exceedances during the USGS study were observed during low tides at the end of the rainy season in April 2010. CLA EMD records of visual observation data indicate the berm was breached during this period. Data presented in the USGS article shows FIB densities generally tended to rise at high tide during the July study period at Surfrider Beach, Puerco Beach and Malibu Colony Beach. This suggests that high tides

are contacting waters of the lagoon, thereby affecting shoreline water quality. Kelp and other debris along the high-tide line also may have contributed to the elevated FIB densities during the July study period.

Other stations that registered elevated levels of exceedances and geometric mean densities, but not to the same degree as the above mentioned sites, especially during dry-weather periods, are 3-4 (Pico-Kenter SD), 1-18 (Topanga Canyon SD), 2-7 (Santa Monica Canyon SD), 3-5 (Ashland SD), and 1-12 (Marie Cyn). These are all sites with more than 10 exceedances. According to the 2014-2015 Heal the Bay Annual Beach Report Card, station 3-4 (Pico-Kenter) received grades of A (summer-dry), C (winter-dry), and F (wet-weather); as evidenced by 4%, 23%, and 70% exceedance rates, respectively; for the 2013-2014 Report Card, grades were A, A, F, respectively.

Station 1-12 is located in front of Marie Canyon storm drain on Puerco Beach, just downstream of a treatment facility. The County of Los Angeles has operated a UV filtration treatment facility near this site since October 2007; it is designed to filter and treat as much as 100 gallons per minute of dry-weather runoff (LADPW 2007). Los Angeles County's treatment facility at Marie Canyon has no sewer line. Instead, the treatment facility treats stormwater through filtration, and returns the cleansed flow to the storm drain. CLA EMD has identified it as a problem beach for the last four years, although it is no longer on the Heal the Bay's Beach Bummer List for 2015. It is given an honorable mention here, because of the 21% single-sample exceedance and 86% flow rates during summer-dry weather, and the fact that it is the only weekly-monitored site with double-digit exceedances.

V. CONCLUSION

Assessment of the FY 2014-2015 SMBBB TMDL and MS4 compliance-monitoring stations reveals an overall increase in the total number of single-sample exceedances in comparison to FY 2013-2014, especially for the winter-dry and wet-weather periods. Most sites had relatively low summer-dry exceedances, with the exception of Santa Monica Pier, Marie Cyn, and Ballona Creek, which is shown graphically, but due to a limited dataset (3 months monitoring) it cannot be properly assessed. There has been no consistent decrease or increase in water quality from FY09-10 to the present monitoring year, with the exception of a few sites such as 1-8 (Escondido Ck), 1-10 (Solstice Crk), 1-14 (Las Flores Crk), 1-17 (Tuna Cyn), 1-18 (Topanga Cyn), and 2-2 (Santa Ynez).

It has been suggested in past assessments that due to constant inaccessibility, station 1-17 (Tuna Canyon), should be re-assessed as to the feasibility of inclusion in the monitoring program. This site was proposed for replacement or deletion by EMD in a letter to the Regional Board in September 2009. Station 1-17 was inaccessible to sampling more than 75 percent of the time, and for the days the site was accessible there were no exceedances. This site is inaccessible to CLA EMD sample collectors during high tide events, where bacterial densities may be higher than those days when it is accessible (low tide). Although Tuna Canyon does not discharge onto a public beach, it was included in the SMB TMDLs to fulfill the requirement of having at least one compliance location in every coastal watershed (CSMP 2004). Unfortunately, as it is accessible to private beach individuals during high tide and bacterial densities are unknown for these periods, health risks also remain unknown. As is, it is not possible to get a true or better

picture of water quality in this area and sampling efforts are wasted; the value of continued monitoring of this site is unknown by this agency. The Regional Board did not approve the removal or replacement of this site.

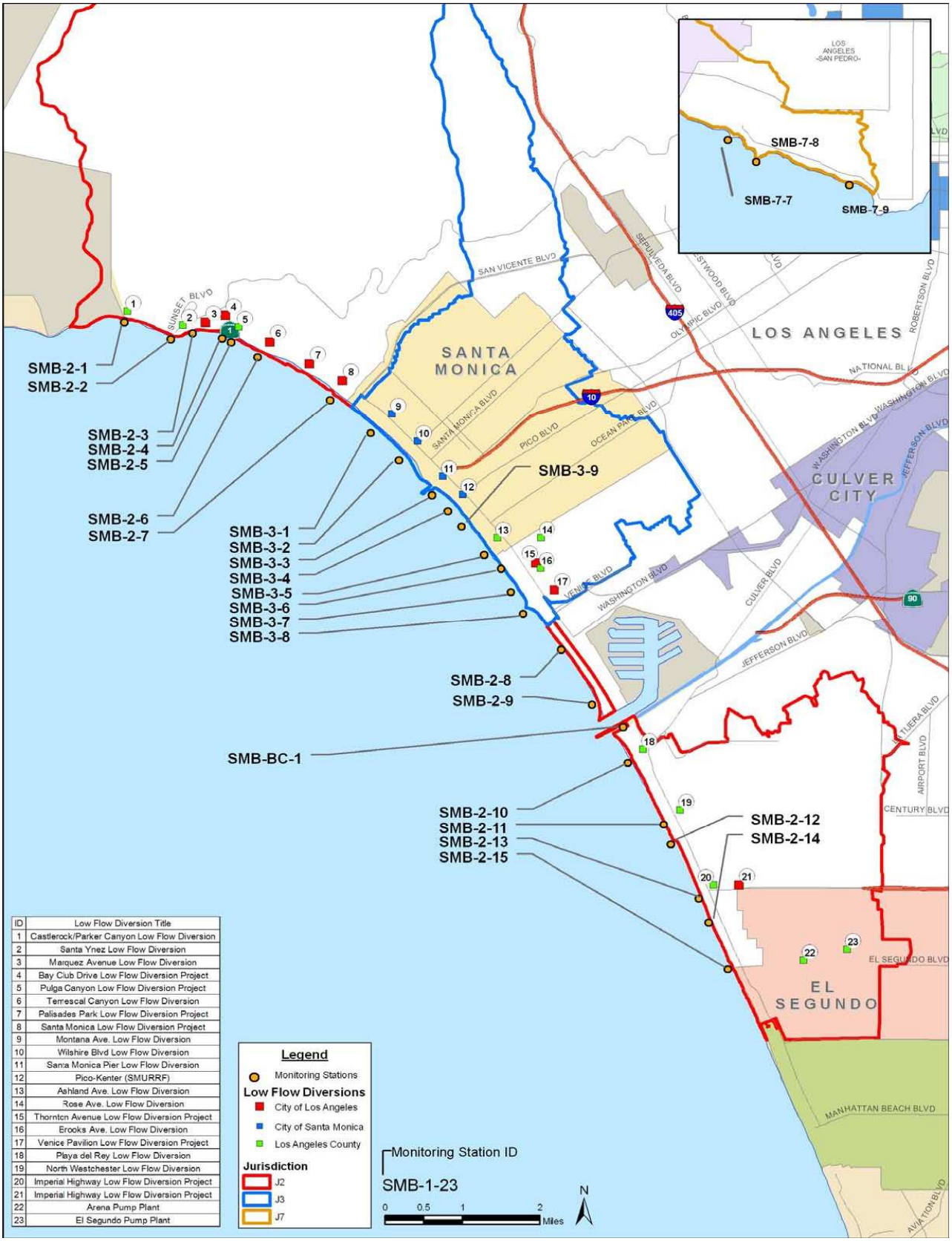
At the inception of the SMBBB TMDL Coordinated Shoreline Monitoring Plan (CSMP), MS4 shoreline compliance stations were adopted into the CSMP and have served dual roles as MS4 and TMDL monitoring sites. A new winter-dry weather exceedance rate at the reference beach, Leo Carrillo, calculated from point zero data collected from November 2004 to October 2010 will increase the final allowable exceedance days for the majority of SMBBB TMDL compliance sites during winter-dry weather. Sites with no change in WLA or that were assigned fewer allowable exceedance days are subject to anti-degradation in which there is no degradation of existing water quality allowed if historical water quality at a particular site is better than the designated reference site.

The Santa Monica Bay Beaches Bacteria TMDL compliance deadline for the winter-dry weather period became effective on July 15, 2009. The maximum allowable exceedance days during the winter-dry weather period (November 1 – March 31) are listed in Table. 3. The City of Los Angeles' compliance approach was to expand the operation of Low-Flow Diversions (LFDs) from the previously implemented summer-dry period (April 1 – October 31) to year-round diversion, excluding wet-weather events. Thus, as of November 1, 2009, the City, as well as the County of Los Angeles and the City of Santa Monica, began year-round operation of their LFDs. There are a total of 23 LFDs installed at major storm drain outfalls along the Santa Monica Bay shoreline within Jurisdictional groups 2 and 3 from Parker Mesa at Castle Rock to Dockweiler subwatershed; eight of the LFDs are owned and operated by the City of Los Angeles (Figure 6). Heal the Bay reported that eight Santa Monica Bay beaches associated with an LFD received A or B grades during both 2013-2014 summer- and winter-dry weather (HTB, 2014). However, as most beaches with LFDs performed well during summer-dry weather during this report period, the same cannot be said for winter-dry period. This is somewhat along the same lines as the 2014-2015 Heal the Bay Beach Report Card, "…found that low-flow diversions were successful at improving water quality, as seen in reductions in concentrations of fecal indictor bacteria and reductions in regulatory exceedances post-BMP implementation. ….also saw that water quality at some sites was further improved when examining only the "core" months of the AB411 period (June, July, August, and September)" – the summer-dry months.

While effective for dry-weather flow, low-flow diversions are not necessarily a viable option for wet-weather flows from stormwater runoff, and according to winter-dry flow data not as important an option for winter-dry period. The percentages of flow days observed during winter-dry period were 2 to 5 times more than for the summer-dry period. Most LFDs do not have the capacity to handle large volumes of runoff during wet weather (Santa Monica Bay Restoration Commission 2010), and, unfortunately, the high pollutant load of wet-weather flow has the capacity to affect beaches that routinely have good water quality. Either the capacity of flow devices must be increased to handle year-round flow, including wet-weather flows, or storm drain flows and runoff to recreational waters must be reduced.

Historically, Los Angeles County has been one of the only counties in the state (along with Humboldt County, San Francisco County and portions of San Diego and Santa Cruz counties) to modify its monitoring program to collect samples directly in front of flowing storm drains and creeks. This change in Los Angeles County was a result of the Santa Monica Bay Beaches Bacteria TMDL requirements and associated implementation plans designed to restore water

quality and protect public health and aquatic life. Starting in April of 2015 all monitoring agencies participating in the California Beach Program will be required to sample at point-zero. This is a major step in achieving monitoring consistency from county to county (HTB, 2015).



ID	Low Flow Diversion Title
1	Castlerock/Parker Canyon Low Flow Diversion
2	Santa Ynez Low Flow Diversion
3	Marquez Avenue Low Flow Diversion
4	Bay Club Drive Low Flow Diversion Project
5	Pulga Canyon Low Flow Diversion Project
6	Terrescal Canyon Low Flow Diversion
7	Palisades Park Low Flow Diversion Project
8	Santa Monica Low Flow Diversion Project
9	Montana Ave. Low Flow Diversion
10	Wilshire Blvd Low Flow Diversion
11	Santa Monica Pier Low Flow Diversion
12	Pico-Kenter (SMURRF)
13	Ashland Ave. Low Flow Diversion
14	Rose Ave. Low Flow Diversion
15	Thornton Avenue Low Flow Diversion Project
16	Brooks Ave. Low Flow Diversion
17	Venice Pavilion Low Flow Diversion Project
18	Playa del Rey Low Flow Diversion
19	North Westchester Low Flow Diversion
20	Imperial Highway Low Flow Diversion Project
21	Imperial Highway Low Flow Diversion Project
22	Arena Pump Plant
23	El Segundo Pump Plant

Figure 6. Low-Flow Diversions (LFDs) devices operated by City of Los Angeles, County of Los Angeles, and the City of Santa Monica along the Santa Monica Bay shoreline from Parker Mesa at Castle Rock to Dockweiler subwatershed.

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