California Regional Water Quality Control Board
San Diego Region

Total Maximum Daily Loads for Indicator Bacteria
Project I – Beaches and Creeks in the San Diego Region

Revised Draft Technical Report

March, 9 2007

Underline/Strikeout Version

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Total Maximum Daily Loads For Indicator Bacteria
Project I – Beaches and Creeks in
The San Diego Region

Revised Draft Technical Report

Adopted by the
California Regional Water Quality Control Board
San Diego Region
on _______________, 200x

Approved by the
State Water Resources Control Board
on _______________, 200 x
and the
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on _______________,200 x
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List of Acronyms and Abbreviations

Ac	Acre
AGR	Agricultural supply
ALERT	Automatic Local Evaluation in Real-Time
AQUA	Aquaculture
Basin Plan	Water Quality Control Plan for the San Diego Basin (9)
BASINS	Better Assessment Science Integrating Point and Nonpoint Sources
BIOL	Preservation of biological habitats of special significance
BMP(s)	Best Management Practice(s)
CAFOs	Concentrated animal feeding operations
Caltrans	California Department of Transportation
CAMMPR	California's Management Measures for Polluted Runoff
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CIMIS	California Irrigation Management Information System
COLD	Cold freshwater habitat
COMM	Commercial and sport fishing
CWA	Clean Water Act
DEH	San Diego County Department of Environmental Health
EST	Estuarine habitat
EQUIP	Environmental Quality Incentives Program
FRSH	Freshwater replenishment
GWR	Ground water recharge
HA	Hydrologic Area
HSA	Hydrologic Sub Area
HSPF	Hydrological Simulation Program–FORTRAN
HU	Hydrologic Unit
IND	Industrial water supply
LA	Load allocations
LAX	Los Angeles Airport
Los Angeles Water Board	California Regional Water Quality Control Board, Los Angeles Region
LSPC	Loading Simulation Program in C++
MEP	Maximum extent practicable
MAR	Marine habitat
MIGR	Migration of aquatic organisms
mL	milliliter
MM	Management measure
MOS	Margin of safety
MP	Management practice
MPN	Most probable number of bacteria colonies
MRLC	Multi-Resolution Land Characteristic
MS4	Municipal separate storm sewer systems
MUN	Municipal and domestic supply

Municipal Dischargers	Persons owning and/or operating MS4s other than Caltrans
NAV	Navigation
NCDC	National Climatic Data Center
NHD	National Hydrography Dataset
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of intent
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
NRCS	Natural Resources Conservation Service
OAL	Office of Administrative Law
Ocean Plan	Water Quality Control Plan for Ocean Waters of California
POTW(s)	Publicly owned treatment work(s)
POW	Hydropower generation
PROC	Industrial process supply
RARE	Rare and endangered species
REC-1	Water contact recreation
REC-2	Non-contact water recreation
RWD	Report of waste discharge
San Diego Water Board	California Regional Water Quality Control Board, San Diego Region
SAL	Inland saline water habitat
SAG	Stakeholder Advisory Group
SANDAG	San Diego Regional Planning Agency
SCAG	Southern California Association of Governments
SCCWRP	Southern California Coastal Water Research Project
SHELL	Shellfish harvesting
SPWN	Spawning, reproduction, and/or early development
STATSGO	State soil geographic
SWRCB	State Water Resources Control Board
TBEL(s)	Technology based effluent limitation(s)
TMDL(s)	Total maximum daily load(s)
U.S.	United States
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
Waiver Policy	Basin Plan Waste Discharge Requirements Waiver Policy
WARM	Warm freshwater habitat
WDR(s)	Waste discharge requirement(s)
WILD	Wildlife habitat
WLA(s)	Wasteload allocation(s)
WQBEL(s)	Water quality based effluent limitation(s)
WQO(s)	Water quality objective(s)
WQS	Water quality standards
yr	Year

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Many dedicated professionals contributed to this Technical Report through their service on the Stakeholder Advisory Group (SAG) for this indicator bacteria Total Maximum Daily Load project. The SAG provided insightful technical comments on early drafts of this report, suggested issues for technical peer review, raised important policy issues, and assisted with drafting the Implementation Plan. The California Regional Water Quality Control Board, San Diego Region, would like to thank the individuals who served on the SAG for their significant contributions to this project.

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1 Executive Summary

Fecal bacteria originate from the intestinal flora of warm-blooded animals, and their presence in surface water is used as an indicator of human pathogens. Pathogens can cause illness in recreational water users and people who harvest and eat filter-feeding shellfish. Bacteria have been historically used as indicators of human pathogens because bacteria are easier and less costly to measure than the pathogens themselves. As required by section 303(d) of the Clean Water Act (CWA), Total Maximum Daily Loads (TMDLs) for indicator bacteria were developed to address ~~17~~ 19 of the 38 bacteria-impaired waterbodies in the San Diego Region, as identified on the *2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments*. This project is referred to as '*Project I- Beaches and Creeks in the San Diego Region.*' The regulatory provisions of these TMDLs have been incorporated into an amendment to the *Water Quality Control Plan for the San Diego Basin (9)* (Basin Plan).

The impaired beaches and creeks (Table 1-1) are located within or hydraulically downstream of five watersheds in Orange County (with a small portion in Riverside

Table 1-1. Bacteria-Impaired Water Quality Limited Segments Addressed in This Analysis

Watershed	Type of Listing	Waterbody Name [a]	Drainage Area (mi^2)[b]
Laguna/San Joaquin	Shoreline	Pacific Ocean Shoreline, Laguna Beach HSA, San Joaquin Hills HSA	13.94
Aliso Creek	Creek, Shoreline	Aliso Creek, Aliso Creek (mouth), Pacific Ocean Shoreline, Aliso HSA	35.74
Dana Point	Shoreline	Pacific Ocean Shoreline, Dana Point HSA (Salt Creek)	8.89
San Juan Creek	Creek, Shoreline	San Juan Creek, San Juan Creek (mouth), Pacific Ocean Shoreline, Lower San Juan HSA	177.18
San Clemente	Shoreline	Pacific Ocean Shoreline, San Clemente HA	18.78
San Luis Rey River	Shoreline	Pacific Ocean Shoreline, San Luis Rey HU	560.42 (354.12)
San Marcos	Shoreline	Pacific Ocean Shoreline, San Marcos HA	1.43
San Dieguito River	Shoreline	Pacific Ocean Shoreline, San Diequito HU (Bell Valley)	346.22 (292.24)
Miramar	Shoreline	Pacific Ocean Shoreline, Miramar Reservoir HA	93.73
Scripps	Shoreline	Pacific Ocean Shoreline, Scripps HA	8.75
San Diego River	Creek, Shoreline	Forester Creek, San Diego River (Lower), Pacific Ocean Shoreline, San Diego HU	436.48 (173.95)
Chollas Creek	Creek	Chollas Creek	26.80

Note: HSA = hydrologic subarea; HA = hydrologic area; HU = hydrologic unit

[a] Listed as impaired for exceedances of fecal coliform, and/or total coliform, and/or enterococci.

[b] The drainage area associated with the dry weather TMDLs are in parenthesis. The drainage areas associated with the wet weather TMDLs are without parenthesis. Some areas impound runoff during dry periods because these watersheds are above large reservoirs and lakes.

County) and seven watersheds in San Diego County. Most of the waterways flow directly to the Pacific Ocean, except Chollas Creek, which flows to San Diego Bay. The combined watersheds cover roughly 1,730 square miles (4,480 square kilometers).

The purpose of a TMDL is to restore the beneficial uses and to attain the WQOs in the waterbody. A TMDL represents the maximum amount of the pollutant of concern that the waterbody can receive and still attain WQSs. Once this maximum pollutant amount has been calculated, it is then divided up and allocated among all of the contributing sources in the watershed. In order to meet the TMDL, an Implementation Plan is also developed that describes the pollutant reduction actions that must be taken by various responsible parties to meet the allocations. The Implementation Plan includes a time schedule for meeting the required pollutant reductions and requirements for monitoring to assess the effectiveness of the load reduction activities in attaining WQOs and restoring beneficial uses.

Bacteria densities in the waters of the beaches and creeks addressed in this project have chronically exceeded the numeric WQOs for total, fecal, and/or enterococci bacteria, or were suspected of exceeding the WQOs because the beaches were consistently posted with health advisories and/or closed. These exceedances and postings threaten and impair the water contact (REC-1), non-water contact (REC-2), and shellfish harvesting (SHELL) beneficial uses. All surface and marine waters in the Region are designated with both REC-1 and REC-2 beneficial uses. All marine waters in the Region (including coastal shorelines and embayments) are designated with REC-1, REC-2, and SHELL beneficial uses.

The San Diego Water Board and the USEPA coordinated a watershed assessment and modeling study to support the development of TMDLs. Because the climate in southern California has two distinct hydrological patterns, two models were developed for estimating bacteria loads. One model specifically quantified loading during wet weather events (storms), which tend to be episodic and short in duration, and characterized by rapid wash-off and transport of very high bacteria loads from all land use types. The other model quantified bacteria loading during dry weather conditions. Dry weather loading was much smaller in magnitude than wet weather loading, did not occur from all land use types, and is more uniform than stormflow. In addition to estimating current loading, both models were used to estimate TMDLs for the two climate conditions for each watershed.

1.1 Numeric Target Selection

When calculating TMDLs, numeric targets are established to meet WQOs and subsequently ensure the protection of beneficial uses. TMDLs were calculated for each impaired waterbody, for each indicator bacteria, for wet and dry weather, and for interim and final phases. The numeric targets used in the TMDL calculations were equal to the WQOs for bacteria for either REC-1 or SHELL beneficial uses. Numeric targets used for beaches were also used for impaired creeks. Although SHELL is not a designated use in freshwater creeks and rivers, the total coliform density in these waters where they discharge to the Pacific Ocean must be protective of the SHELL use at the shorelines.

Thus, the SHELL WQO for total coliform is the appropriate numeric target for the TMDLs for creeks and rivers even though they do not support SHELL use. Although REC-1 WQOs for fecal coliform and enterococci apply throughout the watersheds, the total coliform TMDLs must be met only at the bottom of the watershed where creeks and rivers discharge to the Pacific Ocean.~~, depending on the indicator and/or waterbody. The numeric targets selected in the TMDL analysis depended partly on whether the impaired water body was a beach, a creek tributary to an impaired beach, or a creek not tributary to an impaired beach. The reason that different numeric targets were needed for these three scenarios is because the Ocean Plan contains total coliform WQOs for SHELL and REC-1 beneficial uses at beaches, while the Basin Plan does not assign SHELL uses to inland surface waters, and the REC-1 beneficial use for inland surface waters does not have a WQO for total coliform.~~

Different dry weather and wet weather numeric targets were used because the bacteria transport mechanisms to receiving waters are different under wet and dry weather conditions. Single sample maximum WQOs were used as wet weather numeric targets because wet weather, or storm flow, is episodic and short in duration, and characterized by rapid wash-off and transport of high bacteria loads, with short residence times, from all land use types to receiving waters. Geometric mean WQOs were used as numeric targets for dry weather periods because dry weather runoff is not generated from storm flows, is not uniformly linked to every land use, and is more uniform than stormflow, with lower flows, lower loads, and slower transport, making die-off and/or amplification processes more important.

Another difference between the wet weather and dry weather TMDL calculations, besides the use of single sample maximum WQOs versus geometric mean WQOs, is that the wet weather ~~targets~~ TMDLs (during the interim period, only) ~~are implemented~~ are calculated using a reference system approach. The purpose of the reference system approach is to account for the natural, and largely uncontrollable sources of bacteria (e.g., bird and wildlife feces) in the wet weather loads generated in the watersheds and at the beaches that can, by themselves, cause exceedances of WQOs.

The reference system approach is utilized in the TMDL by allowing a 22 percent exceedance frequency of the single sample WQOs for REC-1. ~~The purpose of the exceedance frequency is to account for the natural, and largely uncontrollable sources of bacteria (e.g., bird and wildlife feces) in the wet weather loads generated in the watersheds and at the beaches that can, by themselves, cause exceedances of WQOs.~~ Twenty-two percent is the frequency of exceedance of the single sample maximum WQO measured in a reference system in Los Angeles County. A reference system is a beach and upstream watershed that are minimally impacted by anthropogenic activities. A reference system typically has at least 95 percent open space.

The final wet weather TMDLs must meet WQOs in the receiving water without application of a reference system approach because, at this time, the Basin Plan does not authorize the implementation of single sample bacteria WQOs using this approach. A Basin Plan amendment authorizing implementation of single sample bacteria WQOs using a reference system approach is being developed by the San Diego Water Board[1] under a separate effort from this TMDL project.

1.2 Source Analysis

Both in-stream and watershed data were used to identify potential sources and characterize the relationship between point and nonpoint source loadings and in-stream response, under both wet weather and dry weather conditions. Point sources typically discharge at a specific location from pipes, outfalls, and conveyance channels from, for example, municipal wastewater treatment plants or municipal separate storm sewer systems (MS4s). These discharges are regulated through waste discharge requirements (WDRs) that implement federal National Pollutant Discharge Elimination System (NPDES) regulations issued by the State Water Resources Control Board (SWRCB) or the San Diego Water Board through various orders.[2] Nonpoint sources are diffuse sources that have multiple routes of entry into surface waters.

Sources of bacteria are the same under both wet weather and dry weather conditions. However, the method of transport for the two conditions is very different. Wet weather loading is dominated by episodic storm flows that wash off bacteria that build up on the surface of all land use types in a watershed during dry periods. Dry weather loading is dominated by nuisance flows from urban land use activities such as car washing, sidewalk washing, and lawn over-irrigation, which pick up bacteria and deposit it into receiving waters. These types of nuisance flows are generally referred to as urban runoff. Because the relative loads from bacteria sources vary significantly between wet weather events and dry weather conditions, distinct modeling platforms for dry and wet weather analysis were used to assess bacteria loading and TMDLs.

Bacteria sources were quantified by land-use type since bacteria loading can be highly correlated with land-use practices. Some land use types, such as low and high density residential, produce high concentration of bacteria while other land use types such as military produce relatively smaller concentrations of bacteria. Bacteria loads attributable to point sources are discharged in urban runoff from the following land use types:

- Low Density Residential;
- High Density Residential;
- Commercial/Institutional;
- Industrial/Transportation (excluding areas owned by the California Department of Transportation, or Caltrans)
- Caltrans;
- Military;
- Parks/Recreation; and
- Transitional (construction activities).

[1] This Basin Plan issue ranked seventh on the 2004 Triennial Review list of priority projects.
[2] A discussion of the SWRCB and San Diego Water Board Orders regulating point source discharges of bacteria is presented in the Implementation Plan, section 11.

These land use types were classified as generating point source loads because, although the bacteria sources on these land use types may be diffuse in origin, the pollutant loading is transported and discharged to receiving waters through MS4s. The principal MS4s contributing bacteria to receiving waters are owned or operated by either municipalities located throughout the watersheds or Caltrans. For this reason, separate wasteload allocations were developed for the municipalities and Caltrans for each watershed. The wet weather wasteload allocations for Caltrans were determined by taking a portion of the bacteria load generated from the industrial transportation land uses in each watershed proportional to the percent of the industrial/transportation land use area occupied by the impermeable surfaces of Caltrans owned highways. Dry weather loads from Caltrans highways were assumed to be insignificant because during dry periods, there is no significant urban runoff from Caltrans owned roadways.

Bacteria loads attributable to nonpoint sources are discharged in stormwater runoff from the following land use types:

- Agriculture;
- Dairy/Intensive Livestock;
- Horse Ranches;
- Open Recreation;
- Open Space; and
- Water.

These land use types were classified as generating nonpoint source loads because the loads are discharged in overland stormwater runoff that is diffuse in origin, and are largely located in areas without constructed (man-made) MS4s or in areas upstream of MS4 networks. One exception is that several dairies in these watersheds are regulated as point source discharges pursuant to NPDES requirements.

Nonpoint sources were separated into controllable and uncontrollable categories. Controllable nonpoint sources are identified by land use types and coverages. Controllable sources include those found in the following land-use types: agriculture, dairy/intensive livestock, and horse ranches. These were considered controllable because the land uses are anthropogenic in nature, and load reductions can be reasonably expected with the implementation of suitable management measures. For implementation purposes, controllable nonpoint source discharges were recognized as originating from agriculture, livestock, and horse ranch facilities. Because these loads are controllable, these nonpoint source discharges were given LAs and in watersheds where these loads were greater than 5 percent of the total load, were required to reduce their bacteria loads.

Uncontrollable nonpoint sources include loads from open recreation, open space, and water land uses. Loads from these areas are considered uncontrollable because they come from mostly natural sources (e.g. bird and wildlife feces). LAs from these land uses were calculated, but there are no accompanying load reductions required since these sources are largely uncontrollable, are nonanthropogenic, and regulation is not warranted.

1.3 Linkage Analysis

The technical analysis of pollutant loading from watersheds, and the waterbody response to this loading is referred to as the linkage analysis. The purpose of the analysis is to quantify the maximum allowable bacteria loading to each impaired waterbody resulting in attainment of WQOs. This value is in fact, the TMDL. Because the final numeric targets are set equal to the numeric WQOs for bacteria, attainment of the numeric targets will result in attainment of WQOs. For these TMDLs, a distinction is made between wet weather events and dry weather conditions because bacteria loads differ between the two scenarios and implementation measures will be specific to wet and dry conditions. Two distinct models were used for calculating bacteria loads. One model specifically quantified loading during wet weather events. The other model quantified loading during dry conditions. Both current loading and TMDLs were calculated for each watershed under both wet weather events and dry weather conditions.

In this analysis, bacteria sources were linked to specific land use types with higher relative bacteria accumulation rates because they are more likely to deliver bacteria to waterbodies through stormwater collection systems. To assess the link between sources of bacteria and the impaired waters, a modeling system that simulates the build-up and wash-off of bacteria and the hydrologic and hydraulic processes that affect delivery was used. This approach assumes the following:

- All sources can be represented through build-up/wash-off of bacteria from specific land use types.
- The discharge of sewage is zero. Sewage spill information was reserved for use during the calibration process to account for observed spikes in bacteria indicators, as applicable; however, the calibration process did not necessitate removal of any wet weather data considered to be affected by sewage spill information. In other words, data from wet weather events used for calibration were not indicative of sewage spills.
- For numeric target assessment, the critical points were assumed to be the point upstream of where the creek/watershed or storm drain initially mixes with ocean water at the surf zone.

The wet weather approach chosen for use in this project is based on the application of the USEPA's Loading Simulation Program in C++ (LSPC) to estimate bacteria loading from streams and assimilation within the waterbodies. LSPC is a recoded C++ version of the USEPA's Hydrological Simulation Program–FORTRAN (HSPF) that relies on fundamental (and USEPA-approved) algorithms.

The density of bacteria in receiving water during dry weather is extremely variable in nature. Data collected from dry weather samples were used to develop empirical relationships that represent water quantity and water quality associated with dry weather runoff from various land uses. For each monitoring station, a watershed was delineated and the land use was related to flow and bacteria densities. A statistical relationship was established between streamflow, bacteria densities, and areas of each land use.

To represent the linkage between source contributions and in-stream response, a steady-state mass balance model was developed to simulate transport of bacteria in the impaired creeks and the creeks flowing to impaired shorelines. This predictive model represents the streams as a series of plug-flow reactors, with each reactor having a constant, steady-state flow and bacteria load. Bacteria densities in each segment were calculated using available water quality data, and assuming values for a first-order die-off rate, stream infiltration, basic channel geometry, and flow.

1.4 Allocation and Reduction Calculations

The calibrated models were used to simulate flow and bacteria densities for use in estimating existing bacteria loads to the impaired waterbodies. Current estimated loads were compared to TMDLs, and necessary reductions were quantified.

To ensure that WQOs are met in impaired waterbodies during wet weather events, a critical period associated with extreme wet conditions was selected for TMDL calculations. The year 1993 was selected as the critical wet period for assessment of extreme wet weather loading conditions because this year was the wettest year of the 12 years of record (1990 through 2002) evaluated in the TMDL analysis. This corresponds to the 92nd percentile of annual rainfalls for those 12 years measured at multiple rainfall gages in the San Diego Region.~~To ensure that WQOs are met in impaired waterbodies during wet weather events, a critical period associated with extreme wet conditions was selected for wet weather TMDL calculations. This critical wet condition was selected based as the 92nd percentile of annual rainfalls observed over the past 12 years (1990 through 2002) at multiple rainfall gages in the San Diego Region (wettest year of the past 12). The year 1993 was selected as the critical wet year for assessment of extreme wet weather loading conditions.~~

Estimation of current loading to the impaired waterbodies required use of the model to predict flows and bacteria densities. Transport processes of bacteria loads from the sources to the impaired waterbodies were simulated in the model with a first-order loss rate based on literature values.

For estimation of bacteria loading during wet weather events, simulations were performed using local rainfall data from 1993, the critical period. For interim TMDLs, the total number of days that numeric targets may be exceeded based on reference conditions, or allowable exceedance days, was calculated for each of the watersheds. Calculations were performed by multiplying the allowable exceedance frequency (0.22) by the number of wet days for the critical period.

Wet weather TMDLs and existing loads were calculated from modeled flow and bacteria densities for each watershed at a node in the model representing the watershed mouth. This model node is referred to as the critical point, since it represents the place in the watershed where the bacteria load from the watershed is discharged to the Pacific Ocean. Since the approach for TMDL calculation was identical for both impaired beaches and impaired creeks, one critical point was identified for each watershed model. The critical point in the model represents the lowest point in the watershed where creeks and storm drains discharge, and before mixing with the surf zone and dilution takes place. This critical point is considered to be a conservative location for assessment of water quality conditions, and is therefore selected based on high bacteria loads predicted at that location.

For each watershed, load-duration curves were produced for each indicator bacteria showing the daily loads ranked by the percentile of their associated flow magnitude. These plots formed the basis for the existing load and TMDL calculations as described below.

1. Calculation of load based on numeric targets – daily flows were multiplied by the representative numeric targets to create a numeric target line across the load-duration curves;
2. Calculation of daily exceedance loads – daily existing loads were ranked based on their associated flow percentile; daily loads above the numeric target line are in exceedance of the numeric target, while loads below the line do not cause the numeric target to be exceeded;
3. Determination of the allowable exceedance loads using reference system approach - sum of the highest daily exceedance loads (loads above the numeric target line) corresponding to the number of allowable exceedance days. The number of allowable exceedance days was equal to 22 percent of the wet days during the critical period of 1993;
4. Calculation of non-allowable exceedance loads - sum of the daily loads exceeding the numeric targets minus allowable exceedance loads from Step 3; and
5. Calculation of the required annual load reduction - non-allowable exceedance load minus allowable loads.

The existing wet weather loads and TMDLs were allocated to point sources and nonpoint sources as follows. Municipalities and Caltrans own and/or operate the MS4s within the watersheds and are regulated under different NPDES requirements. Therefore, separate wasteload allocations were developed for the municipalities and Caltrans for each watershed. The wet weather wasteload allocations for Caltrans were set equal to existing loads, since discharges from Caltrans were found to account for less than 1 percent of the total wet weather load in all watersheds.~~determined by taking a portion of the bacteria load generated from the industrial transportation land uses in each watershed proportional to the percent of the industrial/ transportation land use area occupied by the impermeable surfaces of Caltrans highways.~~

Nonpoint sources were separated into controllable and uncontrollable categories. Controllable nonpoint sources were identified by land use types and coverages. Controllable sources include those found in the following land-use types: agriculture, dairy/intensive livestock, and horse ranches. These sources are considered controllable because the practices associated with these land uses are anthropogenic in nature, and load reductions can be reasonably expected with the implementation of suitable management measures. For implementation purposes, controllable nonpoint source discharges were associated with agriculture, livestock, and horse ranch facilities.

Because these loads are controllable, these nonpoint source discharges were given LAs and in watersheds where these loads were greater than 5 percent of the total load, were required to reduce their bacteria loads (see section 10).

Uncontrollable nonpoint sources include loads from open recreation, open space, and water land uses. Loads from these areas are considered uncontrollable because they come from mostly natural sources (e.g. bird and wildlife feces) and the areas are located in parts of the watershed not likely to be drained by MS4 systems. Loads from these sources were quantified and incorporated into the wet weather TMDL calculations using the reference system approach. In the wet weather TMDLs, uncontrollable source loads were added to the TMDLs and do not take up the loading capacity of the receiving water.

There are two ways to incorporate the Margin of Safety (MOS; USEPA, 1991): (1) implicitly incorporate the MOS using conservative model assumptions to develop allocations and (2) explicitly specify a portion of the total TMDL as the MOS and use the remainder for allocations. For the wet weather bacteria TMDLs, an implicit MOS was incorporated through the use of conservative modeling assumptions. Conservative assumptions imply that worst case conditions exist in terms of current bacteria loading. For example, defining the location of the critical point as the point of cumulative discharge at the mouth of the watershed provides an MOS by ensuring that targets are met at increasing distances from the discharge, where dilution in the surf zone occurs.

Because dry weather loading was estimated as a function of steady-state flows derived from an analysis of average dry weather flows, there was no critical dry period identified. Dry weather days were selected based on the criterion that less than 0.2 inch of rainfall was observed on each of the previous 3 days. Based on analysis of dry weather flow, critical flows were predicted for each impaired watershed.

For each watershed the dry weather model was used to estimate the flows and bacteria densities resulting from dry weather urban runoff. Estimation of source loading was based on empirical relationships established between both flow and bacteria densities and land use distribution in the watershed. Transport of bacteria loads was simulated using standard plug-flow equations to describe steady-state losses resulting from first-order die-off and stream infiltration. Steady-state estimates of bacteria loads were assumed constant for all dry days. For consistency with the wet weather approach, dry days were assessed for the critical wet year, identified as 1993. Numeric targets for the dry weather analysis consisted of the geometric mean WQOs for indicator bacteria.

Consistent with the approach used for wet weather analysis, dry weather TMDLs were calculated based on modeled flow and bacteria density at the critical point, which represents the watershed mouth. As with the wet weather analysis, since the approach for TMDL calculation was identical for both beaches and creeks, one critical point was identified for each watershed model draining to an impaired waterbody.

For each modeled watershed discharging to an impaired waterbody, calculation of TMDLs and required load reductions were performed using the following steps:

1. Calculation of the TMDLs based on model-predicted flows multiplied by applicable numeric targets; and
2. Calculation of required load reductions based on the difference between TMDLs and current bacteria loads.

Unlike the wet weather approach, for the dry weather approach, the TMDLs were allocated solely to MS4 discharges as WLAs (no LA component was quantified). This is because dry weather bacteria loads are generated from urban runoff discharged to receiving waters via MS4s. The only discharge to receive a WLA was the municipal discharges; Caltrans did not receive a WLA. This is because Caltrans-owned areas (freeway surfaces) are unlikely to discharge bacteria to receiving waters during dry weather conditions because there is no flow source to wash bacteria off of Caltrans highways during dry weather.

An implicit MOS was incorporated through application of conservative assumptions throughout TMDL development. As with wet weather, conservative assumptions imply that worst case conditions exist in terms of current bacteria loading. An important conservative assumption was the identification of the 30-day geometric mean WQOs as TMDL numeric targets. Compliance with the 30-day geometric mean WQOs provides assurance that TMDLs will result in the protection of beneficial uses by stressing the importance of maintaining sustained safe levels of bacteria densities over all dry periods. Another conservative assumption was the definition of the critical point as the point of highest loading. Such conservativeness provides an MOS by ensuring that targets are met at increasing distances from the discharge, where dilution in the surf zone occurs.

The interim and final wet weather and dry weather TMDLs and allocations for each watershed are shown in the tables at the end of section 9 of this Technical Report.

1.5 Legal Authority for TMDL Implementation Plan

There is legal authority and a regulatory framework that empowers the San Diego Water Board to require dischargers to implement and monitor compliance with the requirements set forth in these TMDLs. As previously noted, bacteria are transported to impaired beaches and creeks through wet and dry weather runoff generated from human habitation and land use practices. Much of these bacteria discharges result from controllable water quality factors which are defined as those actions, conditions, or circumstances resulting from man's activities that may influence the quality of the waters of the State and that may be reasonably controlled. These TMDLs establish wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources for these controllable discharges.

The regulatory framework for point sources of pollution differs from the regulatory framework for nonpoint sources. CWA section 402 establishes the NPDES program to regulate the ‘‘discharge of a pollutant,’’ other than dredged or fill materials, from a ‘‘point source’’ into ‘‘waters of the U.S.” Under section 402, discharges of pollutants to waters of the U.S. are authorized by obtaining and complying with NPDES permits.

These permits commonly contain effluent limitations consisting of either Technology Based Effluent Limitations (TBELs) or Water Quality Based Effluent Limitations (WQBELs).

In California, State Waste Discharge Requirements (WDRs) for discharges of pollutants from point sources to navigable waters of the United States that implement federal NPDES requirements and CWA requirements (NPDES requirements) serve in lieu of federal NPDES permits. These are referred to as NPDES requirements. Such requirements are issued by the State pursuant to independent state authority described in California's Porter Cologne Water Quality Control Act.

Persons responsible for point source discharges of bacteria to beaches and creeks include municipal phase I urban runoff dischargers, municipal phase II urban runoff dischargers, Caltrans, publicly owned treatment works (POTWs), and concentrated animal feeding operations of a certain size that subject them to NPDES requirements (CAFOs). All but the phase II urban runoff discharges are regulated under NPDES requirements. Phase II urban runoff discharges in the San Diego Region have yet to be enrolled under the applicable NPDES requirements.

For each TMDL where nonpoint sources are determined to be significant, an LA is determined which is the maximum amount of a pollutant that may be contributed to a waterbody by "nonpoint source" discharges in order to attain WQOs. The Porter-Cologne Water Quality Control Act applies to both point and nonpoint sources of pollution and serves as the principle legal authority in California for the application and enforcement of TMDL LAs for nonpoint sources. The State plan and policy for control and regulation of nonpoint source pollution is contained in the *Plan for California's Nonpoint Source Pollution Control Program* (NPS Program Plan), and the *Policy for the Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (NPS Implementation and Enforcement Policy).

Controllable nonpoint sources that warrant regulation include, for example, runoff from agricultural facilities, nurseries, dairy/intensive livestock operations, horse ranches, septic systems, and manure composting and soil amendment operations not regulated under NPDES requirements. These activities are represented by land uses that comprise a significant area in the San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River watersheds. Wet weather bacteria loads generated from these land uses in these watersheds comprise more than 5 percent of the total wet weather bacteria load. Stormwater discharges from several agricultural and/or livestock facilities in the affected watersheds are regulated under WDRs. Those facilities not regulated under WDRs are subject to the terms and conditions of the Basin Plan Waste Discharge Requirement Waiver Policy (Waiver Policy).[3] This policy applies to discharges from agricultural irrigation return flow, nursery irrigation return flow, orchard irrigation return flow,

[3] The San Diego Water Board may waive issuance of WDRs for a specific discharge or types of discharge pursuant to CWC section13269 if such waiver is determined not to be against *(continued on next page)* the public interest. The waiver of WDRs is conditional and may be terminated at any time by the San Diego Water Board for any specific discharge or any specific type of discharge.

animal feeding operations, manure composting, ~~and~~ soil amendment operations, and septic systems. Individual landowners and other persons engaged in these land use activities can be held accountable for attaining bacteria load reductions in affected watersheds through enforcement of WDRs and the Waiver Policy.

Nonpoint source discharges from natural sources (bacteria deposition from aquatic and terrestrial wildlife, and bacteria bound in soil, humic material, etc.) are considered largely uncontrollable, and therefore should not be regulated. Bacteria discharged in runoff from open space and open recreation lands are examples of land uses that generate uncontrollable nonpoint bacteria sources.

1.6 Implementation Plan

The goal of the Implementation Plan is to ensure that WQOs[4] for indicator bacteria for beaches and creeks in the San Diego Region are attained and maintained throughout the waterbody and in all seasons of the year. WQOs are considered "attained" when the waterbody can be removed from the List of Water Quality Limited Segments. WQOs are considered "maintained" when, upon subsequent listing cycles, the waterbody has not returned to an impaired condition and gets re-listed on the List of Water Quality Limited Segments. Attaining and maintaining WQOs will be accomplished by implementing wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources. ~~The goal of the Implementation Plan is to ensure that WQOs[5] for indicator bacteria for beaches and creeks in the San Diego Region are attained and maintained throughout the waterbody and in all seasons of the year. This will be accomplished by dischargers achieving the wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources.~~

TMDL implementation plans are not currently required under federal law; however, federal policy is that TMDLs should include implementation plans. TMDL implementation plans are required under State law. Basin plans must have a program of implementation to achieve WQOs.[6] The implementation plan must include a description of actions that are necessary to achieve the objectives, a time schedule for these actions, and a description of surveillance to determine compliance with the WQOs.[7] State law requires that a TMDL include an implementation plan since a TMDL supplements, interprets, and/or refines existing water quality objectives. The TMDLs, LAs, and WLAs must be incorporated into the Basin Plan.[8]

[4] [40 CFR 131.38(b)(2)]
~~[5] [40 CFR 131.38(b)(2)]~~
[6] See Water Code section 13050(j). A "Water Quality Control Plan" or "Basin Plan" consists of a designation or establishment for the waters within a specified area of all of the following: (1) Beneficial uses to be protected, (2) Water quality objectives and (3) A program of implementation needed for achieving water quality objectives.
[7] See Water Code section 13242.

[8] See Clean Water Act section 303(e).

Because bacteria loads within urbanized areas generally originate from urban runoff discharged from MS4s, the primary mechanism for TMDL attainment will be increased regulation of these discharges. Persons whose point source discharges contribute to the exceedance of WQOs for indicator bacteria (as discussed in section 10) will be required to meet the WLAs in their urban runoff before it is discharged from MS4s to receiving waters. Caltrans, Municipal Dischargers (Phase I), and small MS4 dischargers (Phase II) are responsible for reducing bacteria loads in their urban runoff prior to discharge to impaired receiving waters, or tributaries thereto, because they own or operate MS4s that contribute to the impairment of receiving waters.

One WLA was assigned to the municipal discharges in each watershed. This WLA was not divided up among the various municipalities in each watershed. The municipal dischargers within each subwatershed are collectively responsible for meeting the WLA and required reductions in bacteria loads for these subwatersheds and for meeting all of the TMDL requirements. Because many municipalities reside and discharge into single watersheds, Lead Jurisdictions were designated to be responsible for submitting required reports on behalf of all dischargers within a single watershed (except Caltrans, who has its own set of requirements). Although only Lead Jurisdictions are responsible for submittals, all responsible municipalities are responsible for meeting required load reductions to achieve WLAs. Although allocations are distributed to the identified dischargers of bacteria, this does not imply that other potential sources do not exist. Any potential sources in the watersheds not receiving an explicit allocation described in this Technical Report is not permitted to discharge bacteria to the impaired beaches and creeks.

The bacteria TMDLs shall be implemented in a phased approach with a monitoring component to determine the effectiveness of each phase and guide the selection of BMPs. The waterbodies included in this project are numerous and diverse in terms of geographic location, swimmer accessibility and use, existence of shellfish harvesting, and degree of contamination. Dischargers accountable for attaining load reductions in multiple watersheds may have difficulty providing the same level of effort simultaneously in all watersheds. In order to address these concerns a scheme for prioritizing implementation of bacteria reduction strategies in waterbodies within watersheds was developed in conjunction with the Stakeholder Advisory Group (SAG). The prioritization scheme is largely based on the following criteria:

- Level of beach (marine or freshwater) swimmer usage;
- Existence of shellfish harvesting (for beaches);
- Frequency of exceedances of WQOs; and
- Existing programs designed to reduce bacteria loading to surface waters.

The SAG applied the above criteria and proposed a prioritization scheme for implementing bacteria reduction strategies in the impaired waters addressed in these TMDLs. Impaired waters were given a priority number of 1, 2, or 3 with 1 being the highest priority.

The compliance schedule (Table 1-2) for implementing the wasteload and load reductions required under these TMDLs is structured in a phased manner, with 100 percent of interim reductions necessary for protection of the REC-1 beneficial use required 10 years after OAL approval of this TMDL Basin Plan amendment. Final reductions to attain REC-1 ~~and SHELL~~ WQOs will be required after 12 years. ~~Interim reductions required by the compliance schedule vary on the timeline based on the priority scheme described above. Interim reductions in bacteria wasteloads are required sooner in the higher priority waters.~~

The San Diego Water Board identified a Basin Plan issue in the 2004 Triennial Review of the Basin Plan[9] to authorize a reference system exceedance frequency or frequencies for implementing the single sample indicator bacteria WQOs. When this proposed amendment is incorporated into the Basin Plan, the final REC-1 TMDLs, allocations and reductions will be recalculated based on an appropriate exceedance frequency or frequencies. If the recalculated REC-1 reductions are similar to the interim REC-1 reductions, then final compliance will be required within 10 years of OAL approval of this TMDL rather than within 12 years.

The requirements for meeting final total coliform reductions to attain SHELL WQOs will vary depending on if shellfish harvesting is taking place at each watershed mouth. For areas where shellfish harvesting is known to occur or suspected of occurring, dischargers will be required to meet bacteria reductions within 12 years. For areas where shellfish harvesting is known not to occur, dischargers will be required to meet bacteria reductions within 17 years. Shellfishing determinations must be made by execution of special studies or surveys.

[9] *Prioritized List of Basin Plan Issues for Investigation from September 2004 to September 2007* (Attachment 1 to Resolution No. R9-2004-0156).

Table 1-2. Compliance Schedule and Interim Goals for Achieving Wasteload Reductions

Compliance Year (year after OAL approval)	Required Wasteload Reduction		
	Priority 1	Priority 2	Priority 3
1			
2			
3			
4			
5	50% (Interim REC-1)		
6		50% (Interim REC-1)	
7			50% (Interim REC-1)
8			
9			
10	100% (Interim REC-1)	100% (Interim REC-1)	100% (Interim REC-1)
12	100% (Final REC-1, SHELL)	100% (Final REC-1, SHELL)	100% (Final REC-1, SHELL)
17*	100% (SHELL)	100% (SHELL)	100% (SHELL)

*Dischargers have an additional 5 years to meet WQOs for SHELL if surveys show that shellfishing is not occurring.

Dischargers are expected to plan and implement bacteria load reduction BMPs immediately with all necessary bacteria load reductions being achieved within 10-~~12~~ 17 years. The first four years of the compliance schedule do not require any load reductions from current conditions. These years will provide the dischargers time to identify sources, develop plans, and implement enhanced and expanded BMPs capable of achieving the mandated decreases in bacteria densities in the impaired beaches and creeks.

Because dischargers in the Chollas Creek watershed will be addressing required load reductions from multiple water quality improvement projects in addition to bacteria, namely TMDLs for copper, lead, zinc, and diazinon, and a trash reduction program, the compliance schedule is 20 years to achieve the necessary load reductions for all pollutants in this watershed. This tailored compliance schedule requires comprehensive BMP planning and load reductions for all impairing pollutants as described in Total Maximum Daily Loads for Dissolved Copper, Lead, and Zinc in Chollas Creek, Tributary to San Diego Bay.

The TMDLs will be implemented primarily by reissuing or revising the existing NPDES requirements for MS4 discharges to include WQBELs that are consistent with the assumptions and requirements of the bacteria WLAs for MS4 discharges. The process for issuance of NPDES requirements is distinct from the TMDL process, and is described in section 11.5.1. WQBELs for municipal stormwater discharges can be either numeric or non-numeric. Non-numeric WQBELs typically are a program of expanded or better-tailored BMPs. The USEPA expects that most WQBELs for NPDES-regulated municipal discharges will be in the form of BMPs, and that numeric limitations will be used only in rare instances.[10] WQBELs can be incorporated into NPDES requirements for MS4 discharges by reissuing or revising these requirements.

The Phase I Municipal Dischargers in San Diego and Orange County are required under Receiving Water Limitation A.3.a.1, and C.2[11] of Order Nos. R9-2007-0001 and R9-2002-0001, respectively, (San Diego County and Orange County MS4 NPDES requirements) to implement additional BMPs to reduce bacteria discharges in impaired watersheds to the maximum extent practicable and to restore compliance with the bacteria WQOs. The Municipal Dischargers should be implementing the provisions of Receiving Water Limitations A.3.a.1 and C.2 with respect to their bacteria discharges into water quality limited segments.

In addition to enforcing the provisions of the Receiving Water Limitations, the San Diego Water Board shall reissue or revise Order Nos. R9-2007-0001 and R9-2002-0001, to incorporate WQBELs consistent with the assumptions and requirements of the bacteria WLAs, and requirements for monitoring and reporting. In those orders, the Phase I Municipal Dischargers are referred to as “copermittees.”[12] WQBELs and other requirements implementing the TMDLs could be incorporated into these NPDES requirements upon the normal renewal cycle or sooner, if appropriate. Likewise, the San Diego Water Board shall request that the SWRCB reissue or revise Order No. 99-06 (the Caltrans Stormwater NPDES requirements), to include requirements to implement the TMDL.

The NPDES requirements for urban runoff discharges for both the municipalities and Caltrans shall include the following:

a. WQBELs consistent with the requirements and assumptions of the bacteria WLAs and a schedule of compliance applicable to the MS4 discharges into

[10] EPA Memorandum entitled “Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs,” dated November 22, 2002.

[11] Receiving Water Limitations A.3.a.1 of Order No. R9-2007-0001 and C.2 of Order No. R9-2002-0001 provide that “[u]pon a determination by either the Copermittee or the San Diego Water Board that MS4 discharges are causing or contributing to an exceedance of an applicable water quality standard, the Copermittee shall promptly notify and thereafter submit a report to the San Diego Water Board that describes BMPs that are currently being implemented and additional BMPs that will be implemented to prevent or reduce any pollutants that are causing or contributing to the exceedance of water quality standards. The report may be incorporated in the annual update to the Jurisdictional Urban Runoff Management Plan unless the San Diego Water Board directs an earlier submittal. The report shall include an implementation schedule. The San Diego Water Board may require modification to the report.”

[12] Copermittees own or operate MS4s through which urban runoff discharges into waters of the U.S. within the San Diego Region. These MS4s fall into one or more of the following categories: (1) a medium or large MS4 that services a population of greater than 100,000 or 250,000 respectively; or (2) a small MS4 that is “interrelated” to a medium or large MS4; or (3) an MS4 which contributes to a violation of a water quality standard; or (4) an MS4 which is a significant contributor of pollutants to waters of the United States.

impaired beaches and creeks, or tributaries thereto. At a minimum, WQBELs shall include a BMP program of expanded or better-tailored BMPs to attain the WLAs in accordance with the compliance schedule in Table 1-2 of this Technical Report.

b. If the WQBELS consist of BMP programs, then the reporting requirements shall consist of annual progress reports on BMP planning, implementation, and effectiveness in attaining the WQOs in impaired beaches and creeks, and annual water quality monitoring reports. Reporting shall continue until the bacteria WQOs are attained in impaired beaches and creeks. The first progress report shall consist of a Bacteria Load Reduction Plan. Bacteria Load Reduction Plans must be specific to each impaired waterbody, which fall into one of three types: impaired beach with tributary impaired creek, impaired beach with unimpaired tributary creek, and impaired beach with no tributary creek. Monitoring strategies and choice of compliance points should reflect the type of impaired waterbody involved. The Bacteria Load Reduction Plan must include the following components:

- Description of existing BMPs in each affected watershed;
- Discussion of effectiveness of existing BMPs and method(s) of evaluation;
- Description of additional BMPs that will be utilized to meet the required load reductions and compliance schedule;
- Description of locations where BMPs would be located;
- Discussion of why these locations are appropriate; and
- Effectiveness measures.

Bacteria Load Reduction Plans must have monitoring components that:

- Have the capability to measure receiving water quality and assess compliance with WQOs;
- Provide information showing whether or not wasteload reductions are being met;
- Locate anthropogenic bacteria hotspots;
- Identify and characterize anthropogenic bacteria sources;
- Identify the number and location of sampling sites and provide justification for each;
- Describe the frequency of measurements, the bacteria indicators being measured, and the justification for each.

Subsequent reports should describe the effectiveness of implementing the Bacteria Load Reduction Plan. Methods used for assessing effectiveness should include the following or their equivalent: surveys, pollutant loading estimations, and receiving water quality monitoring. The long-term strategy should also discuss the role of monitoring data in substantiating or refining the assessment. Once WQOs have been attained, a reduced level of monitoring may be appropriate.

If NPDES requirements are not likely to be issued, reissued or revised within 6 months of OAL approval of these TMDLs, the San Diego Water Board may issue an investigative/monitoring order to dischargers pursuant to sections 13267 or 13383 of the Water Code. This order would require BMP planning and receiving water quality monitoring in adherence to performance measures described above.

The Bacteria Load Reduction Plans may be re-evaluated at set intervals (such as 5-year renewal cycles for NPDES requirements, or upon request from named dischargers, as appropriate and in accordance with the San Diego Water Board priorities). Plans may be iterative and adaptive according to assessments and any special studies.

As part of Phase II of the municipal stormwater program, the SWRCB adopted General NPDES requirements for the discharge of urban runoff from small MS4s (SWRCB Order No. 2003-0005-DWQ). This order provides NPDES requirements for smaller municipalities, including non-traditional, small MS4s, which are governmental facilities such as military bases, public campuses, and prison and hospital complexes.

Order No. 2003-0005-DWQ requires the Phase II small MS4 dischargers to develop and implement a Stormwater Management Plan/Program with the goal of reducing the discharge of pollutants to the maximum extent practicable (MEP). The San Diego Water Board shall require owners and operators of small MS4s in the watersheds subject to these TMDLs to submit Notices of Intent[13] to comply with requirements of Order No. 2003-0005-DWQ. Once enrolled under the order, small MS4 owners and operators shall be required to comply with the provisions of the order to reduce the discharge of bacteria to the MEP as specified in their Stormwater Management Plans/Programs.

In the San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River watersheds, significant bacteria loads come from nonpoint sources in addition to wasteloads discharged from MS4s. In these watersheds, load reductions from agriculture, livestock, and horse ranch facilities will be needed to meet bacteria WQOs. The San Diego Water Board will implement the load reductions in these watersheds by enforcing facility specific WDRs and the Waiver Policy with respect to waivers for discharges of waste from agricultural, nursery, and orchard irrigation return flow, animal feeding operations, ~~and~~ manure composting and soil amendment operations, and septic systems. In addition, for any discharges not regulated by WDRs or covered by, or not in compliance with the Waiver Policy, the San Diego Water Board will pursue a Third-Party regulatory-based approach to implement the bacteria load reductions assigned to nonpoint sources. The Third-Party regulatory approach is a key feature of California's NPS Implementation and Enforcement Policy.

Under a third-party agreement with the San Diego Water Board, a coalition of dischargers, in cooperation with a third-party representative, organization, or government

[13] The Notice of Intent, or NOI, is attachment 7 to Order No. 2003-0005-DWQ.

agency, could formulate and implement their own nonpoint source pollution control programs. The third-party role is restricted to entities that are not being regulated by the SWRCB or Regional Water Boards under the action necessitating the third-party agreement. Third parties may include non-governmental organizations (such as the Farm Bureau), citizen groups, industry groups (including discharger groups represented by entities that are not dischargers), watershed coalitions, government agencies (such as cities or counties), or any mix of the above.

Under third party agreements, the San Diego Water Board could conditionally waive regulation of bacteria pollution sources based on the existence of an adequate pollution control program that adequately addresses the sources. Similarly, the San Diego Water Board could adopt individual or general WDRs for discharges that build upon third-party agreements. These WDRs could, for example, require that the dischargers either participate in an acceptable third-party program, or alternatively, submit individual pollution control plans that detail how they will comply with the WDRs. Likewise, the San Diego Water Board could adopt waste discharge prohibitions that include exceptions based on third-party pollution control programs. For example, the San Diego Water Board could except from the discharge prohibition those discharges that are adequately addressed in an acceptable third-party pollution control program. Failure by any single discharger to participate in their respective organization/agency program could result in more stringent regulation of that discharge by the San Diego Water Board through adoption of facility specific WDRs or enforcement actions.

The San Diego Water Board can also ensure implementation of the bacteria TMDLs by taking enforcement actions, and recommending high prioritization of TMDL implementation projects for grant funds. Enforcement action could be taken against any discharger failing to comply with applicable waiver conditions, WDRs, or discharge prohibitions. The San Diego Water Board could take enforcement actions to control the discharge of bacteria to impaired beaches and creeks, to attain compliance with the bacteria WLAs specified in this Technical Report, or to attain compliance with the bacteria WQOs. The San Diego Water Board may also terminate the applicability of waivers and issue WDRs or take other appropriate action against any discharger(s) failing to comply with the waiver conditions. The San Diego Water Board shall recommend that the SWRCB assign a high priority to awarding grant funding for projects to implement the bacteria TMDLs. Special emphasis should be given to projects that can achieve quantifiable bacteria load reductions consistent with the specific bacteria TMDL WLAs and LAs.

The San Diego Water Board will also investigate and process a Basin Plan amendment authorizing a reference system approach for implementing single sample WQOs as described in section 1.1 of this Executive Summary. Adoption of this proposed Basin Plan amendment would eliminate the requirement to meet the more stringent final TMDLs.

The San Diego Water Board recognizes that there are potential problems associated with using bacteriological WQOs to indicate the presence of human pathogens in receiving waters free of sewage discharges. The indicator bacteria WQOs were developed, in part, based on epidemiological studies in waters with sewage inputs. The risk of contracting a water-born illness from contact with urban runoff devoid of sewage, or human-source bacteria is not known. As information is gathered, initiating special studies to understand the uncertainties between bacteria levels and bacteria sources within the watersheds may be useful. Specifically, continuing research may be helpful to answer the following questions:

- What is the risk of illness from swimming in water contaminated with urban/stormwater runoff devoid of sewage?
- Do exceedances of the bacteria water quality objectives from animal sources (wildlife and domestic) increase the risk of illness?
- Are there other, more appropriate surrogates for measuring the risk of illness than the indicator bacteria WQOs currently used?

Addressing these uncertainties is needed to maximize effectiveness of strategies to reduce the risk of illness, which is currently measured by indicator bacteria concentrations. Dischargers may work with the San Diego Water Board to determine if such special studies are appropriate. Additionally, the San Diego Water Board supports the idea of measuring pathogens (the agents causing impairment of beneficial uses) rather than indicator bacteria (surrogates for pathogens). However, as stated previously, indicator bacteria have been used to measure water quality historically because measurement of pathogens is both difficult and costly. The San Diego Water Board is supportive of any efforts by the scientific community to perform epidemiological studies and/or investigate the feasibility of measuring pathogens directly. Ultimately, TMDLs will be recalculated if WQOs are modified due to results from future studies.~~Ultimately, TMDLs will be recalculated if WQOs are modified due to results from new epidemiological studies in the future.~~

~~*1.7Environmental Review*~~

~~The San Diego Water Board must comply with the California Environmental Quality Act (CEQA) when amending the Basin Plan.[14] The CEQA process requires the San Diego Water Board to analyze and disclose the potential adverse environmental impacts of the reasonably foreseeable methods of compliance with a Basin Plan amendment it is initiating or approving. The San Diego Water Board's Basin Plan amendment process must consider alternatives to the Basin Plan amendment to lesson or eliminate potentially significant environmental impacts, develop proposals to mitigate or avoid environmental impacts to the extent feasible, and involve the public and other public agencies in the evaluation process.~~

~~The San Diego Water Board's Basin Plan amendment process is certified by the Secretary of the Resources Agency as "functionally equivalent" to the CEQA process and is therefore exempt from the CEQA's requirements to prepare an EIR, Negative~~

[14] Public Resources Code section 21080.

~~Declaration, or Initial Study.[15] The SWRCB CEQA implementation regulations[16] require the following documents for Basin Plan amendment actions; a written report, an initial draft of the Basin Plan amendment and an Environmental Checklist Form.[17] This report fulfills the requirements of the CEQA for preparation of environmental documents for this TMDL Basin Plan amendment.~~

~~CEQA provisions require that the San Diego Water Board perform an environmental analysis of the reasonably foreseeable methods of compliance with the WLA and LA prior to the adoption of the TMDL Basin Plan amendment. The San Diego Water Board must provide an environmental analysis including at least the following:[18]~~

- ~~A summary of the proposed TMDL Basin Plan amendment;~~
- ~~An analysis of the reasonably foreseeable environmental impacts of the implementation methods that may be employed to comply with the TMDL Basin Plan Amendment. The Environmental Checklist Form[19] was used to identify environmental impacts;~~
- ~~An analysis of the reasonably foreseeable feasible mitigation measures relating to those environmental impacts; and~~
- ~~An analysis of reasonably foreseeable alternatives to the proposed TMDL Basin Plan amendment.~~

~~The San Diego Water Board's method of analysis to identify environmental impacts associated with the TMDL is similar to a "tiering"[20] approach used to provide increased efficiency in the CEQA process. The San Diego Water Board limited its analysis in this document to the broad environmental issues at the Basin Plan amendment "performance standard" adoption stage that are ready for decision. The San Diego Water Board is not required, at the Basin Plan amendment adoption stage, to evaluate environmental issues associated with specific projects to be undertaken later to comply with the performance standard.[21] CEQA provisions allow for project level environmental considerations to be deferred so that more detailed examination of the effects of these projects in subsequent CEQA environmental documents can be made by the appropriate lead agency.[22]~~

[15] 14 CCR section 15251(g).
[16] 23 CCR section 3720 et seq. "Implementation of the Environmental Quality Act of 1970."
[17] 23 CCR section 3776.
[18] Public Resources Code section 21159.4
[19] 23 CCR section 3777.
[20] Public Resources Code section 21068.5
[21] Public Resources Code sections 21159 through 21159.4, and 14 CCR section 15187. See also the legislative intent in Public Resources Code section 21156, and the statutes regarding "tiered" environmental review in Public Resources Code sections 21068.5, and 21093-21094.
[22] Public Resources Code section 21067. "Lead Agency" means the public agency, which has the principal responsibility for carrying out or approving a project. The Lead Agency will decide whether an EIR or Negative Declaration will be required for the project and will cause the document to be prepared.

~~The most reasonably foreseeable methods of compliance with the wasteload and load reductions of these TMDLs are for dischargers to implement structural and non-structural best management practices (BMPs) for point source discharges, and management measures (MMs) for nonpoint sources. Typical BMPs and MMs that may be chosen by dischargers to comply with the load and wasteload reductions are divided into non-structural and structural controls. Non-structural controls include education and outreach, road and street maintenance, storm drain cleaning, and BMP inspection and maintenance, manure fertilizer management plans, and sizing and location of manure composting and storage facilities. Structural controls include buffer strips and vegetated swales, bioretention, infiltration trenches, sand filters, diversion systems, animal exclusion, and animal waste treatment lagoons.~~

~~Potentially significant environmental impacts associated with implementing the controls discussed above, and appropriate mitigation for those impacts are discussed in the Environmental Checklist Form. The potentially significant environmental impacts identified in the checklist are caused by construction and/or operation activities associated with implementing structural controls. Potentially significant environmental impacts for which mitigation may be needed were identified in the areas of aesthetics, air quality, biological resources, hydrology/water quality, and noise. The implementation of TMDLs will provide an overall environmental benefit through the improvement in water quality. Future environmental documents prepared for specific control projects will identify site-specific environmental impacts and appropriate mitigation measures.~~

~~Reasonable alternatives to the Basin Plan amendment include no action, and delaying adoption of the TMDLs until the San Diego Water Board adopts a Basin Plan amendment authorizing a reference system approach for the implementation of the single sample bacteria WQOs. The "no action" alternative does not comply with the CWA, is inconsistent with the mission of the San Diego Water Board, and does not meet the purpose of the proposed TMDL Basin Plan Amendment. The reference system Basin Plan amendment alternative is not recommended because the San Diego Water Board has ample time (12 years) to investigate and adopt such an amendment before the final TMDL reductions are required. Further, because the interim TMDLs were calculated using a reference system exceedance frequency and are likely to be similar to new final TMDLs calculated in accordance with a reference system Basin Plan amendment, the interim TMDLs should be implemented immediately.~~

~~*1.8Economic Analysis*~~

~~The CEQA required environmental analysis of the reasonably foreseeable methods of compliance with the WLAs and LAs of these TMDLs must include an analysis of the economic costs of the methods of compliance.~~[23] ~~The proposed Basin Plan amendment does not include new WQOs but implements existing objectives to protect beneficial uses. The San Diego Water Board is therefore not required to do a formal cost-benefit analysis.~~

[23] See Public Resources Code section 21159(c).

~~As discussed in the previous section, the most reasonably foreseeable methods of compliance with this Basin Plan amendment is for dischargers to implement structural and non-structural controls to reduce bacteria loads in their discharges to surface waters. Additionally, dischargers will need to conduct surface water monitoring to evaluate the effectiveness of the controls they implement. The specific controls to be implemented for bacteria reduction will be chosen by the dischargers after adoption of this TMDL project. All costs are preliminary estimates only since particular elements of a control, such as type, size, and location, would need to be developed to provide a basis for more accurate cost estimations. Identifying the specific controls that dischargers will choose to implement is speculative at this time and the controls presented in this section serve only to demonstrate potential costs. Therefore, this section discloses typical costs of conventional controls for urban runoff, as well as monitoring program costs. The Implementation Plan for these TMDLs does not require additional controls for stormwater runoff from agriculture, livestock, and horse ranch facilities other than what is already required in existing WDRs for these facilities, and in the Waiver Policy. Therefore, there will be no additional costs to agricultural and livestock facility owners and operators to comply with these TMDLs.~~

~~Table 13-2 in section 13 summarizes the estimated costs of non-structural urban runoff controls. Table 13-3 summarizes for each watershed the estimated costs of the specific structural urban runoff BMPs that were evaluated for each watershed. The cost estimates for the structural controls are based on sizing the control to treat 10 percent of the urbanized area of each watershed. Tables 13-4 and 13-5 describe costs associated with implementing MMs for poultry, dairy, and horse operations, and BMPs for addressing runoff from fields with manure applications, respectively.~~

~~The Health and Safety Code already requires a monitoring and reporting program for indicator bacteria at ocean beaches throughout California during dry weather.[24] Thus, the dischargers will incur no additional costs for monitoring water quality at beaches from April 1 through October 31 (the required monitoring period). Water quality and flow monitoring for inland surface water, and storm drains will be required to measure the effectiveness of controls implemented by the dischargers to reduce bacteria loads. This additional monitoring will add to the costs of implementing these TMDLs.~~

1.7 Environmental Analysis, Environmental Checklist, and Economic Factors

The San Diego Water Board must comply with the California Environmental Quality Act (CEQA) when amending the Basin Plan as proposed in this project to adopt these TMDLs for bacteria in the San Diego Region. The SWRCB's CEQA implementation regulations[25] describe the environmental documents required for Basin Plan amendment actions. These documents consist of a written report that includes a description of the proposed activity, alternatives to the proposed activity to lesson or eliminate potentially

[24] Health and Safety Code section 15880 (Assembly Bill 411, Statutes of 1997, Chapter 765).

[25] 23 CCR section 3720 et seq. "Implementation of the Environmental Quality Act of 1970."

significant environmental impacts, and identification of mitigation measures to minimize any significant adverse impacts.

The analysis of potential environmental impacts is based on the numerous alternative means of compliance available for controlling bacteria loading to beaches and creeks in the San Diego Region. The majority of bacteria discharged into the 12 watersheds result from urban and stormwater runoff from a combination of point and nonpoint sources. Attainment of the WLAs will be achieved through discharger implementation of structural and non-structural Best Management Practices (BMPs) for point sources and management measures (MMs) for nonpoint sources. The BMP and MM control strategies should be designed to reduce bacteria loading in urban and stormwater runoff.

The CEQA[26] and CEQA Guidelines[27] require an analysis of the reasonably foreseeable environmental impacts of the methods of compliance with the TMDL Basin Plan amendment. The environmental checklist identifies the potential environmental impacts associated with these methods with respect to earth, air, water, plant life, animal life, noise, light, land use, natural resources, risk of upset, population, housing, transportation, public services, energy, utilities and services systems, human health, aesthetics, recreation, and archeological/historical concerns.

From the 61 reasonably foreseeable environmental impacts identified in the checklist, none were considered to be "Potentially Significant." Fifty-five were considered either "Less Than Significant with Mitigation" or "Less Than Significant." Ten were considered to have "No Impact" on the environment. In addition to the potential impacts mentioned above, mandatory finding of significance regarding short-term, long-term, cumulative, and substantial impacts were evaluated. Based on this review, the San Diego Water Board concluded that the potentially significant cumulative impacts can be mitigated to less than significant levels.

The CEQA requires an analysis of reasonably foreseeable alternative means of compliance with the rule or regulation, which would avoid or eliminate the identified impacts.[28] The dischargers can use the structural and non-structural BMPs and MMs or other structural and non-structural BMPs and MMs, to control and prevent pollution, and meet the TMDLs' required load reductions. The alternative means of compliance with the TMDLs consist of the different combinations of structural and non-structural BMPs and MMs that the dischargers might use. Since most of the adverse environmental effects are associated with the construction and installation of large scale structural BMPs, to avoid or eliminate impacts, compliance alternatives should minimize structural BMPs, maximize non-structural BMPs, and site, size, and design structural BMPs in ways to minimize environmental effects.

The environmental analysis required by the CEQA must also take into account a reasonable range of economic factors. Estimates of the costs of implementing the

[26] Public Resources Code section 21159(a)
[27] 14 CCR section 15187(c)
[28] 14 CCR section 15187 (c)(3)

reasonably foreseeable methods of compliance with the TMDL Basin Plan amendment are included. Specifically, this analysis estimates the costs of implementing the structural and non-structural BMPs which the dischargers could use to reduce bacteria loading. The cost estimates for non-structural BMPs ranged from $0 to $211,000. The cost estimates for treating 10 percent of the watershed with structural BMPs ranged from $50,000 to $973 million, depending on BMP selection, with yearly maintenance costs estimated from $10,000 to $68 million. Implementation of these TMDLs will also entail water quality monitoring which has associated costs. Assuming that a two-person sampling team can collect samples at 5 sites per day, the total cost for one day of sampling would be $2,274. The specific BMPs and MMs to be implemented will be chosen by the dischargers after adoption of these TMDLs. All costs are preliminary estimates since particular elements of a BMP and MM, such as type, size, and location, would need to be developed to provide a basis for more accurate cost estimations.

Finally, the environmental analysis must include an analysis of reasonable alternatives to the proposed activity. The proposed activity is a Basin Plan Amendment to incorporate bacteria TMDLs for the beaches and creeks in the San Diego Region. The purpose of this analysis is to determine if there is an alternative that would feasibly attain the basic objective of the rule or regulation (the proposed activity), but would lessen, avoid, or eliminate any identified impacts. The alternatives analyzed include taking no action, modifying water quality standards, and incorporating a Basin Plan amendment to establish a "Reference System Approach." Because these alternatives are not expected to attain the basic objective of the proposed activity at this point in time, the preferred alternative is the proposed activity itself, which is the Basin Plan amendment incorporating the bacteria TMDLs.

1.8 Necessity of Regulatory Provisions

Following SWRCB approval of this Basin Plan amendment establishing TMDLs, any regulatory portions of the amendment must be approved by the OAL. The SWRCB must include in its submittal to OAL a summary of the necessity[29] for the regulatory provision. Amendment of the Basin Plan to establish and implement bacteria TMDLs in affected watersheds in the San Diego Region is necessary because the existing water quality does not meet applicable numeric WQOs for indicator bacteria. Applicable State and federal laws require the adoption of this TMDL Basin Plan amendment and regulations to address the impairments.

Section 303(d) of the CWA requires the states to identify certain waters within their borders that are not attaining WQSs and to establish TMDLs for certain pollutants impairing those waters. CWA section 303(e) requires that TMDLs, upon USEPA approval, be incorporated into the State's Water Quality Management Plans, along with adequate measures to implement all aspects of the TMDL. CWC sections 13050(j) and

[29] "Necessity" means the record of the rulemaking proceeding demonstrates by substantial evidence the need for a regulation to effectuate the purpose of the statute, court decision, provision of law that the regulation implements, interprets, or makes, taking into account the totality of the record. For purposes of this standard, evidence includes, but is not limited to, facts, studies, and expert opinion. [Government Code section 11349(a)].

13242 require that basin plans have a program of implementation to achieve WQOs. State law requires that a TMDL project include an implementation plan because TMDLs normally are, in essence, interpretations or refinements of existing WQOs. The TMDLs have to be incorporated into the Basin Plan [CWA section 303(e)], and, because the TMDLs supplement, interpret, or refine existing objectives, State law requires a program of implementation.

1.9 Public Participation

Public participation is an important component of TMDL development. The federal regulations require that TMDL projects be subject to public review. All public hearings and public meetings have been conducted as stipulated in the regulations, for all programs under the CWA. Public participation was provided through two public workshops, numerous stakeholder group meetings and communications. Public participation also took place through the San Diego Water Board's Basin Plan amendment process, which included an additional public workshop, two hearings, and three formal public comment periods.

2 Introduction

Fecal bacteria originate from the intestinal flora of warm-blooded animals, and their presence in surface water is used as an indicator of human pathogens. Pathogens can cause illness in recreational water users and people who harvest and eat filter-feeding shellfish. Bacteria have been historically used as indicators of human pathogens because they are easier and less costly to measure than the pathogens themselves. Total Maximum Daily Loads (TMDLs) for indicator bacteria were developed to address ~~17~~ 19 of the 38 bacteria-impaired waterbodies in the San Diego Region, as identified on the *2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments*. This project, referred to as '*Project I- Beaches and Creeks in the San Diego Region*,' is one of two bacteria TMDL projects. Project II addresses bacteria impaired shorelines in San Diego Bay and Dana Point Harbor. Bacteria and other impairments in coastal lagoons will be addressed in TMDLs to be developed for the lagoons and their tributary watersheds.

According to section 303(d)(1)(A) of the Clean Water Act (CWA), "Each state shall identify those waters within its boundaries for which the effluent limitations…are not stringent enough to implement any water quality standard (WQS) applicable to such waters." The CWA also requires states to establish a priority ranking of Water Quality Limited Segments and to establish TMDLs for such waters.

This project involved calculating TMDLs for waterbodies located in 12 watersheds in the San Diego Region. These watersheds drain to the Pacific Ocean (with the exception of Chollas Creek, which flows to San Diego Bay) and include both urbanized and non-urbanized land areas. The waterbodies for which TMDLs were developed include ~~46~~ 47 impaired beach segments (coastal shoreline) and 5 creeks in the San Diego Region. These locations compose ~~17~~ 19 distinct locations identified on the List of Water Quality Limited Segments (multiple beach segments are included in each listing). This project is confined to creeks, coastal shorelines, and creeks discharging to shorelines. Creeks discharging to lagoons, bays, harbors, or creek mouths exhibiting lagoon-like characteristics, were not included. The waterbodies addressed in this project were added to the List of Water Quality Limited Segments on, or before, the 2002 listing cycle. No additional waterbodies are proposed for designation as water quality limited segments due to bacteria impairment in the draft update of the list released by the State Water Resources Control Board (SWRCB) in September 2005. In fact, water quality at several beach segments appears to meet WQOs, and the SWRCB has proposed these segments for removal from the list.

The purpose of a TMDL is to attain water quality objectives (WQOs) and restore and protect the beneficial uses of an impaired waterbody. TMDLs represent a strategy for meeting WQOs by allocating quantitative limits for point and nonpoint pollution sources. A TMDL is defined as the sum of the individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background [40 CFR 130.2] such that the capacity of the waterbody to assimilate pollutant loading (i.e., the loading capacity) is not exceeded.

The TMDL process begins with the development of a technical analysis which includes the following 7 components: (1) a **Problem Statement** describing which WQOs are not being attained and which beneficial uses are impaired; (2) identification of **Numeric Targets** which will result in attainment of the WQOs and protection of beneficial uses; (3) a **Source Analysis** to identify all of the point and nonpoint sources of the impairing pollutant in the watersheds and to estimate the current pollutant loading for each source; (4) a **Linkage Analysis** to calculate the **Loading Capacity** of the waterbodies for the pollutant; i.e., the maximum amount of the pollutant that may be discharged to the waterbodies without causing exceedances of WQOs and impairment of beneficial uses; (5) a **Margin of Safety** (MOS) to account for uncertainties in the analyses; (6) the division and **Allocation** of the TMDL among each of the contributing sources in the watersheds, wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint and background sources; and (7) a description of how **Seasonal Variation and Critical Conditions** are accounted for in the TMDL determination. The write-up of the above components is generally referred to as the technical TMDL analysis. The scientific basis of this TMDL has undergone external peer review pursuant to Health and Safety Code section 57-004. The California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) has considered and responded to all comments submitted by the peer review panel. The peer reviewer's comments and the San Diego Water Board's responses to comments are contained in Appendix A.

The **Implementation Plan** describes the pollutant reduction actions that must be taken by various dischargers to meet the allocations. A time schedule for meeting the required pollutant reductions is included in the Implementation Plan. The implementation provisions may also require studies by the dischargers to fill data gaps, refine the TMDLs, or modify compliance requirements. The dischargers will be ordered to conduct monitoring to assess the effectiveness of the implementation measures at meeting the load and waste load reductions.

Once established, the regulatory provisions of the TMDLs are incorporated into the *Water Quality Control Plan for the San Diego Basin (9)* or "Basin Plan" (San Diego Water Board, 1994). Typically, the San Diego Water Board, following a public comment period and hearing process, adopts a resolution amending the Basin Plan to incorporate the TMDLs, allocations, reductions, compliance schedule, and implementation plan. Basin Plan amendments, including TMDL amendments, must also undergo an evaluation of the environmental impacts of complying with the amendment, and an evaluation of the costs of complying with the amendment. As with any Basin Plan amendment involving surface waters, a TMDL amendment will not take effect until it has undergone subsequent agency approvals by the SWRCB and the Office of Administrative Law (OAL). The United States Environmental Protection Agency (USEPA) must also approve the amendment, however, it will take effect following approval by OAL. The tentative Resolution and draft Basin Plan amendment associated with this project is contained in Appendix B.

Following these approvals, the San Diego Water Board is required to incorporate the regulatory provisions of the TMDL into all applicable orders prescribing waste discharge requirements (WDRs), or other regulatory mechanisms. For point sources, the San Diego Water Board will issue, reissue or amend existing WDRs that implement National Pollutant Discharge Elimination System (NPDES) requirements. For nonpoint sources, the San Diego Water Board will issue, reissue, amend, or enforce WDRs, waivers of WDRs, or adopt discharge prohibitions. Water Quality Based Effluent Limits (WQBELs) for the impairing pollutant in the subject watersheds are incorporated in the appropriate WDRs to implement and make the TMDLs enforceable. WQBELs can consist of either numeric effluent limitations, or an iterative Best Management Practice (BMP) approach of expanded or better-tailored BMPs.

The final and most important step in the process is the implementation of the TMDLs by the dischargers. Per the governing WDR order (or other regulatory mechanism), each discharger must reduce its current loading of the pollutant to its assigned allocation in accordance with the time schedule specified in this Technical Report. When each discharger has achieved its required load reduction, WQOs for the impairing pollutants should be restored in the receiving waters.

Public participation has been a key element in the development of these TMDLs. The San Diego Water Board formed a Stakeholder Advisory Group (SAG), made up of key stakeholders to assist in the development of this Technical Report. The SAG was comprised of representatives from various disciplines and geographic locations. Representatives included municipal separate storm sewer system (MS4) owners/operators from all coastal watersheds in the San Diego Region included in this project, Publicly Owned Treatment Works (POTWs), environmental groups, California Department of Transportation (Caltrans), research and academia, agricultural interests, and business and industry interests.

All public hearings and public meetings have been conducted as stipulated in the regulations [40 CFR 25.5 and 40 CFR 25.6, respectively], for all programs under the CWA. Public participation was provided through two public workshops, numerous SAG meetings and communications. In addition, staff contact information was provided on the San Diego Water Board's web site, along with periodically updated drafts of TMDL project documents throughout the development process. Public participation also took place through the San Diego Water Board's Basin Plan amendment process, which included an additional public workshop, two hearings, and three formal public comment periods.

2.1 Technical Approach

The San Diego Water Board and the USEPA coordinated a watershed assessment and modeling study to support the development of TMDLs. In order to assist the San Diego Water Board in the development of the technical analysis, the USEPA used CWA section 106 funds to contract the environmental consulting firm, Tetra Tech, Inc. Tetra Tech provided the San Diego Water Board with technical assistance in calculating the TMDLs for the impaired waterbodies through the development of region-wide watershed models. Although beaches and creeks are separate systems with different WQOs, the technical approach for assessing both systems were identical.

Because the climate in southern California has two distinct hydrological patterns, two models were developed for estimating bacteria loads. One model specifically quantified loading during wet weather events (storms), which tend to be episodic and short in duration, and characterized by rapid wash-off and transport of very high bacteria loads from all land use types. The wet weather approach is consistent with the methodologies used for bacteria TMDL development for impaired coastal areas of the Los Angeles Region, specifically Santa Monica Bay beaches (Los Angeles Water Board, 2002) and also Malibu Creek (Los Angeles Water Board, 2003). In contrast, the dry weather model quantified bacteria loading during dry weather conditions. Dry weather loading was much smaller in magnitude, did not occur from all land use types, and exhibited less variability over time. In addition to estimating current loading, both models were used to estimate TMDLs for the two climate conditions for each watershed.

TMDLs are reported for interim and final phases. In the wet weather analysis, interim TMDLs were derived by applying a "reference system approach," which takes into account loading of bacteria from natural sources. The reference system approach allows exceedances of the single sample WQOs for water contact recreation (REC-1) beneficial uses. The purpose of the exceedance frequency is to account for the natural, and largely uncontrollable sources of bacteria (e.g. bird and wildlife feces, and re-suspension or re-growth at the beach) in the wet weather loads generated in the watersheds which can, by themselves, cause exceedances of the WQOs. Loads from these sources are natural and largely uncontrollable and therefore do not warrant regulation. In contrast, final TMDLs are based on numerical WQOs in the Basin Plan. The San Diego Water Board is investigating a possible amendment to the Basin Plan to incorporate authorization to implement the single sample bacteria WQOs using the reference system approach.[30] The reference system approach was not used for dry weather TMDL analysis because the dry weather TMDLs used the geometric mean WQOs as numeric targets. Exceedances of the geometric mean WQOs was not observed in reference systems under dry weather conditions.

In these TMDLs, WLAs were calculated for point source discharges and LAs were calculated for nonpoint source discharges. For wet weather, two WLAs were calculated for each watershed; one for Caltrans, where applicable, and one for municipal dischargers. LAs for wet weather were calculated for controllable sources consisting of discharges from agricultural and livestock land uses, and uncontrollable sources from open recreation and open space land uses, and water.

The low-flow, steady state model was used to estimate bacteria loads during dry weather conditions. The steady-state aspect of the model resulted in estimation of a constant bacteria load from each watershed. This load is representative of the average flow and bacteria loading conditions resulting from various urban land use practices (e.g., runoff from lawn irrigation or sidewalk washing).

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[30] A Basin Plan amendment to incorporate a reference system approach for implementation of the WQOs for bacteria is ranked seventh on the 2004 Triennial Review list of priority projects.

3 Problem Statement

Bacteria densities in the waters of the beaches and creeks addressed in this project have exceeded the numeric WQOs for total, fecal, and/or enterococci bacteria. Exceedances of WQOs for indicator bacteria are shown in the monitoring data for beach segments where such data exist. Other beaches were consistently posted with health advisories and/or closed. These exceedances and postings threaten and impair the water contact (REC-1), non-water contact (REC-2), and shellfish harvesting (SHELL) beneficial uses. REC-1 includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible, such as swimming or other water sports. REC-2 includes the uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. Examples include picnicking and sunbathing. SHELL includes uses of water that support habitats suitable for the collection of filter-feeding shellfish for human consumption, commercial, or sport purposes. All surface and marine waters in the Region are designated with both REC-1 and REC-2 beneficial uses. All marine waters in the Region (including coastal shorelines and embayments) are designated with REC-1, REC-2, and SHELL beneficial uses.

Although WQOs for REC-1, REC-2, and SHELL beneficial uses are written in terms of density of indicator bacteria colonies (most probable number of colonies per milliliter of water), the actual risk to human health is caused by the presence of disease-causing pathogens. When the risk to human health from pathogens in the water is so great that beaches are posted with health advisories or closure signs, or shellfish are unsafe to consume, the quality and beneficial use of the water are impaired. At present, measuring pathogens directly is difficult and expensive, and for this reason high concentrations of bacteria, which originate from the intestinal flora of warm-blooded animals, are used to indicate the presence of pathogens. For a discussion of the use of indicator bacteria to measure water quality and the presence of pathogens, see Appendix C.

Sources of bacteria under all conditions vary widely and include natural sources such as feces from aquatic and terrestrial wildlife, and anthropogenic sources such as sewer line breaks, illegal sewage disposal from boats along the coastline, trash, and pet waste. Once in the environment, bacteria also re-grow and multiply. Bacteria sources and their transport mechanisms to receiving waters are discussed in section 6.

3.1 Project Area Description

The beaches and creeks addressed in this analysis are in southern California, primarily in southern Orange and San Diego Counties. The beaches and creeks are located within or hydraulically downstream of five watersheds in Orange County (with a small portion in Riverside County) (Figure 3-1) and seven watersheds in San Diego County (Figure 3-2). Table 3-1 lists the watersheds that affect the bacteria-impaired waterbodies in the Region. Most of the waterways flow directly to the Pacific Ocean, except Chollas Creek, which flows to San Diego Bay. The combined watersheds cover roughly 1,730 square miles (4,480 square kilometers).

The climate in the Region is generally mild with annual temperatures averaging around 65°F near the coastal areas. Average annual rainfall ranges from 9 to 11 inches along the coast to more than 30 inches in the eastern mountains. There are three distinct types of weather in the Region. Summer dry weather occurs from late April to mid-October. During this period almost no rain falls. The winter season (mid-October through early April) has two types of weather; 1) winter dry weather when rain has not fallen for the preceding 72 hours, and 2) wet weather consisting of storms of 0.2 inches of rainfall and the 72 hour period after the storm. Eighty five to 90 percent of the annual rainfall occurs during the winter season (County of San Diego, 2000).

The land use of the Region is highly variable. The coastline areas are highly concentrated with urban and residential land uses, and the inland areas primarily consist of open space. Most of the area is open space or recreational land use (64.2 percent), followed by low-density residential (14.1 percent) and agriculture/livestock (12.4 percent) land uses. Other major land uses are commercial/institutional (3.0 percent), high-density residential (2.2 percent), industrial/transportation (1.6 percent), military (1.0 percent), transitional (0.8 percent), and water (0.7 percent).

3.2 Impairment Overview

The waterbodies included in this project were listed as impaired primarily because of non-attainment of the indicator bacteria WQOs associated with contact recreation. The beaches were listed as impaired based on monitoring data for total coliform, fecal coliform, and enterococci bacteria, or because the beaches were consistently posted with health advisories and/or closed.

For this study, a watershed-based approach was developed to calculate bacteria loadings for the impaired shoreline and creek segments. Table 3-1 lists the impaired waterbodies addressed in this study. The drainage areas of many of the watersheds that affect shoreline impairments are located above more than one impaired beach segment. Table 3-1 lists the watersheds (shown in Figures 3-1 and 3-2) that affect impaired waterbodies due to bacteria loadings. Appendix D provides a more detailed list of the waterbodies included in this project, including waterbody segment names and approximate length of impairment. Appendix E shows higher resolution maps of the impaired watersheds.

3.3 Applicable Water Quality Standards

Water quality standards consist of WQOs and beneficial uses. WQOs are defined under Water Code section 13050(h) as "limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water." Under section 304(a)(1) of the CWA, the USEPA is required to publish water quality criteria that incorporate ecological and human health assessments based on current scientific information. WQOs must be based on scientifically sound water quality criteria, and be at least as stringent as those criteria.

Table 3-1. Bacteria-Impaired Water Quality Limited Segments Addressed in This Analysis

Watershed	Type of Listing	Waterbody Name [a]	Drainage Area (mi^2)[b]
Laguna/San Joaquin	Shoreline	Pacific Ocean Shoreline, Laguna Beach HSA, San Joaquin Hills HSA	13.94
Aliso Creek	Creek, Shoreline	Aliso Creek, Aliso Creek (mouth), Pacific Ocean Shoreline, Aliso HSA	35.74
Dana Point	Shoreline	Pacific Ocean Shoreline, Dana Point HSA (Salt Creek)	8.89
San Juan Creek	Creek, Shoreline	San Juan Creek, San Juan Creek (mouth), Pacific Ocean Shoreline, Lower San Juan HSA	177.18
San Clemente	Shoreline	Pacific Ocean Shoreline, San Clemente HA	18.78
San Luis Rey River	Shoreline	Pacific Ocean Shoreline, San Luis Rey HU	560.42 (354.12)
San Marcos	Shoreline	Pacific Ocean Shoreline, San Marcos HA	1.43
San Dieguito River	Shoreline	Pacific Ocean Shoreline, San Dieguito HU (Bell Valley)	346.22 (292.24)
Miramar	Shoreline	Pacific Ocean Shoreline, Miramar Reservoir HA	93.73
Scripps	Shoreline	Pacific Ocean Shoreline, Scripps HA	8.75
San Diego River	Creek, Shoreline	Forester Creek, San Diego River (Lower), Pacific Ocean Shoreline, San Diego HU	436.48 (173.95)
Chollas Creek	Creek	Chollas Creek	26.80

Note: HSA = hydrologic subarea; HA = hydrologic area; HU = hydrologic unit

[a] Listed as impaired for exceedances of fecal coliform, and/or total coliform, and/or enterococci.

[b] The drainage area associated with the dry weather TMDLs are in parenthesis. The drainage areas associated with the wet weather TMDLs are without parenthesis. Some areas impound runoff during dry periods because these watersheds are above large reservoirs and lakes.

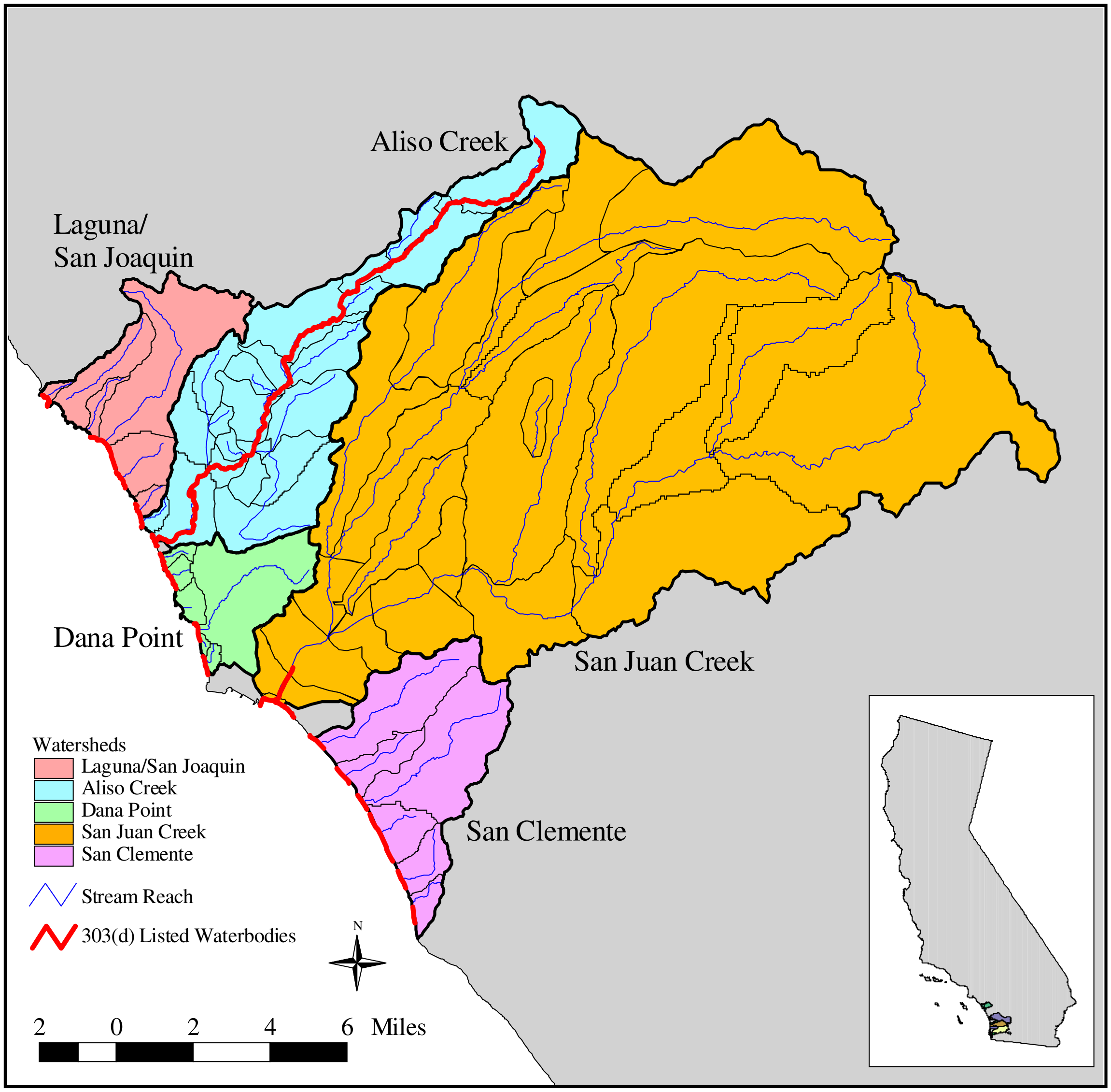


Figure 3-1. Watersheds of interest in Orange County.

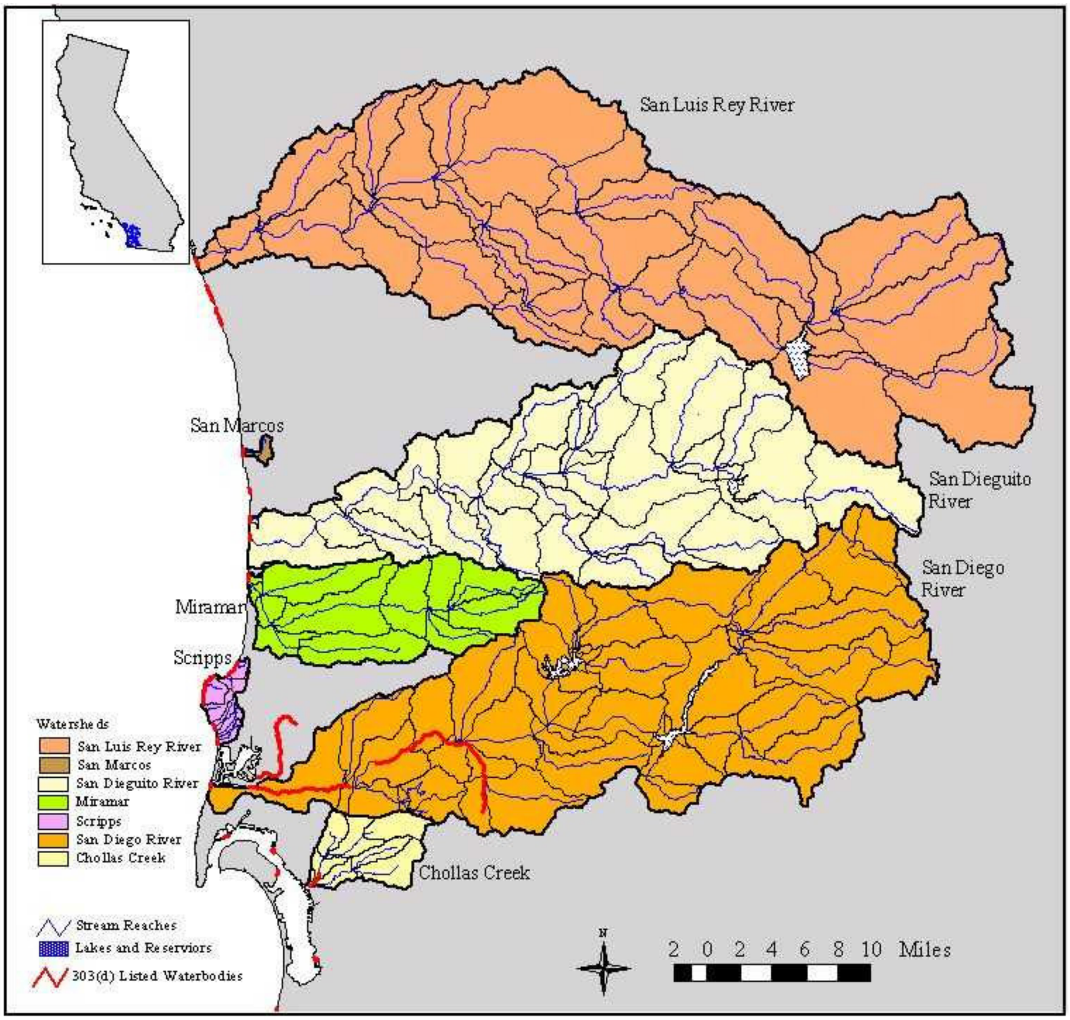


Figure 3-2. Watersheds of interest in San Diego County.

The Basin Plan and *Water Quality Control Plan for Ocean Waters of California* (Ocean Plan) identify beneficial uses and WQOs for the impaired waterbodies. Table 3-2 lists the beneficial uses for each of the impaired inland segments and the Pacific Ocean shoreline. The beneficial use designations are as follows:

- Municipal and domestic supply (MUN)
- Agricultural supply (AGR)
- Industrial process supply (PROC)
- Industrial water supply (IND)
- Ground water recharge (GWR)
- Freshwater replenishment (FRSH)
- Navigation (NAV)
- Hydropower generation (POW)
- Water contact recreation (REC-1)
- Non-contact recreation (REC-2)
- Commercial and sport fishing (COMM)
- Aquaculture (AQUA)
- Warm freshwater habitat (WARM)
- Cold freshwater habitat (COLD)
- Inland saline water habitat (SAL)
- Estuarine habitat (EST)

- Marine habitat (MAR)
- Wildlife habitat (WILD)
- Preservation and enhancement of "Areas of Special Biological Significance" (BIOL)
- Rare and endangered species (RARE)
- Migration of aquatic organisms (MIGR)
- Spawning, reproduction, and/or early development (SPWN)
- Shellfish harvesting (SHELL)

The REC-1 WQOs for indicator bacteria that are applicable to the Pacific Ocean shoreline are contained in the Ocean Plan (SWRCB, 2005). Those applicable to inland surface waters are contained in the Basin Plan. The objectives contained in both Plans are derived from water quality criteria promulgated by the USEPA in 1976, 1986, and 2004. Both the Ocean Plan and Basin Plan contain REC-1 objectives for total coliform, fecal coliform, and enterococci, and SHELL objectives for total coliform. In addition, the Basin Plan contains REC-1 objectives for *Escherichia coli* (*E. coli)* for inland surface waters.

For each type of bacteria, WQOs are expressed as the most probable number (MPN) of bacteria colonies per 100 mL of water sample. For a complete discussion of WQOs for each beneficial use and each type of waterbody, see Appendix F.

Table 3-2. Beneficial Uses of the Impaired Waters

Waterbody Type	Waterbody	Designated Uses
Creek	Aliso Creek	MUN,[a] AGR, REC-1,[b] REC-2, WARM, WILD
Creek	San Juan Creek	MUN,[a] AGR, IND, REC-1, REC-2, WARM, COLD, WILD
Creek	Forrester Creek	MUN,[b] IND, REC-1, REC-2, WARM, WILD
Creek	San Diego River, Lower	MUN,[a] AGR, IND, REC-1, REC-2, WARM, WILD, RARE
Creek	Chollas Creek	MUN,[a] REC-1,[b] REC-2, WARM, WILD
Coastal water	Pacific Ocean Shoreline	IND, NAV, REC-1, REC-2, COMM, BIOL, WILD, RARE, MAR, AQUA, MIGR, SPWN, SHELL

[a] The waterbody is exempted by the San Diego Water Board under terms and conditions of SWRCB Resolution No. 88-63, *Sources of Drinking Water Policy*.
[b] This use is listed as a potential beneficial use.

Source: San Diego Water Board, 1994.

4 Numeric Target Selection

When calculating TMDLs, numeric targets are established to meet WQOs and subsequently ensure the protection of beneficial uses. TMDLs were calculated for each impaired waterbody, for each indicator bacteria, for wet and dry weather, and for interim and final phases. The numeric targets used in the TMDL calculations were equal to the WQOs for bacteria for either REC-1 or SHELL beneficial uses, depending on the indicator (the WQOs for SHELL use are for total coliform, only).~~and/or waterbody. The numeric targets selected in the TMDL analysis depended partly on whether the impaired water body was a beach, a creek tributary to an impaired beach, or a creek tributary to an inland surface water body, enclosed bay or estuary. The reason that different numeric targets were needed for these three scenarios is because the Ocean Plan contains total coliform WQOs for SHELL and REC-1 beneficial uses at beaches, while the Basin Plan does not assign SHELL uses to inland surface waters, and the REC-1 beneficial use for inland surface waters does not have a WQO for total coliform.~~

Different dry weather and wet weather numeric targets were used because the bacteria transport mechanisms to receiving waters are different under wet and dry weather conditions. Single sample maximum WQOs were used as wet weather numeric targets because wet weather, or storm flow, is episodic and short in duration, and characterized by rapid wash-off and transport of high bacteria loads, with short residence times, from all land use types to receiving waters. Geometric mean WQOs were used as numeric targets for dry weather periods because dry weather runoff is not generated from storm flows, is not uniformly linked to every land use, and is more uniform than stormflow, with lower flows, lower loads, and slower transport, making die-off and/or amplification processes more important.

For impaired beaches, the numeric targets were equal to the total coliform, fecal coliform and enterococci WQOs for REC-1 in all cases except for the final numeric targets for total coliform. In this case the SHELL WQO was used because it is more stringent than the REC-1 WQOs for total coliform. Wet weather numeric targets were equal to the single sample maximum WQOs, while dry weather targets were equal to the geometric mean WQOs.

Numeric targets used to calculate TMDLs for beaches were also used to calculate TMDLs for impaired creeks (except where WQOs for creeks are more stringent). Even though beaches and creeks are separate waterbodies with slightly different WQOs, all creeks included in this project eventually discharge to beaches, and therefore beneficial uses applicable to beaches must be protected at creek mouths~~tributary to impaired beaches (Aliso Creek and San Diego River)~~. In other words, although SHELL is not a designated use in freshwater creeks and rivers, the total coliform density in these waters where they discharge to the Pacific Ocean must be protective of the SHELL use at the shorelines. Thus, the SHELL WQO for total coliform is the appropriate numeric target for the TMDLs for creeks and rivers even though they do not support SHELL use. Although REC-1 WQOs for fecal coliform and enterococci apply throughout the watersheds, the total coliform TMDLs must be met only at the bottom of the watershed where creeks and rivers discharge to the Pacific Ocean. ~~Even though these creeks are not designated with SHELL beneficial uses and there is no REC-1 objective for total coliform for inland surface waters in the Basin Plan, numeric targets for total coliform were selected for TMDL calculations for these creeks to ensure that the REC-1 and SHELL beneficial uses will be protected at the impaired downstream beach. For impaired creeks tributary to an inland surface water body or enclosed~~

~~bay or estuary (San Juan Creek,[31] Chollas Creek, and Forrester Creek), numeric targets were selected for fecal coliform and enterococci only.~~ Numeric targets for ~~each scenario (impaired beach, a creek tributary to an impaired beach, or a creek not tributary to an impaired beach)~~beaches and creeks are summarized in sections 4.1 and 4.2.

4.1 Wet Weather Targets: The Reference System Approach

Another difference between the wet weather and dry weather TMDL calculations, besides the use of single sample maximum WQOs versus geometric mean WQOs, is that the wet weather targets (during the interim period, only) are implemented in the TMDL by allowing a 22 percent exceedance frequency of the single sample WQOs for REC-1. The purpose of the exceedance frequency is to account for the natural, and largely uncontrollable sources of bacteria (e.g., bird and wildlife feces) in the wet weather loads generated in the watersheds and at the beaches which can, by themselves, cause exceedances of WQOs. Twenty-two percent is the frequency of exceedance of the single sample maximum WQO measured in a reference system in Los Angeles County. A reference system is a beach and upstream watershed that are minimally impacted by anthropogenic activities. The reference system approach also incorporates antidegradation principles in that, if water quality is better than that of the reference system in a particular location, no degradation of existing bacteriological water quality is permitted. The reference system approach was developed by the California Regional Water Quality Control Board, Los Angeles Region (Los Angeles Water Board), and is included in its Basin Plan as an implementation policy for single sample bacteria WQOs.[32]

4.1.1 Local Reference Conditions

The need to use a reference system approach in the San Diego Region was demonstrated by evaluating data from the mouth of San Mateo Creek and from San Onofre State Beach, both located in northern San Diego County (Figure 4-1). Although data from these areas was evaluated in this Technical Report to show that using the reference system approach was appropriate for these TMDLs, this data was not used to calculate an exceedance frequency. The data was collected by the San Diego County Department of Environmental Health (DEH) during routine monitoring as part of a wider beach-monitoring program. The data was not collected for purposes of characterizing a reference watershed and is not comparable to the data collected to characterize the reference beach used in the Santa Monica Bay and Malibu Creek TMDLs. Most of the San Mateo Creek watershed is open space (95 percent); minor areas are associated with agriculture (2 percent) and low-density residential (1 percent). The remaining land uses, which contribute less that two percent of the total area, include high-density residential, commercial/institutional, industrial/transportation, parks/recreation, open recreation, horse ranches, and transitional (construction activities). The watershed that drains to San Onofre State Beach is likewise mostly open space.

~~[31] San Juan Creek drains to an impaired lagoon, which drains to an impaired beach. The lagoon and adjacent beach are being addressed in a separate TMDL project. Therefore, numeric targets based on WQOs for SHELL beneficial uses are not needed for this waterbody to protect SHELL uses at the downstream beach.~~

[32] The Los Angeles Water Board used the Arroyo Sequit Watershed as the reference system watershed for development of TMDLs for the Santa Monica Bay beaches and Malibu Creek (Los Angeles Water Board, 2002 and 2003). This watershed, consisting primarily of unimpacted land use (98 percent open space), discharges to Leo Carillo Beach, where 22 percent of wet weather fecal coliform data (10 out of 46 samples) were observed to exceed the WQOs).

Water quality data provided by DEH (Table 4-1) from San Mateo Creek and San Onofre State Beach show that single sample WQOs for fecal coliform, total coliform, and enterococci are exceeded at a high enough frequency (from 17 to 50 percent depending on the indicator) to justify the use of the reference system approach in the San Diego Region. The DEH collected bacteria data at two stations located near the mouth of San Mateo Creek from 1999 through 2002 (Appendix G, No. 16). The monitoring data were separated based on their association with wet or dry conditions to better understand bacteria concentration variability during wet weather runoff verses dry weather runoff. To separate the data into two distinct groups, the wet period was defined to be consistent with the DEH's General Advisory to avoid contact with ocean and bay water within 300 feet on either side of any storm drain, river, or lagoon outlet. A wet period is specifically defined as periods of rainfall of 0.2 inch or more and the following 72 hours. For each monitoring station, sampling dates were compared to rainfall data collected at the closest rainfall gage (ALERT21) to determine whether bacteria samples had been collected during wet or dry periods (Appendix G, No. 23).

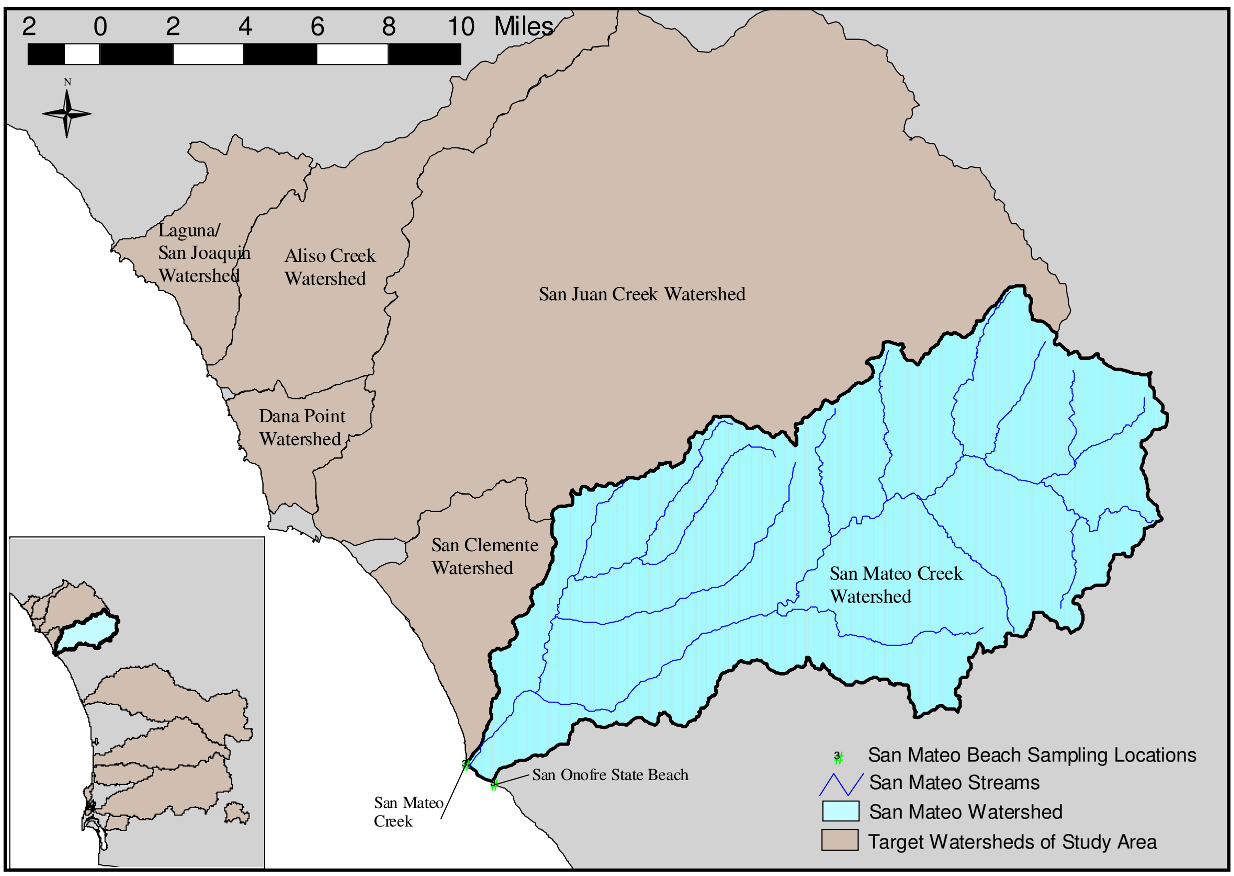


Figure 4-1. San Mateo watershed and San Onofre State Beach.

Table 4-1. Wet Weather Exceedances in Potential Reference Systems

Site ID	Location	Number of wet weather samples	Number of wet weather exceedances	Wet weather exceedance probability
Fecal Coliform				
EH-520	San Mateo Creek	6	2	33%
EH-510	San Onofre State Beach	5	2	40%
Total Coliform				
EH-520	San Mateo Creek	6	1	17%
EH-510	San Onofre State Beach	5	1	20%
Enterococci				
EH-520	San Mateo Creek	6	3	50%
EH-510	San Onofre State Beach	5	2	40%

Once the data for all stations were designated as wet or dry samples, they were compared to single sample WQOs for fecal coliform, total coliform, and enterococci at each station (Tables 4-1). ~~This~~ Although this data set is limited in size, the high percentage of exceedances suggests that during wet weather events, a reference system approach is appropriate for use in the San Diego Region.

The reference system approach was used to calculate wet weather TMDLs for the interim phase only. The final wet weather TMDLs must meet WQOs in the receiving water without application of a reference system approach because, at this time, the Basin Plan does not authorize the implementation of single sample bacteria WQOs using the reference system approach.

A Basin Plan amendment authorizing implementation of single sample bacteria WQOs using a reference system approach is being developed by the San Diego Water Board[33] under a separate effort from this TMDL project. The Basin Plan amendment authorizing a reference system approach is independent from any TMDL and will have its own public participation process. If this Basin Plan amendment is adopted by the San Diego Water Board, and approved by the SWRCB, OAL, and USEPA, the final wet weather targets in this TMDL project can be revised. Final TMDLs can be recalculated and established in a separate Basin Planning process in accordance with San Diego Water Board priorities and resources.

4.1.2 Summary of Wet Weather Targets

For all beaches (except those that are downstream of San Juan Creek, Aliso Creek and the San Diego River; ~~(~~Table 4-2), the **interim** wet weather numeric targets are fecal coliform 400 most probable number of colonies (MPN)/100 milliliters (mL); total coliform 10,000 MPN/100 mL; and enterococci 104 MPN/100 mL (these are single sample maximum values that can be exceeded 22 percent of the time). The **final** wet weather numeric targets are fecal coliform

[33] This Basin Plan issue ranked seventh on the 2004 Triennial Review list of priority projects.

400 MPN/100 mL; total coliform 230 MPN/100 mL; and enterococci 104 MPN/100 mL (single sample maximums in all instances).[34]

For San Juan Creek and downstream beach, Aliso Creek and downstream beach, the San Diego River and downstream beach, and Chollas and Forrester Creeks; ~~Aliso Creek and the San Diego River (~~Table 4-3), the **interim** wet weather numeric targets are fecal coliform 400 MPN/100 mL; total coliform 10,000 MPN/100 mL; and enterococci 61 MPN/100 mL (these are single sample maximum values that can be exceeded 22 percent of the time). The **final** numeric targets are fecal coliform 400 MPN/100 mL; total coliform 230 MPN/100 mL; and enterococci 61 MPN/100 mL (single sample maximums in all instances).

The numeric targets for the beach areas that are downstream of San Juan Creek, Aliso Creek and the San Diego River are equal to the numeric targets for the creeks. Specifically, the WQOs for enterococci are more stringent for creeks than for beaches. Since beaches are downstream of creeks, and numeric targets are equal to WQOs, TMDLs for beaches are calculated using the more stringent WQOs applicable to creeks.
~~For Chollas, San Juan, and Forrester Creeks (Table 4-4), the **interim** wet weather numeric targets are fecal coliform 400 MPN/100 mL; and enterococci 61 MPN/100 mL (these are single sample maximum values that can be exceeded 22 percent of the time). The **final** numeric targets are fecal coliform 400 MPN/100 mL; and enterococci 61 MPN/100 mL (single sample maximums in all instances).~~

Table 4-2. Interim and Final Wet Weather Numeric Targets for Beaches[a]

Indicator Bacteria	Interim Targets		Final Targets	
	Numeric Target [~~a~~b] (MPN/100mL)	Allowable Exceedance Frequency [~~b~~c]	Numeric Target [~~c~~d] (MPN/100mL)	Allowable Exceedance Frequency [~~d~~e]
Fecal coliform	400	22%	400	Not applicable
Total coliform	10,000	22%	230	Not applicable
Enterococci	104	22%	104	Not applicable

[a] Except beaches downstream of San Juan Creek, Aliso Creek, and the San Diego River
[~~a~~b] Targets based on REC-1 single sample WQOs.
[~~b~~c] Exceedance frequency based on reference system in the Los Angeles Region.
[~~c~~d] Targets based on REC-1 single-sample WQOs for fecal coliform and enterococci, and SHELL single-sample WQOs for total coliform.
[~~d~~e] Not applicable because there is no authorization for a reference system approach in the Basin Plan.

[34] In all instances, final numeric targets for fecal coliform are greater than the numeric targets for total coliform, even though total coliform includes fecal coliform. This is because the final targets are based on WQOs associated with SHELL, and SHELL only applies to total coliform. Final targets for fecal coliform are associated with REC-1.

Table 4-3. Interim and Final Wet Weather Numeric Targets for San Juan Creek and Downstream Beach, Aliso Creek and Downstream Beach, the San Diego River and Downstream Beach, and Chollas and Forrester Creeks

Indicator Bacteria	Interim Targets		Final Targets	
	Numeric Target[a] (MPN/100mL)	Allowable Exceedance Frequency[b]	Numeric Target[c] (MPN/100mL)	Allowable Exceedance Frequency[d]
Fecal coliform	400	22%	400	Not applicable
Total coliform	10,000	22%	230	Not applicable
Enterococci	61	22%	61	Not applicable

[a] Targets based on REC-1 single sample WQOs.
[b] Exceedance frequency based on reference system in the Los Angeles Region.
[c] Targets based on REC-1 single-sample WQOs for fecal coliform and enterococci, and SHELL single-sample WQOs for total coliform.

[d] Not applicable because there is no authorization for a reference system approach in the Basin Plan.

~~*Table 4-4. Interim and Final Wet Weather Numeric Targets for Chollas, San Juan, and Forrester Creeks*~~

~~Indicator Bacteria~~	~~Interim Targets~~		~~Final Targets~~	
	~~Numeric Target[a] (MPN/100mL)~~	~~Allowable Exceedance Frequency[b]~~	~~Numeric Target[a] (MPN/100mL)~~	~~Allowable Exceedance Frequency[c]~~
~~Fecal coliform~~	~~400~~	~~22%~~	~~400~~	~~0~~
~~Enterococci~~	~~61~~	~~22%~~	~~61~~	~~0~~

~~[a] Targets based on REC-1 single sample WQOs.~~
~~[b] Exceedance frequency based on reference system in the Los Angeles Region.~~

~~[c] Not applicable because there is no authorization for a reference system approach in the Basin Plan.~~

4.2 Dry Weather Targets

Implementing the dry weather numeric targets with a reference system approach is not ~~necessary~~appropriate. A reference system approach is not applicable to dry weather TMDL calculations because numeric targets are based on the geometric mean WQOs. A reference system approach uses an allowable exceedance frequency—meaning the number of times the ***single sample maximum*** WQOs are exceeded in a reference system—to calculate TMDLs. An allowable exceedance frequency is not relevant to a geometric mean because the geometric mean is an average value over the course of 30 days.

At this point, there is little data available regarding exceedances of WQOs in a reference system during dry weather. Water quality data from the mouth of San Mateo Creek and San Onofre State Beach (Table 4-4) indicate that exceedances of the single sample WQOs during dry weather conditions are uncommon in these relatively undeveloped watersheds. Furthermore, if the exceedance of the single sample WQOs is unlikely, exceedances of the geometric mean are even more unlikely.

The low percentage of exceedances of the single sample WQOs could be caused by the existence of berms that prohibit creeks from flowing all the way to the ocean. When the berms are in place, there may be substantial levels of bacteria in the creeks. Data from the creeks are needed to verify this hypothesis. If berms were in place when this beach data was collected, the exceedances measured at the beaches were most likely caused by local sources on the beach that exist downstream of the mixing zone such as birds, marine mammals, resuspension from sediment, or re-growth in the wrack line.

More data could be collected to better characterize a reference watershed during dry weather flows. However, this information would probably not be used to establish implementation provisions for TMDL calculation for dry weather flow, since the geometric mean component of the WQOs are used as the numeric targets. Therefore WQOs, without any allowable exceedances ~~frequency for natural sources~~, are sufficient for use as dry weather TMDL targets.

Table 4-4. Dry Weather Exceedances in Potential Reference Systems

Site ID	Location	Number of dry weather samples	Number of dry weather exceedances	Dry weather exceedance probability
Fecal Coliform				
EH-520	San Mateo Creek	101	0	0%
EH-510	San Onofre State Beach	72	0	0%
Total Coliform				
EH-520	San Mateo Creek	100	0	0%
EH-510	San Onofre State Beach	72	0	0%
Enterococci				
EH-520	San Mateo Creek	101	3	3%
EH-510	San Onofre State Beach	72	1	1%

4.2.1 Summary of Dry Weather Targets

For beaches (Table 4-5), the **interim** dry weather numeric targets are fecal coliform 200 MPN/100 mL; total coliform 1,000 MPN/100 mL; and, enterococci 35 MPN/100 mL (30-day geometric mean in all instances). The **final** dry weather numeric targets are fecal coliform 200 MPN/100 mL; total coliform 70 MPN/100 mL; and enterococci 35 MPN/100 mL (30-day geometric mean in all instances).

For the creeks included in this project, (Aliso Creek, San Juan Creek, ~~and~~ the San Diego River, Chollas Creek and Forrester Creek, (Table 4-5), the **interim** dry weather numeric targets are fecal coliform 200 MPN/100 mL; total coliform 1,000 MPN/100 mL; and, enterococci 33 MPN/100 mL (30-day geometric mean in all instances). The **final** numeric targets are fecal coliform 200 MPN/100 mL; total coliform 1,000 MPN/100 mL; and, enterococci 33 MPN/100 mL (30-day geometric mean in all instances).
~~For Chollas, San Juan, and Forrester Creeks (Table 4-7), the **interim** dry weather numeric targets are fecal coliform 200 MPN/100 mL; and enterococci 33 MPN/100 mL (30-day geometric mean in all instances). The **final** numeric targets are fecal coliform 200 MPN/100 mL; and enterococci: 33 MPN/100 mL (30-day geometric mean in all instances).~~

Table 4-5. Interim and Final Numeric Dry Weather Targets for Beaches ~~Aliso Creek and San Diego River~~and Creeks

Indicator Bacteria	Interim Targets (MPN/100 mL)		Final Targets (MPN/100 mL)	
	Beaches[a]	Creeks[a]	Beaches[b]	Creeks[a]
Fecal coliform	200	200	200	200
Total coliform	1,000	1,000	70	70
Enterococci	35	33	35	33

[a] Targets based on REC-1 WQOs.

[b] Targets based on REC-1 WQOs for fecal coliform and enterococci; SHELL WQO for total coliform.

~~*Table 4-7. Interim and Final Numeric Dry Weather Targets for Chollas, San Juan, and Forrester Creeks*~~

~~Indicator Bacteria~~	~~Interim Targets (MPN/100 mL)~~	~~Final Targets (MPN/100 mL)~~
	~~Creeks[a]~~	~~Creeks[a]~~
~~Fecal coliform~~	~~200~~	~~200~~
~~Enterococci~~	~~33~~	~~33~~

~~[a] Targets based on REC-1 WQOs.~~

5 Data Inventory and Analysis

Data from numerous sources were used to characterize the watersheds and water quality conditions, identify land uses associated with bacteria sources, and support the calculation of TMDLs for the watersheds. No new data were collected as part of this effort. The data analysis provided an understanding of the conditions that result in impairments.

5.1 Data Inventory

The categories of data used in developing these TMDLs include physiographic data that describe the physical conditions of the watershed and environmental monitoring data that identify past and current conditions and support the identification of potential pollutant sources. Table 5-1 presents the various data types and data sources used in the development of these TMDLs. The following sections describe the key data sets used for TMDL development.

5.1.1 Water Quality Data

Monitoring data for the impaired beaches were received from a number of agencies in San Diego and Orange Counties. Data were received for 52 locations monitored along impaired shorelines, in addition to 7 unimpaired shoreline locations (Figures 5-1 and 5-2; Appendix G, No. 15-20). Bacteria data (including fecal coliform, total coliform, and enterococci data) were collected at various times from 1999 through 2002, and the amount of data varied among monitored locations. Most locations had fecal coliform, total coliform, and enterococci data for assessment of existing conditions.

Special studies were conducted for Aliso Creek and San Juan Creek (San Diego Water Board, 2002b) by the Orange County Public Facilities and Resources Department and the Orange County Public Health Laboratory, respectively (Figure 5-3; Appendix G, No. 4 and 6). The City of San Diego conducted studies of Rose Creek and Tecolote Creek (data included in Figure 5-4 were collected in 2001 and 2002; Appendix G, No. 5). For each of the studies, multiple bacteria samples were collected throughout the year at stations throughout the watersheds and along several tributaries.

In addition, monitoring data were obtained for the following five rivers or creeks from various agencies in the Region: San Diego River (Padre Dam Municipal Water District), San Mateo Creek (Southwest Division Naval Facilities Engineering Command), Santa Margarita River (Southwest Division Naval Facilities Engineering Command), and San Luis Rey River (City of Oceanside). Data sources are described in Appendix G.

Water quality data from six major inland discharges—five at Camp Pendleton and one on Murrieta Creek (Santa Rosa Water Reclamation Facility)—were obtained. All these sources are in the Santa Margarita River watershed. Discharge data for inland outfalls to streams are limited to the period prior to 2002, after which these major inland discharges were either discontinued or diverted to ocean outfalls.

Table 5-1. Inventory of Data and Information Used for the Source Assessment of Bacteria

Data Set	Type of Information	Data Source(s)
Watershed physiographic data	Location of dams	USEPA BASINS
	Stream network	USEPA BASINS (Reach File, Versions 1 and 3); USGS National Hydrography Dataset (NHD) reach file; special studies of Aliso Creek, Tecolote Creek, and Rose Creek.
	Land use	USGS MRLC (1993); San Diego Regional Planning Agency – 2000 land use coverage for San Diego County (SANDAG); Southern California Association of Governments (SCAG) land use coverage of Orange and portions of Riverside Counties (1993)
	Counties	USEPA BASINS
	Cities/populated places	USEPA BASINS, U.S. Census Bureau's Tiger Data
	Soils	USEPA BASINS (USDA-NRCS STATSGO)
	Watershed boundaries	USEPA BASINS (8-digit hydrologic cataloging unit); CALWTR 2.2 (1995)
	Topographic and digital elevation models (DEMs)	USEPA BASINS; USGS
Environmental monitoring data	Water quality monitoring data	USEPA's STORET; California Department of Environmental Health; County of San Diego Department of Environmental Health; Orange County Pubic Facilities and Resources Department; City of San Diego; City of Oceanside; Orange County Public Health Laboratory, San Diego Water Board; Padre Dam Municipal Water District; Southwest Division Naval Facilities Engineering Command
	Streamflow data	USGS; Orange County Public Facilities and Resources Department; City of San Diego
	Meteorological station locations	BASINS; National Oceanic and Atmospheric Administration - National Climatic Data Center (NOAA-NCDC); California Irrigation Management Information System (CIMIS); California Department of Water Resources, Division of Flood Management; ALERT (Automatic Local Evaluation in Real-Time) Flood Warning System

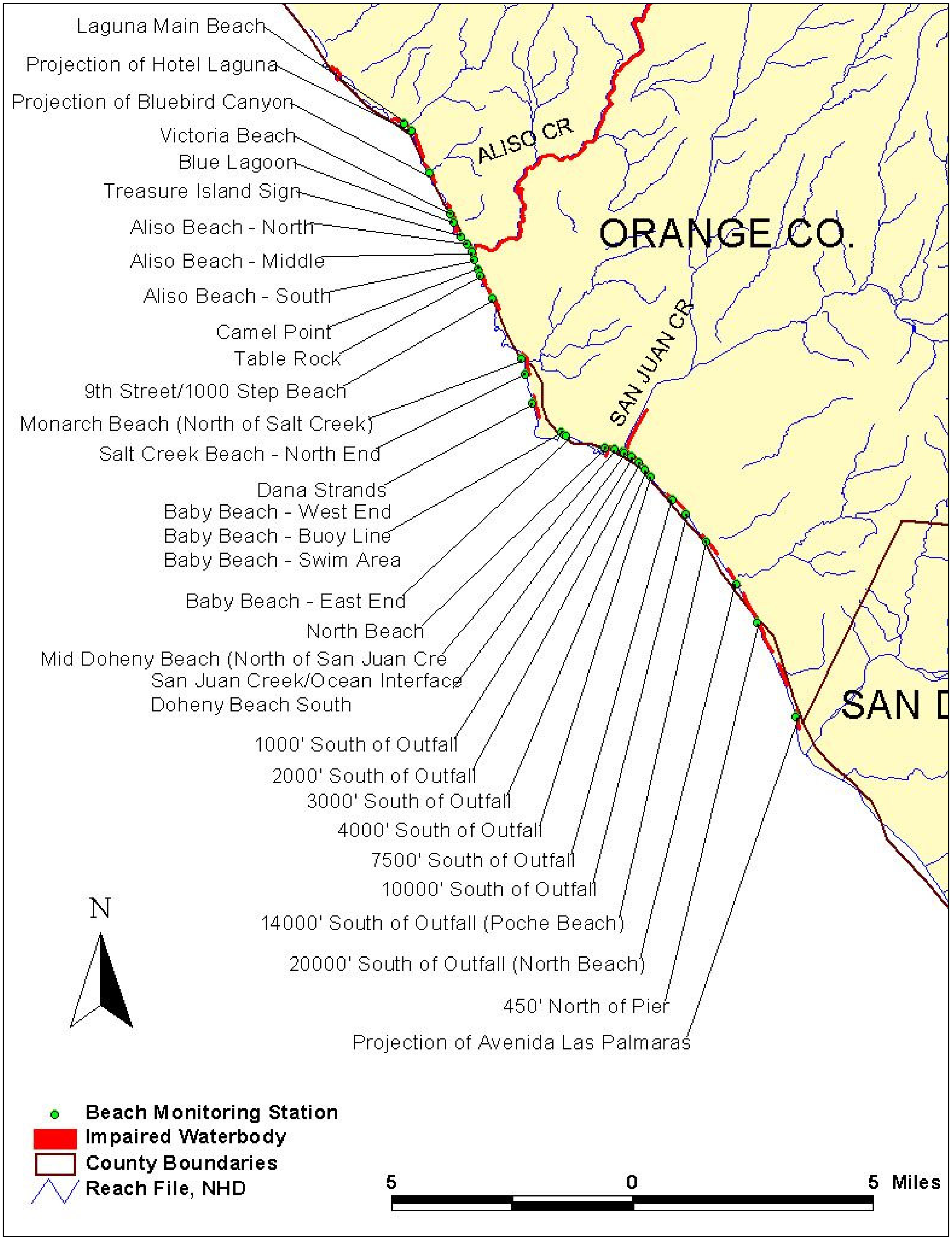


Figure 5-1. Beach monitoring station locations in Orange County.

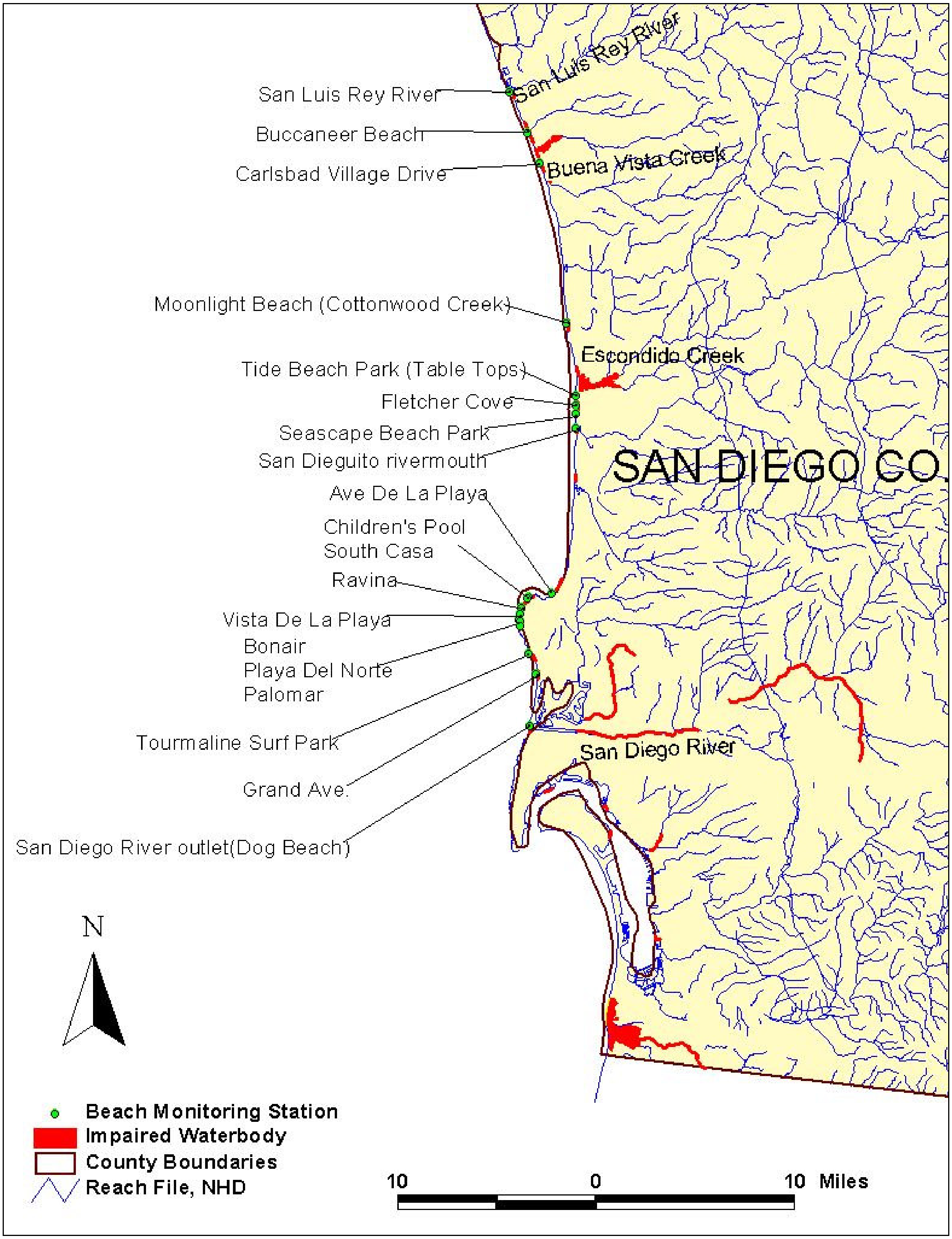


Figure 5-2. Beach monitoring station locations in San Diego County.

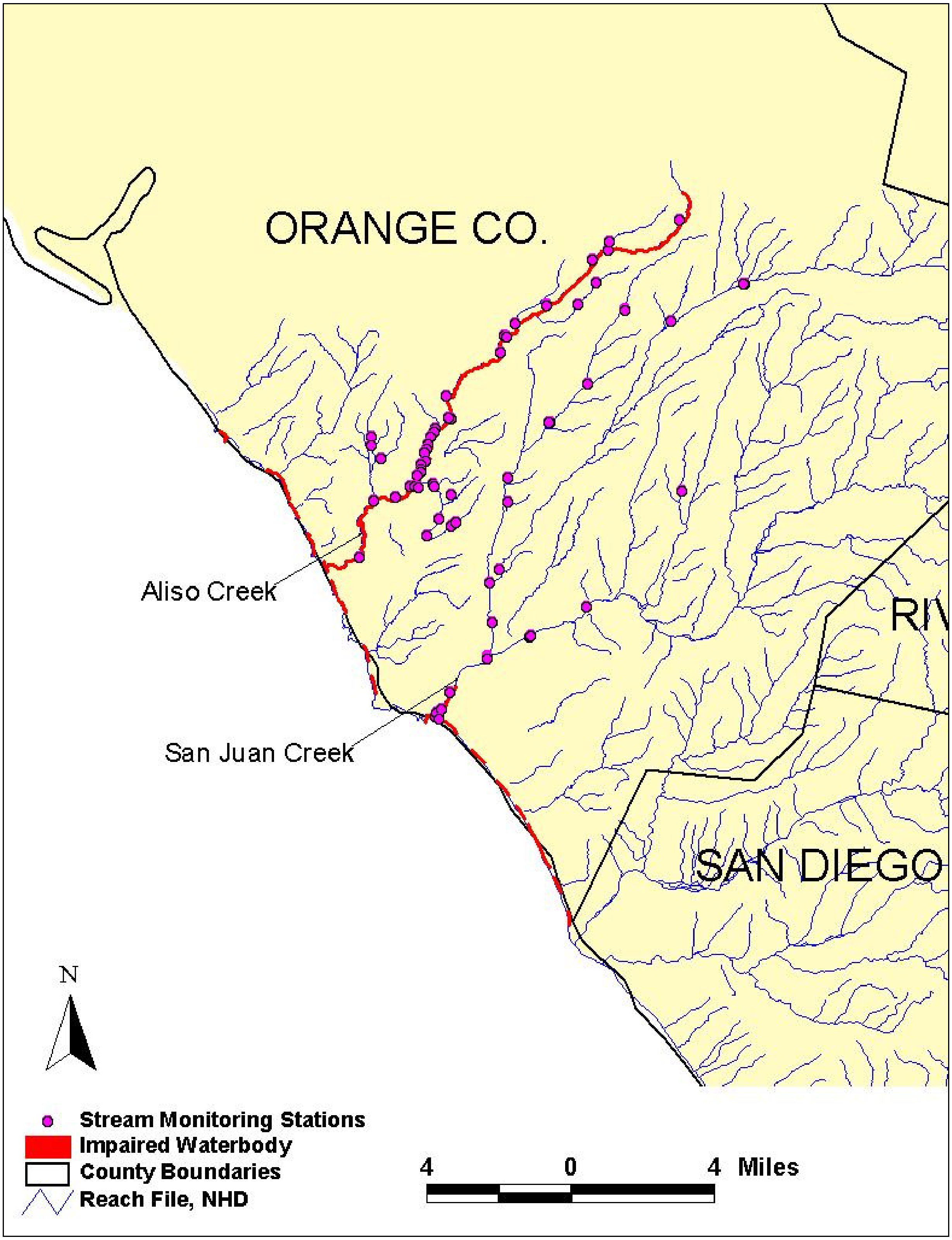


Figure 5-3. Bacteria monitoring stations on Aliso Creek and San Juan Creek.

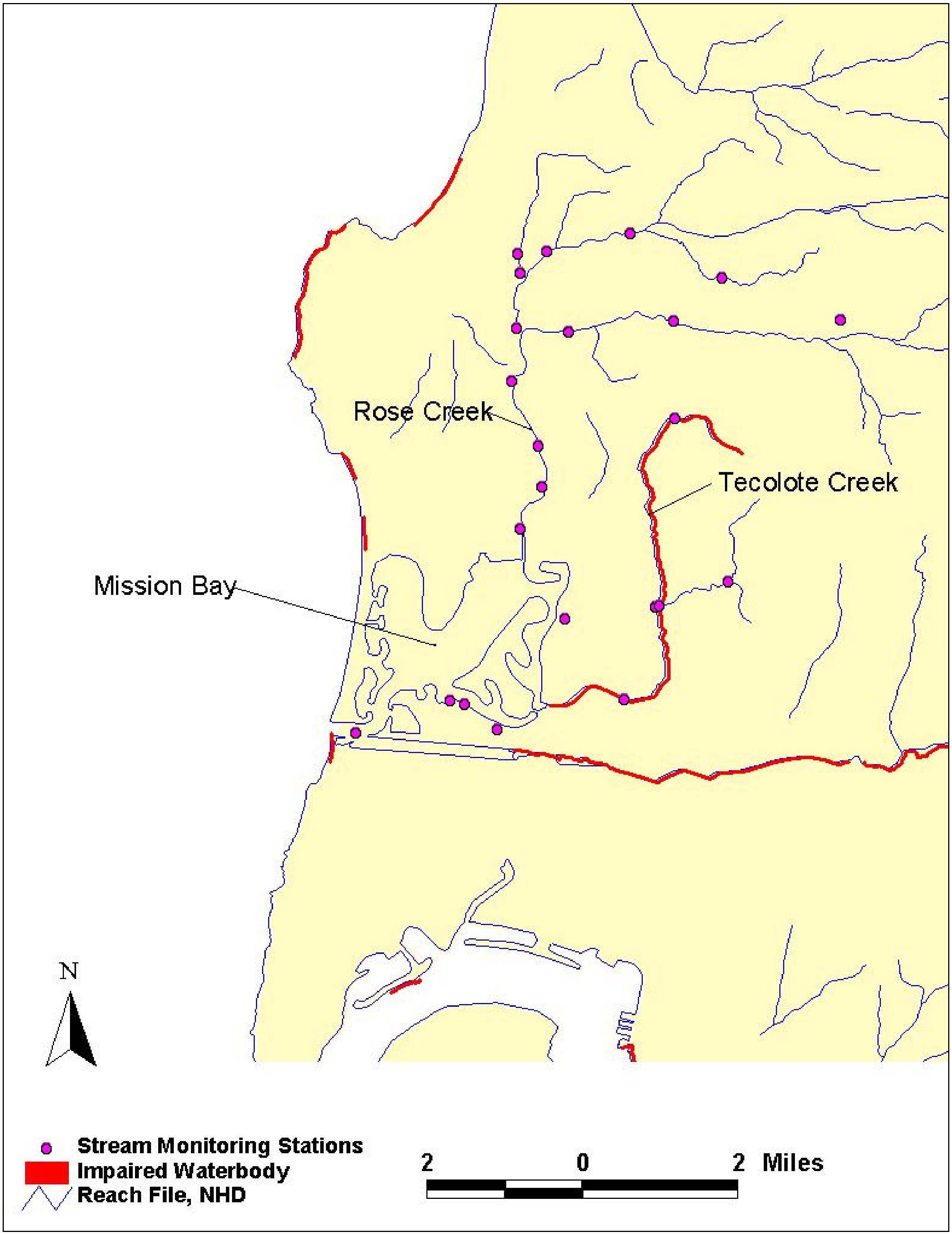


Figure 5-4. Bacteria monitoring stations on Rose Creek and Tecolote Creek.

5.1.2 Waterbody Characteristics

The assessment of waterbody characteristics involved analyzing streamflow data and assessing physical information. This information was used to determine the volume and hydraulic features of waterbodies for determining assimilative capacity and physical processes that affect bacteria transport for TMDL analysis.

A limited amount of streamflow data for the listed segments was available. The Aliso Creek, Rose Creek, and Tecolote Creek watersheds had streamflow information associated with special studies performed for the assessment of bacteria loading characteristics (see section 5.1.1). In addition, U.S. Geological Survey (USGS) gages with recent streamflow records were identified in the study area (Table 5-2). Historical streamflow data and data for stream channel geometry (width and depth) for these gages were obtained from USGS (Appendix G, No. 3).

Table 5-2. USGS Streamflow Gages in the San Diego Region with Recent Data

Station Number	Station Name	Historical Record
11022480	San Diego River at Mast Road near Santee, CA	5/1/1912–9/30/2002
11023000	San Diego River at Fashion Valley at San Diego, CA	1/18/1982–9/30/2002
11023340	Los Penasquitos Creek near Poway, CA	10/1/1964–9/30/2002
11025500	Santa Ysabel Creek near Ramona, CA	2/1/1912–9/30/2002
11028500	Santa Maria Creek near Ramona, CA	12/1/1912–9/30/2002
11042000	San Luis Rey River at Oceanside, CA	10/1/1912–11/10/1997; 4/29/1998–9/30/2002
11042400	Temecula Creek near Aguanga, CA	8/1/1957–9/30/2002
11044300	Santa Margarita River at FPUD Sump near Fallbrook, CA	10/1/1989–9/30/2002
11046000	Santa Margarita River at Ysidora, CA	3/1/1923–2/25/1999; 10/1/2001–9/30/2002
11046530	San Juan Creek at La Novia Street Bridge near San Juan Capistrano, CA	10/1/1985–9/30/2002
11047300	Arroyo Trabuco near San Juan Capistrano, CA	10/1/1970–9/30/1989; 10/1/1995–9/30/2002
11022350	Forrester Creek near El Cajon, CA	10/1/1993–9/30/2002
11039800	San Luis Rey River at Couser Canyon Bridge near Pala, CA	10/1/1986–1/4/1993

5.1.3 Meteorological Data

Hourly rainfall data were obtained from the National Climatic Data Center (NCDC) of the National Oceanic and Atmospheric Administration (NOAA). To augment the NCDC data, hourly rainfall data were also obtained from the California Irrigation Management Information System (CIMIS); California Department of Water Resources, Division of Flood Management;

and the Automatic Local Evaluation in Real-Time (ALERT) Flood Warning System. In addition, hourly evapotranspiration data were obtained from CIMIS (Appendix G, No. 21-23).

5.1.4 Land Characteristic Data

Available land use data to support this study included the 1993 USGS Multi-Resolution Land Characteristic (MRLC) data, which were available for the entire study area. The San Diego Regional Planning Agency (SANDAG) had a more detailed and recent 2000 land use data set that covers San Diego County. For Orange County and portions of Riverside County, land use data were obtained from the Southern California Association of Governments (SCAG). A combination of MRLC, SANDAG, and SCAG data was used to provide the most complete and up-to-date land use representation of the Region (Appendix G, No. 25).

In addition, soil data were obtained from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) State Soil Geographic (STATSGO) database and topographic information was obtained from the USEPA's Better Assessment Science Integrating Point and Nonpoint Sources (BASINS) system (Appendix G, No. 26).

5.2 Review of Impaired Segments

Bacteria data collected from beach and creek segments were analyzed to provide guidance for the source assessment. Results of these analyses are reported in the following sections.

5.2.1 Beach Impairments

Bacteria monitoring data for beach stations (Appendix G, No. 15-20) were analyzed to provide insight into the spatial extent of impairment and the timing of any exceedances of WQOs. Results of this analysis were also used in the source assessment to identify the proximity of impaired coastal segments to tributaries, outfalls, and other potential sources (see Section 6). Monitoring data were reviewed based on their association with wet or dry conditions to better understand variability during periods when methods of transport differ (wet weather runoff versus dry weather runoff). The wet period was defined to be consistent with the DEH General Advisory to avoid contact with ocean and bay water within 300 feet on either side of any storm drain, river, or lagoon outlet for 72 hours after 0.2 inch or more of rain. For each monitoring station, sampling dates were compared to rainfall data collected at the closest rainfall gage to determine whether bacteria samples had been collected during wet or dry periods. Once the data for all stations were identified as wet or dry, the number of exceedances of single sample WQOs was quantified for fecal coliform, total coliform, and enterococci at each station. Wet weather data cannot be analyzed for exceedance of 30-day geometric mean WQOs because wet weather periods do not come close to approaching 30 days in length.

To assess the spatial variability of bacteria levels during both wet and dry conditions, the exceedance frequency of the REC-1 (fecal coliform and enterococci) and SHELL (total coliform) single sample WQOs for each station were plotted in Figures H-1 through H-6 of Appendix H. These plots show that at some locations, bacteria concentrations frequently exceed the WQOs for indicator bacteria. The frequency of exceedances varies for each indicator bacteria, location, and for wet or dry weather conditions. Also, higher exceedance frequencies are observed in the vicinity of creeks or lagoons and major stormwater outfalls, especially at the mouths of those creeks and lagoons that are impaired due to high bacteria levels.

5.2.2 Creek Impairments

The analysis of beach monitoring data confirms that the highest number of exceedances of WQOs was in the vicinity of rivers, major stormwater outfalls, and known local sources (e.g., waterfowl at creek outlets; Appendix G, No. 15-20). This analysis is important in review of creek impairments because high numbers of exceedances were observed at the mouths of Aliso Creek, San Juan Creek, and the San Diego River. Tables 5-3 through 5-5 list the number of monitoring stations and observed data, ranges of indicator bacteria levels observed, and exceedance frequencies of marine WQOs in the watershed of each impaired creek addressed in this TMDL where data were available (Appendix G, No. 4, 6, 10, 11, 13, and 14), and respective indicator bacteria were identified as the pollutant/stressor. For each impaired watershed, exceedances of marine WQOs were observed. Although the data are from inland surface waters (creeks), the marine WQOs were used to tally the number of exceedances likely to occur at a beach at the outlet of the watershed. This is because high bacteria counts in the watershed generally lead to high bacteria counts downstream, at the shoreline.

Table 5-3. Summary of Fecal Coliform Data for Impaired Creeks

Stream	Number of Monitoring Stations	Total Number of Samples	Fecal Coliform (MPN/100mL)			Frequency of Exceedance of WQOs for Marine Waters
			Minimum	Mean	Maximum	
Aliso Creek	108	8,816	2	10,739	684,600	77%
San Diego River	6	36	2	1,557	24,000	36%
San Juan Creek	31	357	10	5,680	350,000	58%

Table 5-4. Summary of Total Coliform Data for Impaired Creeks

Stream	Number of Monitoring Stations	Total Number of Samples	Total Coliform (MPN/100 mL)			Frequency of Exceedance of WQOs for Marine Waters
			Minimum	Mean	Maximum	
Aliso Creek	108	8,815	2	40,750	878,400	55%
San Diego River	6	34	300	14,885	300,000	15%
San Juan Creek	31	357	10	130,683	14,900,000	45%

Table 5-5. Summary of Enterococci Data for Impaired Creeks

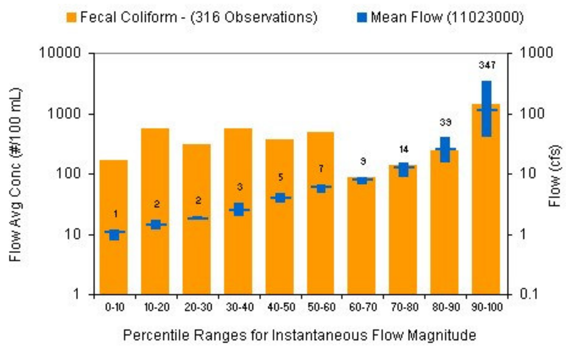
Stream	Number of Monitoring Stations	Total Number of Samples	Enterococci (MPN/100 mL)			Frequency of Exceedance of WQOs for marine waters
			Minimum	Mean	Maximum	
Aliso Creek	108	8,817	1	6,018	492,800	98%
~~Pine Valley Creek~~	~~4~~	~~78~~	~~1~~	~~348~~	~~20,000~~	~~15%~~
San Juan Creek	31	357	5	4,834	280,000	89%

5.3 Analyses of Beach Water Quality Versus Magnitude of Streamflow

A statistical comparison of flow versus bacteria density was also performed to evaluate historical effects of high- and low-flow conditions near the mouths of the creeks. Two USGS gage stations in close proximity to the monitoring locations had flow data for the same time period as the bacteria monitoring data: San Diego River–Dog Beach (USGS 11023000 and FM-010) and San Luis Rey River (USGS 11042000 and OC-100; Appendix G, No. 3, 18-19). Figures 5-5 and 5-6 show the flow versus fecal coliform density comparisons. In general, high fecal coliform levels were observed under a range of flow levels. For both locations, high fecal coliform densities were observed under low-flow and high-flow conditions. This indicates the need to assess bacteria sources separately during both wet weather events and dry weather conditions.

Location: Dog Beach
Pollutant: Fecal Coliform
Data from: 1/4/1999 to 9/27/2001 (316 Observations)

Flow Range	# Obs	Flow (cfs)			Concentration (#/100 mL)		
Percentile	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
0-10	32	1.059	0.790	1.200	170.73	6.00	1400.00
10-20	32	1.422	1.200	1.700	552.58	2.00	16000.00
20-30	32	1.809	1.700	2.000	299.54	2.00	3200.00
30-40	31	2.529	2.100	3.200	552.92	2.00	6800.00
40-50	31	3.961	3.200	4.700	360.19	2.00	7600.00
50-60	32	5.934	4.800	6.700	494.83	2.00	3600.00
60-70	31	7.968	6.800	8.800	86.50	20.00	800.00
70-80	31	12.581	9.000	14.000	135.76	16.00	800.00
80-90	32	25.094	15.000	39.000	245.75	2.00	2300.00
90-100	32	114.094	42.000	347.000	1438.09	20.00	12000.00



Location: Dog Beach
Pollutant: Fecal Coliform
Data from: 1/4/1999 to 9/27/2001 (316 Observations)

Time Period	# Obs	Flow (cfs)			Concentration (#/100 mL)		
Month	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
January	15	19.013	4.900	153.000	614.71	2.00	2400.00
February	38	54.066	5.500	347.000	2179.54	2.00	12000.00
March	25	56.960	11.000	182.000	199.64	2.00	2300.00
April	26	26.262	6.500	248.000	687.87	2.00	1800.00
May	42	7.421	3.600	11.000	282.45	2.00	3600.00
June	41	3.566	1.500	5.600	370.64	2.00	7600.00
July	52	1.830	0.980	2.600	680.52	2.00	16000.00
August	23	1.346	0.790	2.100	61.05	4.00	300.00
September	19	1.284	0.930	1.900	198.19	6.00	1600.00
October	13	34.908	1.000	146.000	260.46	2.00	1500.00
November	13	4.815	1.500	15.000	150.41	20.00	3200.00
December	9	5.344	2.400	14.000	72.16	2.00	500.00

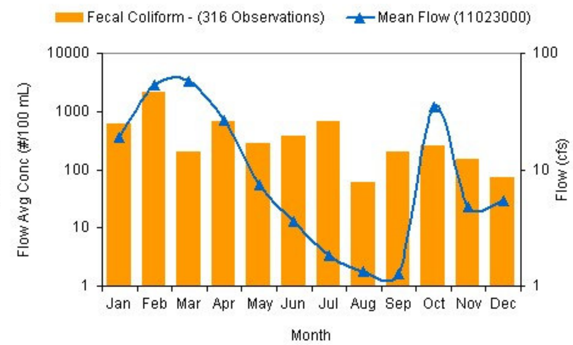
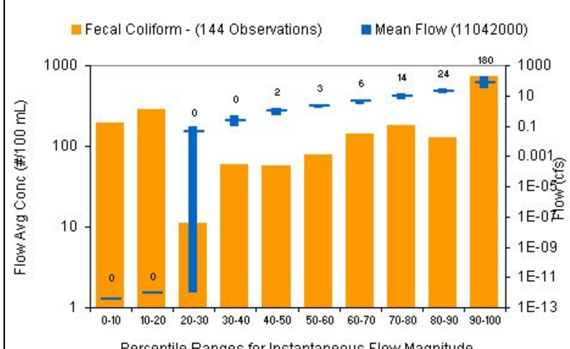


Figure 5-5. Flow versus fecal coliform concentration near San Diego River outlet (Dog Beach).

Location: San Luis Rey River
Pollutant: Fecal Coliform
Data from: 1/11/1999 to 9/25/2001 (144 Observations)

Flow Range	# Obs	Flow (cfs)			Concentration (#/100 mL)		
Percentile	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
0-10	15	0.000	0.000	0.000	195.85	2.00	2400.00
10-20	14	0.000	0.000	0.000	285.52	2.00	1600.00
20-30	14	0.041	0.000	0.060	11.19	2.00	240.00
30-40	15	0.239	0.090	0.460	59.52	4.00	500.00
40-50	14	1.098	0.570	1.600	57.09	2.00	240.00
50-60	14	2.057	1.600	2.600	78.52	2.00	240.00
60-70	15	4.260	2.900	5.700	144.03	11.00	500.00
70-80	15	10.173	6.200	14.000	177.98	17.00	700.00
80-90	13	20.385	15.000	24.000	128.66	2.00	300.00
90-100	15	71.533	28.000	180.000	741.48	5.00	3000.00



Location: San Luis Rey River
Pollutant: Fecal Coliform
Data from: 1/11/1999 to 9/25/2001 (144 Observations)

Time Period	# Obs	Flow (cfs)			Concentration (#/100 mL)		
Month	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
January	7	31.570	0.060	180.000	2449.41	2.00	3000.00
February	5	53.140	5.700	124.000	440.47	11.00	700.00
March	8	50.875	22.000	137.000	135.83	13.00	300.00
April	12	35.750	13.000	95.000	271.09	5.00	900.00
May	17	9.700	4.500	19.000	169.62	17.00	700.00
June	10	5.200	1.600	12.000	74.53	17.00	130.00
July	15	1.799	0.420	5.100	61.14	2.00	240.00
August	15	0.579	0.000	2.100	86.87	7.00	130.00
September	17	1.231	0.000	3.700	134.64	2.00	500.00
October	17	0.241	0.000	4.100	500.00	2.00	2400.00
November	13	0.178	0.000	0.990	168.30	2.00	500.00
December	8	0.029	0.000	0.060	15.39	2.00	240.00

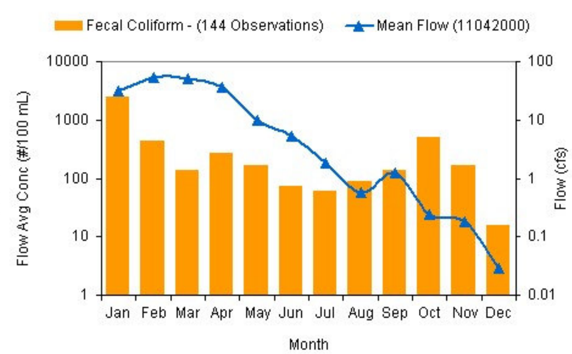


Figure 5-6. Flow versus fecal coliform concentration near San Luis Rey River.

6 Source Analysis

The purpose of the source analysis is to identify and quantify the sources of bacteria to impaired beaches and creeks. Both in-stream and watershed data were used to identify potential sources and characterize the relationship between point and nonpoint source loadings and in-stream response, under both wet weather and dry weather conditions. Point sources typically discharge at a specific location from pipes, outfalls, and conveyance channels from, for example, municipal wastewater treatment plants or municipal separate storm sewer systems (MS4s). These discharges are regulated through waste discharge requirements (WDRs) that implement federal NPDES (National Pollutant Discharge Elimination System) requirements issued by the SWRCB or the San Diego Water Board through various orders.[35] Nonpoint sources are diffuse sources that have multiple routes of entry into surface waters. Some nonpoint sources, such as agriculture, livestock, and horse ranch facilities are regulated under waivers of WDRs in the Basin Plan.

During both wet weather and dry weather periods, multiple point and nonpoint sources of bacteria contribute to overall loads to the impaired waterbodies. Bacteria are deposited both directly to the waterways and also onto land surfaces. Sources can include storm drain discharges, sewer line breaks, leaking septic systems, agricultural activities, deposit of waste from aquatic and terrestrial wildlife and pets, decaying matter, soil, and deposit of waste from encampments of homeless persons. Discharges directly to marine shorelines include illegal sewage disposal from boats along the coastline, direct input to waterbodies from waterfowl, bacteria re-growth in the wrack line, and even swimmers themselves.

Sources of bacteria are the same under both wet weather and dry weather conditions. However, the method of transport for the two conditions is very different. Wet weather loading is dominated by episodic storm flows that wash off bacteria that build up on the surface of all land use types in a watershed during dry periods. Dry weather loading is dominated by nuisance flows from urban land use activities such as car washing, sidewalk washing, and lawn over-irrigation, which pick up bacteria and deposit it into receiving waters. These types of nuisance flows are generally referred to as urban runoff. Because the relative loads from bacteria sources vary significantly between wet weather events and dry weather conditions, load assessment required separate wet and dry weather analyses. For this reason, two distinct modeling platforms were used to assess bacteria loading and TMDLs. These models are described in the Linkage Analysis in section 7.

6.1 Land Use / Bacteria Source Correlation

In this analysis, bacteria sources were quantified by land-use type since bacteria loading can be highly correlated with land-use practices. Some land use types, such as low and high density residential, produce high concentration of bacteria while other land use types such as military produce relatively smaller concentrations of bacteria.

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[35] A discussion of the SWRCB and San Diego Water Board Orders regulating point source discharges of bacteria is presented in the Implementation Plan, section 11.

Since several land-use types share hydrologic or pollutant loading characteristics, many were grouped into similar classifications, resulting in a subset of 13 categories for modeling. Selection of these land-use categories was based on the availability of monitoring data and literature values that could be used to characterize individual land use contributions and critical bacteria-contributing practices associated with different land uses. For example, multiple urban categories were represented independently (e.g., high density residential, low density residential and commercial/institutional), whereas forest and other natural categories were grouped.

6.1.1 Wet Weather Transport

During wet weather events, wash-off of bacteria from various land uses is considered the primary mechanism for transport of bacteria. This is due to the relatively large bacteria levels observed at the mouths and/or within the watersheds of impaired creeks. After bacteria build up on the land surface as the result of various land sources and associated management practices (e.g., management of livestock in agricultural areas, pet waste in residential areas), many of the bacteria are washed off the surface during rainfall events. The amount of runoff and associated bacteria concentrations are therefore highly dependent on land use. This methodology of correlating land use to bacteria sources produced successful modeling results, despite the fact that some sources are distributed across several different land uses (i.e. wildlife inhabiting open space land use and also urbanized land uses such as high and low density residential).

Pie charts were developed that show relative bacteria loads by land use type for each watershed (Appendix I). Land use classifications were provided by SANDAG and SCAG and were grouped in some instances (Appendix J). Land uses were further classified into either point source dominated discharge or nonpoint source dominated discharge (Appendix I).

6.1.2 Dry Weather Transport

From analysis of spatial distributions of bacteria concentrations along the Pacific Ocean shoreline, high bacteria levels were observed at the mouths of major stormwater outfalls and creeks under dry conditions. This observance was validated through an analysis of streamflow versus bacteria concentration that indicated a significant dry weather bacteria source to streams. During dry conditions, most impaired streams exhibit a sustained baseflow even if no rainfall has occurred for a significant period to provide runoff. These flows result from various urban land use practices that generate urban runoff, which enters storm drains and creeks. As these flows travel across lawns and urban surfaces, bacteria are carried from these areas to receiving waters.

Analysis of flow and bacteria data from Aliso Creek, San Juan Creek, Tecolote Creek, and Rose Creek showed that dry weather urban runoff and associated bacteria levels could be estimated from land use information in a given watershed. This analysis is discussed in detail in Appendix K.

6.2 Point Sources

Bacteria loads attributable to point sources are discharged in urban runoff from the following land use types:

- Low Density Residential;

- High Density Residential;
- Commercial/Institutional;
- Industrial/Transportation (excluding areas owned by Caltrans)
- Caltrans;
- Military;
- Parks/Recreation; and
- Transitional (construction activities).

These land use types were classified as generating point source loads because, although the bacteria sources on these land use types may be diffuse in origin, the pollutant loading is transported and discharged to receiving waters through MS4s. The principal MS4s contributing bacteria to receiving waters are owned or operated by either municipalities located throughout the watersheds or Caltrans.[36]

6.3 Nonpoint Sources

Bacteria loads attributable to nonpoint sources are discharged in stormwater runoff from the following land use types:

- Agriculture;
- Dairy/Intensive Livestock;
- Horse Ranches;
- Open Recreation;
- Open Space;
- Water.

These land use types were classified as generating nonpoint source loads because the loads are discharged in overland stormwater runoff that is diffuse in origin, and are largely located in areas without constructed (man-made) MS4s or in areas upstream of MS4 networks. One exception is that several dairies in these watersheds are regulated as point source discharges pursuant to NPDES requirements.

[36] A complete discussion regarding the dischargers identified for meeting allocations is available in section 10, Legal Authority for TMDL Implementation Plan.

7 Linkage Analysis

The technical analysis of pollutant loading from watersheds, and the waterbody response to this loading is referred to as the linkage analysis. The purpose of the analysis is to quantify the maximum allowable bacteria loading to each impaired waterbody resulting in attainment of WQOs. This value is in fact, the TMDL. TMDLs were calculated for each watershed. Because the final numeric targets are set equal to the numeric WQOs for bacteria, attainment of the numeric targets will result in attainment of WQOs. The percent reduction from the total existing load in a watershed needed in order to attain WQOs was also calculated for each watershed.

For these TMDLs, a distinction is made between wet weather events and dry weather conditions because bacteria loads differ between the two scenarios and implementation measures will be specific to wet and dry conditions. Two distinct models were used for calculating bacteria loads. One model specifically quantified loading during wet weather events. The other model quantified loading during dry conditions. Both current loading and TMDLs were calculated for each watershed under both wet weather events and dry weather conditions. This information is available in Tables 9-1 through 9-10.

7.1 Consideration Factors for Model Selection

In selecting an appropriate modeling approach for TMDL calculation, technical and regulatory criteria were considered. Technical criteria include the physical system in question, including watershed or stream characteristics and processes, and the constituent of interest, in this case, bacteria. Regulatory criteria include WQOs or procedural protocol. The following discussion details the considerations in each of these categories. Based on these considerations, appropriate models were chosen to simulate both wet weather events and dry weather conditions. The same technical approaches were used for both beaches and creeks.

7.1.1 Technical Criteria

Technical criteria are divided into four main topics. Consideration of each topic was critical in selecting the most appropriate modeling approach to address the types of sources and the numeric targets associated with the impaired waters.

7.1.1.a Physical Domain

Representation of the physical domain is perhaps the most important consideration in model selection. The physical domain is the focus of the modeling effort—typically described by either the receiving water itself or a combination of the contributing watershed and the receiving water. Selection of the appropriate modeling domain depends on the constituents and the conditions under which the stream exhibits impairment. For a stream dominated by point source inputs (e.g., wastewater treatment plant discharge; urban runoff discharged from stormwater outfalls) that exhibits impairments under only low-flow conditions, a steady-state approach is typically used. This type of modeling approach focuses on only in-stream (receiving water) processes during a user-specified condition. For streams affected additionally or solely by nonpoint sources or primarily rainfall-driven flow and pollutant contributions during wet weather, a dynamic approach is recommended. Dynamic watershed models consider time-variable nonpoint source contributions from a watershed surface or subsurface. Some models consider monthly or seasonal variability, while others enable assessment of conditions immediately before, during, and after individual rainfall events. Dynamic models require a substantial amount of information regarding input parameters and data for calibration purposes.

For this project, two conditions were recognized that require specific model development to address key physical and environmental conditions. For wet weather, it was assumed that the San Diego Region is dominated by nonpoint sources that are generally constant on an hourly time step and deposit directly to drains.~~rainfall-driven flow and pollutant contributions that are generally constant on an hourly time step and deposit directly to storm drains and receiving waters.~~ For dry weather, streams in the Region are characterized by much smaller flows than wet conditions, with flows less dynamic than wet periods and assumed steady-state for model development. Although during both conditions the sources are nonpoint in nature, their behavior in the streams are represented in the models more like that of a point source, since specific discharge points of watershed inflows are assumed.

7.1.1.b Source Contributions

Primary sources of pollution to a waterbody must be considered in the model selection process. Accurately representing contributions from nonpoint sources and regulated point sources is critical in properly representing the system and ultimately evaluating potential load reduction scenarios.

Water quality monitoring data were not sufficient to fully characterize all sources of bacteria in the watersheds draining to impaired waterbodies. However, analyses of the available data indicate that the main controllable sources are dry and wet weather urban runoff. Thus, models were selected to develop bacteria TMDLs for beaches and creeks to address the major source categories during wet weather events and dry weather conditions considered controllable for TMDL implementation purposes.

7.1.1.c Critical Conditions

The goal of a TMDL analysis is to determine the assimilative capacity of a waterbody and to identify potential allocation scenarios that will enable the waterbodies to achieve WQOs. The critical condition is the set of environmental conditions for which controls designed to protect water quality will ensure attainment of objectives for all other conditions. This is typically the period of time in which the waterbody exhibits the most vulnerability. Critical conditions are accounted for in this project by way of using separate modeling approaches for wet weather events and dry weather conditions. In addition, to ensure that WQOs are met in impaired waterbodies, a critical period associated with extreme rainfall conditions was selected for watershed modeling analysis. The dry weather critical condition was based on predictions of flow from the steady-state model (described in Appendix K).

7.1.1.d Constituents

Another important consideration in model selection and application is the constituent(s) to be assessed. Choice of state variables is a critical part of model application. The more state variables included, the more difficult the model is to apply and calibrate. However, if key state variables are omitted from the simulation, the model might not simulate all necessary aspects of the system and might produce unrealistic results. A delicate balance must be met between minimal constituent simulation and maximum applicability.

The focus of development of these TMDLs is on fecal coliform, total coliform, and enterococci bacteria. Factors affecting the survival of bacteria include soil moisture content, pH, solar radiation, and available nutrients. In-stream bacteria dynamics can be extremely complex, and accurate estimation of bacteria concentrations relies on a host of interrelated environmental factors. Bacteria concentrations in the water column are influenced by die-off, re-growth, partitioning of bacteria between water and sediment during transport, settling, and re-suspension of bottom materials. First-order die-off is likely the most important dynamic process to simulate in the San Diego Region, despite observations that bacteria re-grow in low flow conditions. The limited data available provide few insights into which of the other factors listed above might be most influential on bacterial behavior for the models. A description of assumptions regarding these factors is described in Appendix L.

7.1.2 Regulatory Criteria

A properly designed and applied model provides the source-response linkage component for each waterbody and enables accurate assessment of assimilative capacities. A stream's assimilative capacity is determined by assuming adherence to WQOs. The Basin Plan establishes, for all waters in the San Diego Region, the beneficial uses for each waterbody to be protected, the WQOs that protect those uses, and an implementation plan that accomplishes those objectives. The modeling platform must enable direct comparison of model results to in-stream concentrations and allow for the analysis of the duration of those concentrations. For the watershed loading analysis and implementation of measures to reduce sources, that the modeling platform enable examination of gross land use loading as well as in-stream concentration is also important.

7.2 Wet Weather Modeling Analysis

During wet weather events, sources of bacteria are associated with wash-off of bacteria accumulated on the land surface. Bacteria are delivered to receiving waters through creeks and stormwater collection systems. In this analysis, bacteria sources were linked to specific land use types with higher relative bacteria accumulation rates because they are more likely to deliver bacteria to waterbodies through stormwater collection systems. To assess the link between sources of bacteria and the impaired waters, a modeling system that simulates the build-up and wash-off of bacteria and the hydrologic and hydraulic processes that affect delivery was used. This approach assumes the following:

- All sources can be represented through build-up/wash-off of bacteria from specific land use types.
- The discharge of sewage is zero. Sewage spill information was reserved for use during the calibration process to account for observed spikes in bacteria indicators, as applicable; however, the calibration process did not necessitate removal of any wet weather data considered to be affected by sewage spill information. In other words, data from wet weather events used for calibration were not indicative of sewage spills.
- For numeric target assessment, the critical points were assumed to be the point upstream of where the creek/watershed or storm drain initially mixes with ocean water at the surf zone.

The wet weather approach chosen for use in this project is based on the application of the USEPA's Loading Simulation Program in C++ (LSPC) to estimate bacteria loading from streams and assimilation within the waterbodies. LSPC is a recoded C++ version of the USEPA's Hydrological Simulation Program–FORTRAN (HSPF) that relies on fundamental (and USEPA-approved) algorithms. LSPC has been successfully applied and calibrated in the Los Angeles, San Gabriel, and San Jacinto Rivers in Southern California. A complete discussion of LSPC configuration, calibration, and application is provided in Appendix J. Additional assumptions for wet weather modeling can be found in Appendix L.

7.3 Dry Weather Modeling Analysis

The density of bacteria in receiving water during dry weather is extremely variable in nature. This necessitated an approach that relied on detailed analysis of available data to better identify and characterize sources. Data collected from dry weather samples were used to develop empirical relationships that represent water quantity and water quality associated with dry weather runoff from various land uses. For each monitoring station, a watershed was delineated and the land use was related to flow and bacteria densities. A statistical relationship was established between streamflow, bacteria densities, and areas of each land use.

To represent the linkage between source contributions and in-stream response, a steady-state mass balance model was developed to simulate transport of bacteria in the impaired creeks and the creeks flowing to impaired shorelines. This predictive model represents the streams as a series of plug-flow reactors, with each reactor having a constant, steady-state flow and bacteria load. A complete discussion of the development of the empirical framework for estimating watershed loads, and a description of the configuration and calibration of the stream-modeling network is provided in Appendix K.

The model was created to estimate bacteria densities in the San Diego Region, to develop necessary load allocations for TMDL development, and to allow for incorporation of any new data. Bacteria densities in each segment were calculated using available water quality data, and assuming values for a first-order die-off rate, stream infiltration, basic channel geometry, and flow. Assumptions made for dry weather modeling can be found in Appendix L.

8 Allocation and Reduction Calculations

The calibrated models were used to simulate flow and bacteria densities for use in estimating existing bacteria loads to the impaired waterbodies. Current estimated loads were compared to TMDLs, and necessary reductions were quantified. Although the name implies that a "daily load" is calculated, TMDLs for each watershed are expressed as "annual loads" in terms of number of bacteria colonies per year (billion MPN/yr) for wet weather, and "monthly loads" in terms of number of bacteria colonies per month (billion MPN/mo) for dry weather. Although allocations are distributed to the dischargers of bacteria identified in this Technical Report, this does not imply that other potential sources do not exist. Any potential sources in the watersheds not receiving an explicit allocation described in this Technical Report is allowed a zero discharge of bacteria to the impaired beaches and creeks.

This section describes briefly the methodology used to calculate and allocate TMDLs. An in-depth discussion of this topic is the subject of Appendix I.

8.1 Wet Weather Loading Analysis

The LSPC model (see Appendix J) was used to estimate existing bacteria loads at critical conditions for comparison to numeric targets and determination of required reductions for each watershed. The hydrology calibration and validation results for the LSPC model are shown in Appendix M. A comparison of the modeling results to observed bacteria densities are shown in Appendix N.

8.1.1 Identification of the Critical Wet Weather Condition

To ensure that WQOs are met in impaired waterbodies during wet weather events, a critical period associated with extreme wet conditions was selected for TMDL calculations. The year 1993 was selected as the critical wet period for assessment of extreme wet weather loading conditions because this year was the wettest year of the 12 years of record (1990 through 2002) evaluated in the TMDL analysis. This corresponds to the 92nd percentile of annual rainfalls for those 12 years measured at multiple rainfall gages in the San Diego Region (Appendix G, No.21-23). Selection of this year was consistent with studies performed by the Southern California Coastal Water Research Project (SCCWRP). An analysis of rainfall data for the Los Angeles Airport (LAX) from 1947 to 2000 shows that 1993 was the 90th percentile year, meaning 90 percent of the years between 1947 and 2000 had less annual rainfall than 1993 (Los Angeles Water Board, 2002).

8.1.2 Wet Weather Load Estimation

Estimation of current loading to the impaired waterbodies required use of the model to predict flows and bacteria densities. The dynamic model-simulated watershed processes, based on observed rainfall data as model input, provided temporally variable load estimates for the critical period. These load estimates were simulated using calibrated, land use-specific processes associated with hydrology and build-up and wash-off of bacteria from the land surface. Transport processes of bacteria loads from the source to the impaired waterbodies were also simulated in the model with a first-order loss rate based on literature values.

For estimation of bacteria loading during wet weather events, simulations were performed using local rainfall data. The total number of wet days for each watershed is listed in Table 8-1. For larger watersheds that extend into the mountains (e.g., San Luis Rey River, San Dieguito River, San Diego River), more rainfall was observed. Although the Miramar watershed is near the coast and does not extend into the mountains as do the larger watersheds, localized rainfall patterns for 1993 suggested that there were a large number of wet days relative to neighboring watersheds.

Table 8-1. Wet Days of the Critical Period (1993) Identified for Watersheds Affecting Impaired Waterbodies

Watershed	Number of Wet Days in 1993
Laguna/San Joaquin	69
Aliso Creek	69
Dana Point	69
San Juan Creek	76
San Clemente	73
San Luis Rey River	90
San Marcos	49
San Dieguito River	98
Miramar	94
Scripps	57
San Diego River	86
Chollas Creek	65

Only the model-predicted flows and bacteria densities for wet days were considered in estimating existing loads and TMDLs. A separate modeling approach was used for assessment of dry weather loads (see section 8.2).

8.1.3 Identification of Allowable Exceedance Days

The numeric targets used to estimate both interim and final TMDLs is discussed in section 4.1.2. For the interim period, the total number of days that numeric targets may be exceeded based on reference conditions, or allowable exceedance days, was calculated for each of the watersheds addressed in this document. Calculations were performed by multiplying the allowable exceedance frequency (0.22) by the number of wet days for the critical period (Table 8-1). The resulting number of allowable exceedance days for each watershed is listed in Table 8-2.

8.1.4 Critical Points for TMDL Calculation

TMDLs and existing loads were calculated from modeled flow and bacteria densities for each watershed at a node in the model representing the culmination point at the bottom of the watershed, before intertidal mixing and dilution takes place (or at the downstream end of the impaired creek segment, in the case of Forrester Creek). Since the approach for TMDL calculation was identical for both impaired beaches and impaired creeks, one critical point was identified for each watershed. The critical point in the model represents the lowest point in the watershed where creeks and storm drains discharge, and before mixing with the surf zone and dilution takes place. This critical point is considered to be a conservative location for assessment of water quality conditions, and is therefore selected based on high bacteria loads predicted at that location. Although this critical point for water quality assessment is utilized to calculate the bacteria loads discharged from the watersheds to the ocean, compliance with WQOs must be assessed and maintained for all segments of a waterbody to ensure that impairments of beneficial uses do not occur. Beneficial uses apply throughout all segments of a waterbody.

Table 8-2. Allowable Exceedance Days for Affected Watersheds

Watershed	Number of Allowable Exceedance Days for Interim Period
Laguna/San Joaquin	15
Aliso Creek	15
Dana Point	15
San Juan Creek	17
San Clemente	16
San Luis Rey River	20
San Marcos	11
San Dieguito River	22
Miramar	21
Scripps	13
San Diego River	19
Chollas Creek	14

8.1.5 Calculation of TMDLs

For each modeled subwatershed discharging to an impaired waterbody (subwatersheds and proximity to impaired waterbodies are shown in Appendix E), existing wet weather loads were compared to TMDLs through the use of load-duration curves. Load-duration curves are bar graphs that rank the modeled flows into percentiles, or groups arranged in increasing orders of magnitude. This allows current estimated bacteria loads to be compared to interim and final numeric targets. Load-duration curves and TMDL calculations for the watersheds for interim and final targets are provided in Appendices O and P, respectively.

On each load-duration curve, much of the lower range of flow has no associated bacteria loads. This is due to model predicted flows or bacterial concentrations close to zero. Although days were categorized as wet periods based on a criterion associated with rainfall (0.2 inches or more of rainfall and the following 72 hours), some of these days were actually dry in terms of streamflow (some streams may return to baseflow conditions within 72 hours following a rainfall event), leading to poor modeling results. For this reason, bacteria loading during dry weather (low flow) was analyzed with a separate computer model.

For each watershed, load-duration curves were produced for each indicator bacteria showing the daily loads ranked by the percentile of their associated flow magnitude. These plots formed the basis for the existing load and TMDL calculations as described below.

1. Calculation of load based on numeric targets – daily flows were multiplied by the representative numeric targets to create a numeric target line across the load-duration curves;
2. Calculation of daily exceedance loads – daily existing loads were ranked based on their associated flow percentile; daily loads above the numeric target line are in exceedance of the numeric target, while loads below the line do not cause the numeric target to be exceeded;
3. Determination of the allowable exceedance loads using reference system approach - sum of the highest daily exceedance loads (loads above the numeric target line) corresponding to the number of allowable exceedance days (shown in blue in the interim load-duration curves). The number of allowable exceedance days was equal to 22 percent of the wet days during the critical period of 1993;
4. Calculation of non-allowable exceedance loads - sum of the daily loads exceeding the numeric targets minus allowable exceedance loads from Step 3; and
5. Calculation of the required annual load reduction - non-allowable exceedance load minus allowable loads.

The use of load-duration curves to calculate wet weather TMDLs is further described in Appendix I.

8.1.6 Allocation of Bacteria Loads to Point and Nonpoint Sources

The TMDLs were allocated to point sources and nonpoint sources as follows. Loads generated by urban land uses were classified as point sources because of the likelihood that urban lands are drained by MS4s. Loads generated by rural land uses were classified as nonpoint sources based on the likelihood that MS4s are absent in these areas. Loads generated on undeveloped lands were classified as uncontrollable nonpoint sources based on the likelihood that loads from these lands are from wildlife sources. For each watershed, wasteload allocations were developed for municipal discharges and Caltrans discharges from urban lands. Load allocations were developed for controllable nonpoint source discharges that include agricultural and livestock facilities. Finally, load allocations were developed for uncontrollable nonpoint sources from undeveloped lands.

Municipalities and Caltrans own and/or operate the MS4s within the watersheds and are regulated under different NPDES requirements. Therefore, separate wasteload allocations were developed for the municipalities and Caltrans for each watershed. The wet weather wasteload allocations for Caltrans were ~~determined by taking a portion of the bacteria load generated from the industrial transportation land uses in each watershed proportional to the percent of the industrial/ transportation land use area occupied by the impermeable surfaces of Caltrans highways~~set equal to existing loads, since discharges from Caltrans were found to account for less than 1 percent of the wet weather load. The rationale and methodology for distributing the wasteload allocations are described in Appendix I.

Nonpoint sources were separated into controllable and uncontrollable categories. Controllable nonpoint sources were identified by land use types and coverages. Controllable sources include those found in the following land-use types: agriculture, dairy/intensive livestock, and horse ranches. These are considered controllable because the land uses are anthropogenic in nature, and load reductions can be reasonably expected with the implementation of suitable management measures. For implementation purposes, controllable nonpoint source discharges were associated with loads from agriculture, livestock, and horse ranch facilities. Because these loads are controllable, these nonpoint source discharges were given LAs and in watersheds where these loads were greater than 5 percent of the total load, were required to reduce their bacteria loads (see section 10).

In the watersheds affected by these TMDLs, there are four concentrated animal feeding operations that are regulated as point source discharges under NPDES requirements.[37] Although technically point sources of bacteria, these facilities are included in the controllable nonpoint source load allocations because the precision of the modeling results, and loading parameters associated with the dairy/intensive livestock land use category is not sufficient to calculate individual wasteload allocations for these facilities. The same is true for other agriculture, livestock, and horse ranch facilities in the watersheds regulated under non-NPDES waste discharge requirements.

Uncontrollable nonpoint sources include loads from open recreation, open space, and water land uses. Loads from these areas are considered uncontrollable because they come from mostly natural sources (e.g. bird and wildlife feces) and the areas are located in parts of the watershed not likely to be drained by MS4 systems. Loads from these sources were quantified and incorporated into the wet weather TMDL calculations using the reference system approach. In the wet weather TMDLs, uncontrollable source loads were added to the TMDLs and do not take up the loading capacity of the receiving water. The methodology for calculating the load and wasteload allocations is presented in Appendix I.

8.1.7 Margin of Safety

Once TMDLs are calculated, they must be assigned a margin of safety (MOS). There are two ways to incorporate the MOS: (1) implicitly incorporate the MOS using conservative model assumptions to develop TMDLs and (2) explicitly specify a portion of the total TMDL as the MOS and use the remainder for allocations (USEPA, 1991). For both wet and dry weather TMDLs, some general assumptions were made regarding overall conditions facilitating bacteria subsistence and growth, and conditions affecting bacteria die-off. These assumptions are conservative in that they are protective of water quality. The following examples describe the conservative assumptions that constitute the implicit MOS for the wet weather TMDLs.

- *Critical Point for Loading Assessments* - For existing load and TMDL calculations, the water quality at a *critical point* or location in each impaired waterbody has been compared to TMDL targets for assessment of reductions of pollutant loads to meet TMDLs. For beaches, the critical points for evaluating numeric targets are at the mouths of the watersheds, upstream of any surf zone mixing and dilution. High bacteria loads

[37] Order No. 2000-163 NPDES No. CA0109053 *Waste Discharge Requirements for Frank J. Konyn, Frank J. Konyn Dairy, San Diego County*, Order No. 2000-18 NPDES No. CA0109011 *Waste Discharge Requirements for Jack and Mark Stiefel Dairy, Riverside County*, Order No. 2000-0206, NPDES No. CA 0109321, *Waste Discharge Requirements for Diamond Valley Dairy, Riverside County*, Order No. 2002-0067 NPDES No.CA0109371 *Waste Discharge Requirements for S&S Farms, Swine Raising Facility, San Diego County*.

are predicted at this area. This critical point is therefore a conservative location for assessment of water quality conditions. Because beneficial uses of the beach are to be maintained at all locations, including the discharge point of creeks, the conservative approach was to evaluate numeric targets at those discharge points where bacterial densities are assumed to be greatest. For development of TMDLs for impaired creeks, critical points were also selected at the mouths of the impaired creek segments. This approach provides an implicit margin of safety to ensure protection of the beneficial uses of the beaches and creeks under critical conditions.

- *Wet weather TMDL Numeric Targets* – Separate numeric targets are used for wet- and dry weather TMDL calculations. For each condition, selection of the applicable numeric target provides assurance of the protection of beneficial uses in the impaired waterbodies for that condition, and is consistent with State and federal guidance. For wet weather, numeric targets are based on the single sample WQOs in the Ocean Plan and Basin Plan. Because bacteria in wet weather runoff and streamflows have a quick travel time, and therefore, a short residence time in the waterbodies, the single-sample WQOs were determined to be most appropriate for calculating the wet weather TMDLs.
- *Wet weather Critical Condition* – The critical wet condition was selected based on identification of the wettest year of the 12 years of record (1990 through 2002) included in this TMDL analysis. This corresponds to the 92nd percentile of annual rainfalls ~~observed over the past 12 years (1990 through 2002)~~for those 12 years measured at multiple rainfall gages in the San Diego region. This resulted in selection of 1993 as the critical wet year for assessment of wet weather loading conditions. This condition was consistent with studies performed by Southern California Coastal Water Research Project (SCCWRP), where a 90th percentile year was selected based on rainfall data for LAX from 1947 to 2000, also resulting in selection of 1993 as the critical year (Los Angeles Water Board, 2002). Because of the large amount of rainfall, bacteria loads are assumed higher in 1993 than another year with less rainfall.
- *Reference System* – The bacteria in the reference system (watershed and downstream beach) is assumed to behave similarly to bacteria in an urbanized watershed. Natural processes that affect survival and propagation of bacteria (presence of wrack line, re-suspension of sediments) are present in both the reference watershed and all urbanized watersheds.

8.1.8 Seasonality

Through simulation of an entire critical wet year, daily wet weather loads were estimated for all seasons of that year and compared to TMDLs to determine necessary load reductions. Model simulation of a full year accounted for seasonal variations in rainfall, evaporation, and associated impacts on runoff and transport of bacteria loads to receiving waters. Although large storms in the wet season of the critical year were associated with large volumes of runoff that transported large bacteria loads, smaller storms during the dry season (April-October) also provided large bacteria loads resulting from wash-off of bacteria that had accumulated on the surface during the preceding extended dry period. For estimating bacteria loads during dry weather conditions, the separate dry weather modeling approach was used.

8.2 Dry Weather Loading Analysis

The low-flow, steady state model was used to estimate bacteria loads during dry weather conditions. The steady-state aspect of the model resulted in estimation of a constant bacteria load from each watershed. This load is representative of the average flow and bacteria loading conditions resulting from various urban land use practices (e.g., runoff from lawn irrigation or sidewalk washing). A complete discussion of model development, calibration, and validation is provided in Appendix K.

Because dry weather loading was estimated as a function of steady-state flows derived from an analysis of average dry weather flows, there was no critical dry period identified. Dry weather days were selected based on the criterion that less than 0.2 inch of rainfall was observed on each of the previous 3 days. Based on analysis of dry weather flow, critical flows were predicted for each impaired watershed.

8.2.1 Dry Weather Load Estimation

For each watershed the dry weather model was used to estimate the flows and bacteria densities resulting from dry weather urban runoff. Estimation of source loadings was based on empirical relationships established between both flow and bacteria densities and land use distribution in the watershed. Transport of bacteria loads was simulated using standard plug-flow equations to describe steady-state losses resulting from first-order die-off and stream infiltration. Steady-state estimates of bacteria loads were assumed constant for all dry days.

For consistency with the wet weather approach, dry days were assessed for the critical wet year, identified as 1993. The dry days in 1993 for each watershed are listed in Table 8-3.

Table 8-3. Dry Days of the Critical Period (1993) Identified for Watersheds Affecting Impaired Waterbodies

Watershed	Number of Dry Days in 1993
Laguna/San Joaquin	296
Aliso Creek	296
Dana Point	296
San Juan Creek	289
San Clemente	292
San Luis Rey River	275
San Marcos	316
San Dieguito River	267
Miramar	271
Scripps	308
San Diego River	279
Chollas Creek	300

8.2.2 Dry Weather Numeric Targets

Dry weather numeric targets consist of the 30-day geometric mean WQOs. These targets are appropriate for the dry weather analysis because the dry weather model simulates average flows.

Since the 30-day geometric mean WQO is an average bacteria density of 5 samples over 30 days, it is an appropriate numeric target to use with an average flow. The dry weather numeric targets are discussed further in section 4.2.

8.2.3 Critical Points for TMDL Calculation

Consistent with the approach used for wet weather analysis, TMDLs were calculated based on modeled flow and bacteria density at a node in the model, called the *critical point*, which represents the watershed mouth. Since the approach for TMDL calculation was identical for both beaches and creeks, one critical point was identified for each watershed model draining to an impaired waterbody. The critical point in the model represents the lowest point in the watershed where creeks and storm drains discharge, and before mixing with the surf zone and dilution takes place. This critical point is considered to be a conservative location for assessment of water quality conditions, and is therefore selected based on high bacteria loads predicted at that location. Although this critical point for water quality assessment is utilized for TMDL analysis, compliance to WQOs must be assessed and maintained for all segments of a waterbody to ensure that impairments of beneficial uses are not observed. Beneficial uses apply throughout all segments of a waterbody.

8.2.4 Calculation of TMDLs and Allocations of Bacteria Loads

For each modeled watershed discharging to an impaired waterbody (see Figures 3-1 and 3-2), calculation of allocations and required load reductions were performed using the following steps:

1. Calculation of the TMDLs based on model-predicted flows multiplied by applicable numeric targets; and
2. Calculation of required load reductions based on the difference between TMDLs and current bacteria loads.

Unlike the wet weather approach, for the dry weather approach, the TMDLs were allocated solely to MS4 discharges as WLAs (no LA component was broken out). This is because dry weather bacteria loads are generated from urban runoff discharged to receiving waters via MS4s. The only discharge to receive a WLA was the municipal discharges; Caltrans did not receive a WLA. This is because Caltrans-owned areas (freeway surfaces) are unlikely to discharge bacteria to receiving waters during dry weather conditions because there is no flow source to wash bacteria off of Caltrans highways during dry weather. See Appendix I for methodology used for reporting WLAs.

8.2.5 Margin of Safety

An implicit MOS was incorporated through application of conservative assumptions throughout TMDL development. As with wet weather, conservative assumptions imply that worst case conditions exist in terms of current bacteria loading. The following list describes the conservative assumptions that constitute the implicit MOS for the dry weather TMDLs.

- *Critical Point for Loading Assessments* - For existing load and TMDL calculations, the water quality at a *critical point* or location in each impaired waterbody has been compared to TMDL targets for assessment of reductions of pollutant loads to meet

TMDLs. For beaches, the critical points for evaluating numeric targets are at the mouths of the watersheds, upstream of any surf zone mixing and dilution. High bacteria loads are predicted at this area. This critical point is therefore a conservative location for assessment of water quality conditions. Because beneficial uses of the beach are to be maintained at all locations, including the discharge point of creeks, the conservative approach was to evaluate numeric targets at those discharge points where bacterial densities are assumed to be greatest. For development of TMDLs for impaired creeks, critical points were also selected at the mouths of the impaired creek segments. This approach provides an implicit margin of safety to ensure protection of the beneficial uses of the beaches and creeks under critical conditions.

- *Dry weather TMDL Numeric Targets* - For dry weather, the 30-day geometric mean was used to as a numeric target to calculate TMDLs because of the steady-state characteristic of bacteria loads predicted through modeling analysis. Compliance with the 30-day geometric mean WQOs provides assurance that TMDLs will result in the protection of beneficial uses by stressing the importance of maintaining sustained safe levels of bacteria densities over all dry periods.

8.2.6 Seasonality

The dry weather approach uses a unique modeling system designed to assess average bacteria loading and TMDLs during dry weather conditions. This approach is distinct from the wet weather approach described in section 8.1.

9 Total Maximum Daily Loads and Allocations

The TMDL for a given pollutant and waterbody is the total amount of pollutant that can be assimilated by the receiving waterbody while still achieving WQOs. Once calculated, the TMDL is set equal to the sum of individual waste load allocations (WLAs) for point sources, and load allocations (LAs) for both nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. Conceptually, this definition is represented by the equation:

$$\text{TMDL} = \sum \text{WLAs} + \sum \text{LAs} + \text{MOS}$$

In the case of beaches and creeks in the San Diego Region, applicable WQOs are designed to protect the REC-1 and SHELL beneficial uses. In TMDL development, allowable loadings from pollutant sources that cumulatively amount to no more than the TMDL must be established; this provides the basis to establish water quality-based controls. TMDLs can be expressed on a mass-loading basis (e.g., numbers of bacteria colonies per month or year) or as a concentration in accordance with federal regulations [40 CFR 130.2(l)].

For this project, TMDLs are expressed as number of bacteria colonies per month or year (billion MPN/mo or year). This is an innovative manner for expressing bacteria TMDLs in California, but has been used elsewhere in the country.[38] In order to measure bacteria loading, both flow rates and bacteria densities must be measured at the critical point. When multiplied together, these two parameters result in bacteria loading, or the number of bacteria colonies measured per unit time.

$$\textit{Bacteria Loading} = \textit{flow rate}\,(\textit{volume} / \textit{time}) \times \textit{bacteria density}(\textit{number of colonies} / \textit{volume})$$

Determination of bacteria loading cannot take place solely in the wavewash, since flow measurements cannot be obtained there. Estimation of bacteria loading to determine compliance with the TMDLs may or may not be required from dischargers. Method(s) of compliance will be determined upon issuance, re-issuance or amendment of applicable WDRs, enforcement of waivers, or other appropriate means of enforcement. For a discussion of the implementation of TMDLs and enforcement mechanisms, see section 11, Implementation Plan.

9.1 Summary of Technical Approach for TMDL Calculations

For each watershed containing an impaired waterbody, TMDLs were calculated based on modeled flow and bacteria density at the model critical point for both wet weather events and dry

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[38] Although TMDLs for most constituents are usually expressed as loads, the bacteria TMDLs developed by the Los Angeles Water Board are expressed as "number of days" of exceedance. Per calendar year, each location for which TMDLs were developed has a corresponding number of days in which exceedances of the WQOs may be allowed (Los Angeles Water Board, 2002 and 2003). In contrast, this project contains TMDLs in terms of mass loading per unit time. The *Nooksack River Watershed Bacteria TMDL*, developed by the Washington Department of Ecology in 2001, and the *Lynnhaven Bay TMDL Report for Shellfish Areas Listed Due to Bacteria Contamination*, developed by the Virginia Department of Environmental Quality in 2004, both use loads as the method of expressing the allocations.

weather conditions. The calculations and technical approaches were different for the two conditions.

9.1.1 Summary of Wet Weather TMDLs

For wet weather, TMDLs were calculated for interim and final periods, and allocations were divided among point source dischargers and nonpoint source dischargers. Interim TMDLs were calculated using interim numeric targets. Final TMDLs were calculated using final numeric targets, including numeric targets equal to the WQOs protective of the SHELL beneficial use. Numeric targets utilized the single sample maximum component of the WQOs.

Interim TMDLs for wet weather were calculated by applying the reference system approach, which takes into consideration loading of bacteria from natural sources within the watersheds. The reference system approach was used to calculate wet weather TMDLs for the interim period, only. Although the San Diego Water Board recognizes that the reference system approach is appropriate since watersheds receive bacterial loadings from natural sources, final TMDLs must adhere to WQOs, without exception from these sources. This is because, unlike the Los Angeles Water Board, the San Diego Water Board does not have implementation provisions for a reference system approach in its Basin Plan.

Federal regulations [40 CFR 130.7] require TMDLs to include individual WLAs for each point source. The only point sources identified to affect impaired waterbodies addressed in this study were MS4s, although other point sources of bacteria exist (such as concentrated animal feeding operations (CAFOs) or publicly owned treatment works (POTWs)). USEPA's permitting regulations require municipalities to obtain NPDES requirements for all stormwater discharges from MS4s. The existing loads estimated from computer modeling were solely the result of watershed runoff, not other types of point sources. WLAs were assigned to municipalities and Caltrans.

TMDLs must also include LAs for each nonpoint source. LAs were divided into controllable and uncontrollable categories. Controllable sources include discharges from agriculture, livestock, and horse ranch facilities and were quantified by the agriculture, dairy/intensive livestock, and horse ranches land use categories. Uncontrollable sources include loads from natural sources and, although LAs are presented, no reductions are required.

The loads associated with uncontrollable nonpoint sources cannot be reduced because they come from natural sources in the watershed. Comparing the final wet weather allowable loads to the loads allocated to uncontrollable nonpoint sources (from the previous analysis) shows that, in every watershed, the uncontrollable nonpoint source allocation is greater than the TMDL. This indicates that the natural bacteria sources in the watersheds consume and exceed the assimilative capacity of the creeks, resulting in allocations of zero loads to all remaining sources, namely controllable point and nonpoint sources.

9.1.2 Summary of Dry Weather TMDLs

For dry weather, TMDLs were calculated for interim and final periods, and allocations were assigned solely to point source dischargers. Interim and final TMDLs were identical for fecal coliform and enterococci (no reference system approach was used) and were calculated using the

REC-1 WQOs as numeric targets. Final TMDLs for total coliform were calculated using numeric targets equal to the SHELL WQOs. Numeric targets utilized the geometric mean WQOs rather than the single sample WQOs.

The reference system approach was not utilized in calculating dry weather TMDLs. This is because available data shows that exceedances of WQOs in local reference systems during dry weather conditions are uncommon (see section 4.2). Further, reference systems do not generate significant dry weather bacteria loads because flows are minimal. During dry weather, flow, and hence bacteria loads, are generated by urban runoff, which is not a product of a reference system.

For dry weather, WLAs were developed for MS4s. The only point sources identified to affect impaired waterbodies addressed in this study were MS4s, although other point sources of bacteria exist (such as CAFOs or POTWs). USEPA's permitting regulations require municipalities to obtain NPDES requirements for all urban runoff discharges from MS4s. The existing loads estimated from computer modeling were solely the result of watershed runoff, not other types of point sources. WLAs were assigned to municipalities located in the affected watersheds. Unlike the wet weather approach, dry weather WLAs were not distributed to Caltrans. This is because Caltrans-owned freeway surfaces are not likely to discharge bacteria to receiving waters during dry weather conditions.

Although TMDLs must also include LAs for each nonpoint source, LAs were not developed for controllable sources for dry weather conditions.~~Uncontrollable sources were given the same load allocation as the in the interim TMDLs.~~ TMDLs and associated WLAs and LAs are presented in Tables 9-1 through 9-10.

Table 9-1. Interim TMDLs for Fecal Coliform

Hydrologic Descriptor	Model Subwatershed[A]	Wet Weather TMDL Results (Billion MPN/year)							Dry Weather TMDL Results (Billion MPN/year)[C]		
		Existing Load	Total Maximum Daily Load	Percent[B] Reduction	Wasteload Allocation (Municipal MS4s)	Wasteload Allocation (Caltrans)	Load Allocation (Controllable)	Load Allocation (Non-Controllable)	Existing Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12) Cameo Cove at Irvine Cove Dr. – Riviera Way at Heisler Park – North	101 103	52,676	49,474	6.1%	5,434	15	511	43,247	5,041	154	96.9%
Laguna Beach HSA (901.12) at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Ave. Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Rd. Laguna Beach at Dumond Drive	104 105 106	652,339	615,160	5.7%	67,609	184	6,401	541,166	21,999	2,083	90.5%
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	1,752,095	1,579,074	9.9%	585,753	241	23,844	968,920	53,972	2,383	95.6%
Dana Point HSA (901.14) Aliso Beach at West Street Aliso Beach at Table Rock Drive 1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave) at Salt Creek (large outlet) Salt Creek Beach at Salt Creek service road Salt Creek Beach at Dana Strand Road	301 302 304 305 306	403,911	377,313	6.6%	167,225	0	0	210,050	18,263	912	95.0%
Lower San Juan HSA (901.27) San Juan Creek	401	15,304,790	14,714,833	3.9%	1,274,294	1,482	3,148,974	10,288,611	62,179	16,038	74.2%

~~Table 9-1. Interim TMDLs for Fecal Coliform~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~San Clemente HA (901.30)~~ ~~at Poche Beach (large outlet)~~ ~~Ole Hanson Beach Club Beach at Pico Drain~~ ~~San Clemente City Beach at El Portal St. Stairs~~ ~~San Clemente City Beach at Mariposa St.~~ ~~San Clemente City Beach at Linda Lane~~ ~~San Clemente City Beach at South Linda Lane~~ ~~San Clemente City Beach at Lifeguard Headquarters~~ ~~Under San Clemente Municipal Pier~~ ~~San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.)~~ ~~San Clemente State Beach at Riviera Beach~~ ~~San Clemente State Beach at Cypress Shores~~	~~501~~ ~~502~~ ~~503~~ ~~504~~ ~~505~~ ~~506~~	~~1,441,719~~	~~1,378,930~~	~~4.4%~~	~~244,166~~	~~318~~	~~414~~	~~1,133,894~~	~~32,382~~	~~1,865~~	~~94.2%~~
~~San Luis Rey HU (903.00)~~ ~~at San Luis Rey River Mouth~~	~~701~~	~~33,120,012~~	~~32,445,470~~	~~2.0%~~	~~926,397~~	~~1,543~~	~~20,265,441~~	~~11,252,089~~	~~15,918~~	~~9,697~~	~~39.1%~~
~~San Marcos HA (904.50)~~ ~~at Moonlight State Beach~~	~~1101~~	~~20,886~~	~~17,224~~	~~17.5%~~	~~6,676~~	~~7~~	~~9,236~~	~~1,307~~	~~1,571~~	~~273~~	~~82.6%~~
~~San Dieguito HU (905.00)~~ ~~at San Dieguito Lagoon Mouth~~	~~1301~~ ~~1302~~	~~21,286,909~~	~~21,106,683~~	~~0.8%~~	~~802,681~~	~~1,483~~	~~11,771,197~~	~~8,531,321~~	~~14,517~~	~~11,512~~	~~20.7%~~
~~Miramar Reservoir HA (906.10)~~ ~~Torrey Pines State Beach at Del Mar (Anderson Canyon)~~	~~1401~~	~~10,392~~	~~10,256~~	~~1.3%~~	~~6,750~~	~~0~~	~~0~~	~~3,506~~	~~1,849~~	~~66~~	~~96.4%~~

~~*Table 9-1. Interim TMDLs for Fecal Coliform*~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~Scripps HA (906.30)~~ ~~La Jolla Shores Beach at El Paseo Grande~~ ~~La Jolla Shores Beach at Caminito Del Oro~~ ~~La Jolla Shores Beach at Vallecitos~~ ~~La Jolla Shores Beach at Ave de la Playa~~ ~~at Casa Beach, Children's Pool~~ ~~South Casa Beach at Coast Blvd.~~ ~~Whispering Sands Beach at Ravina St.~~ ~~Windansea Beach at Vista de la Playa~~ ~~Windansea Beach at Bonair St.~~ ~~Windansea Beach at Playa del Norte~~ ~~Windansea Beach at Palomar Ave.~~ ~~at Tourmaline Surf Park~~ ~~Pacific Beach at Grand Ave.~~	~~1501~~ ~~1503~~ ~~1505~~ ~~1507~~	~~204,057~~	~~176,906~~	~~13.3%~~	~~111,327~~	~~0~~	~~0~~	~~65,579~~	~~34,085~~	~~1,221~~	~~96.4%~~
~~San Diego HU (907.11)~~ ~~at San Diego River Mouth (aka Dog Beach)~~	~~1801~~	~~4,932,380~~	~~4,681,150~~	~~5.1%~~	~~448,867~~	~~992~~	~~393,685~~	~~3,838,075~~	~~45,831~~	~~14,003~~	~~69.4%~~
~~Santee HSA (907.12)~~ ~~Forrester Creek~~	~~1801~~	~~4,932,380~~	~~4,681,150~~	~~5.1%~~	~~448,867~~	~~992~~	~~393,685~~	~~3,838,075~~	~~45,831~~	~~14,003~~	~~69.4%~~
~~San Diego HU (907.11) & Santee HSA (907.12)~~ ~~San Diego River, Lower~~	~~1801~~	~~4,932,380~~	~~4,681,150~~	~~5.1%~~	~~448,867~~	~~992~~	~~393,685~~	~~3,838,075~~	~~45,831~~	~~14,003~~	~~69.4%~~
~~Chollas HSA (908.22)~~ ~~Chollas Creek~~	~~1901~~	~~603,863~~	~~520,440~~	~~13.8%~~	~~289,423~~	~~774~~	~~0~~	~~230,139~~	~~50,680~~	~~3,982~~	~~92.1%~~

[A] ~~This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O.~~

[B] ~~Percent Reduction = [1 – (Total Maximum Daily Load / Existing Load)] x 100%~~

[C] ~~The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans highways, controllable point sources, and non-controllable point sources are not likely during dry weather.~~

~~*Table 9-2. Final TMDLs for Fecal Coliform*~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12)~~ ~~Cameo Cove at Irvine Cove Dr. - Riviera Way~~ ~~at Heisler Park – North~~	~~101~~ ~~103~~	~~52,676~~	~~1,119~~	~~97.8%~~	~~0~~	~~0~~	~~0~~	~~43,247~~	~~5,041~~	~~154~~	~~96.9%~~
~~Laguna Beach HSA (901.12)~~ ~~at Main Laguna Beach~~ ~~Laguna Beach at Ocean Avenue~~ ~~Laguna Beach at Laguna Ave.~~ ~~Laguna Beach at Cleo Street~~ ~~Arch Cove at Bluebird Canyon Rd.~~ ~~Laguna Beach at Dumond Drive~~	~~104~~ ~~105~~ ~~106~~	~~652,339~~	~~14,923~~	~~97.7%~~	~~0~~	~~0~~	~~0~~	~~541,166~~	~~21,999~~	~~2,083~~	~~90.5%~~
~~Aliso HSA (901.13)~~ ~~Laguna Beach at Lagunita Place / Blue Lagoon Place~~ ~~at Aliso Beach~~ ~~Aliso Creek~~	~~201~~ ~~202~~	~~1,752,095~~	~~84,562~~	~~95.2%~~	~~0~~	~~0~~	~~0~~	~~968,920~~	~~53,972~~	~~2,383~~	~~95.6%~~
~~Dana Point HSA (901.14)~~ ~~Aliso Beach at West Street~~ ~~Aliso Beach at Table Rock Drive~~ ~~1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave)~~ ~~at Salt Creek (large outlet)~~ ~~Salt Creek Beach at Salt Creek service road~~ ~~Salt Creek Beach at Dana Strand Road~~	~~301~~ ~~302~~ ~~304~~ ~~305~~ ~~306~~	~~403,911~~	~~14,894~~	~~96.3%~~	~~0~~	~~0~~	~~0~~	~~210,050~~	~~18,263~~	~~912~~	~~95.0%~~
~~Lower San Juan HSA (901.27)~~ ~~San Juan Creek~~	~~401~~	~~15,304,790~~	~~358,410~~	~~97.6%~~	~~0~~	~~0~~	~~0~~	~~10,288,611~~	~~62,179~~	~~16,038~~	~~74.2%~~

~~Table 9-2. Final TMDLs for Fecal Coliform~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~San Clemente HA (901.30)~~ ~~at Poche Beach (large outlet)~~ ~~Ole Hanson Beach Club Beach at Pico Drain~~ ~~San Clemente City Beach at El Portal St. Stairs~~ ~~San Clemente City Beach at Mariposa St.~~ ~~San Clemente City Beach at Linda Lane~~ ~~San Clemente City Beach at South Linda Lane~~ ~~San Clemente City Beach at Lifeguard Headquarters~~ ~~Under San Clemente Municipal Pier~~ ~~San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.)~~ ~~San Clemente State Beach at Riviera Beach~~ ~~San Clemente State Beach at Cypress Shores~~	~~501~~ ~~502~~ ~~503~~ ~~504~~ ~~505~~ ~~506~~	~~1,441,719~~	~~36,481~~	~~97.5%~~	~~0~~	~~0~~	~~0~~	~~1,133,894~~	~~32,382~~	~~1,865~~	~~94.2%~~
~~San Luis Rey HU (903.00)~~ ~~at San Luis Rey River Mouth~~	~~701~~	~~33,120,012~~	~~641,823~~	~~98.1%~~	~~0~~	~~0~~	~~0~~	~~11,252,089~~	~~15,918~~	~~9,697~~	~~39.1%~~
~~San Marcos HA (904.50)~~ ~~at Moonlight State Beach~~	~~1101~~	~~20,886~~	~~1,559~~	~~92.5%~~	~~0~~	~~0~~	~~0~~	~~1,307~~	~~1,571~~	~~273~~	~~82.6%~~
~~San Dieguito HU (905.00)~~ ~~at San Dieguito Lagoon Mouth~~	~~1301~~ ~~1302~~	~~21,286,909~~	~~431,004~~	~~98.0%~~	~~0~~	~~0~~	~~0~~	~~8,531,321~~	~~14,517~~	~~11,512~~	~~20.7%~~
~~Miramar Reservoir HA (906.10)~~ ~~Torrey Pines State Beach at Del Mar (Anderson Canyon)~~	~~1401~~	~~10,392~~	~~312~~	~~97.0%~~	~~0~~	~~0~~	~~0~~	~~3,506~~	~~1,849~~	~~66~~	~~96.4%~~

~~Table 9-2. Final TMDLs for Fecal Coliform~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~Scripps HA (906.30)~~ ~~La Jolla Shores Beach at El Paseo Grande~~ ~~La Jolla Shores Beach at Caminito Del Oro~~ ~~La Jolla Shores Beach at Vallecitos~~ ~~La Jolla Shores Beach at Ave de la Playa~~ ~~at Casa Beach, Children's Pool~~ ~~South Casa Beach at Coast Blvd.~~ ~~Whispering Sands Beach at Ravina St.~~ ~~Windansea Beach at Vista de la Playa~~ ~~Windansea Beach at Bonair St.~~ ~~Windansea Beach at Playa del Norte~~ ~~Windansea Beach at Palomar Ave.~~ ~~at Tourmaline Surf Park~~ ~~Pacific Beach at Grand Ave.~~	~~1501~~ ~~1503~~ ~~1505~~ ~~1507~~	~~204,057~~	~~10,329~~	~~94.9%~~	~~0~~	~~0~~	~~0~~	~~65,579~~	~~34,085~~	~~1,221~~	~~96.4%~~
~~San Diego HU (907.11)~~ ~~at San Diego River Mouth (aka Dog Beach)~~	~~1801~~	~~4,932,380~~	~~311,132~~	~~93.7%~~	~~0~~	~~0~~	~~0~~	~~3,838,075~~	~~45,831~~	~~14,003~~	~~69.4%~~
~~Santee HSA (907.12)~~ ~~Forrester Creek~~	~~1801~~	~~4,932,380~~	~~311,132~~	~~93.7%~~	~~0~~	~~0~~	~~0~~	~~3,838,075~~	~~45,831~~	~~14,003~~	~~69.4%~~
~~San Diego HU (907.11) & Santee HSA (907.12)~~ ~~San Diego River, Lower~~	~~1801~~	~~4,932,380~~	~~311,132~~	~~93.7%~~	~~0~~	~~0~~	~~0~~	~~3,838,075~~	~~45,831~~	~~14,003~~	~~69.4%~~
~~Chollas HSA (908.22)~~ ~~Chollas Creek~~	~~1901~~	~~603,863~~	~~55,516~~	~~90.8%~~	~~0~~	~~0~~	~~0~~	~~230,139~~	~~50,680~~	~~3,982~~	~~92.1%~~

[A] ~~This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load duration curves and TMDL calculation tables for each subwatershed are provided in Appendix P.~~

[B] ~~Percent reduction = [1 – (Total Maximum Daily Load / Existing Load)] x 100%~~

[C] ~~The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans highways, controllable point sources, and non-controllable point sources are not likely during dry weather.~~

~~*Table 9-3. Interim TMDLs for Total Coliform*~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Waste-load Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12)~~ ~~Cameo Cove at Irvine Cove Dr. – Riviera Way~~ ~~at Heisler Park – North~~	~~101~~ ~~103~~	~~628,669~~	~~567,611~~	~~9.7%~~	~~114,373~~	~~511~~	~~3,519~~	~~449,150~~	~~25,369~~	~~770~~	~~97.0%~~
~~Laguna Beach HSA (901.12)~~ ~~at Main Laguna Beach~~ ~~Laguna Beach at Ocean Avenue~~ ~~Laguna Beach at Laguna Ave.~~ ~~Laguna Beach at Cleo Street~~ ~~Arch Cove at Bluebird Canyon Rd.~~ ~~Laguna Beach at Dumond Drive~~	~~104~~ ~~105~~ ~~106~~	~~7,593,233~~	~~6,878,039~~	~~9.4%~~	~~1,385,925~~	~~6,190~~	~~42,644~~	~~5,442,593~~	~~110,707~~	~~10,415~~	~~90.6%~~
~~Aliso HSA (901.13)~~ ~~Laguna Beach at Lagunita Place / Blue Lagoon Place~~ ~~at Aliso Beach~~ ~~Aliso Creek~~	~~201~~ ~~202~~	~~23,210,774~~	~~20,190,798~~	~~13.0%~~	~~10,390,638~~	~~9,642~~	~~155,469~~	~~9,635,049~~	~~262,841~~	~~11,915~~	~~95.9%~~
~~Dana Point HSA (901.14)~~ ~~Aliso Beach at West Street~~ ~~Aliso Beach at Table Rock Drive~~ ~~1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave)~~ ~~at Salt Creek (large outlet)~~ ~~Salt Creek Beach at Salt Creek service road~~ ~~Salt Creek Beach at Dana Strand Road~~	~~301~~ ~~302~~ ~~304~~ ~~305~~ ~~306~~	~~6,546,962~~	~~6,031,472~~	~~7.9%~~	~~3,611,042~~	~~603~~	~~0~~	~~2,419,827~~	~~91,908~~	~~4,558~~	~~95.0%~~
~~Lower San Juan HSA (901.27)~~ ~~San Juan Creek~~	~~401~~	~~130,258,863~~	~~122,879,198~~	~~5.7%~~	~~18,781,704~~	~~55,677~~	~~17,461,134~~	~~86,580,683~~	~~297,153~~	~~80,190~~	~~73.0%~~

~~Table 9-3. Interim TMDLs for Total Coliform~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~San Clemente HA (901.30)~~ ~~at Poche Beach (large outlet)~~ ~~Ole Hanson Beach Club Beach at Pico Drain~~ ~~San Clemente City Beach at El Portal St. Stairs~~ ~~San Clemente City Beach at Mariposa St.~~ ~~San Clemente City Beach at Linda Lane~~ ~~San Clemente City Beach at South Linda Lane~~ ~~San Clemente City Beach at Lifeguard Headquarters~~ ~~Under San Clemente Municipal Pier~~ ~~San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.)~~ ~~San Clemente State Beach at Riviera Beach~~ ~~San Clemente State Beach at Cypress Shores~~	~~501~~ ~~502~~ ~~503~~ ~~504~~ ~~505~~ ~~506~~	~~16,236,540~~	~~15,147,590~~	~~6.7%~~	~~4,260,551~~	~~12,584~~	~~1,515~~	~~10,871,425~~	~~162,961~~	~~9,326~~	~~94.3%~~
~~San Luis Rey HU (903.00)~~ ~~at San Luis Rey River Mouth~~	~~701~~	~~231,598,677~~	~~224,189,156~~	~~3.2%~~	~~14,765,590~~	~~53,313~~	~~113,596,645~~	~~95,796,026~~	~~78,370~~	~~48,483~~	~~38.1%~~
~~San Marcos HA (904.50)~~ ~~at Moonlight State Beach~~	~~1101~~	~~515,278~~	~~425,083~~	~~17.5%~~	~~301,962~~	~~442~~	~~101,000~~	~~21,679~~	~~7,907~~	~~1,364~~	~~82.7%~~
~~San Dieguito HU (905.00)~~ ~~at San Dieguito Lagoon Mouth~~	~~1301~~ ~~1302~~	~~163,541,132~~	~~159,978,672~~	~~2.2%~~	~~17,008,759~~	~~44,967~~	~~68,038,929~~	~~74,870,018~~	~~67,236~~	~~57,563~~	~~14.4%~~
~~Miramar Reservoir HA (906.10)~~ ~~Torrey Pines State Beach at Del Mar (Anderson Canyon)~~	~~1401~~	~~212,986~~	~~210,182~~	~~1.3%~~	~~171,940~~	~~9~~	~~0~~	~~38,232~~	~~9,307~~	~~328~~	~~96.5%~~

~~*Table 9-3. Interim TMDLs for Total Coliform*~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~Scripps HA (906.30)~~ ~~La Jolla Shores Beach at El Paseo Grande~~ ~~La Jolla Shores Beach at Caminito Del Oro~~ ~~La Jolla Shores Beach at Vallecitos~~ ~~La Jolla Shores Beach at Ave de la Playa~~ ~~at Casa Beach, Children's Pool~~ ~~South Casa Beach at Coast Blvd.~~ ~~Whispering Sands Beach at Ravina St.~~ ~~Windansea Beach at Vista de la Playa~~ ~~Windansea Beach at Bonair St.~~ ~~Windansea Beach at Playa del Norte~~ ~~Windansea Beach at Palomar Ave.~~ ~~at Tourmaline Surf Park~~ ~~Pacific Beach at Grand Ave.~~	~~1501~~ ~~1503~~ ~~1505~~ ~~1507~~	~~5,029,518~~	~~4,356,972~~	~~13.4%~~	~~3,569,231~~	~~0~~	~~0~~	~~787,305~~	~~171,530~~	~~6,103~~	~~96.4%~~
~~San Diego HU (907.11)~~ ~~at San Diego River Mouth (aka Dog Beach)~~	~~1801~~	~~72,757,569~~	~~66,114,283~~	~~9.1%~~	~~15,845,473~~	~~48,401~~	~~3,180,097~~	~~47,033,701~~	~~269,592~~	~~70,017~~	~~74.0%~~
~~Santee HSA (907.12)~~ ~~Forrester Creek~~	~~1801~~	~~72,757,569~~	~~66,114,283~~	~~9.1%~~	~~15,845,473~~	~~48,401~~	~~3,180,097~~	~~47,033,701~~	~~269,592~~	~~70,017~~	~~74.0%~~
~~San Diego HU (907.11) & Santee HSA (907.12)~~ ~~San Diego River, Lower~~	~~1801~~	~~72,757,569~~	~~66,114,283~~	~~9.1%~~	~~15,845,473~~	~~48,401~~	~~3,180,097~~	~~47,033,701~~	~~269,592~~	~~70,017~~	~~74.0%~~
~~Chollas HSA (908.22)~~ ~~Chollas Creek~~	~~1901~~	~~15,390,608~~	~~13,247,626~~	~~13.9%~~	~~10,349,391~~	~~39,397~~	~~0~~	~~2,858,838~~	~~250,803~~	~~19,910~~	~~92.1%~~

[A] ~~This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O.~~

[B] ~~Percent reduction = [1 – (Total Maximum Daily Load / Existing Load)] x 100%~~

[C] ~~The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans highways, controllable point sources, and non-controllable point sources are not likely during dry weather.~~

~~*Table 9-4. Final TMDLs for Total Coliform*~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Waste-load Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12)~~ ~~Cameo Cove at Irvine Cove Dr. – Riviera Way~~ ~~at Heisler Park – North~~	~~101~~ ~~103~~	~~628,669~~	~~644~~	~~99.9%~~	~~0~~	~~0~~	~~0~~	~~449,150~~	~~25,369~~	~~54~~	~~97.0%~~
~~Laguna Beach HSA (901.12)~~ ~~at Main Laguna Beach~~ ~~Laguna Beach at Ocean Avenue~~ ~~Laguna Beach at Laguna Ave.~~ ~~Laguna Beach at Cleo Street~~ ~~Arch Cove at Bluebird Canyon Rd.~~ ~~Laguna Beach at Dumond Drive~~	~~104~~ ~~105~~ ~~106~~	~~7,593,233~~	~~8,594~~	~~99.9%~~	~~0~~	~~0~~	~~0~~	~~5,442,593~~	~~110,707~~	~~729~~	~~90.6%~~
~~Aliso HSA (901.13)~~ ~~Laguna Beach at Lagunita Place / Blue Lagoon Place~~ ~~at Aliso Beach~~ ~~Aliso Creek~~	~~201~~ ~~202~~	~~23,210,774~~	~~57,629~~	~~99.8%~~	~~0~~	~~0~~	~~0~~	~~9,635,049~~	~~262,841~~	~~834~~	~~95.9%~~
~~Dana Point HSA (901.14)~~ ~~Aliso Beach at West Street~~ ~~Aliso Beach at Table Rock Drive~~ ~~1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave)~~ ~~at Salt Creek (large outlet)~~ ~~Salt Creek Beach at Salt Creek service road~~ ~~Salt Creek Beach at Dana Strand Road~~	~~301~~ ~~302~~ ~~304~~ ~~305~~ ~~306~~	~~6,546,962~~	~~8,387~~	~~99.9%~~	~~0~~	~~0~~	~~0~~	~~2,419,827~~	~~91,908~~	~~319~~	~~95.0%~~
~~Lower San Juan HSA (901.27)~~ ~~San Juan Creek~~	~~401~~	~~130,258,863~~	~~8,947,114~~	~~93.2%~~	~~0~~	~~0~~	~~0~~	~~86,580,683~~	~~297,153~~	~~80,190~~	~~73.0%~~

~~Table 9-4. Final TMDLs for Total Coliform~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~San Clemente HA (901.30)~~ ~~at Poche Beach (large outlet)~~ ~~Ole Hanson Beach Club Beach at Pico Drain~~ ~~San Clemente City Beach at El Portal St. Stairs~~ ~~San Clemente City Beach at Mariposa St.~~ ~~San Clemente City Beach at Linda Lane~~ ~~San Clemente City Beach at South Linda Lane~~ ~~San Clemente City Beach at Lifeguard Headquarters~~ ~~Under San Clemente Municipal Pier~~ ~~San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.)~~ ~~San Clemente State Beach at Riviera Beach~~ ~~San Clemente State Beach at Cypress Shores~~	~~501~~ ~~502~~ ~~503~~ ~~504~~ ~~505~~ ~~506~~	~~16,236,540~~	~~20,998~~	~~99.9%~~	~~0~~	~~0~~	~~0~~	~~10,871,425~~	~~162,961~~	~~653~~	~~94.3%~~
~~San Luis Rey HU (903.00)~~ ~~at San Luis Rey River Mouth~~	~~701~~	~~231,598,677~~	~~440,347~~	~~99.8%~~	~~0~~	~~0~~	~~0~~	~~95,796,026~~	~~78,370~~	~~3,394~~	~~38.1%~~
~~San Marcos HA (904.50)~~ ~~at Moonlight State Beach~~	~~1101~~	~~515,278~~	~~899~~	~~99.8%~~	~~0~~	~~0~~	~~0~~	~~21,679~~	~~7,907~~	~~95~~	~~82.7%~~
~~San Dieguito HU (905.00)~~ ~~at San Dieguito Lagoon Mouth~~	~~1301~~ ~~1302~~	~~163,541,132~~	~~461,886~~	~~99.7%~~	~~0~~	~~0~~	~~0~~	~~74,870,018~~	~~67,236~~	~~4,029~~	~~14.4%~~
~~Miramar Reservoir HA (906.10)~~ ~~Torrey Pines State Beach at Del Mar (Anderson Canyon)~~	~~1401~~	~~212,986~~	~~182~~	~~99.9%~~	~~0~~	~~0~~	~~0~~	~~38,232~~	~~9,307~~	~~23~~	~~96.5%~~

~~Table 9-4. Final TMDLs for Total Coliform~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~Scripps HA (906.30)~~ ~~La Jolla Shores Beach at El Paseo Grande~~ ~~La Jolla Shores Beach at Caminito Del Oro~~ ~~La Jolla Shores Beach at Vallecitos~~ ~~La Jolla Shores Beach at Ave de la Playa~~ ~~at Casa Beach, Children's Pool~~ ~~South Casa Beach at Coast Blvd.~~ ~~Whispering Sands Beach at Ravina St.~~ ~~Windansea Beach at Vista de la Playa~~ ~~Windansea Beach at Bonair St.~~ ~~Windansea Beach at Playa del Norte~~ ~~Windansea Beach at Palomar Ave.~~ ~~at Tourmaline Surf Park~~ ~~Pacific Beach at Grand Ave.~~	~~1501~~ ~~1503~~ ~~1505~~ ~~1507~~	~~5,029,518~~	~~5,940~~	~~99.9%~~	~~0~~	~~0~~	~~0~~	~~787,305~~	~~171,530~~	~~427~~	~~96.4%~~
~~San Diego HU (907.11)~~ ~~at San Diego River Mouth (aka Dog Beach)~~	~~1801~~	~~72,757,569~~	~~189,650~~	~~99.7%~~	~~0~~	~~0~~	~~0~~	~~47,033,701~~	~~269,592~~	~~4,901~~	~~74.0%~~
~~Santee HSA (907.12)~~ ~~Forrester Creek~~	~~1801~~	~~72,757,569~~	~~189,650~~	~~99.7%~~	~~0~~	~~0~~	~~0~~	~~47,033,701~~	~~269,592~~	~~4,901~~	~~74.0%~~
~~San Diego HU (907.11) & Santee HSA (907.12)~~ ~~San Diego River, Lower~~	~~1801~~	~~72,757,569~~	~~189,650~~	~~99.7%~~	~~0~~	~~0~~	~~0~~	~~47,033,701~~	~~269,592~~	~~4,901~~	~~74.0%~~
~~Chollas HSA (908.22)~~ ~~Chollas Creek~~	~~1901~~	~~15,390,608~~	~~1,386,037~~	~~99.1%~~	~~0~~	~~0~~	~~0~~	~~2,858,838~~	~~250,803~~	~~19,910~~	~~92.1%~~

[A] ~~This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix P.~~

[B] ~~Percent reduction =[1 – (Total Maximum Daily Load / Existing Load)] x 100%~~

[C] ~~The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans highways, controllable point sources, and non-controllable point sources are not likely during dry weather.~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12)~~ ~~Cameo Cove at Irvine Cove Dr. – Riviera Way~~ ~~at Heisler Park – North~~	~~101~~ ~~103~~	~~61,351~~	~~56,419~~	~~8.0%~~	~~9,025~~	~~23~~	~~209~~	~~47,184~~	~~4,268~~	~~27~~	~~99.4%~~
~~Laguna Beach HSA (901.12)~~ ~~at Main Laguna Beach~~ ~~Laguna Beach at Ocean Avenue~~ ~~Laguna Beach at Laguna Ave.~~ ~~Laguna Beach at Cleo Street~~ ~~Arch Cove at Bluebird Canyon Rd.~~ ~~Laguna Beach at Dumond Drive~~	~~104~~ ~~105~~ ~~106~~	~~791,298~~	~~726,379~~	~~8.2%~~	~~116,144~~	~~290~~	~~2,687~~	~~607,235~~	~~18,624~~	~~365~~	~~98.0%~~
~~Aliso HSA (901.13)~~ ~~Laguna Beach at Lagunita Place / Blue Lagoon Place~~ ~~at Aliso Beach~~ ~~Aliso Creek~~	~~201~~ ~~202~~	~~2,230,206~~	~~1,950,980~~	~~12.5%~~	~~887,834~~	~~447~~	~~9,950~~	~~1,052,944~~	~~45,525~~	~~394~~	~~99.1%~~
~~Dana Point HSA (901.14)~~ ~~Aliso Beach at West Street~~ ~~Aliso Beach at Table Rock Drive~~ ~~1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave)~~ ~~at Salt Creek (large outlet)~~ ~~Salt Creek Beach at Salt Creek service road~~ ~~Salt Creek Beach at Dana Strand Road~~	~~301~~ ~~302~~ ~~304~~ ~~305~~ ~~306~~	~~501,525~~	~~462,306~~	~~7.8%~~	~~238,504~~	~~46~~	~~0~~	~~223,756~~	~~15,462~~	~~160~~	~~99.0%~~
~~Lower San Juan HSA (901.27)~~ ~~San Juan Creek~~	~~401~~	~~12,980,098~~	~~12,152,446~~	~~6.4%~~	~~1,780,011~~	~~2,753~~	~~1,077,922~~	~~9,292,975~~	~~52,338~~	~~2,646~~	~~94.9%~~

~~*Table 9-5. Interim TMDLs for Enterococci*~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~San Clemente HA (901.30)~~ ~~at Poche Beach (large outlet)~~	~~501~~	~~1,663,093~~	~~1,563,186~~	~~6.0%~~	~~371,593~~	~~601~~	~~156~~	~~1,190,522~~	~~27,415~~	~~326~~	~~98.8%~~
~~Ole Hanson Beach Club Beach at Pico Drain~~ ~~San Clemente City Beach at El Portal St. Stairs~~	~~502~~										
~~San Clemente City Beach at Mariposa St.~~ ~~San Clemente City Beach at Linda Lane~~	~~503~~										
~~San Clemente City Beach at South Linda Lane~~ ~~San Clemente City Beach at Lifeguard Headquarters~~	~~504~~										
~~Under San Clemente Municipal Pier~~ ~~San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.)~~	~~505~~										
~~San Clemente State Beach at Riviera Beach~~ ~~San Clemente State Beach at Cypress Shores~~	~~506~~										
~~San Luis Rey HU (903.00)~~ ~~at San Luis Rey River Mouth~~	~~701~~	~~18,439,920~~	~~17,470,687~~	~~5.3%~~	~~1,395,578~~	~~2,077~~	~~6,520,060~~	~~9,552,972~~	~~13,442~~	~~1,697~~	~~87.4%~~
~~San Marcos HA (904.50)~~ ~~at Moonlight State Beach~~	~~1101~~	~~40,558~~	~~32,966~~	~~18.7%~~	~~24,206~~	~~20~~	~~6,362~~	~~2,377~~	~~1,330~~	~~48~~	~~96.4%~~
~~San Dieguito HU (905.00)~~ ~~at San Dieguito Lagoon Mouth~~	~~1301~~ ~~1302~~	~~14,796,210~~	~~14,327,364~~	~~3.2%~~	~~1,850,515~~	~~2,014~~	~~4,282,449~~	~~8,192,387~~	~~12,175~~	~~2,015~~	~~83.4%~~
~~Miramar Reservoir HA (906.10)~~ ~~Torrey Pines State Beach at Del Mar (Anderson Canyon)~~	~~1401~~	~~11,564~~	~~11,405~~	~~1.4%~~	~~8,155~~	~~0~~	~~0~~	~~3,249~~	~~1,566~~	~~11~~	~~99.3%~~

~~*Table 9-5. Interim TMDLs for Enterococci*~~

Hydrologic Descriptor	Model Subwatershed[A]	Wet Weather TMDL Results (Billion MPN/year)							Dry Weather TMDL Results (Billion MPN/year)[C]		
		Existing Load	Total Maximum Daily Load	Percent[B] Reduction	Wasteload Allocation (Municipal MS4s)	Wasteload Allocation (Caltrans)	Load Allocation (Controllable)	Load Allocation (Non-Controllable)	Existing Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction
Scripps HA (906.30) La Jolla Shores Beach at El Paseo Grande La Jolla Shores Beach at Caminito Del Oro La Jolla Shores Beach at Vallecitos La Jolla Shores Beach at Ave de la Playa at Casa Beach, Children's Pool South Casa Beach at Coast Blvd. Whispering Sands Beach at Ravina St. Windansea Beach at Vista de la Playa Windansea Beach at Bonair St. Windansea Beach at Playa del Norte Windansea Beach at Palomar Ave. at Tourmaline Surf Park Pacific Beach at Grand Ave.	1501 1503 1505 1507	377,839	324,033	14.2%	245,131	0	0	78,902	28,856	214	99.3%
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach)	1801	7,255,759	6,591,843	9.2%	1,413,110	2,159	193,800	4,982,774	38,190	2,311	93.9%
Santee HSA (907.12) Forrester Creek	1801	7,255,759	6,591,843	9.2%	1,413,110	2,159	193,800	4,982,774	38,190	2,311	93.9%
San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	7,255,759	6,591,843	9.2%	1,413,110	2,159	193,800	4,982,774	38,190	2,311	93.9%
Chollas HSA (908.22) Chollas Creek	1901	1,371,972	1,152,645	16.0%	858,736	1,714	0	292,080	42,826	657	98.5%

~~[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O.~~

~~[B] Percent reduction = [1 – (Total Maximum Daily Load / Existing Load)] x 100%~~

~~[C] The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans highways, controllable point sources, and non-controllable point sources are not likely during dry weather.~~

~~Table 9-6. Final TMDLs for Enterococci~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~San Joaquin Hills HSA (901.11) &~~ ~~Laguna Beach HSA (901.12)~~ ~~Cameo Cove at Irvine Cove Dr. – Riviera Way~~ ~~at Heisler Park – North~~	~~101~~ ~~103~~	~~61,351~~	~~291~~	~~99.5%~~	~~0~~	~~0~~	~~0~~	~~47,184~~	~~4,268~~	~~27~~	~~99.4%~~
~~Laguna Beach HSA (901.12)~~ ~~at Main Laguna Beach~~ ~~Laguna Beach at Ocean Avenue~~ ~~Laguna Beach at Laguna Ave.~~ ~~Laguna Beach at Cleo Street~~ ~~Arch Cove at Bluebird Canyon Rd.~~ ~~Laguna Beach at Dumond Drive~~	~~104~~ ~~105~~ ~~106~~	~~791,298~~	~~3,884~~	~~99.5%~~	~~0~~	~~0~~	~~0~~	~~607,235~~	~~18,624~~	~~365~~	~~98.0%~~
~~Aliso HSA (901.13)~~ ~~Laguna Beach at Lagunita Place / Blue Lagoon Place~~ ~~at Aliso Beach~~ ~~Aliso Creek~~	~~201~~ ~~202~~	~~2,230,206~~	~~13,704~~	~~99.4%~~	~~0~~	~~0~~	~~0~~	~~1,052,944~~	~~45,525~~	~~394~~	~~99.1%~~
~~Dana Point HSA (901.14)~~ ~~Aliso Beach at West Street~~ ~~Aliso Beach at Table Rock Drive~~ ~~1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave)~~ ~~at Salt Creek (large outlet)~~ ~~Salt Creek Beach at Salt Creek service road~~ ~~Salt Creek Beach at Dana Strand Road~~	~~301~~ ~~302~~ ~~304~~ ~~305~~ ~~306~~	~~501,525~~	~~3,875~~	~~99.3%~~	~~0~~	~~0~~	~~0~~	~~223,756~~	~~15,462~~	~~160~~	~~99.0%~~
~~Lower San Juan HSA (901.27)~~ ~~San Juan Creek~~	~~401~~	~~12,980,098~~	~~56,119~~	~~99.6%~~	~~0~~	~~0~~	~~0~~	~~9,292,975~~	~~52,338~~	~~2,646~~	~~94.9%~~

~~Table 9-6. Final TMDLs for Enterococci~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~San Clemente HA (901.30)~~ ~~at Poche Beach (large outlet)~~ ~~Ole Hanson Beach Club Beach at Pico Drain~~ ~~San Clemente City Beach at El Portal St. Stairs~~ ~~San Clemente City Beach at Mariposa St.~~ ~~San Clemente City Beach at Linda Lane~~ ~~San Clemente City Beach at South Linda Lane~~ ~~San Clemente City Beach at Lifeguard Headquarters~~ ~~Under San Clemente Municipal Pier~~ ~~San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.)~~ ~~San Clemente State Beach at Riviera Beach~~ ~~San Clemente State Beach at Cypress Shores~~	~~501~~	~~1,663,093~~	~~9,492~~	~~99.4%~~	~~0~~	~~0~~	~~0~~	~~1,190,522~~	~~27,415~~	~~326~~	~~98.8%~~
	~~502~~										
	~~503~~										
	~~504~~										
	~~505~~										
	~~506~~										
~~San Luis Rey HU (903.00)~~ ~~at San Luis Rey River Mouth~~	~~701~~	~~18,439,920~~	~~174,221~~	~~99.1%~~	~~0~~	~~0~~	~~0~~	~~9,552,972~~	~~13,442~~	~~1,697~~	~~87.4%~~
~~San Marcos HA (904.50)~~ ~~at Moonlight State Beach~~	~~1101~~	~~40,558~~	~~406~~	~~99.0%~~	~~0~~	~~0~~	~~0~~	~~2,377~~	~~1,330~~	~~48~~	~~96.4%~~
~~San Dieguito HU (905.00)~~ ~~at San Dieguito Lagoon Mouth~~	~~1301~~ ~~1302~~	~~14,796,210~~	~~135,530~~	~~99.1%~~	~~0~~	~~0~~	~~0~~	~~8,192,387~~	~~12,175~~	~~2,015~~	~~83.4%~~
~~Miramar Reservoir HA (906.10)~~ ~~Torrey Pines State Beach at Del Mar (Anderson Canyon)~~	~~1401~~	~~11,564~~	~~81~~	~~99.3%~~	~~0~~	~~0~~	~~0~~	~~3,249~~	~~1,566~~	~~11~~	~~99.3%~~

~~*Table 9-6. Final TMDLs for Enterococci*~~

~~Hydrologic Descriptor~~	~~Model Subwatershed~~[A]	~~Wet Weather TMDL Results (Billion MPN/year)~~							~~Dry Weather TMDL Results (Billion MPN/year)~~[C]		
		~~Existing Load~~	~~Total Maximum Daily Load~~	~~Percent~~[B] ~~Reduction~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Wasteload Allocation (Caltrans)~~	~~Load Allocation (Controllable)~~	~~Load Allocation (Non-Controllable)~~	~~Existing Load~~	~~Wasteload Allocation (Municipal MS4s)~~	~~Percent Reduction~~
~~Scripps HA (906.30)~~ ~~La Jolla Shores Beach at El Paseo Grande~~ ~~La Jolla Shores Beach at Caminito Del Oro~~ ~~La Jolla Shores Beach at Vallecitos~~ ~~La Jolla Shores Beach at Ave de la Playa~~ ~~at Casa Beach, Children's Pool~~ ~~South Casa Beach at Coast Blvd.~~ ~~Whispering Sands Beach at Ravina St.~~ ~~Windansea Beach at Vista de la Playa~~ ~~Windansea Beach at Bonair St.~~ ~~Windansea Beach at Playa del Norte~~ ~~Windansea Beach at Palomar Ave.~~ ~~at Tourmaline Surf Park~~ ~~Pacific Beach at Grand Ave.~~	~~1501~~ ~~1503~~ ~~1505~~ ~~1507~~	~~377,839~~	~~2,686~~	~~99.3%~~	~~0~~	~~0~~	~~0~~	~~78,902~~	~~28,856~~	~~214~~	~~99.3%~~
~~San Diego HU (907.11)~~ ~~at San Diego River Mouth (aka Dog Beach)~~	~~1801~~	~~7,255,759~~	~~48,356~~	~~99.3%~~	~~0~~	~~0~~	~~0~~	~~4,982,774~~	~~38,190~~	~~2,311~~	~~93.9%~~
~~Santee HSA (907.12)~~ ~~Forrester Creek~~	~~1801~~	~~7,255,759~~	~~48,356~~	~~99.3%~~	~~0~~	~~0~~	~~0~~	~~4,982,774~~	~~38,190~~	~~2,311~~	~~93.9%~~
~~San Diego HU (907.11) & Santee HSA (907.12)~~ ~~San Diego River, Lower~~	~~1801~~	~~7,255,759~~	~~48,356~~	~~99.3%~~	~~0~~	~~0~~	~~0~~	~~4,982,774~~	~~38,190~~	~~2,311~~	~~93.9%~~
~~Chollas HSA (908.22)~~ ~~Chollas Creek~~	~~1901~~	~~1,371,972~~	~~9,073~~	~~99.4%~~	~~0~~	~~0~~	~~0~~	~~292,080~~	~~42,826~~	~~657~~	~~98.5%~~

[A] ~~This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix P.~~

[B] ~~Percent reduction = [1 – (Total Maximum Daily Load / Existing Load)] x 100%~~

[C] ~~The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans highways, controllable point sources, and non-controllable point sources are not likely during dry weather.~~

Table 9-1. Interim Wet Weather TMDLs for Fecal Coliform Expressed as an Annual Load

Hydrologic Descriptor	**Model Subwatershed[A]**	**Existing Load** (Billion MPN/year)	**Total Maximum Daily Load** (Billion MPN/year)	**Wasteload Allocation (Municipal MS4s)** (Billion MPN/year)	**Percent Reduction (Municipal MS4s)**	**Load Allocation (Agriculture / Livestock)** (Billion MPN/year)	**Percent Reduction (Agriculture / Livestock)**	**Wasteload Allocation[B] (Caltrans)** (Billion MPN/year)	**Load Allocation[B] (Open Space)** (Billion MPN/year)
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12) Cameo Cove at Irvine Cove Dr. - Riviera Way at Heisler Park – North	101 103	52,676	49,474	2,765	52.2%	545	0.0%	16	46,318
Laguna Beach HSA (901.12) at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Ave. Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Rd. Laguna Beach at Dumond Drive	104 105 106	652,339	615,160	34,405	52.2%	6,787	0.0%	196	573,602
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	1,752,095	1,579,074	477,264	26.6%	26,457	0.0%	268	1,075,085
Dana Point HSA (901.14) Aliso Beach at West Street Aliso Beach at Table Rock Drive 1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave) at Salt Creek (large outlet) Salt Creek Beach at Salt Creek service road Salt Creek Beach at Dana Strand Road	301 302 304 305 306	403,911	377,313	152,456	14.8%	0	0.0%	0	224,857
Lower San Juan HSA (901.27) San Juan Creek	401	15,304,790	14,714,833	1,155,725	12.9%	2,856,458	12.8%	1,541	10,701,109

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O.

[B] No reductions for Caltrans and Open Space categories because allocations are equal to existing loads.

Table 9-1. Interim Wet Weather TMDLs for Fecal Coliform Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
San Clemente HA (901.30) at Poche Beach (large outlet); Ole Hanson Beach Club Beach at Pico Drain; San Clemente City Beach at El Portal St. Stairs; San Clemente City Beach at Mariposa St.; San Clemente City Beach at Linda Lane; San Clemente City Beach at South Linda Lane; San Clemente City Beach at Lifeguard Headquarters; Under San Clemente Municipal Pier; San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.); San Clemente State Beach at Riviera Beach; San Clemente State Beach at Cypress Shores	501, 502, 503, 504, 505, 506	1,441,719	1,378,930	192,639	24.6%	433	0.0%	333	1,185,526
San Luis Rey HU (903.00) at San Luis Rey River Mouth	701	33,120,012	32,445,470	916,123	3.3%	20,041,752	3.1%	1,575	11,486,020
San Marcos HA (904.50) at Moonlight State Beach	1101	20,886	17,224	6,558	19.1%	9,073	19.0%	8	1,585
San Dieguito HU (905.00) at San Dieguito Lagoon Mouth	1301, 1302	21,286,909	21,106,683	798,010	1.6%	11,703,008	1.4%	1,496	8,604,169
Miramar Reservoir HA (906.10) Torrey Pines State Beach at Del Mar (Anderson Canyon)	1401	10,392	10,256	6,704	2.0%	0	0.0%	0	3,552

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O.

[B] No reductions for Caltrans and Open Space categories because allocations are equal to existing loads.

Table 9-1. Interim Wet Weather TMDLs for Fecal Coliform Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
Scripps HA (906.30) La Jolla Shores Beach at El Paseo Grande La Jolla Shores Beach at Caminito Del Oro La Jolla Shores Beach at Vallecitos La Jolla Shores Beach at Ave de la Playa at Casa Beach, Children's Pool South Casa Beach at Coast Blvd. Whispering Sands Beach at Ravina St. Windansea Beach at Vista de la Playa Windansea Beach at Bonair St. Windansea Beach at Playa del Norte Windansea Beach at Palomar Ave. at Tourmaline Surf Park Pacific Beach at Grand Ave.	1501 1503 1505 1507	204,057	176,906	101,262	21.1%	0	0.0%	0	75,644
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach)	1801	4,932,380	4,681,150	221,233	53.3%	414,813	0.0%	1,045	4,044,058
Santee HSA (907.12) Forrester Creek	1801	4,932,380	4,681,150	221,233	53.3%	414,813	0.0%	1,045	4,044,058
San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	4,932,380	4,681,150	221,233	53.3%	414,813	0.0%	1,045	4,044,058
Chollas HSA (908.22) Chollas Creek	1901	603,863	520,440	252,514	25.0%	0	0.0%	898	267,028

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O.

[B] No reductions for Caltrans and Open Space categories because allocations are equal to existing loads.

Table 9-2. Final Wet Weather TMDLs for Fecal Coliform Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year	Billion MPN/year	Billion MPN/year		Billion MPN/year		Billion MPN/year	Billion MPN/year
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12) Cameo Cove at Irvine Cove Dr. - Riviera Way at Heisler Park – North	101 103	52,676	1,119	0	100%	0	100%	0	46,318
Laguna Beach HSA (901.12) at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Ave. Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Rd. Laguna Beach at Dumond Drive	104 105 106	652,339	14,923	0	100%	0	100%	0	573,602
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	1,752,095	84,562	0	100%	0	100%	0	1,075,085
Dana Point HSA (901.14) Aliso Beach at West Street Aliso Beach at Table Rock Drive 1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave) at Salt Creek (large outlet) Salt Creek Beach at Salt Creek service road Salt Creek Beach at Dana Strand Road	301 302 304 305 306	403,911	14,894	0	100%	0	100%	0	224,857
Lower San Juan HSA (901.27) San Juan Creek	401	15,304,790	358,410	0	100%	0	100%	0	10,701,109

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix P.

[B] No bacteria load reductions are required from Open Space category because allocations are equal to existing loads.

Table 9-2. Final Wet Weather TMDLs for Fecal Coliform Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
San Clemente HA (901.30) at Poche Beach (large outlet) Ole Hanson Beach Club Beach at Pico Drain	501	1,441,719	36,481	0	100%	0	100%	0	1,185,526
San Clemente City Beach at El Portal St. Stairs	502								
San Clemente City Beach at Mariposa St. San Clemente City Beach at Linda Lane	503								
San Clemente City Beach at South Linda Lane San Clemente City Beach at Lifeguard Headquarters	504								
Under San Clemente Municipal Pier San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.)	505								
San Clemente State Beach at Riviera Beach San Clemente State Beach at Cypress Shores	506								
San Luis Rey HU (903.00) At San Luis Rey River Mouth	701	33,120,012	641,823	0	100%	0	100%	0	11,486,020
San Marcos HA (904.50) At Moonlight State Beach	1101	20,886	1,559	0	100%	0	100%	0	1,585
San Dieguito HU (905.00) At San Dieguito Lagoon Mouth	1301 1302	21,286,909	431,004	0	100%	0	100%	0	8,604,169
Miramar Reservoir HA (906.10) Torrey Pines State Beach at Del Mar (Anderson Canyon)	1401	10,392	312	0	100%	0	100%	0	3,552

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix P.

[B] No bacteria load reductions are required from Open Space category because allocations are equal to existing loads.

Table 9-2. Final Wet Weather TMDLs for Fecal Coliform Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
Scripps HA (906.30) La Jolla Shores Beach at El Paseo Grande La Jolla Shores Beach at Caminito Del Oro La Jolla Shores Beach at Vallecitos La Jolla Shores Beach at Ave de la Playa at Casa Beach, Children's Pool South Casa Beach at Coast Blvd. Whispering Sands Beach at Ravina St. Windansea Beach at Vista de la Playa Windansea Beach at Bonair St. Windansea Beach at Playa del Norte Windansea Beach at Palomar Ave. at Tourmaline Surf Park Pacific Beach at Grand Ave.	1501 1503 1505 1507	204,057	10,329	0	100%	0	100%	0	75,644
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach)	1801	4,932,380	311,132	0	100%	0	100%	0	4,044,058
Santee HSA (907.12) Forrester Creek	1801	4,932,380	311,132	0	100%	0	100%	0	4,044,058
San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	4,932,380	311,132	0	100%	0	100%	0	4,044,058
Chollas HSA (908.22) Chollas Creek	1901	603,863	55,516	0	100%	0	100%	0	267,028

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix P.

[B] No bacteria load reductions are required from Open Space category because allocations are equal to existing loads.

Table 9-3. Interim/Final Dry Weather TMDLs for Fecal Coliform Expressed as a Monthly Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation[B] (Municipal MS4s)	Percent Reduction
		Billion MPN/month			
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12) Cameo Cove at Irvine Cove Dr. - Riviera Way at Heisler Park – North	101 103	511	16	16	96.9%
Laguna Beach HSA (901.12) at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Ave. Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Rd. Laguna Beach at Dumond Drive	104 105 106	2,230	211	211	90.5%
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	5,470	242	242	95.6%
Dana Point HSA (901.14) Aliso Beach at West Street Aliso Beach at Table Rock Drive 1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave) at Salt Creek (large outlet) Salt Creek Beach at Salt Creek service road Salt Creek Beach at Dana Strand Road	301 302 304 305 306	1,851	92	92	95.0%
Lower San Juan HSA (901.27) San Juan Creek	401	6,455	1,665	1,665	74.2%

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E).
[B] The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

Table 9-3. Interim/Final Dry Weather TMDLs for Fecal Coliform Expressed as a Monthly Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation[B] (Municipal MS4s)	Percent Reduction
		Billion MPN/month			
San Clemente HA (901.30) at Poche Beach (large outlet) Ole Hanson Beach Club Beach at Pico Drain San Clemente City Beach at El Portal St. Stairs San Clemente City Beach at Mariposa St. San Clemente City Beach at Linda Lane San Clemente City Beach at South Linda Lane San Clemente City Beach at Lifeguard Headquarters Under San Clemente Municipal Pier San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.) San Clemente State Beach at Riviera Beach San Clemente State Beach at Cypress Shores	501 502 503 504 505 506	3,327	192	192	94.2%
San Luis Rey HU (903.00) at San Luis Rey River Mouth	701	1,737	1,058	1,058	39.1%
San Marcos HA (904.50) at Moonlight State Beach	1101	149	26	26	82.6%
San Dieguito HU (905.00) at San Dieguito Lagoon Mouth	1301 1302	1,631	1,293	1,293	20.7%
Miramar Reservoir HA (906.10) Torrey Pines State Beach at Del Mar (Anderson Canyon)	1401	205	7	7	96.4%

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E).

[B] The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

Table 9-3. Interim/Final Dry Weather TMDLs for Fecal Coliform Expressed as a Monthly Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load (Billion MPN/month)	Total Maximum Daily Load (Billion MPN/month)	Wasteload Allocation[B] (Municipal MS4s) (Billion MPN/month)	Percent Reduction
Scripps HA (906.30) La Jolla Shores Beach at El Paseo Grande La Jolla Shores Beach at Caminito Del Oro La Jolla Shores Beach at Vallecitos La Jolla Shores Beach at Ave de la Playa at Casa Beach, Children's Pool South Casa Beach at Coast Blvd. Whispering Sands Beach at Ravina St. Windansea Beach at Vista de la Playa Windansea Beach at Bonair St. Windansea Beach at Playa del Norte Windansea Beach at Palomar Ave. at Tourmaline Surf Park Pacific Beach at Grand Ave.	1501 1503 1505 1507	3,320	119	119	96.4%
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach)	1801	4,928	1,506	1,506	69.4%
Santee HSA (907.12) Forrester Creek	1801	4,928	1,506	1,506	69.4%
San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	4,928	1,506	1,506	69.4%
Chollas HSA (908.22) Chollas Creek	1901	5,068	398	398	92.1%

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E).

[B] The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

Table 9-4. Interim Wet Weather TMDLs for Total Coliform Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load (Billion MPN/year)	Total Maximum Daily Load (Billion MPN/year)	Wasteload Allocation (Municipal MS4s) (Billion MPN/year)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock) (Billion MPN/year)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans) (Billion MPN/year)	Load Allocation[B] (Open Space) (Billion MPN/year)
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12) Cameo Cove at Irvine Cove Dr. - Riviera Way at Heisler Park – North	101 103	628,669	567,611	67,154	47.0%	3,884	0.0%	564	497,466
Laguna Beach HSA (901.12) at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Ave. Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Rd. Laguna Beach at Dumond Drive	104 105 106	7,593,233	6,878,039	814,129	47.0%	47,092	0.0%	6,836	6,008,525
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	23,210,774	20,190,798	8,924,810	25.4%	178,723	0.0%	11,084	11,076,181
Dana Point HSA (901.14) Aliso Beach at West Street Aliso Beach at Table Rock Drive 1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave) at Salt Creek (large outlet) Salt Creek Beach at Salt Creek service road Salt Creek Beach at Dana Strand Road	301 302 304 305 306	6,546,962	6,031,472	3,404,176	13.2%	0	0.0%	655	2,626,641
Lower San Juan HSA (901.27) San Juan Creek	401	130,258,863	122,879,198	16,079,932	19.5%	14,959,851	19.2%	59,021	91,780,395

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O.

[B] No bacteria load reductions are required for Caltrans or Open Space categories because allocations are equal to existing loads.

Table 9-4. Interim Wet Weather TMDLs for Total Coliform Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
San Clemente HA (901.30) at Poche Beach (large outlet); Ole Hanson Beach Club Beach at Pico Drain; San Clemente City Beach at El Portal St. Stairs; San Clemente City Beach at Mariposa St.; San Clemente City Beach at Linda Lane; San Clemente City Beach at South Linda Lane; San Clemente City Beach at Lifeguard Headquarters; Under San Clemente Municipal Pier; San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.); San Clemente State Beach at Riviera Beach; San Clemente State Beach at Cypress Shores	501, 502, 503, 504, 505, 506	16,236,540	15,147,590	3,479,513	24.0%	1,624	0.0%	13,489	11,652,965
San Luis Rey HU (903.00) at San Luis Rey River Mouth	701	231,598,677	224,189,156	14,395,880	6.0%	110,776,086	5.6%	55,075	98,962,115
San Marcos HA (904.50) at Moonlight State Beach	1101	515,278	425,083	298,420	18.6%	99,848	18.4%	536	26,279
San Dieguito HU (905.00) at San Dieguito Lagoon Mouth	1301, 1302	163,541,132	159,978,672	16,676,828	4.3%	66,718,625	4.1%	45,968	76,537,250
Miramar Reservoir HA (906.10) Torrey Pines State Beach at Del Mar (Anderson Canyon)	1401	212,986	210,182	171,430	1.6%	0	0.0%	10	38,742

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O.

[B] No bacteria load reductions are required for Caltrans or Open Space categories because allocations are equal to existing loads.

Table 9-4. Interim Wet Weather TMDLs for Total Coliform Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
Scripps HA (906.30) La Jolla Shores Beach at El Paseo Grande La Jolla Shores Beach at Caminito Del Oro La Jolla Shores Beach at Vallecitos La Jolla Shores Beach at Ave de la Playa at Casa Beach, Children's Pool South Casa Beach at Coast Blvd. Whispering Sands Beach at Ravina St. Windansea Beach at Vista de la Playa Windansea Beach at Bonair St. Windansea Beach at Playa del Norte Windansea Beach at Palomar Ave. at Tourmaline Surf Park Pacific Beach at Grand Ave.	1501 1503 1505 1507	5,029,518	4,356,972	3,448,138	16.3%	0	0.0%	0	908,834
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach)	1801	72,757,569	66,114,283	10,801,645	38.2%	3,499,639	0.0%	53,264	51,759,735
Santee HSA (907.12) Forrester Creek	1801	72,757,569	66,114,283	10,801,645	38.2%	3,499,639	0.0%	53,264	51,759,735
San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	72,757,569	66,114,283	10,801,645	38.2%	3,499,639	0.0%	53,264	51,759,735
Chollas HSA (908.22) Chollas Creek	1901	15,390,608	13,247,626	9,880,562	18.1%	0	0.0%	45,770	3,321,293

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O.

[B] No bacteria load reductions are required for Caltrans or Open Space categories because allocations are equal to existing loads.

Table 9-5. Final Wet Weather TMDLs for Total Coliform Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12) Cameo Cove at Irvine Cove Dr. - Riviera Way at Heisler Park – North	101 103	628,669	644	0	100%	0	100%	0	497,466
Laguna Beach HSA (901.12) at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Ave. Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Rd. Laguna Beach at Dumond Drive	104 105 106	7,593,233	8,594	0	100%	0	100%	0	6,008,525
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	23,210,774	57,629	0	100%	0	100%	0	11,076,181
Dana Point HSA (901.14) Aliso Beach at West Street Aliso Beach at Table Rock Drive 1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave) at Salt Creek (large outlet) Salt Creek Beach at Salt Creek service road Salt Creek Beach at Dana Strand Road	301 302 304 305 306	6,546,962	8,387	0	100%	0	100%	0	2,626,641
Lower San Juan HSA (901.27) San Juan Creek	401	130,258,863	8,947,114	0	100%	0	100%	0	91,780,395

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O.

[B] The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

Table 9-5. Final Wet Weather TMDLs for Total Coliform Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
San Clemente HA (901.30) at Poche Beach (large outlet); Ole Hanson Beach Club Beach at Pico Drain; San Clemente City Beach at El Portal St. Stairs; San Clemente City Beach at Mariposa St.; San Clemente City Beach at Linda Lane; San Clemente City Beach at South Linda Lane; San Clemente City Beach at Lifeguard Headquarters; Under San Clemente Municipal Pier; San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.); San Clemente State Beach at Riviera Beach; San Clemente State Beach at Cypress Shores	501, 502, 503, 504, 505, 506	16,236,540	20,998	0	100%	0	100%	0	11,652,965
San Luis Rey HU (903.00) at San Luis Rey River Mouth	701	231,598,677	440,347	0	100%	0	100%	0	98,962,115
San Marcos HA (904.50) at Moonlight State Beach	1101	515,278	899	0	100%	0	100%	0	26,279
San Dieguito HU (905.00) at San Dieguito Lagoon Mouth	1301, 1302	163,541,132	461,886	0	100%	0	100%	0	76,537,250
Miramar Reservoir HA (906.10) Torrey Pines State Beach at Del Mar (Anderson Canyon)	1401	212,986	182	0	100%	0	100%	0	38,742

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix P.

[B] No bacteria load reductions are required form Open Space category because allocations are equal to existing loads.

Table 9-5. Final Wet Weather TMDLs for Total Coliform Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
Scripps HA (906.30) La Jolla Shores Beach at El Paseo Grande La Jolla Shores Beach at Caminito Del Oro La Jolla Shores Beach at Vallecitos La Jolla Shores Beach at Ave de la Playa at Casa Beach, Children's Pool South Casa Beach at Coast Blvd. Whispering Sands Beach at Ravina St. Windansea Beach at Vista de la Playa Windansea Beach at Bonair St. Windansea Beach at Playa del Norte Windansea Beach at Palomar Ave. at Tourmaline Surf Park Pacific Beach at Grand Ave.	1501 1503 1505 1507	5,029,518	5,940	0	100%	0	100%	0	908,834
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach)	1801	72,757,569	189,650	0	100%	0	100%	0	51,759,735
Santee HSA (907.12) Forrester Creek	1801	72,757,569	189,650	0	100%	0	100%	0	51,759,735
San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	72,757,569	189,650	0	100%	0	100%	0	51,759,735
Chollas HSA (908.22) Chollas Creek	1901	15,390,608	1,386,037	0	100%	0	100%	0	3,321,293

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix P.

[B] No bacteria load reductions are required form Open Space category because allocations are equal to existing loads.

Table 9-6. Interim Dry Weather TMDLs for Total Coliform Expressed as a Monthly Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Waste-load Allocation[B] (Municipal MS4s)	Percent Reduction
		Billion MPN/month			
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12) Cameo Cove at Irvine Cove Dr. - Riviera Way at Heisler Park – North	101 103	2,571	78	78	97.0%
Laguna Beach HSA (901.12) at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Ave. Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Rd. Laguna Beach at Dumond Drive	104 105 106	11,220	1,056	1,056	90.6%
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	26,639	1,208	1,208	95.9%
Dana Point HSA (901.14) Aliso Beach at West Street Aliso Beach at Table Rock Drive 1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave) at Salt Creek (large outlet) Salt Creek Beach at Salt Creek service road Salt Creek Beach at Dana Strand Road	301 302 304 305 306	9,315	462	462	95.0%
Lower San Juan HSA (901.27) San Juan Creek	401	30,846	8,342	8,342	73.0%

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E).
[B] The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

Table 9-6. Interim Dry Weather TMDLs for Total Coliform Expressed as a Monthly Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation[B] (Municipal MS4s)	Percent Reduction
		Billion MPN/month			
San Clemente HA (901.30) at Poche Beach (large outlet); Ole Hanson Beach Club Beach at Pico Drain	501	16,743	958	958	94.3%
San Clemente City Beach at El Portal St. Stairs; San Clemente City Beach at Mariposa St.	502				
San Clemente City Beach at Linda Lane; San Clemente City Beach at South Linda Lane	503				
San Clemente City Beach at Lifeguard Headquarters; Under San Clemente Municipal Pier	504				
San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.); San Clemente State Beach at Riviera Beach	505				
San Clemente State Beach at Cypress Shores	506				
San Luis Rey HU (903.00) at San Luis Rey River Mouth	701	8,549	5,289	5,289	38.1%
San Marcos HA (904.50) at Moonlight State Beach	1101	751	129	129	82.7%
San Dieguito HU (905.00) at San Dieguito Lagoon Mouth	1301, 1302	7,555	6,468	6,468	14.4%
Miramar Reservoir HA (906.10) Torrey Pines State Beach at Del Mar (Anderson Canyon)	1401	1,030	36	36	96.5%

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E).

[B] The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

Table 9-6. Interim Dry Weather TMDLs for Total Coliform Expressed as a Monthly Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation[B] (Municipal MS4s)	Percent Reduction
		Billion MPN/month			
Scripps HA (906.30) La Jolla Shores Beach at El Paseo Grande La Jolla Shores Beach at Caminito Del Oro La Jolla Shores Beach at Vallecitos La Jolla Shores Beach at Ave de la Playa at Casa Beach, Children's Pool South Casa Beach at Coast Blvd. Whispering Sands Beach at Ravina St. Windansea Beach at Vista de la Playa Windansea Beach at Bonair St. Windansea Beach at Playa del Norte Windansea Beach at Palomar Ave. at Tourmaline Surf Park Pacific Beach at Grand Ave.	1501 1503 1505 1507	16,707	594	594	96.4%
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach)	1801	28,988	7,529	7,529	74.0%
Santee HSA (907.12) Forrester Creek	1801	28,988	7,529	7,529	74.0%
San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	28,988	7,529	7,529	74.0%
Chollas HSA (908.22) Chollas Creek	1901	25,080	1,991	1,991	92.1%

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E).

[B] The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

Table 9-7. Final Dry Weather TMDLs for Total Coliform Expressed as a Monthly Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Waste-load Allocation[B] (Municipal MS4s)	Percent Reduction
		Billion MPN/month			
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12) Cameo Cove at Irvine Cove Dr. - Riviera Way at Heisler Park – North	101 103	2,571	5	5	99.8%
Laguna Beach HSA (901.12) at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Ave. Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Rd. Laguna Beach at Dumond Drive	104 105 106	11,220	74	74	99.3%
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	26,639	85	85	99.7
Dana Point HSA (901.14) Aliso Beach at West Street Aliso Beach at Table Rock Drive 1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave) at Salt Creek (large outlet) Salt Creek Beach at Salt Creek service road Salt Creek Beach at Dana Strand Road	301 302 304 305 306	9,315	32	32	99.7%
Lower San Juan HSA (901.27) San Juan Creek	401	30,846	8,324	8,324	73.0%

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E).

[B] The dry weather TMDLs are only allocated to Municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

Table 9-7. Final Dry Weather TMDLs for Total Coliform Expressed as a Monthly Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation[B] (Municipal MS4s)	Percent Reduction
		Billion MPN/month			
San Clemente HA (901.30) at Poche Beach (large outlet); Ole Hanson Beach Club Beach at Pico Drain	501	16,743	67	67	99.6%
San Clemente City Beach at El Portal St. Stairs; San Clemente City Beach at Mariposa St.	502				
San Clemente City Beach at Linda Lane	503				
San Clemente City Beach at South Linda Lane; San Clemente City Beach at Lifeguard Headquarters	504				
Under San Clemente Municipal Pier; San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.)	505				
San Clemente State Beach at Riviera Beach; San Clemente State Beach at Cypress Shores	506				
San Luis Rey HU (903.00) at San Luis Rey River Mouth	701	8,549	370	370	95.7%
San Marcos HA (904.50) at Moonlight State Beach	1101	751	9	9	98.8%
San Dieguito HU (905.00) at San Dieguito Lagoon Mouth	1301 1302	7,555	453	453	94.0%
Miramar Reservoir HA (906.10) Torrey Pines State Beach at Del Mar (Anderson Canyon)	1401	1,030	3	3	99.8%

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E).

[B] The dry weather TMDLs are only allocated to Municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

Table 9-7. Final Dry Weather TMDLs for Total Coliform Expressed as a Monthly Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily	Wasteload Allocation[B] (Municipal MS4s)	Percent Reduction
		Billion MPN/month			
Scripps HA (906.30) La Jolla Shores Beach at El Paseo Grande La Jolla Shores Beach at Caminito Del Oro La Jolla Shores Beach at Vallecitos La Jolla Shores Beach at Ave de la Playa at Casa Beach, Children's Pool South Casa Beach at Coast Blvd. Whispering Sands Beach at Ravina St. Windansea Beach at Vista de la Playa Windansea Beach at Bonair St. Windansea Beach at Playa del Norte Windansea Beach at Palomar Ave. at Tourmaline Surf Park Pacific Beach at Grand Ave.	1501 1503 1505 1507	16,707	42	42	99.8
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach)	1801	28,988	527	527	98.2%
Santee HSA (907.12) Forrester Creek	1801	28,988	527	527	98.2%
San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	28,988	527	527	98.2%
Chollas HSA (908.22) Chollas Creek	1901	25,080	1,991	1,991	92.1%

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E).

[B] The dry weather TMDLs are only allocated to Municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

Table 9-8. Interim Wet Weather TMDLs for Enterococci Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12) Cameo Cove at Irvine Cove Dr. - Riviera Way at Heisler Park – North	101 103	61,351	56,419	4,787	51.4%	227	0.0%	25	51,289
Laguna Beach HSA (901.12) at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Ave. Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Rd. Laguna Beach at Dumond Drive	104 105 106	791,298	726,379	61,701	51.4%	2,928	0.0%	316	661,526
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	2,230,206	1,950,980	735,453	27.6%	11,374	0.0%	511	1,203,642
Dana Point HSA (901.14) Aliso Beach at West Street Aliso Beach at Table Rock Drive 1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave) at Salt Creek (large outlet) Salt Creek Beach at Salt Creek service road Salt Creek Beach at Dana Strand Road	301 302 304 305 306	501,525	462,306	219,518	15.2%	0	0.0%	50	242,738
Lower San Juan HSA (901.27) San Juan Creek	401	12,980,098	12,152,446	1,384,643	27.3%	838,982	27.1%	2,941	9,925,881

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O

[B] No reductions for Caltrans and Open Space categories because allocations are equal to existing loads.

Table 9-8. Interim Wet Weather TMDLs for Enterococci Expressed as an Annual Load

Hydrologic Descriptor	**Model Subwatershed[A]**	**Existing Load**	**Total Maximum Daily Load**	**Wasteload Allocation (Municipal MS4s)**	**Percent Reduction (Municipal MS4s)**	**Load Allocation (Agriculture / Livestock)**	**Percent Reduction (Agriculture / Livestock)**	**Wasteload Allocation[B] (Caltrans)**	**Load Allocation[B] (Open Space)**
		Billion MPN/year				**Billion MPN/year**		**Billion MPN/year**	
San Clemente HA (901.30) at Poche Beach (large outlet) Ole Hanson Beach Club Beach at Pico Drain San Clemente City Beach at El Portal St. Stairs San Clemente City Beach at Mariposa St. San Clemente City Beach at Linda Lane San Clemente City Beach at South Linda Lane San Clemente City Beach at Lifeguard Headquarters Under San Clemente Municipal Pier San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.) San Clemente State Beach at Riviera Beach San Clemente State Beach at Cypress Shores	501 502 503 504 505 506	1,663,093	1,563,186	295,768	25.3%	166	0.0%	640	1,266,612
San Luis Rey HU (903.00) at San Luis Rey River Mouth	701	18,439,920	17,470,687	1,301,910	11.7%	2,193	6,083,637	11.6%	10,082,948
San Marcos HA (904.50) at Moonlight State Beach	1101	40,558	32,966	23,768	20.3%	25	6,249	20.2%	2,924
San Dieguito HU (905.00) at San Dieguito Lagoon Mouth	1301 1302	14,796,210	14,327,364	1,769,497	7.5%	4,095,315	7.4%	2,079	8,460,473
Miramar Reservoir HA (906.10) Torrey Pines State Beach at Del Mar (Anderson Canyon)	1401	11,564	11,405	8,110	1.9%	0	0.0%	0	3,295

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O.

[B] No reductions for Caltrans and Open Space categories because allocations are equal to existing loads.

Table 9-8. Interim Wet Weather TMDLs for Enterococci Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
Scripps HA (906.30) La Jolla Shores Beach at El Paseo Grande La Jolla Shores Beach at Caminito Del Oro La Jolla Shores Beach at Vallecitos La Jolla Shores Beach at Ave de la Playa at Casa Beach, Children's Pool South Casa Beach at Coast Blvd. Whispering Sands Beach at Ravina St. Windansea Beach at Vista de la Playa Windansea Beach at Bonair St. Windansea Beach at Playa del Norte Windansea Beach at Palomar Ave. at Tourmaline Surf Park Pacific Beach at Grand Ave.	1501 1503 1505 1507	377,839	324,033	232,029	18.8%	0	0.0%	0	92,004
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach)	1801	7,255,759	6,591,843	891,519	42.8%	213,319	0.0%	2,376	5,484,628
Santee HSA (907.12) Forrester Creek	1801	7,255,759	6,591,843	891,519	42.8%	213,319	0.0%	2,376	5,484,628
San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	7,255,759	6,591,843	891,519	42.8%	213,319	0.0%	2,376	5,484,628
Chollas HSA (908.22) Chollas Creek	1901	1,371,972	1,152,645	802,947	21.6%	0	0.0%	2,040	347,658

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix O.

[B] No reductions for Caltrans and Open Space categories because allocations are equal to existing loads.

Table 9-9. Final Wet Weather TMDLs for Enterococci Expressed as an Annual Load

Hydrologic Descriptor	**Model Subwatershed[A]**	**Existing Load**	**Total Maximum Daily Load**	**Wasteload Allocation (Municipal MS4s)**	**Percent Reduction (Municipal MS4s)**	**Load Allocation (Agriculture / Livestock)**	**Percent Reduction (Agriculture / Livestock)**	**Wasteload Allocation[B] (Caltrans)**	**Load Allocation[B] (Open Space)**
		Billion MPN/year				**Billion MPN/year**		**Billion MPN/year**	
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12) Cameo Cove at Irvine Cove Dr. - Riviera Way at Heisler Park – North	101 103	61,351	291	0	100%	0	100%	0	51,289
Laguna Beach HSA (901.12) at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Ave. Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Rd. Laguna Beach at Dumond Drive	104 105 106	791,298	3,884	0	100%	0	100%	0	661,526
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	2,230,206	13,704	0	100%	0	100%	0	1,203,642
Dana Point HSA (901.14) Aliso Beach at West Street Aliso Beach at Table Rock Drive 1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave) at Salt Creek (large outlet) Salt Creek Beach at Salt Creek service road Salt Creek Beach at Dana Strand Road	301 302 304 305 306	501,525	3,875	0	100%	0	100%	0	242,738
Lower San Juan HSA (901.27) San Juan Creek	401	12,980,098	56,119	0	100%	0	100%	0	9,925,881

[A] This number is used the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix P.

[B] No bacteria load reductions are required from Open Space category because allocations are equal to existing loads.

Table 9-9. Final Wet Weather TMDLs for Enterococci Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
San Clemente HA (901.30) at Poche Beach (large outlet) Ole Hanson Beach Club Beach at Pico Drain San Clemente City Beach at El Portal St. Stairs San Clemente City Beach at Mariposa St. San Clemente City Beach at Linda Lane San Clemente City Beach at South Linda Lane San Clemente City Beach at Lifeguard Headquarters Under San Clemente Municipal Pier San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.) San Clemente State Beach at Riviera Beach San Clemente State Beach at Cypress Shores	501 502 503 504 505 506	1,663,093	9,492	0	100%	0	100%	0	1,266,612
San Luis Rey HU (903.00) at San Luis Rey River Mouth	701	18,439,920	174,221	0	100%	0	100%	0	10,082,948
San Marcos HA (904.50) at Moonlight State Beach	1101	40,558	406	0	100%	0	100%	0	2,924
San Dieguito HU (905.00) at San Dieguito Lagoon Mouth	1301 1302	14,796,210	135,530	0	100%	0	100%	0	8,460,473
Miramar Reservoir HA (906.10) Torrey Pines State Beach at Del Mar (Anderson Canyon)	1401	11,564	81	0	100%	0	100%	0	3,295

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix P.

[B] No bacteria load reductions are required from Open Space category because allocations are equal to existing loads.

Table 9-9. Final Wet Weather TMDLs for Enterococci Expressed as an Annual Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation (Municipal MS4s)	Percent Reduction (Municipal MS4s)	Load Allocation (Agriculture / Livestock)	Percent Reduction (Agriculture / Livestock)	Wasteload Allocation[B] (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
Scripps HA (906.30) La Jolla Shores Beach at El Paseo Grande La Jolla Shores Beach at Caminito Del Oro La Jolla Shores Beach at Vallecitos La Jolla Shores Beach at Ave de la Playa at Casa Beach, Children's Pool South Casa Beach at Coast Blvd. Whispering Sands Beach at Ravina St. Windansea Beach at Vista de la Playa Windansea Beach at Bonair St. Windansea Beach at Playa del Norte Windansea Beach at Palomar Ave. at Tourmaline Surf Park Pacific Beach at Grand Ave.	1501 1503 1505 1507	377,839	2,686	0	100%	0	100%	0	92,004
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach)	1801	7,255,759	48,356	0	100%	0	100%	0	5,484,628
Santee HSA (907.12) Forrester Creek	1801	7,255,759	48,356	0	100%	0	100%	0	5,484,628
San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	7,255,759	48,356	0	100%	0	100%	0	5,484,628
Chollas HSA (908.22) Chollas Creek	1901	1,371,972	9,073	0	100%	0	100%	0	347,658

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E). Load-duration curves and TMDL calculation tables for each subwatershed are provided in Appendix P.

[B] No bacteria load reductions are required from Open Space category because allocations are equal to existing loads.

Table 9-10. Interim/Final Dry Weather TMDLs for Enterococci Expressed as a Monthly Load

Hydrologic Descriptor	Model Subwatershed[A]	Existing Load	Total Maximum Daily Load	Wasteload Allocation[B] (Municipal MS4s)	Percent Reduction
		Billion MPN/month			
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12) Cameo Cove at Irvine Cove Dr. - Riviera Way at Heisler Park – North	101 103	433	3	3	99.4%
Laguna Beach HSA (901.12) at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Ave. Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Rd. Laguna Beach at Dumond Drive	104 105 106	1,888	37	37	98.0%
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	4,614	40	40	99.1%
Dana Point HSA (901.14) Aliso Beach at West Street Aliso Beach at Table Rock Drive 1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave) at Salt Creek (large outlet) Salt Creek Beach at Salt Creek service road Salt Creek Beach at Dana Strand Road	301 302 304 305 306	1,567	16	16	99.0%
Lower San Juan HSA (901.27) San Juan Creek	401	5,433	275	275	94.9%

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E).

[B] The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

Table 9-10. Interim/Final Dry Weather TMDLs for Enterococci Expressed as a Monthly Load

Hydrologic Descriptor	**Model Subwatershed[A]**	**Existing Load**	**Total Maximum Daily Load**	**Wasteload Allocation[B] (Municipal MS4s)**	**Percent Reduction**
		Billion MPN/month			
San Clemente HA (901.30) at Poche Beach (large outlet) Ole Hanson Beach Club Beach at Pico Drain San Clemente City Beach at El Portal St. Stairs San Clemente City Beach at Mariposa St. San Clemente City Beach at Linda Lane San Clemente City Beach at South Linda Lane San Clemente City Beach at Lifeguard Headquarters Under San Clemente Municipal Pier San Clemente City Beach at Trafalgar Canyon (Trafalgar Ln.) San Clemente State Beach at Riviera Beach San Clemente State Beach at Cypress Shores	501 502 503 504 505 506	2,817	33	33	98.8%
San Luis Rey HU (903.00) at San Luis Rey River Mouth	701	1,466	185	185	87.4%
San Marcos HA (904.50) at Moonlight State Beach	1101	126	5	5	96.4%
San Dieguito HU (905.00) at San Dieguito Lagoon Mouth	1301 1302	1,368	226	226	83.4%
Miramar Reservoir HA (906.10) Torrey Pines State Beach at Del Mar (Anderson Canyon)	1401	173	1	1	99.3%

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E).

[B] The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

Table 9-10. Interim/Final Dry Weather TMDLs for Enterococci Expressed as a Monthly Load

Hydrologic Descriptor	**Model Subwatershed[A]**	**Existing Load**	**Total Maximum Daily Load**	**Wasteload Allocation[B] (Municipal MS4s)**	**Percent Reduction**
		Billion MPN/month			
Scripps HA (906.30) La Jolla Shores Beach at El Paseo Grande La Jolla Shores Beach at Caminito Del Oro La Jolla Shores Beach at Vallecitos La Jolla Shores Beach at Ave de la Playa at Casa Beach, Children's Pool South Casa Beach at Coast Blvd. Whispering Sands Beach at Ravina St. Windansea Beach at Vista de la Playa Windansea Beach at Bonair St. Windansea Beach at Playa del Norte Windansea Beach at Palomar Ave. at Tourmaline Surf Park Pacific Beach at Grand Ave.	1501 1503 1505 1507	2,811	21	21	99.3%
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach)	1801	4,106	248	248	93.9%
Santee HSA (907.12) Forrester Creek	1801	4,106	248	248	93.9%
San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	4,106	248	248	93.9%
Chollas HSA (908.22) Chollas Creek	1901	4,283	66	66	98.5%

[A] This number is used in the LSPC model to identify the subwatershed associated with the listed segment(s) within a hydrologic region (see Appendix E).

[B] The dry weather TMDLs are only allocated to municipal MS4s because bacteria discharges from Caltrans, Open Space, and Agriculture/Livestock land uses are unlikely during dry weather.

10 LEGAL AUTHORITY FOR TMDL IMPLEMENTATION PLAN

This section presents the legal authority and regulatory framework used as a basis for assigning responsibilities to dischargers to implement and monitor compliance with the requirements set forth in these TMDLs. The laws and policies governing point source[39] and nonpoint source discharges are described below. A large portion of the bacteria loads generated in the watersheds and discharged to beaches and creeks comes from natural, nonanthropogenic sources. These nonpoint sources are considered largely uncontrollable and therefore cannot be regulated.

Discharger accountability for attaining bacteria allocations is established in this section. The legal authority and regulatory framework is described in terms of the following:

- Controllable water quality factors;
- Regulatory background;
- Persons accountable for point source discharges; and
- Persons accountable for controllable nonpoint source discharges.

10.1 Controllable Water Quality Factors

The source analysis (section 6) found that the vast majority of bacteria are transported to impaired beaches and creeks through wet and dry weather runoff generated from human habitation and land use practices. Much of these bacteria discharges result from controllable water quality factors which are defined as those actions, conditions, or circumstances resulting from man's activities that may influence the quality of the waters of the state and that may be reasonably controlled. These TMDLs establish wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources for these controllable discharges.

10.2 Regulatory Framework

The regulatory framework for point sources of pollution differs from the regulatory framework for nonpoint sources. The different regulatory frameworks are described in the subsections below.

10.2.1 Point Sources

CWA section 402 establishes the National Pollutant Discharge Elimination System (NPDES) program to regulate the ‘‘discharge of a pollutant,’’ other than dredged or fill materials, from a ‘‘point source’’ into ‘‘waters of the U.S.” Under section 402, discharges of pollutants to waters of the U.S. are authorized by obtaining and complying with NPDES permits. These permits commonly contain effluent limitations consisting of either Technology Based Effluent Limitations (TBELs) or Water Quality Based Effluent

[39] The term ‘‘point source’’ is defined in CWA section 502(6) to mean any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture.

Limitations (WQBELs). TBELs represent the degree of control that can be achieved by point sources using various levels of pollution control technology that are defined by the USEPA for various categories of discharges and implemented on a nation-wide basis.

TBELs may not be sufficient to ensure that WQOs will be attained in receiving waters. In such cases, NPDES regulations require the San Diego Water Board to develop WQBELs that derive from and comply with all applicable WQSs. If necessary to achieve compliance with the applicable WQOs, NPDES requirements must contain WQBELs more stringent than the applicable TBELs [CWA 303 (b)(1)(c)] [40 CFR 122.44(d)(1)]. WQBELs may be expressed as numeric effluent limitations or as BMP development, implementation and revision requirements. Numeric effluent limitations require monitoring to assess load reductions while non-numeric provisions, such as BMP programs, require progress reports on BMP implementation and efficacy, and could also require monitoring of the waste stream for conformance with a numeric wasteload allocation requiring a mass load reduction.

In California, state Waste Discharge Requirements (WDRs) for discharges of pollutants from point sources to navigable waters of the United States that implement federal NPDES regulations and CWA requirements serve in lieu of federal NPDES permits. These are referred to as NPDES requirements. Such requirements are issued by the State pursuant to independent state authority described in California's Porter Cologne Water Quality Control Act[40] (not authority delegated by the USEPA or derived from the CWA).

Within each TMDL, a WLA is determined which is the maximum amount of a pollutant that may be contributed to a waterbody by point source discharges of the pollutant in order to attain WQOs. NPDES requirements must include conditions that are consistent with the assumptions and requirements of the WLAs. The principal regulatory means of implementing TMDLs for point source discharges regulated under these types of NPDES requirements are:

1. Dividing up and distributing the WLAs for the pollutant entering the waterbody among all the point sources that discharge the pollutant;

2. Evaluating whether the effluent limitations or conditions within the NPDES requirements are consistent with the WLAs. If not, incorporate WQBELs that are consistent with the WLAs into the NPDES requirements or otherwise revise the requirements[41] to make them consistent with the assumptions and requirements of the TMDL WLAs.[42] A time schedule to achieve compliance

[40] Division 7 of the Water Code, commencing with section 13000
[41] In the case of NPDES requirements, WQBELs may include best management practices that evidence shows are consistent with the WLAs.
[42] See federal regulations [40 CFR section 122.44(d)(1)(vii)(B)]. NPDES water quality-based effluent limitations must be consistent with the assumptions and requirements of any available TMDL wasteload allocation. The regulations do not require the WQBELs to be identical to the WLAs. The regulations leave open the possibility that the San Diego Water Board could determine that fact-specific circumstances render something other than literal incorporation of the wasteload allocation to be consistent with the TMDL assumptions and requirements. The rationale for such a finding could include a trade amongst

should also be incorporated into the NPDES requirements in instances where the discharger is unable to immediately comply with the required wasteload reductions;

3. Mandate discharger compliance with the WLAs in accordance with the terms and conditions of the new or revised NPDES requirements;

4. Implement a monitoring and/or modeling plan designed to measure the effectiveness of the controls implementing the WLAs and the progress the waterbodies are making toward attaining WQOs; and

5. Establish criteria to measure progress toward attaining WQOs and criteria for determining whether the TMDLs or WLAs need to be revised.

Because bacteria loading within urbanized areas were largely determined to be from urban runoff discharged from MS4s, the primary mechanism for TMDL attainment will be regulation of these discharges. Mechanisms to impose regulations on these discharges are discussed in the Implementation Plan, section 11.

10.2.2 Nonpoint Sources

While laws mandating control of point source discharges are contained in the federal CWA's NPDES regulations, direct control of nonpoint source pollution is left to state programs developed under state law. Within each TMDL where nonpoint sources are determined to be significant, a LA is determined which is the maximum amount of a pollutant that may be contributed to a waterbody by "nonpoint source" discharges in order to attain WQOs. LAs for nonpoint sources are not directly enforceable under the CWA and are only enforceable to the extent they are made so by state laws and regulations. The Porter-Cologne Water Quality Control Act applies to both point and nonpoint sources of pollution and serves as the principle legal authority in California for the application and enforcement of TMDL LAs for nonpoint sources.

Although the majority of bacteria reductions in these TMDLs will take place by regulation of point source discharges, LAs have been established in some watersheds where wet weather nonpoint sources are significant. Controllable nonpoint sources that warrant regulation include, for example, runoff from agricultural facilities, nurseries, dairy/intensive livestock operations, horse ranches, and manure composting and soil amendment operations not regulated under NPDES requirements, and septic systems. Land uses associated with these practices comprise a significant area in the San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River watersheds. Wet weather bacteria loads generated from these land uses in these watersheds comprise more than 5 percent of the total wet weather bacteria load. Nonpoint source discharges from natural sources (bacteria deposition from aquatic and terrestrial wildlife, and bacteria bound in soil, humic material, etc.) are considered largely uncontrollable, and therefore

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dischargers of portions of their LAs or WLAs, performance of an offset program that is approved by the San Diego Water Board, or any number of other considerations bearing on facts applicable to the circumstances of the specific discharger.

cannot be regulated. A description of the State policy pertaining to regulation of nonpoint sources of pollution in California is provided below.

California's Nonpoint Source Pollution Control Program

In December 1999, the SWRCB, in its continuing efforts to control nonpoint source pollution in California, adopted the Plan for California's Nonpoint Source Pollution Control Program (NPS Program Plan; SWRCB, 2000). The NPS Program Plan upgraded the state's first Nonpoint Source Management Plan adopted by the SWRCB in 1988 (1988 Plan). The primary objective of the NPS Program Plan is to reduce and prevent nonpoint source pollution so that the waters of California support a diversity of biological, educational, recreational, and other beneficial uses. Towards this end, the NPS Program Plan focuses on implementation of 61 management measures[43] (MMs) and related management practices[44] (MPs) in six land use categories by the year 2013.[45]

The success of the NPS Program Plan depends upon individual discharger implementation of MPs. Pollutants can be effectively reduced in nonpoint source discharges by the application of a combination of pollution prevention,[46] source control, and treatment control MPs. Source control MPs (both structural and non-structural) minimize the contact between pollutants and flows (e.g., rerouting run-off around pollutant sources or keeping pollutants on-site and out of receiving waters). Treatment control (or structural) MPs remove pollutants from NPS discharges. MPs can be applied before, during, and after pollution producing activities to reduce or eliminate the introduction of pollutants into receiving waters.

California's NPS Implementation and Enforcement Policy

In May 2004, pursuant to Water Code section 13369, the SWRCB adopted the *Policy for the Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (NPS Implementation and Enforcement Policy; SWRCB 2004), setting forth how the NPS Program Plan should be implemented and enforced to control nonpoint source pollution. The NPS Implementation and Enforcement Policy provides guidance on the statutory and regulatory authorities of the SWRCB and the San Diego Water Board to prevent and control nonpoint source pollution. The policy also provides guidance on the structure of nonpoint source control implementation programs, including third-party

[43] MMs serve as general goals for the control and prevention of nonpoint source polluted runoff.

[44] MPs are the implementation actions taken by nonpoint source dischargers to achieve the management measure goals. The USEPA and the SWRCB have dropped the word 'best' when describing the implementation actions taken by nonpoint source dischargers to control NPS pollution because "best" is considered too subjective. The "best" management practice in one area or situation might be entirely inappropriate in another area or situation. In this document the term "best management practices (BMPs)" is used exclusively in reference to schedules of activities, prohibitions of practices, maintenance procedures, and other management practices taken by NPDES dischargers.

[45] MMs are identified in Volume II of the *Plan for California's Nonpoint Source Pollution Control Program* (NPS Program Plan) 1999 Program Plan: *California's Management Measures for Polluted Runoff* (CAMMPR) (http://www.waterboards.ca.gov/nps/cammpr.html).

[46] Pollution prevention, the initial reduction/elimination of pollutant generation at its source should be used in conjunction with source control and treatment control MPs. Pollutants that are never generated do not have to be controlled or treated.

implementation programs, and the mandatory five key elements applicable to all nonpoint source implementation programs.

The NPS Implementation and Enforcement Policy emphasizes the fact that the Regional Water Boards have primary responsibility for ensuring that appropriate nonpoint source control implementation programs are in place throughout the state. Regional Water Board responsibilities include, but are not limited to, regulating all current and proposed nonpoint source discharges under WDRs, waivers of WDRs, or a basin plan prohibition, or some combination of these administrative tools.

Third-party NPS Implementation Programs
Under the NPS Implementation and Enforcement Policy, Regional Water Boards continue to have primary responsibility for ensuring that there are appropriate NPS control implementation programs in place to meet water quality objectives and to protect the beneficial uses of the waters of the State. An NPS pollution control implementation program is a program developed to comply with State or Regional Water Board Waste Discharge Requirements (WDRs), waivers of WDRs, or Basin Plan prohibitions. Implementation programs for NPS pollution control may be developed by a Regional Water Board, the SWRCB, an individual discharger, or by or for a coalition of dischargers in cooperation with a third-party representative, organization, or government agency. The latter programs are collectively known as "third-party" programs and the third-party role is restricted to entities that are not being regulated by the SWRCB or Regional Water Boards under the action necessitating the third-party agreement. These may include nongovernmental organizations such as the county Farm Bureaus, citizen groups, industry groups (including discharger groups represented by entities that are not dischargers), watershed coalitions, government agencies (e.g. cites or counties), or any mix of the above.

Third-party programs can enhance the San Diego Water Board's ability to reach multiple numbers of NPS dischargers who individually may be unknown to the San Diego Water Board. Under this approach, oversight of discharger NPS pollution control efforts can be achieved more efficiently and with less impact on the San Diego Water Board's limited NPS program staffing and financial resources.

Given the extent and diversity of NPS pollution discharges, the San Diego Water Board needs to be as creative and efficient as possible in devising approaches to prevent or control NPS pollution. The San Diego Water Board is free to use whatever mix of different approaches to controlling NPS pollution it deems appropriate, as long as it can provide a rational explanation for why it is treating some dischargers differently than other dischargers (e.g., because one group of dischargers is actively participating in a watershed group's efforts, while another is not).

Key Elements of an NPS Implementation Programs
Under the NPS Implementation and Enforcement Policy the San Diego Water Board is required to ensure that NPS implementation programs developed by dischargers or third parties meets the requirements of the five key structural elements described below:

Key Element 1: The objectives of an NPS control implementation program shall be explicitly stated and must, at a minimum, address NPS pollution in a manner designed to achieve State and regional water quality standards, including whatever higher level of water quality the San Diego Water Board determines is appropriate in accordance with antidegradation principles.

Key Element 2: The NPS control implementation program shall include a discussion of the MPs expected to be implemented to ensure attainment of program objectives, and a discussion of the process to be used to verify proper MP implementation.

Key Element 3: Where the San Diego Water Board determines that allowing time to achieve water quality standards is necessary, the NPS control implementation program shall include a specific time schedule and corresponding quantifiable milestones designed to measure progress toward reaching the program's objectives.

Key Element 4: The NPS control implementation program shall include sufficient feedback mechanisms so that the San Diego Water Board, dischargers, and the public can determine if the program is achieving its stated objectives or if further MPs or other measures are needed.

Key Element 5: The San Diego Water Board shall make clear, in advance, the potential consequences for failure to achieve an NPS control implementation program's stated purposes.

10.2.3 Bacteria Nonpoint Source Discharges

The major controllable nonpoint sources of bacteria in the affected watersheds result from agriculture, nurseries, dairy/intensive livestock, and horse ranch, and manure composting and soil amendment operations, and septic systems as described below. Stormwater discharges from several agricultural and/or livestock facilities in the affected watersheds are regulated under WDRs. Those facilities not regulated under WDRs are subject to the terms and conditions of the San Diego Water Board's Basin Plan WDR Waiver Policy (Waiver Policy).[47] Individual landowners and other persons engaged in these land use activities can be held accountable for attaining bacteria load reductions in affected watersheds. For all waivers, the following conditions must be met:

- The discharge shall not create a nuisance as defined in the Water Code;

[47] Regional Water Boards may waive issuance of WDRs for a specific discharge or types of discharge pursuant to Water Code section 13269 if such waiver is determined not to be against the public interest. The waiver of WDRs is conditional and may be terminated at any time by the Regional Water Board for any specific discharge or any specific type of discharge.

- The discharge shall not cause a violation of any applicable water quality standard; and

- The discharge of any substance in concentrations toxic to animal or plant life is prohibited.

Agricultural Fields

Agricultural activities that cause nonpoint source pollution include plowing, fertilizing, irrigation, pesticide spraying, planting, and harvesting. The major agricultural nonpoint source pollutants that result from these activities are nutrients, sediment, pathogens, pesticides, and salts. Agricultural producers apply nutrients in the form of chemical fertilizers, manure, or sludge to optimize production. Excess fertilizers and irrigation runoff, as well as rainfall runoff, can wash bacteria and sediments off of properties into nearby waterways. Agricultural impacts on surface water can be minimized by properly managing fertilizer applications and irrigation practices, and by controlling sediment erosion and runoff from their operations.

Agricultural Irrigation Return Water Discharge Waiver

Discharges of irrigation return water from agriculture[48] fields in the San Diego Region are regulated under terms and conditions of the Waiver Policy. Under the terms of this policy the San Diego Water Board waives the obligation of agricultural field owners and operators to obtain WDRs for agricultural irrigation return water discharges to waters of the state subject to the following condition, in addition to the conditions applicable to all waivers:

- Management measures are implemented for the discharge as described in the Plan for California's Nonpoint Source Pollution Control Program.

Orchards

Agricultural activities that cause nonpoint source pollution include fertilizing, irrigation, planting, and harvesting. The major agricultural nonpoint source pollutants that result from these activities are nutrients, sediment, pathogens, pesticides, and salts. Agricultural producers apply fertilizers and irrigate to optimize production. Excess fertilizers and irrigation runoff, as well as rainfall runoff, can wash bacteria and sediments off of properties into nearby waterways. Agricultural impacts on surface water can be minimized by properly managing fertilizer applications and irrigation practices, and by controlling sediment erosion and runoff from their operations.

Agricultural Orchard Irrigation Return Water Discharge Waiver

Discharges of irrigation return water from orchards in the San Diego Region are regulated under terms and conditions of the Waiver Policy for agricultural irrigation

[48] For the purposes of the Waiver Policy, "agriculture" is defined as the production of fiber and/or food (including food for animal consumption, e.g., alfalfa).

return water. (See above discussion on *Agricultural Irrigation Return Water Discharge Waiver*.)

Commercial Nurseries

Greenhouses and container crop industries apply nutrients in the form of chemical fertilizers (e.g., liquid or time release) to optimize production. When fertilizer applications exceed plant needs, the excess can wash into creeks during wet weather events or through irrigation runoff. Excessive irrigation can affect water quality by causing erosion, and transporting nutrients, pesticides, bacteria, and heavy metals to nearby waterways and groundwater. Commercial nursery impacts on surface water and groundwater can be minimized by properly managing nutrient and fertilizer applications and irrigation practices, and by controlling sediment erosion and runoff.

Nursery Irrigation Return Water Waiver

Discharges of irrigation return water from nurseries[49] in the San Diego Region currently are regulated under the terms and conditions of the Waiver Policy. Under the terms of this policy the San Diego Water Board waives the obligation of nursery owners and operators to obtain WDRs for discharges of irrigation return water from nurseries subject to the following conditions, in addition to the conditions applicable to all waivers:

- There is no discharge to waters of the United States; and

- Management practices are implemented for the discharge as described in the NPS Program Plan (SWRCB, 2000).

Dairy/Intensive Livestock and Horse Ranch Facilities

Dairy, intensive livestock, and horse ranch facilities generate animal wastes that must be managed to prevent wash off to surface waters. Additionally, animals must be kept out of surface waters to prevent direct deposition of animal wastes into surface waters. If manure from concentrated animal facilities is used as a soil amendment or is disposed of on land, subsequent irrigation of the land must be managed to not leach excessive bacteria loads to surface waters.

Animal Feeding Operations Waivers

Discharges of waste from facilities that feed veal calves, cattle, swine, horses, sheep or lambs, turkeys, laying hens or broilers, chickens, ducks, goats, and buffalo in the San Diego Region are regulated under terms and conditions of the Waiver Policy for animal feeding operations. Under the terms of this policy the San Diego Water Board waives the obligation of animal feeding operations owners and operators to obtain WDRs for discharges of waste to waters of the State subject to the following conditions:

[49] For the purposes of the waiver, a "nursery" is defined as a facility engaged in growing plants (shrubs, trees, vines, etc.) for sale.

- The facility has not been designated as a Concentrated Animal Feeding Operation pursuant to the USEPA administered permit programs [40 CFR 122.23 as revised December 15, 2202].

- The facility is operated and maintained in conformance with the State regulations [27 CCR 22562 through 22565]; and

- Pollutants are not discharged (1) to waters of the U.S. through a manmade ditch, flushing system or other similar man-made device, or (2) directly into waters of the U.S. which originate outside of and pass over, across or through the facility or otherwise come into direct contact with the animals confined in the operation.

Manure Composting and Soil Amendment Operations Waivers
Discharges of waste from manure composting and soil amendment operations in the San Diego Region are regulated under terms and conditions of the Waiver Policy for manure composting and soil amendment operations. Under the terms of this policy the San Diego Water Board waives the obligation owners and operators of manure composting and soil amendment operations to obtain WDRs for discharges of waste to waters of the State where SWRCB minimal guidelines for protection of water quality from animal wastes are followed.

Individual Septic Systems
Another potential source of bacteria is discharge from individual septic systems. Although waste from septic systems is discharged to groundwater, the contamination could affect surface waters through upwelling occurring as a result of high groundwater conditions or seasonal variation, and/or systems are not properly maintained. Because a properly maintained septic system should not discharge pollutants under any circumstances, these types of discharges are given a zero load allocation.

Conventional Septic Tank Discharges / Subsurface Disposal Systems for Residential Units, Commercial/Industrial Establishments and Campgrounds, and Alternative Individual Sewerage System Waivers
Discharges of wastewater from conventional septic tank/subsurface disposal systems and alternative individual sewerage systems in the San Diego Region are regulated under the terms and conditions of the Waiver Policy. Under the terms[50] of this policy, the San Diego Water Board waives the obligation of septic tank and individual sewerage system owners and operators to obtain WDRs for discharges to groundwater subject to the following conditions.

For *conventional septic tank/subsurface disposal systems for residential units and commercial/industrial establishments and alternative individual sewerage systems*:

[50] This waiver is applicable until six months after the SWRCB adopts statewide criteria for on-site disposal systems pursuant to the CWC §13291 regulations for onsite sewage treatment systems.

- The design of the system must be approved by the county health agency having jurisdiction where the system is located, and must adhere to the conditions set forth in the *Basin Plan, Chapter 4, (Implementation)* section entitled *Guidelines for New Community and Individual Sewerage Facilities*, and where systems are not constructed within areas designated as Zone A as defined by the California Department of Health Services' *Drinking Water Source Assessment and Protection Program.*

For *conventional septic tank/subsurface disposal systems for campgrounds*:

- No facilities shall exist which would enable recreational vehicles to connect with the campground sewerage system, and systems are not constructed within areas designated as Zone A as defined by the California Department of Health Services' *Drinking Water Source Assessment and Protection Program.*

10.3 Persons Responsible for Point Source Discharges

Persons responsible for point source discharges of bacteria include municipal Phase I urban runoff dischargers, municipal Phase II urban runoff dischargers, Caltrans, publicly owned treatment works (POTWs), and concentrated animal feeding operations of a certain size that subject them to NPDES requirements (CAFOs).

10.3.1 Municipal Dischargers of Urban Runoff

Since the impaired beaches and creeks included in this project are mostly in urbanized areas, significant bacteria loads enter these waterbodies through the MS4s within the watersheds. MS4 discharges are point source discharges because they are released from channelized, discrete conveyance pipe systems and outfalls. Discharges from MS4s to navigable waters of the U.S. are considered to be point source discharges and are regulated in California through the issuance of NPDES requirements. Persons owning and/or operating MS4s other than Caltrans (herein referred to as Municipal Dischargers) that discharge to impaired beaches and creeks, or tributaries thereto, have specific roles and responsibilities assigned to them for achieving compliance with the bacteria WLAs described in section 9.

10.3.2 Municipal Phase II Dischargers of Urban Runoff

A statewide order prescribing general NPDES requirements for discharges from small MS4s[51] regulates urban runoff not covered by the San Diego Water Board's Phase I MS4 NPDES requirements (Orders Nos. R9-2007-0001, and R9-2002-0001). This statewide order addresses smaller municipalities with a population of at least 10,000 and/or a population density of more than 1,000 people per square mile. Typical enrollees under this order include federal facilities and universities. Although there are no Municipal Phase II MS4 facilities in the San Diego Region currently enrolled under the statewide order, the San Diego Water Board can require small MS4 facilities to enroll.

[51] SWRCB Water Quality Order No. 2003-0005-DWQ, NPDES General Permit No. CAS000004, *Waste Discharge Requirements for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems*.

10.3.3 California Department of Transportation

Caltrans is responsible for the design, construction, maintenance, and operation of the California State Highway System, including the portion of the Interstate Highway System within the State's boundaries. The roads and highways operated by Caltrans are legally defined as MS4s and discharges of pollutants from Caltrans MS4s to waters of the U.S constitute a point source discharge that is subject to regulation under NPDES requirements.

Discharges of storm water from the Caltrans owned right-of-ways, properties, facilities, and activities, including storm water management activities in construction, maintenance, and operation of State-owned highways are regulated under SWRCB Order No. 99-06-DWQ.[52] Runoff from highway construction projects and maintenance and operation activities can carry sediment containing bacteria and other pollutants. These discharges can contribute to exceedances of water quality objectives for bacteria indicators at impaired beaches and creeks. Caltrans is responsible, under the terms and conditions of Order No. 99-06-DWQ, for ensuring that their operations do not contribute to violations of water quality objectives in the Region's beaches and creeks.

10.3.4 Publicly Owned Treatment Works

Wastewater treatment plants, or POTWs are regulated under various San Diego Water Board orders that contain effluent limitations for point source discharges of bacteria from these facilities. POTWs are located in the watersheds; however most effluent from these facilities is discharged to the Pacific Ocean through offshore ocean outfalls. One exception is Padre Dam, which discharges effluent to the San Diego River via a series of treatment ponds known as Santee Lakes. Additionally, the City of Escondido's Hale Avenue Resource Recovery Facility has NPDES requirements regulating its intermittent wet weather discharge of up to nine million gallons per day of tertiary treated effluent into Escondido Creek to relieve flows in excess of the ocean outfall capacity. All POTWs, including the two mentioned here, are subject to NPDES requirements with effluent limits for various pollutants, including bacteria. Since POTW discharges do not pose a known bacteria threat to surface waters, no wasteload allocation requiring a reduction in bacteria loading is assigned to POTW discharges under this TMDL Basin Plan amendment.

Bacteria levels in sewage spills from sanitary sewer systems are subject to regulation under SWRCB Order No. 2006-0003-DWQ and San Diego Water Board Order No. R9-2007-0005, which establishes waste discharge requirements prohibiting sanitary sewer overflows by sewage collection agencies. Order Nos. 2006-0003-DWQ and R9-2007-0005 replace San Diego Water Board Order No. 96-04, which has been successful at reducing the number and volume of spills and protecting water quality, the environment, and public health. ~~Bacteria levels in sewage spills from the POTW sewage collection~~

[52] Order No. 99-06-DWQ, NPDES General Permit No. CAS000003, *National Pollutant Discharge Elimination System (NPDES) Permit Statewide Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation (Caltrans).*

~~system are subject to regulation under San Diego Water Board Order No. 96-04[53] which establishes requirements prohibiting sanitary sewer collection system overflows by sewage collection agencies. Order No. 96-04 has been successful at reducing the number and volume of spills and protecting water quality, the environment, and public health.~~ Accordingly no wasteload allocation requiring a reduction in bacteria loading is assigned to POTW collection system sewage overflows under this TMDL Basin Plan amendment.

10.3.5 Concentrated Animal Feeding Operations

There are a small number of animal feeding operations in the San Diego Region, some of them regulated by the San Diego Water Board via NPDES requirements. Three dairies and one pig farm located in the affected watersheds are regulated by NPDES requirements[54] because they are considered concentrated animal feeding operations (CAFOs). Facilities are considered CAFOs (and subject to NPDES requirements) if they meet the criteria specified by USEPA regulations.[55] These criteria include a minimum number of animals and degree of threat to surface waters from discharge from these facilities. Discharges from facilities with less than the minimum number of animals are regulated as nonpoint source discharges under the NPS Implementation and Enforcement Policy and the Waiver Policy as discussed in section 10.2.3.

Orders Nos. 2000-163, 2000-018, 2000-0206, and 2002-0067 prohibit the discharge to surface water of bacteria and other pollutants in stormwater runoff from CAFOs up to and including a 25-year, 24-hour storm event. Since CAFOs do not discharge directly to surface waters except in extreme storm events exceeding the 25-year recurrence interval, additional controls to limit bacteria discharges will not be required of CAFOs. Enforcement of the CAFO NPDES requirements will ensure that CAFOs maintain full compliance with prohibitions specified in the NPDES requirements. If CAFOs are determined to be a cause of impairment to beaches and creeks and/or found to be out of compliance with the NPDES requirements, then the San Diego Water Board could establish a WLA and mandate a reduction in bacteria loading, or take enforcement actions as appropriate.

10.4 Persons Responsible for Controllable Nonpoint Source Discharges

The persons responsible for controllable nonpoint source bacteria discharges are the owners and operators of agricultural facilities, nurseries, ~~and~~ dairy/intensive livestock, ~~and~~ horse ranch facilities, owners of manure composting and soil amendment operations not regulated by NPDES requirements, and owners of individual septic systems. Controllable nonpoint source discharges are present in most watersheds, however, in only

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[53] Order No. 96-04 *General Waste Discharge Requirements Prohibiting Sanitary Sewer Overflows by Sewage Collections Agencies*

[54] Order No. 2000-163 NPDES No. CA0109053 *Waste Discharge Requirements for Frank J. Konyn, Frank J. Konyn Dairy, San Diego County*, Order No. 2000-18 NPDES No. CA0109011 *Waste Discharge Requirements for Jack and Mark Stiefel Dairy, Riverside County*, Order No. 2000-0206, NPDES No. CA 0109321, *Waste Discharge Requirements for Diamond Valley Dairy, Riverside County*, Order No. 2002-0067 NPDES No.CA0109371 *Waste Discharge Requirements for S&S Farms, Swine Raising Facility, San Diego County*.

[55] 40 CFR Part 122.23

four watersheds do these dischargers account for more than 5 percent of the total wet weather load for all three indicator bacteria. These watersheds are the San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River watersheds. Nonpoint sources will be regulated via WDRs, waivers of WDRs, or discharge prohibitions as mandated by California's NPS Implementation and Enforcement Policy, preferably through a third party agreement with the San Diego Water Board.

The San Diego Water Board's WDR Waiver Policy includes conditional waivers for runoff from agricultural facilities, orchards, animal feeding operations, and soil amendment and composting facilities. Essentially, these discharges are waived from requiring WDRs provided that the conditions specified for each type of discharge are being met. If dischargers knowingly or unknowingly violate the waiver conditions, the San Diego Water Board can issue WDRs, take enforcement action, and/or establish additional LAs.

11 IMPLEMENTATION PLAN

This section describes the actions necessary to implement the TMDLs to attain WQOs for indicator bacteria in impaired beaches and creeks. The plan describes implementation responsibilities assigned to point source and nonpoint source dischargers and describes the schedule and key milestones for the actions to be taken.

The goal of the Implementation Plan is to ensure that WQOs[56] for indicator bacteria for beaches and creeks in the San Diego Region are attained and maintained throughout the waterbody and in all seasons of the year. WQOs are considered “attained” when ~~so that~~ the waterbody can be removed from the List of Water Quality Limited Segments. WQOs are considered “maintained” when, upon subsequent listing cycles, the waterbody ~~and does~~ has not returned to an impaired condition and is not re-listed on the List of Water Quality Limited Segments. ~~This~~ Attaining and maintaining WQOs will be accomplished by achieving wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources.

11.1 Regulatory Authority for Implementation Plans

TMDL implementation plans are not currently required under federal law; however, federal policy is that TMDLs should include implementation plans. CWA section 303 [40 CFR 130] authorizes the USEPA to require implementation plans for TMDLs. USEPA regulations implementing section 303 do not currently require states to include implementation plans for TMDLs but are likely to be revised in the future. USEPA regulations [40 CFR 130.6] require states to incorporate TMDLs in the State Water Quality Management Plans (Basin Plans) along with adequate implementation measures to implement all aspects of the plan. USEPA policy is that states must include implementation plans as an element of TMDL Basin Plan amendments submitted to USEPA for approval.[57]

TMDL implementation plans are required under State law. Basin plans must have a program of implementation to achieve WQOs.[58] The implementation plan must include a description of actions that are necessary to achieve the objectives, a time schedule for these actions, and a description of surveillance to determine compliance with the WQOs.[59] State law requires that a TMDL include an implementation plan since a TMDL supplements, interprets, and/or refines existing water quality objectives. The TMDLs, LAs, and WLAs must be incorporated into the Basin Plan.[60]

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[56] [40 CFR 131.38(b)(2)]

[57] See *Guidance for Developing TMDLs in California,* USEPA Region 9, (January 7, 2000).

[58] See Water Code section 13050(j). A “Water Quality Control Plan” or “Basin Plan” consists of a designation or establishment for the waters within a specified area of all of the following: (1) Beneficial uses to be protected, (2) Water quality objectives and (3) A program of implementation needed for achieving water quality objectives.

[59] See Water Code section 13242.

[60] See CWA section 303(e).

11.2 Implementation Plan Objectives

The specific objectives of this Implementation Plan are as follows:

1. Identify the persons responsible for meeting the WLAs in discharges of bacteria to impaired beaches and creeks;

2. Establish a time schedule for meeting the LAs and WLAs. The schedule will establish interim milestones that are to be achieved until the LAs and WLAs are achieved;

3. Reissue or revise the various existing statewide and regional NPDES requirements that regulate urban runoff and other point source discharges to beaches and creeks to implement wasteload allocations set forth in section 9;

4. Enforce the Waiver Policy for nonpoint source (NPS) bacteria discharges, or regulate NPS bacteria discharges pursuant to the NPS Implementation and Enforcement Policy in watersheds where NPS discharges contribute significant bacteria loads to receiving waters.

5. Establish mechanisms to track BMP and MM implementation, monitor BMP and MM effectiveness in achieving the allocations in bacteria discharges, assess success in achieving TMDL objectives and milestones, and report on TMDL program effectiveness in attaining WQOs for indicator bacteria in impaired beaches and creeks; and

6. Investigate and process a Basin Plan amendment authorizing a reference watershed approach for implementing bacteria WQOs pursuant to Issue No. 7 on the *Prioritized List of Basin Plan Issues for Investigation from September 2004 to September 2007* adopted by the San Diego Water Board as part of the 2004 Triennial Review of the Basin Plan.

11.3 Allocations and Identification of Dischargers

Allocations for each watershed are described in Tables 9-1 thru 9-10 and are expressed as annual "loads" in terms of number of bacteria colonies per year (billion MPN/yr) for wet weather, and per month (billion MPN/mo) for dry weather. Allocations were expressed as either WLAs for point sources, or LAs for nonpoint sources. Allocations were divided between point and nonpoint sources based on land use, as discussed in Appendix I. Persons responsible for point source discharges include the California Department of Transportation (Caltrans), and owners and operators of Phase I and Phase II MS4 systems within all of the affected watersheds. Persons responsible for nonpoint source discharges include owners and operators of agriculture, livestock, and horse ranch facilities in watersheds where bacteria loads from these land uses are more than 5 percent of the total load. These watersheds are the San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River watersheds.

Although allocations are distributed to the identified dischargers of bacteria, this does not imply that other potential sources do not exist. Any potential sources in the watersheds not receiving an explicit allocation described in this Technical Report are allowed a zero discharge of bacteria to the impaired beaches and creeks.

11.3.1 Point Source Discharges

Because bacteria loading within urbanized areas generally originate from urban runoff discharged from MS4s, the primary mechanism for TMDL attainment will be increased regulation of these discharges. Persons whose point source discharges contribute to the exceedance of WQOs for indicator bacteria (as discussed in section 10) will be required to meet the WLAs in their urban runoff before it is discharged from MS4s to receiving waters. Caltrans, Municipal Dischargers (Phase I), and small MS4 dischargers (Phase II) are responsible for reducing bacteria loads in their urban runoff prior to discharge to impaired receiving waters, or tributaries thereto, because they own or operate MS4s that contribute to the impairment of receiving waters. These discharges are identified in and regulated by NPDES requirements prescribed in the SWRCB and San Diego Water Board orders listed in Table 11-1.

Table 11-1. SWRCB and San Diego Water Board Orders Regulating MS4 Discharges

Order Number/Short Name	Order Title
SWRCB Order No. 99-06-DWQ *Caltrans Stormwater NPDES Requirements*	*Statewide Storm Water Permit, and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation (Caltrans)*
San Diego Water Board Order No. R9-2007-0001 *San Diego County MS4 NPDES Requirements*	*Waste Discharge Requirements for Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds of the County of San Diego, the Incorporated Cities of San Diego County, and the San Diego Unified Port District*
San Diego Water Board Order No. R9-2002-0001 *Orange County MS4 NPDES Requirements*	*Waste Discharge Requirements for Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds of the County of Orange, the Incorporated Cities of Orange County, and the Orange County Flood Control District within the San Diego Region*
SWRCB Order No. 2003-0005-DWQ *Small MS4 NPDES Requirements*	*Waste Discharge Requirements for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems*

11.3.2 Nonpoint Source Discharges

Nonpoint source discharges from natural sources (bacteria deposition from aquatic and terrestrial wildlife, and bacteria bound in soil, humic material, etc.) are considered largely uncontrollable, and therefore should not be regulated. Furthermore, bacteria from these nonanthropogenic sources are unlikely to indicate the presence of human pathogens. Natural sources of bacteria have been accounted for in the interim TMDLs via the reference watershed approach, discussed in section 4. Controllable nonpoint sources, on the other hand, warrant regulation. Controllable nonpoint sources come from agriculture, livestock, and horse ranch facilities in the affected watersheds.

In most watersheds included in this TMDL project, controllable nonpoint source discharges of bacteria were determined to be minor in comparison to point source discharges.~~, and t~~ Therefore, although LAs have ~~not~~ been established for these discharges, no reductions are required. However, in the San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River watersheds, LAs have been established because anthropogenic nonpoint sources comprise more than 5 percent of the total wet weather bacteria loads.

11.3.3 Lead Jurisdictions for Municipal Discharges

One WLA was assigned to the municipal discharges in each watershed. This WLA was not divided up among the various municipalities in each watershed. The Municipal Dischargers within each subwatershed are collectively responsible for meeting the WLA and required reductions in bacteria loads for these subwatersheds and for meeting all of the TMDL requirements. Responsible municipalities in each affected watershed are listed in Table 11-2, including both point and nonpoint source dischargers. In many cases there are multiple incorporated and unincorporated areas within a subwatershed.

Because many municipalities reside and discharge into single watersheds, Lead Jurisdictions were designated to be responsible for submitting the required reports described in section 11.5.2. These submittals must be on behalf of all dischargers within a single watershed (except Caltrans, who has its own set of requirements). Although only Lead Jurisdictions are responsible for submittals, all responsible municipalities identified in Table 11-2 are responsible for meeting required load reductions to achieve WLAs. Table 11-2 shows the impaired watersheds in the San Diego Region, the dischargers required to meet load reductions, and Lead Jurisdictions for these watersheds (indicated in **bold** lettering). Watersheds were also placed into one of three groups: Group N (north), Group C (central), and Group S (south), for the purpose of prioritizing the impaired waterbodies for implementation of BMPs as discussed in section 11.4.1. The Lead Jurisdictions identified in Table 11-2 are defaults identified by the San Diego Water Board. Responsible Municipalities in each watershed may collectively choose a different Lead Jurisdiction if desired.

Table 11-2. Responsible Municipalities and Lead Jurisdictions

Watershed	Waterbody	Segment or Area	Responsible Municipalities	Group
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12)	Pacific Ocean Shoreline	Cameo Cove at Irvine Cove Dr. - Riviera Way at Heisler Park – North	~~City of Aliso Viejo~~ City of Laguna Beach **County of Orange** ~~City of Laguna Woods~~ Orange County Flood Control District Caltrans Owners/operators of small MS4s*	N
Laguna Beach HSA (901.12)	Pacific Ocean Shoreline	at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Avenue	City of Aliso Viejo **County of Orange** City of Laguna Beach City of Laguna Woods Orange County Flood Control	N

Watershed	Waterbody	Segment or Area	Responsible Municipalities	Group
		Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Road Laguna Beach at Dumond Drive	District Caltrans Owners/operators of small MS4s*	
Aliso HSA (901.13)	Pacific Ocean Shoreline	Laguna Beach at Lagunita Place/Blue Lagoon Place at Aliso Beach	City of Aliso Viejo City of Laguna Beach City of Laguna Hills City of Laguna Niguel City of Laguna Woods City of Lake Forest City of Mission Viejo **County of Orange** Orange County Flood Control District Caltrans Owners/operators of small MS4s*	N
	Aliso Creek	The entire reach (7.2 miles) and associated tributaries Aliso Hills Channel, English Canyon Creek, Dairy Fork Creek, Sulphur Creek, and Wood Canyon Creek At creek mouth		
Dana Point HSA (901.14)	Pacific Ocean Shoreline	Aliso Beach at West Street Aliso Beach at Table Rock Drive 1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave) at Salt Creek (large outlet) Salt Creek Beach at Salt Creek service road Salt Creek Beach at Dana Strand Road	City of Dana Point City of Laguna Beach City of Laguna Niguel **County of Orange** Orange County Flood Control District Caltrans Owners/operators of small MS4s*	N
Lower San Juan HSA (901.27)	Pacific Ocean Shoreline	At San Juan Creek mouth	City of San Juan Capistrano City of Mission Viejo City of Laguna Hills City of Laguna Niguel City of Dana Point City of Rancho Santa Margarita **County of Orange** Orange County Flood Control District ~~City of San Clemente~~ Caltrans Owners/operators of small MS4s*	N
	San Juan Creek	Lower 1 mile		
San Clemente HA (901.30)		Poche Beach Ole Hanson Beach Club Beach at Pico Drain San Clemente City Beach at El Portal Street Stairs	City of San Clemente ~~City of San Juan Capistrano~~ **County of Orange** Orange County Flood Control District Dana Point	N

Watershed	Waterbody	Segment or Area	Responsible Municipalities	Group
		San Clemente City Beach at Mariposa Street San Clemente City Beach at Linda Lane San Clemente City Beach at South Linda Lane San Clemente City Beach at Lifeguard Headquarters Under San Clemente Municipal Pier San Clemente City Beach at Trafalgar Canyon (Trafalgar Lane) San Clemente State Beach at Riviera Beach San Clemente State Beach at Cypress Shores	Caltrans Owners/operators of small MS4s*	
San Luis Rey HU (903.00)	Pacific Ocean Shoreline	at San Luis Rey River Mouth	~~City of Escondido~~ **City of Oceanside** City of Vista County of San Diego Caltrans Owners/operators of small MS4s* Controllable nonpoint sources	C
San Marcos HA (904.50)	Pacific Ocean Shoreline	at Moonlight State Beach	City of Carlsbad **City of Encinitas** City of Escondido City of Oceanside City of San Marcos City of Solana Beach City of Vista County of San Diego Caltrans Owners/operators of small MS4s* Controllable nonpoint sources	C
San Dieguito HU (905.00)	Pacific Ocean Shoreline	at San Dieguito Lagoon Mouth	City of Del Mar **City of Escondido** City of Poway City of San Diego City of Solana Beach County of San Diego Caltrans Owners/operators of small MS4s* Controllable nonpoint sources	C/S
Miramar Reservoir HA (906.10)	Pacific Ocean Shoreline	Torrey Pines State Beach at Del Mar (Anderson Canyon)	City of Del Mar **City of Poway** City of San Diego County of San Diego Caltrans Owners/operators of small MS4s*	S

Watershed	Waterbody	Segment or Area	Responsible Municipalities	Group
Scripps HA (906.30)	Pacific Ocean Shoreline	La Jolla Shores Beach at El Paseo Grande	**City of San Diego** Owners/operators of small MS4s*	S
		La Jolla Shores Beach at Caminito Del Oro		
		La Jolla Shores Beach at Vallecitos		
		La Jolla Shores Beach at Ave de la Playa		
		at Casa Beach, Children's Pool		
		South Casa Beach at Coast Blvd.		
		Whispering Sands Beach at Ravina Street		
		Windansea Beach at Vista de la Playa		
		Windansea Beach at Bonair Street		
		Windansea Beach at Playa del Norte		
		Windansea Beach at Palomar Ave.		
		at Tourmaline Surf Park		
		Pacific Beach at Grand Ave.		
Santee HSA (907.12)	Forrester Creek	Lower 1 mile	**City of El Cajon** City of La Mesa ~~City of Poway~~ City of Santee County of San Diego Caltrans Owners/operators of small MS4s*	S
Mission San Diego HSA (907.11) & Santee HSA (907.12)	San Diego River, Lower	Lower 6 miles	**City of El Cajon** City of La Mesa City of Poway City of San Diego City of Santee County of San Diego Caltrans Owners/operators of small MS4s*	S
	At San Diego River Mouth (aka Dog Beach)			
Chollas HSA (908.22)	Chollas Creek	Lower 1.2 miles	City of La Mesa City of Lemon Grove **City of San Diego** County of San Diego San Diego Unified Port District Caltrans Owners/operators of small MS4s*	S

*Owners/operators of small MS4s are listed in Appendix Q.

11.4 Compliance Schedule and Interim Goals for Achieving Allocations

The purpose of these TMDLs is to attain and maintain the applicable WQOs in impaired beaches and creeks through incremental mandated reductions of bacteria from point sources and nonpoint sources discharging to impaired waters. The requirements of this project mandate that dischargers improve water quality conditions in impaired waters by achieving load and wasteload reductions in their discharges. The bacteria TMDLs shall be implemented in a phased approach with a monitoring component to determine the effectiveness of each phase and guide the selection of BMPs.

11.4.1 Prioritization of Waterbodies

The waterbodies included in this project are numerous and diverse in terms of geographic location, swimmer accessibility and use, existence of shellfish harvesting, and degree of contamination. Dischargers accountable for attaining load reductions in multiple watersheds may have difficulty providing the same level of effort simultaneously in all watersheds. In order to address these concerns a scheme for prioritizing implementation of bacteria reduction strategies in waterbodies within watersheds was developed in conjunction with the Stakeholder Advisory Group (SAG). The prioritization scheme is largely based on the following criteria:

- Level of beach (marine or freshwater) swimmer usage;
- Existence of shellfish harvesting (for beaches);
- Frequency of exceedances of WQOs; and
- Existing programs designed to reduce bacteria loading to surface waters.

Dischargers were placed into one of three groups (North, Central, and South), based on geographic location. Group N consists of dischargers located in watersheds within Orange County, the northernmost region watersheds included in this project. Group C consists of dischargers located in watersheds in northern San Diego County, outside the City of San Diego limits, the central region watersheds included in this project. Group S consists of dischargers who are located in watersheds within and south of the City of San Diego limits, the southernmost region watersheds included in this project. Table 11.2 shows the dischargers in each of the three groups.

The SAG applied the above criteria and proposed a prioritization scheme for implementing bacteria reduction strategies in the impaired waters addressed in these TMDLs. Impaired waters were given a priority number of 1, 2, or 3 with 1 being the highest priority. Priority 1 waters also included waterbodies likely meeting WQOs and likely to be removed from the List of Water Quality Limited Segments. A prioritized list of impaired beaches and creeks included in this project is shown in Table 11-3. Priority schemes are designated within watersheds.

Table 11-3. Prioritized List of Impaired Waters for TMDL Implementation

Watershed	Waterbody	Segment or Area	Priority
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12)	Pacific Ocean Shoreline	Cameo Cove at Irvine Cove Dr. - Riviera Way	1
		at Heisler Park – North	1
Laguna Beach HSA (901.12)	Pacific Ocean Shoreline	at Main Laguna Beach	1
		Laguna Beach at Ocean Avenue	1
		Laguna Beach at Laguna Avenue	1
		Laguna Beach at Cleo Street	1
		Arch Cove at Bluebird Canyon Road	1
		Laguna Beach at Dumond Drive	1
Aliso HSA (901.13)	Pacific Ocean Shoreline	Laguna Beach at Lagunita Place/Blue Lagoon Place at Aliso Beach	1
	Aliso Creek		3
	At creek mouth		
Dana Point HSA (901.14)	Pacific Ocean Shoreline	Aliso Beach at West Street	1
		Aliso Beach at Table Rock Drive	1
		1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave)	1
		at Salt Creek (large outlet)	1
		Salt Creek Beach at Salt Creek service road	2
		Salt Creek Beach at Dana Strand Road	2
Lower San Juan HSA (901.27)	Pacific Ocean Shoreline	at Creek mouth	1
	San Juan Creek		~~3~~1
San Clemente HA (901.30)	Pacific Ocean Shoreline	at Poche Beach (large outlet)	1
		Ole Hanson Beach Club Beach at Pico Drain	1
		San Clemente City Beach at Linda Lane	1
		San Clemente State Beach at Riviera Beach	1
		San Clemente City Beach at Mariposa Street	2
		San Clemente State Beach at Cypress Shores	2
		San Clemente City Beach at Lifeguard Headquarters	2
		Under San Clemente Municipal Pier	2
		San Clemente City Beach at El Portal Street Stairs	2
		San Clemente City Beach at South Linda Lane	3
		San Clemente City Beach at Trafalgar Canyon (Trafalgar Lane)	3
San Luis Rey HU (903.00)	Pacific Ocean Shoreline	at San Luis Rey River Mouth	2

Watershed	Waterbody	Segment or Area	Priority
San Marcos HA (904.50)	Pacific Ocean Shoreline	at Moonlight State Beach	1
San Dieguito HU (905.00)	Pacific Ocean Shoreline	at San Dieguito Lagoon Mouth	1
Miramar Reservoir HA (906.10)	Pacific Ocean Shoreline[a]	Torrey Pines State Beach at Del Mar (Anderson Canyon)	1
Scripps HA (906.30)	Pacific Ocean Shoreline[a]	La Jolla Shores Beach at El Paseo Grande	1
		La Jolla Shores Beach at Caminito Del Oro	1
		La Jolla Shores Beach at Vallecitos	1
		La Jolla Shores Beach at Ave de la Playa	1
		at Casa Beach, Children's Pool	1
		South Casa Beach at Coast Blvd.	1
		Whispering Sands Beach at Ravina Street	1
		Windansea Beach at Vista de la Playa	1
		Windansea Beach at Bonair Street	1
		Windansea Beach at Playa del Norte	1
		Windansea Beach at Palomar Ave.	1
		at Tourmaline Surf Park	1
		Pacific Beach at Grand Ave.	1
Santee HSA (907.12)	Forrester Creek		3
Mission San Diego HSA (907.11) & Santee HSA (907.12)	San Diego River, Lower		3
Chollas HSA (908.22)	Chollas Creek	Bottom 1.2 miles	3

[a] The SWRCB has proposed removing these beach segments from the 2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments.

11.4.2 Compliance Schedule

In establishing the compliance schedule for achieving the bacteria WLAs and LAs, the San Diego Water Board must balance the need of the dischargers for a reasonable amount of time to implement an effective bacteria load reduction program against the broad-based public interest in having water quality standards attained in the waters of the Region as soon as practicable. The public interest is best served when dischargers take all reasonable and immediately feasible actions to reduce pollutant discharges to impaired waters in the shortest possible time. In fact, pursuant to receiving water limitations in the Caltrans stormwater NPDES requirements, and San Diego and Orange County MS4 NPDES requirements (see section 11.5.2 and 11.5.3), the urban runoff discharges should already be planning and implementing a BMP program and monitoring for all MS4 bacteria and other pollutant discharges that cause or contribute to violations of water quality standards in the water quality limited segments within, or receiving pollutant discharges from their jurisdictions.

Compliance Schedule for Meeting REC-1 WQOs

The compliance schedule (Table 11-4) for implementing the wasteload and load reductions required under these TMDLs is structured in a phased manner, with 100 percent of interim reductions necessary for protection of the REC-1 beneficial use required 10 years after OAL approval of this TMDL Basin Plan amendment. Interim reductions required by the compliance schedule vary on the timeline based on the priority scheme described in section 11.4.1. Interim reductions in bacteria wasteloads are required sooner in the higher priority waters. The requirement to meet ~~F~~final reductions to attain REC-1 ~~and SHELL~~ WQOs will be required after 12 years. ~~Interim reductions required by the compliance schedule vary on the timeline based on the priority scheme described in section 11.4.1. Interim reductions in bacteria wasteloads are required sooner in the higher priority waters.~~

The San Diego Water Board identified a Basin Plan issue in the 2004 Triennial Review of the Basin Plan[61] to authorize a reference watershed exceedance frequency or frequencies for implementing the single sample indicator bacteria WQOs. When this proposed amendment is incorporated into the Basin Plan, the final REC-1 TMDLs, allocations and reductions will be recalculated based on an appropriate exceedance frequency or frequencies. If the recalculated REC-1 reductions are similar to the interim REC-1 reductions, then final compliance will be required within 10 years of OAL approval of this TMDL rather than within 12 years. This proposed Basin Plan amendment is discussed in section 11.5.7.

Variable Compliance Schedule for Meeting SHELL WQOs
The requirements for meeting final total coliform reductions to attain SHELL WQOs will vary depending on if shellfish harvesting is taking place at each watershed mouth. This approach is appropriate given new information regarding the contribution of natural sources to SHELL WQO exceedances.

A recent study demonstrated that natural sources cause exceedances of REC-1 WQOs at high frequencies (Schiff et al., 2005; see discussion in section 11.5.7). Natural sources in 4 reference watersheds in Southern California were found to cause exceedances of REC-1 WQOs at an average frequency of 27 percent. The San Diego Water Board analyzed the total coliform data collected by Schiff et al (2005) and found that total coliform density at the four reference beaches exceeded the SHELL single sample WQOs at an average frequency of 53 percent.

Because the exceedance frequency due to natural sources is significant, and because the SHELL total coliform WQO is very low, achieving the SHELL WLA will be difficult. Dischargers have commented that allowing more time to meet the SHELL WLA is reasonable for beach segments where shellfishing is not occurring. For this reason, a tiered compliance schedule was established that takes into account whether or not shellfish harvesting is taking place at an impaired beach segment. For areas where shellfish harvesting is known to occur or suspected of occurring, dischargers will be required to meet total coliform reductions within 12 years. For areas where shellfish harvesting is shown not to occur, dischargers will be required to meet bacteria reductions within 17 years. Shellfishing determinations must be made by execution of special

[61] *Prioritized List of Basin Plan Issues for Investigation from September 2004 to September 2007* (Attachment 1 to Resolution No. R9-2004-0156).

studies or surveys that should be designed and completed as soon as possible, before the San Diego Water Board issues implementing Orders for these TMDLs.

Table 11-4. Compliance Schedule and Interim Goals for Achieving Wasteload Reductions

Compliance Year (year after OAL approval)	Required Wasteload Reduction		
	Priority 1	Priority 2	Priority 3
1			
2			
3			
4			
5	50% (Interim REC-1)		
6		50% (Interim REC-1)	
7			50% (Interim REC-1)
8			
9			
10	100% (Interim REC-1)	100% (Interim REC-1)	100% (Interim REC-1)
11			
12	100% (Final REC-1, SHELL)	100% (Final REC-1, SHELL)	100% (Final REC-1, SHELL)
17*	100% (SHELL)	100% (SHELL)	100% (SHELL)

* Dischargers have an additional 5 years to meet Wasteload reductions for SHELL if surveys show that shellfishing is not occurring.

Dischargers are expected to plan and implement bacteria load reduction BMPs and MMs immediately with all necessary bacteria load reductions being achieved within 10-~~12~~ 17 years. The first four years of the compliance schedule do not require any load reductions from current conditions. These years will provide the dischargers time to identify sources, develop plans and implement enhanced and expanded BMPs capable of achieving the mandated decreases in bacteria densities in the impaired beaches and creeks.

Because dischargers in the Chollas Creek watershed will be addressing required load reductions from multiple water quality improvement projects in addition to bacteria, namely TMDLs for copper, lead, zinc, and diazinon, and a trash reduction program, the compliance schedule is 20 years to achieve the necessary load reductions for all pollutants in this watershed. Regarding bacteria, these interim milestones described in Table 11-5 apply.

Table 11-5. Compliance Schedule Including Interim Milestones—Chollas Creek

Compliance Year (year after OAL approval)	**Wasteload Reduction Milestone**
7	50% interim REC-1 for dry weather
10	100% interim REC-1 for dry weather, 50% interim REC-1 for wet weather
12	100% final REC-1 and SHELL for dry weather,
17	100% SHELL for dry weather*
20	100% REC-1 and SHELL for wet weather

* Dischargers have an additional 5 years to meet dry weather Wasteload reductions for SHELL if surveys show that shellfishing is not occurring.

This tailored compliance schedule requires comprehensive BMP planning and load reductions for all impairing pollutants as described in *Total Maximum Daily Loads for Dissolved Copper, Lead, and Zinc in Chollas Creek, Tributary to San Diego Bay*.

11.5 San Diego Water Board Actions

This section describes the actions that the San Diego Water Board will take to implement the TMDLs. The TMDLs will be implemented primarily by reissuing or revising the existing NPDES requirements for MS4 discharges to include WQBELs that are consistent with the assumptions and requirements of the bacteria WLAs for MS4 discharges. The process for issuance of NPDES requirements is distinct from the TMDL process, and is described in section 11.5.1. WQBELs for municipal stormwater discharges can be either numeric or non-numeric. Non-numeric WQBELs typically are a program of expanded or better-tailored BMPs. The USEPA expects that most WQBELs for NPDES-regulated municipal discharges will be in the form of BMPs, and that numeric limitations will be used only in rare instances.[62] WQBELs can be incorporated into NPDES requirements for MS4 discharges by reissuing or revising these requirements.

In the San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River watersheds, significant bacteria loads come from nonpoint sources in addition to wasteloads discharged from MS4s. In these watersheds, load reductions from agriculture, livestock, and horse ranch facilities will be needed to meet bacteria WQOs. The San Diego Water Board will implement the load reductions in these watersheds by enforcing existing WDRs and the Waiver Policy with respect to waivers for discharges of waste from animal feeding operations, manure composting and soil amendment operations, and agricultural and orchard irrigation return flow. If the conditions in the Waiver Policy are

[62] USEPA memorandum entitled "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs," dated November 22, 2002.

not sufficient to protect water quality for these types of discharges, the San Diego Water Board could amend discharge conditions upon renewal of the Waiver Policy. In addition, for any discharges not covered by, or not in compliance with the Waiver Policy, the San Diego Water Board will issue WDRs or a Basin Plan prohibition pursuant to the SWRCB NPS Implementation and Enforcement Policy.[63]

11.5.1 Process and Schedule for Issuing NPDES Requirements

The public process for issuing NPDES requirements is distinct but similar from the process to adopt TMDLs. For NPDES requirements, the process begins when the operator of the facility (discharger) submits a report of waste discharge (RWD) to the San Diego Water Board for review. After reviewing the RWD, the San Diego Water Board must make a decision to proceed with the NPDES requirements. Using the information and data in the RWD the San Diego Water Board develops draft NPDES requirements and the justification for the conditions (referred to as the fact sheet).

The first major step in the development process is to develop numerical effluent limitations on the amounts of specified pollutants that may be discharged and / or specified best management practices (BMPs) designed to minimize water quality impacts. These numerical effluent limitations and BMPs or other non-numerical effluent limitations must implement both technology-based and water quality-based requirements of the Clean Water Act. Technology-based effluent limitations (TBELs) represent the degree of control that can be achieved by point sources using various levels of pollution control technology. If necessary to achieve compliance with applicable water quality standards, NPDES requirements must contain water quality-based effluent limitations (WQBELs), derived from the applicable receiving water quality standards, more stringent than the applicable technology-based standards. In the context of a TMDL, the WQBELs must be consistent with the assumptions and requirements of the wasteload allocations of any applicable TMDL. Following the development of effluent limitations, the San Diego Water Board develops appropriate monitoring and reporting conditions, facility-specific special conditions, and includes standard provisions that are the same for all NPDES requirements.

After the draft NPDES requirements are complete, the San Diego Water Board provides an opportunity for public participation in the process. A public notice announces the availability of the draft requirements, and interested persons may submit comments. Based on the comments, the San Diego Water Board develops the final requirements, documenting the process and decisions in the administrative record. The final NPDES requirements are issued to the facility in an order adopted by the San Diego Water Board.

Although NPDES requirements must contain WQBELs that are consistent with the assumptions and requirements of the TMDL WLAs, the federal regulations[64] do not require the WQBELS to be identical to the WLAs. The regulations leave open the possibility that the San Diego Water Board could determine that fact-specific

[63] *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program*, SWRCB, May 20, 2004.
[64] 40 CFR section 122.44(d)(1)(vii)(B).

circumstances render something other than literal incorporation of the WLA to be consistent with the TMDL assumptions and requirements. For example, the WLAs in Tables 9-1 through 9-10 are expressed as billion MPN per year (or per month); however, the WQBELs prescribed in response to the WLAs may or may not be written using the same metric. WQBELs may be expressed as numeric effluent limitations using a different metric, or, more likely, as BMP development, implementation, and revision requirements.

NPDES requirements should be issued, reissued, or revised "as expeditiously as practicable" to incorporate WQBELs derived from the TMDL WLAs. "As expeditiously as practicable" means the following:

1. **New point sources**. "New" point sources previously unregulated by NPDES requirements must obtain their NPDES requirements before they can lawfully discharge pollutants. For point sources receiving NPDES requirements for the first time, "as expeditiously as practicable" means that the San Diego Water Board incorporates WQBELs that are consistent with the assumptions and requirements of the WLAs into the NPDES requirements and requires compliance with the WQBELs upon the commencement of the discharge.

2. **Point Sources Currently Regulated Under NPDES Requirements**. For point sources currently regulated under NPDES requirements, "as expeditiously as practicable" means that:

   a. WQBELs that are consistent with the assumptions and requirements of the WLAs should be incorporated into NPDES requirements during their 5-year term, prior to expiration, in accordance with the applicable NPDES requirement reopening provisions, taking into account factors such as available NPDES resources, staff and budget constraints, and other competing priorities.

   b. In the event the NPDES requirement revisions cannot be considered during the 5-year term, the San Diego Water Board will incorporate WQBELs that are consistent with the assumptions and requirements of the WLAs into the NPDES requirements at the end of the 5-year term.

11.5.2 Actions with respect to the California Department of Transportation

Under Receiving Water Limitation C-1-3.a of SWRCB Order No. 99-06-DWQ (Caltrans stormwater NPDES requirements) Caltrans is required to implement additional BMPs to reduce bacteria discharges in impaired watersheds to the maximum extent practicable and to restore compliance with the bacteria WQOs. This obligation is triggered when either the discharger or the SWRCB determines that MS4 discharges are causing or contributing to an exceedance of an applicable water quality objective, in this case indicator bacteria WQOs. Designation of beaches and/or creeks as water quality limited segments under CWA section 303(d) provided sufficient evidence that that MS4 discharges are causing or contributing to the violation of water quality standards. Thus, Caltrans should be implementing the provisions of Receiving Water Limitation C-1-3.a with respect to bacteria discharges into water quality limited segments.

The WLAs for Caltrans established in section 9 are equal to the existing load estimated from Caltrans discharges. Although Caltrans is not required to reduce discharges of bacteria from existing loading, WLAs are established so that Caltrans shall not increase its wet weather discharges above current levels. The San Diego Water Board shall request that the SWRCB enforce the provisions of Receiving Water Limitation C-1-3.a and reissue or revise Order No. 99-06, to include requirements to implement the TMDL. The requirements implementing the TMDLs shall include the following:

a. WQBELs consistent with the requirements and assumptions of the bacteria WLAs described in Tables 9-1 through 9-10 and a schedule of compliance applicable to MS4 discharges into impaired beaches and creeks, or tributaries thereto, described in Tables 11.3 and 11.4. At a minimum, WQBELs shall include a BMP program of expanded or better-tailored BMPs to attain the WLAs in accordance with the compliance schedule in Table 11.4.

b. If the WQBELS consist of a BMP program, then the reporting requirements shall consist of annual progress reports on BMP planning, implementation, and effectiveness in attaining the WQOs in impaired beaches and creeks, and annual water quality monitoring reports. Reporting shall continue until the bacteria WQOs are attained in impaired beaches and creeks.

   The first progress report shall consist of a Bacteria Load Reduction Plan. Bacteria Load Reduction Plans must be specific to each impaired waterbody, which fall into one of three types: impaired beach with tributary impaired creek, impaired beach with unimpaired tributary creek, and impaired beach with no tributary creek. Monitoring strategies and choice of compliance points should reflect which type of impaired waterbody is involved. The Bacteria Load Reduction Plan must include the following components:

   - Description of existing BMPs in each affected watershed;
   - Discussion of effectiveness of existing BMPs and method(s) of evaluation;
   - Description of additional BMPs that will be utilized to meet the required load reductions and compliance schedule;
   - Description of locations where BMPs would be located;
   - Discussion of why these locations are appropriate; and
   - Effectiveness measures.

   Bacteria Load Reduction Plans must have monitoring components that:

   - Have the capability to measure receiving water quality and assess compliance with water quality objectives;

- Provide information showing whether or not wasteload reductions are being met;
- Locate anthropogenic bacteria hotspots;
- Identify and characterize anthropogenic bacteria sources;
- Identify the number and location of sampling sites and provide justification for each;
- Describe the frequency of measurements, the bacteria indicators being measured, and the justification for each.

Subsequent reports should describe the effectiveness of implementing the Bacteria Load Reduction Plan. Methods used for assessing effectiveness should include the following or their equivalent: surveys, pollutant loading estimations, and receiving water quality monitoring. The long-term strategy should also discuss the role of monitoring data in substantiating or refining the assessment. Once WQOs have been attained, a reduced level of monitoring may be appropriate.

In addition to these requirements, if numerical WQBELS are included in the NPDES requirements, the monitoring requirements shall include flow and bacteria density measurements to determine if bacteria loads in effluent are in compliance with WQBELS.

If NPDES requirements are not likely to be issued, reissued or revised within 6 months of OAL approval of these TMDLs, the San Diego Water Board may issue an investigative/monitoring order to Caltrans pursuant to sections 13267 or 13383 of the Water Code. This order would require submission of reports on BMP planning and receiving water quality monitoring in adherence to performance measures described above.

Bacteria Load Reduction Plans may be re-evaluated at set intervals (such as 5-year renewal cycles for NPDES requirements, or upon request from dischargers, as appropriate and in accordance with San Diego Water Board priorities). Plans may be iterative and adaptive according to assessments and any special studies.

11.5.3 Actions with respect to Phase I Municipal Dischargers

California's Municipal Stormwater Program regulates stormwater discharges from MS4s. NPDES requirements for MS4 discharges were issued in two phases. Under Phase I, which began in 1990, the Regional Water Boards adopted NPDES urban runoff requirements for medium (serving between 100,000 and 250,000 people) and large (serving 250,000 people) municipalities. Most of these requirements are issued to a group of municipalities ("copermittees") encompassing an entire metropolitan or county area. These requirements are issued for fixed terms of five years and are reissued upon the request of the discharger as they expire.

The Phase I Municipal Dischargers in San Diego and Orange County are required under Receiving Water Limitations A.3.a.1 and C.2[65] of Orders No. R9-2007-0001 and R9-2002-0001, respectively (San Diego County and Orange County MS4 NPDES requirements) to implement additional BMPs to reduce bacteria discharges in impaired watersheds to the maximum extent practicable and to restore compliance with the bacteria WQOs. This obligation is triggered when either the discharger or the San Diego Water Board determines that MS4 discharges are causing or contributing to an exceedance of an applicable water quality objective, in this case indicator bacteria WQOs. Designation of beaches and/or creeks as water quality limited segments under CWA section 303(d) provided sufficient evidence that that MS4 discharges are causing or contributing to the violation of water quality standards. Thus, the Municipal Dischargers should be implementing the provisions of Receiving Water Limitation C.2 with respect to bacteria discharges water quality limited segments.

In addition to enforcing the provisions of the Receiving Water Limitations, the San Diego Water Board shall reissue or revise Orders No. R9-2007-0001 and R9-2002-0001, to incorporate WQBELs consistent with the assumptions and requirements of the bacteria WLAs, and requirements for monitoring and reporting. In those orders, the Phase I Municipal Dischargers are referred to as "copermittees."[66] WQBELs and other requirements implementing the TMDLs could be incorporated into these NPDES requirements upon the normal renewal cycle or sooner, if appropriate. The requirements implementing the TMDLs shall include the following:

a. WQBELs consistent with the requirements and assumptions of the bacteria WLAs described in Tables 9-1 through 9-10 and a schedule of compliance applicable to the MS4 discharges into impaired beaches and creeks, or tributaries thereto, described in Tables 11-3 and 11-4. At a minimum, WQBELs shall include a BMP program of expanded or better-tailored BMPs to attain the WLAs in accordance with the compliance schedule in Table 11.4.

b. If the WQBELS consist of BMP programs, then the reporting requirements shall consist of annual progress reports on BMP planning, implementation, and effectiveness in attaining the WQOs in impaired beaches and creeks, and

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[65] Receiving Water Limitations A.3.a.1and C.2.a provide that "[u]pon a determination by either the Copermittee or the San Diego Water Board that MS4 discharges are causing or contributing to an exceedance of an applicable water quality standard, the Copermittee shall promptly notify and thereafter submit a report to the San Diego Water Board that describes BMPs that are currently being implemented and additional BMPs that will be implemented to prevent or reduce any pollutants that are causing or contributing to the exceedance of water quality standards. The report may be incorporated in the annual update to the Jurisdictional URMP unless the San Diego Water Board directs an earlier submittal. The report shall include an implementation schedule. The San Diego Water Board may require modification to the report."

[66] Copermittees own or operate MS4s through which urban runoff discharges into waters of the U.S. within the San Diego Region. These MS4s fall into one or more of the following categories: (1) a medium or large MS4 that services a population of greater than 100,000 or 250,000 respectively; or (2) a small MS4 that is "interrelated" to a medium or large MS4; or (3) an MS4 which contributes to a violation of a water quality standard; or (4) an MS4 which is a significant contributor of pollutants to waters of the United States.

annual water quality monitoring reports. Reporting shall continue until the bacteria WQOs are attained in impaired beaches and creeks. The first progress report shall consist of a Bacteria Load Reduction Plan. Bacteria Load Reduction Plans must be specific to each impaired waterbody, which fall into one of three types: impaired beach with tributary impaired creek, impaired beach with unimpaired tributary creek, and impaired beach with no tributary creek. Monitoring strategies and choice of compliance points should reflect the type of impaired waterbody involved. The Bacteria Load Reduction Plan must include the following components:

- Description of existing BMPs in each affected watershed;
- Discussion of effectiveness of existing BMPs and method(s) of evaluation;
- Description of additional BMPs that will be utilized to meet the required load reductions and compliance schedule;
- Description of locations where BMPs would be located;
- Discussion of why these locations are appropriate; and
- Effectiveness measures.

Bacteria Load Reduction Plans must have monitoring components that:

- Have the capability to measure receiving water quality and assess compliance with WQOs;
- Provide information showing whether or not wasteload reductions are being met;
- Locate anthropogenic bacteria hotspots;
- Identify and characterize anthropogenic bacteria sources;
- Identify the number and location of sampling sites and provide justification for each;
- Describe the frequency of measurements, the bacteria indicators being measured, and the justification for each.

Subsequent reports should describe the effectiveness of implementing the Bacteria Load Reduction Plan. Methods used for assessing effectiveness should include the following or their equivalent: surveys, pollutant loading estimations, and receiving water quality monitoring. The long-term strategy should also discuss the role of monitoring data in substantiating or refining the assessment. Once WQOs have been attained, a reduced level of monitoring may be appropriate.

If NPDES requirements are not likely to be issued, reissued or revised within 6 months of OAL approval of these TMDLs, the San Diego Water Board may issue an investigative/monitoring order to dischargers pursuant to sections 13267 or 13383 of the Water Code. This order would require BMP planning and receiving water quality monitoring in adherence to performance measures described above.

The Bacteria Load Reduction Plans may be re-evaluated at set intervals (such as 5-year renewal cycles for NPDES requirements, or upon request from named dischargers, as appropriate and in accordance with the San Diego Water Board priorities). Plans may be iterative and adaptive according to assessments and any special studies.

The SWRCB has proposed removing beach segments in the Miramar Reservoir and Scripps Hydrologic Areas from the 2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments. If these beach segments are removed from the list, municipal dischargers and Caltrans need not prepare bacteria load reduction plans for their discharges in these watersheds. However, any BMPs implemented in these watersheds to reduce bacteria loading should be continued and maintained. Likewise, monitoring to assess the effectiveness of these BMPs should continue.

11.5.4 Actions with respect to Discharges from Small MS4s

As part of Phase II of the municipal stormwater program, the SWRCB adopted General NPDES requirements for the discharge of stormwater from small MS4s (SWRCB Order No. 2003-0005-DWQ). This order provides NPDES requirements for smaller municipalities, including non-traditional, small MS4s, which are governmental facilities such as military bases, public campuses, and prison and hospital complexes.

Order No. 2003-0005-DWQ requires the Phase II small MS4 dischargers to develop and implement a Stormwater Management Plan/Program with the goal of reducing the discharge of pollutants to the maximum extent practicable (MEP). MEP is the performance standard specified in section 402(p) of the CWA. The management programs specify what BMPs will be used to address certain program areas. The program areas include public education and outreach; illicit discharge detection and elimination; construction and post-construction; and good housekeeping for municipal operations. In general, medium and large municipalities are required to conduct chemical monitoring, though small municipalities are not.

Order No. 2003-0005-DWQ identifies the facilities in the San Diego Region subject to regulation under the order. Currently, none of these facilities are enrolled under the general NPDES requirements. Appendix Q contains a list of the small MS4 facilities in the watersheds affected by these TMDLs.

The San Diego Water Board shall require owners and operators of small MS4s in the watersheds subject to this TMDL to submit Notices of Intent[67] to comply with the requirements of Order No. 2003-0005-DWQ. Once enrolled under the order, small MS4 owners and operators will be required to comply with the provisions of the order to reduce the discharge of bacteria to the MEP as specified in their Stormwater Management Plans/Programs.

[67] The Notice of Intent, or NOI, is attachment 7 to Order No. 2003-0005-DWQ.

11.5.5 Actions with Respect to Discharges from Nonpoint Sources

The San Diego Water Board will implement the load reductions described in Tables 9-1 through 9-10 for the San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River watersheds by enforcing facility specific WDRs and the Basin Plan WDR Waiver Policy with respect to waivers of discharges of waste from animal feeding operations, manure composting and soil amendment operations, ~~and~~ agricultural irrigation return flow, nursery irrigation return flow, and discharge from conventional septic tank/subsurface disposal systems for residential and commercial units, campgrounds, and alternative individual sewerage systems. In addition, for discharges not regulated by WDRs or covered by the Waiver Policy, the San Diego Water Board shall pursue a Third-Party regulatory-based approach to implement the bacteria load reductions assigned to nonpoint sources. The Third-Party regulatory approach is a key feature of California's NPS Implementation and Enforcement Policy, as discussed in section 10.2.2.

Under a third-party agreement with the San Diego Water Board, a coalition of dischargers, in cooperation with a third-party representative, organization, or government agency, could formulate and implement their own nonpoint source pollution control programs. The third-party role is restricted to entities that are not being regulated by the SWRCB or Regional Water Boards under the action necessitating the third-party agreement. Third parties may include non-governmental organizations (such as the Farm Bureau), citizen groups, industry groups (including discharger groups represented by entities that are not dischargers), watershed coalitions, government agencies (such as cities or counties), or any mix of the above.

Under third party agreements, the San Diego Water Board could conditionally waive regulation of bacteria pollution sources based on the existence of an adequate pollution control program that adequately addresses the sources. Similarly, the San Diego Water Board could adopt individual or general WDRs for discharges that build upon third-party agreements. These WDRs could, for example, require that the dischargers either participate in an acceptable third-party program, or alternatively, submit individual pollution control plans that detail how they will comply with the WDRs. Likewise, the San Diego Water Board could adopt waste discharge prohibitions which include exceptions based on third-party pollution control programs. For example, the San Diego Water Board could except from the discharge prohibition those discharges that are adequately addressed in an acceptable third-party pollution control program. Failure by any single discharger to participate in their respective organization/agency program could result in more stringent regulation of that discharge by the San Diego Water Board through adoption of facility specific WDRs or enforcement actions.

11.5.6 Additional Actions

Additional actions that the San Diego Water Board can take to ensure implementation of the bacteria TMDLs are to take enforcement actions, and recommend high prioritization of TMDL implementation projects for grant funds as described below.

Take Enforcement Actions

The San Diego Water Board shall consider enforcement actions,[68] as necessary, against any discharger failing to comply with applicable waiver conditions, WDRs, discharge prohibitions, or take enforcement action, as necessary, to control the discharge of bacteria to impaired beaches and creeks, to attain compliance with the bacteria WLAs specified in this Technical Report, or to attain compliance with the bacteria WQOs. The San Diego Water Board may also terminate the applicability of waivers and issue WDRs or take other appropriate action against any discharger(s) failing to comply with the waiver conditions.

Investigate Landfills as a Potential Bacteria Source

At this time, whether or not landfills are a significant source of bacteria to surface waters is not known. The San Diego Region has 47 regulated landfills (Class III and Class I) and approximately 80 unregulated land discharge sites (e.g., historical burn-ash, waste piles, and other past discharges of waste to land). All 7 of the active Class III (municipal solid waste or MSW) landfills include engineered liner systems with annual leachate monitoring, regular groundwater monitoring and storm water monitoring under the statewide Industrial Storm Water WDRs (Order No. 97-03-DWQ). Under the applicable solid waste regulations (CCR Title 27 and CFR Title 40 Part 258), the existing monitoring systems do not include bacteria monitoring. The remaining regulated landfills perform groundwater monitoring and some form of storm water monitoring but do not test for bacteria.

MSW landfills contain bacteria in their waste management units as evidenced by the continued off-gassing of methane in landfill gas, although the extent of underground migration of landfill gas (LFG) is generally limited to favorable bacteriological habitat and food source, and the effectiveness of LFG extraction systems.

Sewage wastes are categorically prohibited from being discharged into MSW landfills by the applicable regulations (cited above), however under certain specific conditions active MSW landfills can accept some types of treated sewage sludge for disposal, or use such materials as a component to an alternative daily cover (as allowed under CCR Title 27). Landfills are an unlikely source of bacteria with respect to these TMDLs. They may, however, contain bacteria that are actively degrading wastes within the waste management unit.

Active landfills may contribute discharges of storm water containing bacteria to the beaches and creeks because their waste management operations are not fully capped and therefore may result in storm water discharges. Closed and inactive landfills (not closed

[68] An enforcement action is any formal or informal action taken to address an incidence of actual or threatened noncompliance with existing regulations or provisions designed to protect water quality. Potential enforcement actions including notices of violation (NOVs), notices to comply (NTCs), imposition of time schedules (TSO), issuance of cease and desist orders (CDOs) and cleanup and abatement orders (CAOs), administrative civil liability (ACL), and referral to the attorney general (AG) or district attorney (DA). The San Diego Water Board generally implements enforcement through an escalating series of actions to: (1) assist cooperative dischargers in achieving compliance; (2) compel compliance for repeat violations and recalcitrant violators; and (3) provide a disincentive for noncompliance.

under CCR Title 27 or CFR Title 40) in the San Diego Region are generally covered by an engineered soil cap. These caps vary in thickness from 2 feet to approximately 8 feet of earthen cover to protect against pollutant migration from the wastes buried in the waste management unit.

All 47 MSW landfills are regulated by WDRs (general or site specific) issued by the San Diego Water Board and via the statewide Industrial Stormwater NPDES requirements for landfills. Both are interrelated in that a change to the statewide WDRs are always reflected in the Regional WDRs, which are renewed in 5 or 10 year cycles depending on the perceived threat to water quality and complexity ranking of the facility (pursuant to CCR Title 23, section 2200).

From the information available to the San Diego Water Board, active MSW landfills could be a potential source for bacteria discharges to surface waters. MSW landfills, as a source of surface water bacteria, should be investigated using the following recommended approach:

- All active MSW landfills should be evaluated to determine if they are located upstream of impaired surface waters;

- A technical evaluation should be performed to determine the relationships between landfill locations and proximity to impaired surface waters and viable surface waters. The evaluation should specifically identify the active landfills that are located upstream and in proximity to impaired surface waters, and the type(s) of analytical methods and protocols that are necessary to evaluate/quantify potential bacteria loading and subsequent impairment to surface waters, and the approximate costs associated with obtaining the required data from the specific landfills identified in the analysis;

- Based upon the technical evaluation, an investigative Order (under authority of Water Code section 13267) may be issued to all active MSW landfills. The investigative Order should request two years of data collection, data analysis, and reporting of results to the San Diego Water Board to determine if the active MSW landfills are contributing bacteria via pathways that affect beaches and creeks.

Those active landfills that are determined to be likely contributors of bacteria into impaired surface waters may be required to continue sampling for bacteria. Several options exist for implementing continued monitoring:

- Establish a long-term monitoring and reporting program in an investigative Order issued under authority of Water Code section 13267;

- Issue a Cleanup and Abatement Order (CAO; authority found in Water Code section 13304) including the evaluation and implementation of measures to mitigate excess loading of bacteria from the facility, and continue long-term monitoring and reporting of results to the San Diego Water Board;

- Amend the statewide NPDES requirements to include regular monitoring and reporting of bacteria in storm water discharges from industrial facilities, including active MSW landfills; and

- Issue general NPDES requirements that require regular monitoring of storm water discharges for bacteria. The general NPDES requirements would allow the San Diego Water Board to enroll any storm water discharge in a program for long-term monitoring for bacteria and implementation of BMPs to control such discharges.

The regulatory tool chosen to impose the bacteria monitoring requirements may require the affected discharger(s) to:

- Sample in all reasonable and significant locations to determine contribution to the impairment of beaches and creeks;
- Implement BMPs to reduce the bacteria discharges; and
- Monitor until all significant bacteria discharge has ceased for 2 cycles of re-issuance of relevant NPDES requirements.

Recommend High Priority for Grant Funds

The San Diego Water Board shall recommend that the SWRCB assign a high priority to awarding grant funding[69] for projects to implement the bacteria TMDLs. Special emphasis will be given to projects that can achieve quantifiable bacteria load reductions consistent with the specific bacteria TMDL WLAs and LAs.

11.5.7 Investigate and Process a Basin Plan Amendment Authorizing a Reference Watershed Approach for Implementing Bacteria WQOs

Issue No. 7 on the *Prioritized List of Basin Plan Issues for Investigation Between September 2004 and September 2007* includes the investigation and processing of a Basin Plan amendment to establish a reference watershed approach for interpreting the bacteria WQOs in the Basin Plan and Ocean Plan. SCCWRP recently completed a study to characterize reference systems for bacteria in southern California. A reference system was defined in the study as a beach and upstream watershed consisting of at least 95 percent undeveloped lands. Because the reference systems consist almost entirely of undeveloped land, the bacteria washed down to the beach come from natural, nonanthropogenic sources. Measurements during the 2004-2005 winter season showed that in four reference systems (two in Los Angeles County, one in Orange County, and one in San Diego County), 27 percent of all samples collected within 24 hours of rainfall exceeded water quality thresholds for at least one indicator (i.e. a single sample WQO was exceeded 27 percent of the time due to nonanthropogenic sources within 24 hours of rainfall) (Schiff et al., 2005). This is higher than the 22 percent found at the Arroyo

[69] The SWRCB administers the awarding of grants funded from Proposition 13, Proposition 50, Clean Water Act section 319(h) and other federal appropriations to projects that can result in measurable improvements in water quality, watershed condition, and/or capacity for effective watershed management. Many of these grant fund programs have specific set-asides for expenditures in the areas of watershed management and TMDL project implementation for non-point source pollution.

Sequit watershed in Los Angeles, which was used to calculate interim TMDLs discussed in section 4.1. The Arroyo Sequit watershed is one of the four reference watersheds included in this study.

The reference system approach is designed to account for bacteria loading from natural sources. This approach assumes that the natural processes that generate bacteria loads in a reference system, such as bacteria regrowth on beach wrack,[70] resuspension from disturbed sediment, and direct deposition of bird and mammal feces in water, also occurs in the urbanized watershed and downstream beach. The frequency of exceedance of single sample bacteria WQOs from natural sources can be measured in reference systems, and applied in urbanized watersheds. As discussed in section 4, dischargers are not required to reduce bacteria loads from these and other natural sources to achieve TMDLs.

Although not discussed in SCCWRP's report, the data show significant exceedances of the SHELL WQOs. Evaluated against the single sample WQO for total coliform (230 MPN/mL), the average number of exceedances for all four watersheds is roughly 53 percent, with a range from 25 percent to 88 percent, depending on the watershed.

As written, this TMDL project requires attainment of both interim TMDLs, which incorporate the reference system approach, and final TMDLs, which adhere to WQOs as currently written in the Basin Plan. A Basin Plan amendment to authorize the reference system approach for implementing single sample bacteria WQOs is required to avoid the need to attain the final TMDLs. The San Diego Water Board will investigate and process the proposed reference system Basin Plan amendment in accordance with local priorities and resources. After this Basin Plan amendment is adopted, TMDLs included in this project can be re-calculated to reflect an appropriate exceedance frequency.

11.6 Coordination and Execution of Special Studies

The San Diego Water Board recognizes that coordination and execution of special studies by dischargers and other interested persons could result in improved TMDL analyses. Areas of study that could benefit TMDL analysis include collection of data that can be used to improve model output, improved understanding of bacteria levels and the relationship to health effects, and identification of an appropriate and affordable method(s) to measure pathogens directly. Additionally, studies designed to measure BMP effectiveness and bacteria source identification (see sections 11.5.2 and 11.5.3) will be useful for dischargers in identifying appropriate strategies to meet the requirements of these TMDLs.

11.6.1 Collect Data Useful for Model Improvement

As described in Appendices J and K, calibration and verification of the computer models used for TMDL analysis was based on limited data (water quality, flow) and assumed values for input parameters such as rates for bacteria die-off and re-growth. Studies designed to collect additional data that can be used for model improvement will result in

[70] Wrack consists of seaweed, eel grass, kelp, and other marine vegetation that washes up on shore and accumulates at the high tide line. The "wrack line" is essentially the high tide line.

more accurate TMDL results. Also, data from each watershed can be collected and used to calibrate and verify the models for that watershed instead of relying on the regional calibration used in this project.

11.6.2 Improve Understanding Between Bacteria Levels and Health Effects

The San Diego Water Board recognizes that there are potential problems associated with using bacteriological WQOs to indicate the presence of human pathogens in receiving waters free of sewage discharges. The indicator bacteria WQOs were developed, in part, based on epidemiological studies in waters with sewage inputs. The risk of contracting a water-born illness from contact with urban runoff devoid of sewage, or human-source bacteria is not known. Some pathogens, such as *giardia* and *cryptosporidium* can be contracted from animal hosts. Likewise, domestic animals can pass on human pathogens through their feces. These and other uncertainties need to be addressed through special studies and, as a result, revisions to the TMDLs established in this project may be appropriate.

Indicator bacteria are used to measure the risk of swimmer illness because they have been shown to indicate the presence of human pathogens, such as viruses, when human bacteria sources are present. Bacterial indicators have been historically used because they are easier and less costly to measure than the pathogens themselves (see Appendix C). In recent years, however, questions have been raised regarding the validity of using indicator bacteria to ascertain risk to swimmers in recreational waters, since they appear to be less correlated to viruses when sources are from urban runoff (Jiang et al, 2001). In fact, most epidemiology studies conducted to measure the risk of swimmer illness in the presence of indicator bacteria have taken place in receiving waters containing known sewage impacts.

To date, only two epidemiology studies have been conducted where the bacteria source was primarily urban runoff. The Santa Monica Bay epidemiology study (Haile et al, 1999) reported that there was a direct correlation between swimming related illnesses and densities of indicator bacteria. The sites included in this study were known to contain human sources of fecal contamination. Most recently, the Mission Bay epidemiological study (Colford et al, 2005) showed that there was no correlation between swimmer illness and concentrations of indicator bacteria. Unlike Santa Monica Bay, bacteria sources in Mission Bay were shown to be primarily of nonhuman origin (City of San Diego and MEC/Weston, 2004). The studies caution against extrapolating the results from the Mission Bay study to other locations, since there have been extensive cleanup activities on this waterbody and subsequently bacteria source analyses have shown that human fecal sources are only a minor contributor. The link between bacteria loads from urban runoff containing mostly nonhuman sources, and risk of illness needs to be better understood.

Recent studies have also shown that bacteria regrowth is a significant phenomenon (City of San Diego and MEC/Weston, 2004; City of Laguna Niguel and Kennedy Jenks, 2003). Such regrowth can cause elevations in bacteria levels that do not correspond to an increase in human pathogens and risk of illness. For example, the Mission Bay Source

Identification Study found that bacteria multiply in the wrack line on the beach (eel grass and other debris) during low tide, causing exceedances of the water quality objectives during high tide when the wrack is inundated. This same phenomenon likely occurs inside storm drains, where tidal cycles and freshwater input can cause bacteria to multiply. In both these cases, an increase in bacteria densities does not necessarily correlate to an increase in the presence of human pathogens. The regrowth phenomenon is problematic since dischargers must expend significant resources to reduce the current bacteria loads to receiving waters to meet the required waste load reductions.

As information is gathered, initiating special studies to understand the uncertainties between bacteria levels and bacteria sources within the watersheds may be useful. Specifically, continuing research may be helpful to answer the following questions:

- What is the risk of illness from swimming in water contaminated with urban/stormwater runoff devoid of sewage?
- Do exceedances of the bacteria water quality objectives from animal sources (wildlife and domestic) increase the risk of illness?
- Are there other, more appropriate surrogates for measuring the risk of illness than the indicator bacteria WQOs currently used?

Addressing these uncertainties is needed to maximize effectiveness of strategies to reduce the risk of illness, which is currently measured by indicator bacteria densities. Dischargers may work with the San Diego Water Board to determine if such special studies are appropriate. ~~Ultimately, TMDLs will be recalculated if WQOs are modified due to results from new epidemiological studies in the future.~~

11.6.3 Identification of Method for Direct Pathogen Measurement

Ultimately, the San Diego Water Board supports the idea of measuring pathogens (the agents causing impairment of beneficial uses) rather than indicator bacteria (surrogates for pathogens). However, as stated previously, indicator bacteria have been used to measure water quality historically because measurement of pathogens is both difficult and costly. The San Diego Water Board is supportive of any efforts by the scientific community to perform epidemiological studies and/or investigate the feasibility of measuring pathogens directly. Ultimately, TMDLs will be recalculated if WQOs are modified due to results from future studies.

~~12Environmental Analysis~~

~~The San Diego Water Board must comply with the California Environmental Quality Act (CEQA) when amending the Basin Plan.~~[71] ~~The CEQA process requires the San Diego Water Board to analyze and disclose the potential adverse environmental impacts of the reasonably foreseeable methods of compliance with a Basin Plan amendment it is initiating or approving. The San Diego Water Board's Basin Plan amendment process must consider alternatives to the Basin Plan amendment to lesson or eliminate potentially significant environmental impacts, develop proposals to mitigate or avoid environmental impacts to the extent feasible, and involve the public and other public agencies in the evaluation process.~~

~~*12.1Exemption from Requirement to Prepare CEQA Documents*~~

~~The CEQA authorizes the Secretary of the Resources Agency to certify State regulatory programs, designed to meet the goals of the CEQA, as exempt from its requirements to prepare an Environmental Impact Report (EIR), Negative Declaration, or Initial Study. The San Diego Water Board's Basin Plan amendment process is certified as "functionally equivalent" to the CEQA process and is therefore exempt from the CEQA's requirements to prepare an EIR, Negative Declaration, or Initial Study.~~[72] ~~The SWRCB CEQA implementation regulations~~[73] ~~describe the environmental documents required for Basin Plan Amendment actions. These documents consist of a written report, an initial draft of the Basin Plan amendment (Appendix B) and an Environmental Checklist Form (Appendix R).~~[74] ~~This report fulfills the requirements of the CEQA for preparation of environmental documents for this Basin Plan amendment.~~

~~*12.2Scope of Environmental Analysis*~~

~~Total maximum daily load Basin Plan amendments typically include "performance standards."~~[75] ~~TMDLs normally contain a quantifiable numeric target that interprets the applicable water quality objective. TMDLs also include WLAs for point sources, LAs for nonpoint sources and natural background. The quantifiable target together with the allocations may be considered a performance standard.~~

~~The CEQA has specific provisions governing the San Diego Water Board's adoption of regulations such as the regulatory provisions of Basin Plans that establish "performance standards" or treatment requirements.~~[76] ~~These provisions require that the San Diego Water Board perform an environmental analysis of the reasonably foreseeable methods of compliance with the WLAs and LAs prior to the adoption of the TMDL Basin Plan~~

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[71] Public Resources Code section 21080.5.
[72] 14 CCR section 15251(g).
[73] 23 CCR section 3720 et seq. "Implementation of the Environmental Quality Act of 1970."
[74] 23 CCR section 3776.
[75] The term "performance standard" is defined in the rulemaking provisions of the Administrative Procedure Act [Government Code sections 11340-l 1359]. A "performance standard" is a regulation that describes an objective with the criteria stated for achieving the objective [Government Code section 11342(d)].
[76] Public Resources Code sections 21159 and 21159.4.

~~amendment. The San Diego Water Board must provide an environmental analysis including at least the following:[77]~~

1. ~~A summary of the proposed TMDL Basin Plan amendment. This should include an analysis of issues voiced by the public in the CEQA scoping meeting held during the course of the TMDL Basin Plan development. In this case, no substantive issues were raised during the CEQA scoping meeting;~~

2. ~~An analysis of the reasonably foreseeable environmental impacts of the implementation methods that may be employed to comply with the TMDL Basin Plan Amendment. The Environmental Checklist Form[78] should be used to identify any environmental impacts;~~

3. ~~An analysis of the reasonably foreseeable feasible mitigation measures relating to those environmental impacts; and~~

4. ~~An analysis of reasonably foreseeable alternatives to the proposed TMDL Basin Plan amendment.~~

~~The San Diego Water Board's method of analysis to identify environmental impacts associated with the TMDL is similar to a "tiering"[79] approach used to provide increased efficiency in the CEQA process. The San Diego Water Board limited its analysis in this document to the broad environmental issues at the Basin Plan amendment "performance standard" adoption stage that are ready for decision. The San Diego Water Board is not required, at the Basin Plan amendment adoption stage, to evaluate environmental issues associated with specific projects to be undertaken later to comply with the performance standard.[80] CEQA provisions allow for project level environmental considerations to be deferred so that more detailed examination of the effects of these projects in subsequent CEQA environmental documents can be made by the appropriate lead agency.[81]~~

~~*12.3 Project Description*~~

~~The purpose of this project is to amend the Basin Plan to incorporate TMDLs for bacteria indicators and to assign LAs and WLAs in order to attain and maintain water quality objectives in the impaired waterbodies addressed in this TMDL. A WLA is assigned to point source dischargers and an LA is assigned to nonpoint sources. The only point sources identified that significantly affect impaired waterbodies addressed in this project were municipal separate storm sewer systems (MS4) discharges. In most of the~~

[77] Public Resources Code section 21159
[78] 23 CCR section 3777
[79] Public Resources Code section 21068.5
[80] Public Resources Code sections 21159 through 21159.4, and 14 CCR section 15187. See also the legislative intent in Public Resources Code section 21156, and the statutes regarding "tiered" environmental review in Public Resources Code sections 21068.5, and 21093-21094.
[81] Public Resources Code section 21067. "Lead Agency" means the public agency, which has the principal responsibility for carrying out or approving a project. The Lead Agency will decide whether an EIR or Negative Declaration will be required for the project and will cause the document to be prepared.

~~watersheds, nonpoint sources of pollution accounted for less than 5 percent of the bacteria loads generated in the watersheds. However, in four of the watersheds, San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River, nonpoint sources of pollution from agricultural and livestock land uses were significant.~~

~~The Basin Plan amendment establishes a final numeric target for each impaired waterbody included in this project, for both wet and dry weather. The TMDLs were set equal to the numeric water quality objectives associated with the water contact (REC-1) beneficial use for fecal coliform and enterococci bacteria as defined in the San Diego Water Board's Basin Plan. For total coliform, the final numeric targets were set equal to the numeric water quality objectives associated with the shellfish harvesting (SHELL) beneficial use. In addition, during wet weather, an interim numeric target was established based on the reference watershed approach that allows a 22 percent exceedance frequency of the single sample water quality objectives during wet weather conditions to account for natural sources of bacteria in a watershed (e.g., bird or wildlife waste).~~

~~The Basin Plan amendment contains an Implementation Plan describing:~~

1. ~~Actions that are specific to the pollutant and waterbody for which the TMDLs are being established;~~
2. ~~Persons responsible for implementing specified control actions;~~
3. ~~A timeline description of when activities necessary to implement the TMDL will occur;~~
4. ~~A description of the legal authorities under which implementation will occur;~~
5. ~~A description of milestones that will be used to measure progress; and~~
6. ~~The time required for attaining water quality objectives.~~

~~The Basin Plan amendment also requires monitoring to evaluate the overall effectiveness and success of the TMDL implementation strategies to restore and attain indicator bacteria WQOs at the beaches and in creeks in the San Diego Region.~~

~~*12.4Analysis of Reasonably Foreseeable Environmental Impacts*~~

~~This section identifies a range of reasonably foreseeable method(s) of compliance with the Basin Plan amendment. Bacteria generation is linked to different types of land uses, and bacteria are transported to receiving waters via urban runoff, runoff from lands used for agriculture, livestock, and horse ranch operations, natural background, and sewage spills from wastewater treatment plants. The most significant controllable source of bacteria to receiving waters is urban runoff discharges from MS4s during wet and dry weather. In wet weather, the amount of runoff and associated bacteria densities are highly dependent on land use and associated management practices (e.g., management of livestock in agricultural areas, pet waste in residential areas). In dry weather, the amount of runoff and associated bacteria densities result from various land use practices that cause water to enter storm drains and creeks, such as lawn irrigation runoff and car washing. Bacteria loads from natural sources are uncontrollable and were added to the interim wet weather TMDLs using the reference watershed approach. In the final wet weather TMDLs, background sources were not added to the TMDLs and, thus, take up~~

~~the entire loading capacity of the creeks resulting in load and wasteload allocations of zero.~~

~~The most reasonably foreseeable methods of compliance with the wasteload and load reductions of these TMDLs are for dischargers to implement structural and non-structural best management practices (BMPs) for point source discharges, and management measures (MMs) for nonpoint sources. Typical BMPs and MMs that may be chosen by dischargers to comply with the load and wasteload reductions are divided into non-structural and structural controls, and are described below.~~

~~Non-structural Controls~~
~~Non-structural controls typically are aimed at controlling sources of a pollutant and generally do not involve new construction. No potentially significant impacts on the environment were identified for these controls.~~

~~Education and Outreach~~~~: Conduct education and outreach to residents to minimize the potential for contamination of stormwater runoff by cleaning up after their pets, minimizing runoff from agriculture, livestock, and horse ranch facilities, and controlling excessive irrigation. Bacterial source-tracking studies in a watershed in the Seattle, Washington area found that nearly 20 percent of the bacteria isolates that could be matched with host animals were matched with dogs.~~[82]

~~Road and Street Maintenance~~~~: Increase frequency of street sweeping to maintain clean sidewalks, streets, and gutters. Street sweeping can reduce non-point source pollution by 5 to 30 percent when a conventional mechanical broom and vacuum-assisted wet sweeper is used.~~[83] ~~The USEPA reports that the new vacuum assisted dry sweepers can achieve 50 to 88 percent overall reductions in the annual sediment loading for a residential street, depending on sweeping frequency. A reduction in sediment load may lead to a reduction in bacteria being carried to the MS4, and ultimately to beaches and creeks.~~

~~Storm Drain System Cleaning~~~~: Storm drain systems should be cleaned regularly since flows in the drains are rarely high enough to flush the drains. Cleaning of the storm drain systems will reduce the levels of bacteria as well as reduction of other pollutants, trash, and debris both in the storm drain system and in receiving waters.~~

~~BMP Inspection and Maintenance~~~~: Conduct regular inspections of treatment control BMPs to ensure their adequacy of design and proper function. Routine inspection and maintenance is an efficient way to prevent potential nuisance situations, such as odors, mosquitoes, weeds, etc., and can reduce the need for repair maintenance and the chance of polluting storm water runoff by finding and correcting problems before the next rain.~~[84]

[82] USEPA, 1999, National Menu of Best Management Practices for Stormwater-Phase II, *http://cfpub.epa.gov/npdes/stormwater/menuofbmps*
[83] ibid
[84] ibid

~~**Manure Fertilizer Management Plan**: Farms and livestock operations that use manure as a soil amendment, or dispose of manure on site can adopt a manure fertilizer management plan to ensure that manure fertilizers or wastes are stored, used, and disposed of in ways that minimize exposure of manure to stormwater.~~

~~**Sizing and Location of Facilities**: Manure composting and storage facilities, and livestock holding pens, paddocks, and corrals should be properly sized, and sited in areas that do not drain to surface streams.~~

~~**Structural Controls**~~

~~Structural controls divert, store, and treat stormwater, or infiltrate stormwater into the ground. Structural controls can involve construction and operation activities that create potentially significant environmental impacts.~~

~~**Buffer Strips and Vegetated Swales**: Construct and maintain vegetative buffer strips along roadsides and in medians to slow runoff velocity and increase stormwater infiltration. Replace curbs with vegetated swales to allow highway and road runoff to percolate into the ground. Buffer strips can also be used to keep stormwater out of livestock holding pens, corrals, and paddocks.~~

~~**Bioretention**: Construct and maintain bioretention BMPs to provide on-site removal of pollutants from stormwater runoff through landscaping features.~~

~~**Infiltration Trenches**: Construct and maintain infiltration trenches designed to capture and naturally filter stormwater runoff.~~

~~**Sand Filters**: Install and maintain sand filters, which are effective for pollutant removal from stormwater. Sand filters may be a good option in densely developed urban areas with little pervious surface since the filters occupy minimal space.~~

~~**Diversion Systems**: Install diversion systems to capture non-stormwater runoff. During low flow conditions, runoff may be diverted to an on-site treatment system and released back to the MS4/receiving water, or it may be diverted to wastewater collection plants for treatment. Diversion systems consist of berms, roofs, or enclosures that can be used at farms and livestock facilities to drain storm water away from holding pens, paddocks, corrals, and manure composting areas.~~

~~**Animal Exclusion**: Construct fencing, hedgerows, and livestock trails and walkways to exclude animals from streams and riparian areas to prevent direct deposition of feces into surface waters. Alternative water supplies, shade, and forage may need to be provided if animals are excluded from streams and riparian areas.~~

~~**Waste Treatment Lagoon**: Construct liquid manure storage and treatment structures to store and treat facility wastewater and the contaminated runoff from livestock facilities at all times, up to and including storms exceeding a 25-year, 24-hour frequency event.~~

~~*12.5 Environmental Impacts of Reasonably Foreseeable Compliance Methods*~~

~~Potentially significant environmental impacts associated with implementing the controls discussed above, and appropriate mitigation for those impacts are discussed in the Environmental Checklist Form, found in Appendix R. The checklist indicates that the TMDL Basin Plan amendment will not have any adverse environmental impacts that cannot be mitigated. Further, the implementation of TMDLs will lead to an overall environmental benefit through the improvement in the water quality.~~

~~The San Diego Water Board cannot dictate the means and methods of compliance with the Basin Plan amendment. Because the dischargers have discretion to choose the BMPs and MMs they will implement to meet the load and wasteload allocations, identifying the specific controls that the dischargers might implement is speculative at this time. The CEQA does not require the San Diego Water Board to consider the speculative, local impacts that the regulation might cause in a given locality. Therefore, the checklist identified the potentially significant environmental impacts and mitigation that might reasonably result from implementation of the general types of structural controls for bacteria reduction without regard to specific sites. Future CEQA documents prepared for specific control projects will identify site-specific environmental impacts and appropriate mitigation measures.~~

~~The potentially significant environmental impacts identified in the checklist are caused by construction and/or operation activities associated with implementing structural controls. Potentially significant environmental impacts were identified in the areas of aesthetics, air quality, biological resources, hydrology/water quality, and noise. Please see Appendix R for a discussion of these impacts and appropriate mitigation.~~

~~*12.6 Unavoidable Adverse Environmental Effects*~~

~~The proposed amendment could have a significant adverse effect on the environment. However, there are feasible alternatives, feasible mitigation measures, or both that would substantially lessen any significant adverse impact. The public agencies responsible for achieving the load reductions required to implement the TMDLs can and should incorporate such alternatives and mitigation into any subsequent projects or project approvals. Possible alternatives and mitigation are described in the Environmental Checklist (Appendix R). To the extent the alternatives, mitigation measures, or both are not deemed feasible by those agencies, the necessity of implementing the bacteria load reductions and TMDLs needed to attain compliance with the WQOs for the REC-1 and SHELL beneficial uses (that have been identified as impaired by bacterial pollution pursuant to section 303(d) of the Clean Water Act) outweighs the unavoidable adverse environmental effects.~~

~~The benefits of meeting water quality standards to achieve the expressed, national policy of the CWA far outweigh the mostly transient adverse environmental impacts that may be associated with the projects undertaken by persons responsible for reducing discharges of bacteria from sources of bacterial pollutants to achieve implementation of the TMDLs.~~

~~The transient air quality and noise impacts will occur only during the short time period that is required for construction of structural BMPs.~~

~~Meeting water quality standards and the national policy of the CWA is a benefit to the people of the State because of their paramount interest in the conservation, control, and utilization of the water resources of the State for beneficial use and enjoyment (Water Code section 13000). Furthermore, the health, safety and welfare of the people of the State requires that the State be prepared to exercise its full power and jurisdiction to protect the quality of waters in the State from degradation, particularly including degradation that unreasonably impairs the water quality necessary for beneficial uses.~~

~~Water quality that supports the beneficial uses of water are necessary for the survival and well being of people, plants, and animals. Water-contact recreation (REC-1) and shellfish harvesting (SHELL) are beneficial uses of water that serve to promote the economic and social goals of the people of the San Diego Region. Coastal waters are used extensively in the San Diego Region for recreation, commercial, and sport fishing and are therefore key to the economic vitality and social well being of the region.~~

~~*12.7Reasonable Alternatives to the TMDL Basin Plan Amendment*~~

~~This section describes the San Diego Water Board's analysis of reasonable alternatives to the proposed project. The purpose of this analysis is to determine if the alternatives would feasibly attain the basic objective of the TMDL Basin Plan amendment but would avoid or substantially lessen any potential significant effects of the proposed amendment. The alternatives include taking "no action," using a regulatory approach to TMDL implementation, and deferring adoption of the TMDLs until the San Diego Water Board investigates and adopts a Basin Plan amendment authorizing the implementation of indicator bacteria WQOs using a reference system/antidegradation approach.~~

~~*12.7.1No Action Alternative*~~

~~Under the "no action" alternative, the San Diego Water Board would not adopt the proposed TMDL Basin Plan amendment, and bacteria loading would likely continue at current levels. The "no action" alternative 1) does not comply with the CWA; 2) is inconsistent with the mission of the San Diego Water Board; and 3) does not meet the purpose of the proposed TMDL Basin Plan Amendment. Under CWA section 303(d), the San Diego Water Board is obligated to adopt a TMDL project for waters that do not meet water quality standards.~~[85] ~~The mission of the San Diego Water Board is to ensure the protection of receiving water beneficial uses through attainment of applicable WQOs. Consistent with the San Diego Water Board's mission, the purpose of the proposed TMDL Basin Plan Amendment is to attain WQOs for bacteria indicators to restore and protect the beneficial uses of the beaches and creeks in the San Diego region.~~

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[85] Water quality standards are comprised of designated beneficial uses, the applicable numeric and/or narrative WQOs to protect those uses, and the SWRCB's anti-degradation policy provisions (Resolution No. 68-16, *Statement of Policy with Respect to Maintaining High Quality of Waters in California*).

~~*12.7.2Reference System Approach Basin Plan Amendment*~~

~~Issue No. 7 from the San Diego Water Board's 2004 Triennial Review of the Basin Plan includes investigating and considering adoption of a Basin Plan amendment authorizing the implementation of single sample bacteria WQOs in fresh and marine waters using a 'reference system/antidegradation approach.' A reference system is defined as an area and associated monitoring point that is not impacted by human activities that potentially affect the bacteria densities of the receiving water. If this Basin Plan amendment is adopted, the final wet weather bacteria TMDLs would be replaced with TMDLs that incorporate the reference system approach. The San Diego Water Board could delay adoption of the TMDLs until after it adopts a Reference System Basin Plan amendment and replaces the final TMDLs of this project with new ones calculated with a wet weather exceedance frequency as authorized in by the new amendment. The new final wet weather TMDLs will be similar to the interim wet weather TMDLs of this project and will not require the large load and wasteload reductions of the final TMDLs of this project. This alternative is not recommended because the San Diego Water Board has ample time (10 years) to investigate and adopt a reference system Basin Plan amendment before the final TMDL reductions are required. Further, because the interim TMDLs were calculated using a reference system exceedance frequency and are likely to be similar to new final TMDLs calculated in accordance with a Reference System Basin Plan amendment, the interim TMDLs should be implemented immediately.~~

~~13Economic Analysis~~

~~This section presents the San Diego Water Board's economic analysis of the most reasonably foreseeable methods of compliance with the Basin Plan amendment to incorporate TMDLs for bacteria indicators at beaches and creeks in the San Diego region.~~

~~*13.1Legal Requirement for Economic Analysis*~~

~~The San Diego Water Board must comply with CEQA when amending the Basin Plan~~[86]~~. The CEQA process requires the San Diego Water Board to analyze and disclose the potential adverse environmental impacts of a Basin Plan amendment that is being considered for approval. TMDL Basin Plan amendments typically include "performance standards."~~[87] ~~TMDLs normally contain a quantifiable numeric target that interprets the applicable WQO. TMDLs also include WLAs for point sources and LAs for both nonpoint sources and natural background. The quantifiable target together with the allocations may be considered a performance standard.~~

~~CEQA has specific provisions governing the San Diego Water Board's adoption of regulations such as the regulatory provisions of Basin Plans that establish "performance standards" or treatment requirements.~~[88] ~~These provisions require that the San Diego Water Board perform an environmental analysis of the reasonably foreseeable methods of compliance with the WLAs and LAs prior to the adoption of the TMDL Basin Plan amendment. The San Diego Water Board must consider the economic costs of the methods of compliance in this analysis.~~[89] ~~The proposed Basin Plan amendment does not include new WQOs but implements existing objectives to protect beneficial uses. The San Diego Water Board is therefore not required to do a formal cost-benefit analysis.~~

~~The most reasonably foreseeable methods of compliance with this Basin Plan amendment is for dischargers to implement structural and non-structural controls to reduce bacteria loads in their discharges to surface waters. Additionally, dischargers will need to conduct surface water monitoring to evaluate the effectiveness of the controls they implement.~~

~~Porter Cologne Water Quality Control Act , Article 3, section 13141, California Water Plan, states that "prior to implementation of any agricultural water quality control program, an estimate of the total cost of such a program, together with an identification of potential sources of financing, shall be indicated in any regional water quality control plan." Sections 13.2.3 in this document addresses this requirement.~~

[86] Public Resources Code section 21080

[87] The term "performance standard" is defined in the rulemaking provisions of the Administrative Procedure Act (Government Code sections 11340-l 1359). A "performance standard" is a regulation that describes an objective with the criteria stated for achieving the objective. [Government Code section11342(d)].

[88] Public Resources Code sections 21159 and 21159.4

[89] See Public Resources Code section 21159(c)

~~*13.2TMDL Project Implementation Costs*~~

~~The specific controls to be implemented for bacteria reduction will be chosen by the dischargers after adoption of this TMDL Basin Plan amendment. All costs are preliminary estimates only since particular elements of a control, such as type, size, and location, would need to be developed to provide a basis for more accurate cost estimations. Identifying the specific controls that dischargers will choose to implement is speculative at this time and the controls presented in this section serve only to demonstrate potential costs. Therefore, this section discloses typical costs of conventional controls for urban runoff, as well as monitoring program costs. The Implementation Plan for these TMDLs does not require additional controls for stormwater runoff from agriculture, livestock, and horse ranch facilities other than what is already required in existing WDRs for these facilities, and in the Basin Plan WDR Waiver Policy. Therefore, there will be no additional costs to agricultural and livestock facility owners and operators to comply with these TMDLs.~~

~~*13.2.1Cost Estimates of Typical Controls for Urban Run-Off Discharges*~~

~~Approximate costs associated with typical non-structural and structural BMPs that might be implemented in order to comply with the requirements of this TMDL project are provided below. The BMPs are divided into non-structural and structural classes. Cost estimates for structural BMPs cited from "*Stormwater Best Management Practice Handbook – New Development and Redevelopment. January 2003*" are for new construction costs only (CASQA, 2003). These estimates generally do not take into account retrofit of existing structures or the potential purchase on land needed for the BMP. Cost estimates provided by Caltran's *BMP Pilot Retrofit Pilot Program* were from BMPs retrofitted on existing State owned land (Caltrans, 2004). Annual maintenance costs estimates are based on a percentage of the construction cost estimate (USEPA, 1999).~~

~~**Non-Structural Controls**~~
~~**Education and Outreach:** Education and outreach to residents, businesses and industries can be a very effective tool. These efforts can include methods to reduce sources of pathogens like pet waste in residential areas and livestock in agricultural areas and methods aimed at reducing excessive irrigation that will flow into the storm drain system. The cost of educational programs will vary with the scope of efforts and are estimated range up to $210,900. Educations materials can cost from 10¢ per flyer to $1,750 for household surveys (USEPA, 1999). Because education and outreach efforts are typically a component of water quality programs, the cost to develop educational programs and materials to comply with the TMDL project requirements are expected to be less than estimated because the programs and materials addressing storm water and urban run-off related issues may already exist.~~

~~**Road and Street Maintenance:** Another effective BMP to prevent pollutants, trash, and organic material from entering the storm drain is proper maintenance and cleaning of the sidewalks, streets, and gutters. The largest expenditures for street sweeping programs are in staffing and equipment. The capital cost for a street sweeper is between $60,000 and $180,000 and the average useful life of a sweeper is about four to eight years (USEPA,~~

~~1999). Operation and maintenance costs are estimated to range from $15 to $30 per curb mile. This particular BMP may prove to be more cost-effective than certain structural controls, especially in more urbanized areas with greater areas of pavement.~~

~~**Illicit Connection Identification:** Illicit connections of sanitary sewer line and infiltration from leaking sewer lines to the storm water drain system can be a source of pathogens in urban run-off. Identification of illegal connections can be done through visual inspection or through the use of dye and smoke tests. Visual inspection of the storm drain system can cost from $1,250 to $1,750 per square mile (USEPA, 1999).~~

~~**Land Use Modifications:** Land Use Modifications can be used to minimize the degradation of water resources caused by storm water run-off by directing urban growth and development away from environmentally sensitive areas and waterways. Sensitive areas can be protected through open space preservation and rezoning of development rights. Costs for new development will be lower if the site is adjacent to existing urban areas because the infrastructure and public services should already exist. Savings can also be realized if the development site is modified to reduce the impacts from urban run-off caused by impervious surfaces by reducing street widths, clustering housing developments, smaller parking lots, and incorporating vegetative BMPs into the site design. Savings come through the reduction of costs associated with clearing and grading, road paving, and storm water drainage systems. See Table 13-1 for an example of capital cost savings (CASQA, 2003).~~

~~*Table 13-1. Summary of Potential Savings by Land Use Modifications*~~

~~**Development Pattern**~~	~~**Capital Costs (2005 Dollars)**~~[4]
~~Compact Growth~~[1]	~~$31,000~~
~~Low-Density Growth (3 units/acre)~~[2]	~~$60,100~~
~~Low-Density Growth, 10 miles from Existing Development~~[3]	~~$82,500~~

[1]~~Costs include streets (full curb and gutter), central sewage and water supply, storm drainage and school construction.~~

[2]~~Assumes housing mix of 30 percent single-family units and townhouses; 70 percent apartments.~~

[3]~~Assumes housing is located 10 miles from major concentration of employment, drinking water plant and sewage treatment plant.~~

[4] ~~Adjusted for inflation from 1987 dollars (Sahr, 2006).~~

~~**Structural Controls**~~

~~**Vegetated Buffer or Filter Strips**: Vegetated buffer strips are vegetated surfaces that are designed to treat sheet flow from adjacent surfaces, such as parking lots, highways, and rooftops (CASQA, 2003). The costs associated with vegetated buffer strips vary and are dependent of the costs associated with establishing the vegetation. Cost estimates range from $13,000 to 30,000 per acre. Additional costs could include the purchase of land for the buffer strip (CASQA, 2003). Maintenance of the buffer strip consists mainly of irrigation, mowing, weeding, and litter removal. Costs are estimated to be $350/acre/year (CASQA, 2003). Caltrans reported actual construction costs of a buffer strip for Carlsbad Maintenance Station to be $81,000 with average annual maintenance cost of $1,900 (Caltrans, 2004).~~

~~**Bioretention**: Bioretention systems are designed to mimic the functions of a natural forest ecosystem for treating storm water runoff (USEPA, 1999). Pollutants are removed by a number of processes including adsorption, filtration, volatilization, ion exchange, and decomposition (USEPA, 1999). Bioretention construction costs in residential areas are estimated to be $3 to $4 per square foot depending on the soil conditions and plant selection. Commercial and industrial costs range from $10 to $40 per square foot depending on the design and need for storm drains (CASQA, 2003). Maintenance activities conducted on bioretention facilities were not found to be very different from maintenance of a landscaped area (CASQA, 2003).~~

~~**Sand Filters**: Media filters are commonly used to treat runoff from small sites such as parking lots and small developments, in areas with high pollution potential such as industrial areas, or in highly urbanized areas where land availability or costs preclude the use of other BMP types (USEPA, 1999). An Austin Sedimentation-Filtration System (a type of surface sand filter) is estimated to cost $18,500 (CASQA, 2003). A sand filter constructed at the La Costa Park and Ride for a 2.7-acre watershed area cost $226,000 with an average annual maintenance cost of $870 (Caltrans, 2004).~~

~~**Infiltration Trench**: Infiltration systems are designed to capture a volume of storm water runoff, retain it, and infiltrate that volume into the ground (USEPA, 1999). Infiltration trench is estimated to cost $45,000 for a 5-acre commercial site (USEPA. 1999). An infiltration trench constructed at the Carlsbad Maintenance Station for a 0.7-hectare watershed area cost $180,000 with an average annual maintenance cost of $723 (Caltrans, 2004).~~

~~**Diversion Systems**: If no other on-site treatment options are available, diverting the polluted runoff to the sanitary sewer system or other treatment plant may be considered. An individual diversion structure is likely to cost over one million dollars, which does not include maintenance costs.~~

~~For example, the City of Dana Point recently put into operation a diversion and ozone treatment system targeting Salt Creek and Monarch Beach. The system has a capacity of 1,000 gallons per minute. According to the Orange County Register (October 18, 2005), the system cost $6.7 million. These costs include $1 million in architectural features, and $1 million for design and administration of the project. Operation and maintenance is contracted out at a cost of $90,000 per year. In another example, the City of Encinitas has constructed a diversion and ultraviolet radiation treatment system to kill bacteria in runoff to Moonlight Beach. The system has a capacity of 150 gallons per minute, and cost $1 million for testing, design and construction. Operation and maintenance costs are $10,000 per year (Jeremy J. Clemmons, PBS&J, personal communication, October 26, 2005).~~

~~*13.2.2Cost Estimate Summary for Urban Runoff Controls*~~

~~Table 13-2 summarizes the estimated costs of non-structural urban runoff controls. Tables 13-3 summarizes for each watershed the estimated costs of the specific structural~~

~~urban runoff BMPs that were evaluated for each watershed. The cost estimates for the structural controls are based on sizing the control to treat 10 percent of the urbanized area of each watershed. For example, using the 10 percent cost estimates provided in Table 13-3, a cost estimate for 100 percent land treatment could easily be calculated by multiplying the 10 percent cost estimate by 10, or by 5 for 50 percent, or 8 for 80 percent, etc. Additionally, the estimated cost of one diversion structure is provided and can be scaled upward depending on the individual needs in any given watershed.~~

~~Table 13-2. Summary of Cost Estimates for Non-Structural Controls~~

~~BMP~~	~~Estimated Cost[1]~~
~~Education and Outreach~~	~~$0 to $210,900 per program~~
~~Road and Street Maintenance~~	~~$60,000 to $180,000~~
~~Illicit Connection Identification~~	~~$1,250 to $1,750 per square mile~~
~~Land Use Modifications~~	~~Potential cost reduction to developers and local government~~

~~[1] USEPA, 1999.~~

~~Table 13-3. Cost Estimates for Structural Controls for 10 Percent of Urbanized Areas~~

~~Laguna/San Joaquin Watershed~~

~~BMP~~	~~Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres)[1, 2, 3]~~	~~Estimated Yearly Maintenance Cost[2]~~
~~Vegetated Buffer Strip~~	~~$1,605,752 - $3,705,583~~	~~$39,526~~
~~Bioretention~~	~~$3,866,672 - $51,555,919~~	~~$270,667 - $3,608,914~~
~~Sand Filters~~	~~$5,434,855 - $21,492,379~~	~~$706,531 - $2,794,009~~
~~Infiltration Trench~~	~~$217,394 - $513,841~~	~~$43,479 - $102,768~~
~~Diversion~~	~~> $1 million per diversion structure~~	~~> $10,000 per structure~~

~~Aliso Creek Watershed~~

~~BMP~~	~~Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres)[1, 2, 3]~~	~~Estimated Yearly Maintenance Cost[2]~~
~~Vegetated Buffer Strip~~	~~$7,941,403 - $18,326,314~~	~~$195,481~~
~~Bioretention~~	~~$19,122,996 - $254,974,741~~	~~$1,338,610 - $17,848,232~~
~~Sand Filters~~	~~$26,878,594 - $106,292,622~~	~~$3,494,217 - $13,818,041~~
~~Infiltration Trench~~	~~$1,075,144 - $2,541,249~~	~~$215,029 - $508,250~~
~~Diversion~~	~~> $1 million per diversion structure~~	~~> $10,000 per structure~~

~~[1] CASQA, 2003.~~
~~[2] USEPA, 1999.~~
~~[3] Urbanized Area includes the following Land Uses: Residential (low and high), Commercial, Industrial, Military, Parks/Recreation, and Transitional.~~

~~Table 13-3. Cost Estimates for Structural Controls for 10 Percent of Urbanized Areas, Continued~~

~~Dana Point (Salt Creek Watershed)~~

~~**BMP**~~	~~**Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres)**~~ [1, 2, 3]	~~**Estimated Yearly Maintenance Cost**~~[2]
~~Vegetated Buffer Strip~~	~~$2,446,069 - $5,644,774~~	~~$60,211~~
~~Bioretention~~	~~$5,890,163 - $78,535,960~~	~~$412,311 - $5,497,517~~
~~Sand Filters~~	~~$8,279,001 - $32,739,687~~	~~$1,076,270 - $4,256,159~~
~~Infiltration Trench~~	~~$331,160 - $782,742~~	~~$66,232 - $156,548~~
~~Diversion~~	~~> $1 million per diversion structure~~	~~> $10,000 per structure~~

~~San Juan Creek Watershed~~

~~**BMP**~~	~~**Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres)**~~ [1, 2, 3]	~~**Estimated Yearly Maintenance Cost**~~[2]
~~Vegetated Buffer Strip~~	~~$12,326,022 - $28,444,667~~	~~$303,410~~
~~Bioretention~~	~~$29,681,213 - $395,751,785~~	~~$2,077,685 - $27,702,625~~
~~Sand Filters~~	~~$41,718,844 - $164,979,067~~	~~$5,423,450 - $21,447,279~~
~~Infiltration Trench~~	~~$1,668,754 - $3,944,327~~	~~$333,751 - $788,865~~
~~Diversion~~	~~> $1 million per diversion structure~~	~~> $10,000 per structure~~

~~San Clemente Hydrologic Area~~

~~**BMP**~~	~~**Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres)**~~ [1, 2, 3]	~~**Estimated Yearly Maintenance Cost**~~[2]
~~Vegetated Buffer Strip~~	~~$3,407,024 - $7,862,363~~	~~$83,865~~
~~Bioretention~~	~~$8,204,156 - $109,389,373~~	~~$574,291 - $7,657,256~~
~~Sand Filters~~	~~$11,531,466 - $45,601,091~~	~~$1,499,091 - $5,928,222~~
~~Infiltration Trench~~	~~$461,259 - $1,090,248~~	~~$92,252 - $218,050~~
~~Diversion~~	~~> $1 million per diversion structure~~	~~> $10,000 per structure~~

[1] ~~CASQA, 2003.~~
[2] ~~USEPA, 1999.~~
[3] ~~Urbanized Area includes the following Land Uses: Residential (low and high), Commercial, Industrial, Military, Parks/Recreation, and Transitional.~~

~~*Table 13-3. Cost Estimates for Structural Controls for 10 Percent of Urbanized Areas, Continued*~~

~~***San Luis Rey River Watershed***~~

~~BMP~~	~~Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres)~~ ~~[1, 2, 3]~~	~~Estimated Yearly Maintenance Cost~~[2]
~~Vegetated Buffer Strip~~	~~$30,297,138 - $69,916,472~~	~~$745,776~~
~~Bioretention~~	~~$72,955,881 - $972,750,675~~	~~$5,106,912 - $68,092,547~~
~~Sand Filters~~	~~$102,544,159 - $405,515,539~~	~~$13,330,741 - $52,717,020~~
~~Infiltration Trench~~	~~$4,101,766 - $9,695,084~~	~~$820,353 - $1,939,017~~
~~Diversion~~	~~> $1 million per diversion structure~~	~~> $10,000 per structure~~

~~***San Marcos Hydrologic Area***~~

~~BMP~~	~~Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres)~~ ~~[1, 2, 3]~~	~~Estimated Yearly Maintenance Cost~~[2]
~~Vegetated Buffer Strip~~	~~$370,238 - $854,396~~	~~$9,114~~
~~Bioretention~~	~~$891,538 - $11,887,246~~	~~$62,408 - $832,107~~
~~Sand Filters~~	~~$1,253,114 - $4,955,497~~	~~$162,905 - $644,215~~
~~Infiltration Trench~~	~~$50,125 - $118,476~~	~~$10,025 - $23,695~~
~~Diversion~~	~~> $1 million per diversion structure~~	~~> $10,000 per structure~~

~~***San Dieguito River Watershed***~~

~~BMP~~	~~Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres)~~ ~~[1, 2, 3]~~	~~Estimated Yearly Maintenance Cost~~[2]
~~Vegetated Buffer Strip~~	~~$23,678,609 - $54,642,944~~	~~$582,858~~
~~Bioretention~~	~~$57,018,382 - $760,249,464~~	~~$3,991,287 - $53,217,462~~
~~Sand Filters~~	~~$80,142,984 - $316,929,074~~	~~$10,418,588 - $41,200,780~~
~~Infiltration Trench~~	~~$3,205,719 - $7,577,155~~	~~$641,144 - $1,515,431~~
~~Diversion~~	~~> $1 million per diversion structure~~	~~> $10,000 per structure~~

~~***Miramar (Miramar Reservoir Hydrologic Area)***~~

~~BMP~~	~~Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres)~~ ~~[1, 2, 3]~~	~~Estimated Yearly Maintenance Cost~~[2]
~~Vegetated Buffer Strip~~	~~$18,565,993 - $42,844,599~~	~~$457,009~~
~~Bioretention~~	~~$44,707,140 - $596,098,622~~	~~$3,129,500 - $41,726,904~~
~~Sand Filters~~	~~$62,838,745 - $248,498,675~~	~~$8,169,037 - $32,304,828~~
~~Infiltration Trench~~	~~$2,513,550 - $5,941,118~~	~~$502,710 - $1,188,224~~
~~Diversion~~	~~> $1 million per diversion structure~~	~~> $10,000 per structure~~

[1] ~~CASQA, 2003.~~
[2] ~~USEPA, 1999.~~
[3] ~~Urbanized Area includes the following Land Uses: Residential (low and high), Commercial, Industrial, Military, Parks/Recreation, and Transitional.~~

~~Table 13-3. Cost Estimates for Structural Controls for 10 Percent of Urbanized Areas, Continued~~

~~Scripps Hydrologic Area~~

~~BMP~~	~~Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres)~~ [1, 2, 3]	~~Estimated Yearly Maintenance Cost~~[2]
~~Vegetated Buffer Strip~~	~~$3,161,585 - $7,295,966~~	~~$77,824~~
~~Bioretention~~	~~$7,613,136 - $101,509,064~~	~~$532,920 - $7,105,634~~
~~Sand Filters~~	~~$10,700,750 - $42,316,602~~	~~$1,391,097 - $5,501,158~~
~~Infiltration Trench~~	~~$428,030 - $1,011,707~~	~~$85,606 - $202,341~~
~~Diversion~~	~~> $1 million per diversion structure~~	~~> $10,000 per structure~~

~~San Diego River Watershed~~

~~BMP~~	~~Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres)~~ [1, 2, 3]	~~Estimated Yearly Maintenance Cost~~[2]
~~Vegetated Buffer Strip~~	~~$45,339,627 - $104,629,910~~	~~$1,116,052~~
~~Bioretention~~	~~$109,178,381 - $1,455,720,117~~	~~$7,642,487 - $101,900,408~~
~~Sand Filters~~	~~$153,457,201 - $606,853,475~~	~~$19,949,436 - $78,890,952~~
~~Infiltration Trench~~	~~$6,138,288 - $14,508,681~~	~~$1,227,658 - $2,901,736~~
~~Diversion~~	~~> $1 million per diversion structure~~	~~> $10,000 per structure~~

~~Chollas Creek Watershed~~

~~BMP~~	~~Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres)~~ [1, 2, 3]	~~Estimated Yearly Maintenance Cost~~[2]
~~Vegetated Buffer Strip~~	~~$9,780,114 - $22,569,494~~	~~$240,741~~
~~Bioretention~~	~~$23,550,635 - $314,010,276~~	~~$1,648,544 - $21,980,719~~
~~Sand Filters~~	~~$33,101,925 - $130,903,066~~	~~$4,303,250 - $17,017,399~~
~~Infiltration Trench~~	~~$1,324,077 - $3,129,637~~	~~$264,815 - $625,927~~
~~Diversion~~	~~> $1 million per diversion structure~~	~~> $10,000 per structure~~

[1] ~~CASQA, 2003.~~
[2] ~~USEPA, 1999.~~
[3] ~~Urbanized Area includes the following Land Uses: Residential (low and high), Commercial, Industrial, Military, Parks/Recreation, and Transitional.~~

~~13.2.3Costs for Agricultural Sources of Nonpoint Pollution~~

~~The most reasonably foreseeable method of compliance with this Basin Plan amendment establishing TMDL projects for agricultural areas and livestock facilities involves reducing bacteria loading to surface waters by implementing MMs (management measures) and MPs (management practices). Current WDRs for agricultural facilities already require the design and implementation of systems that collect solids, reduce contaminant concentrations, and reduce runoff to minimize the discharge of contaminants in both facility wastewater and in runoff that is caused by storms up to and including a~~

~~25-year, 24-hour frequency storm. Additionally, the Waiver Policy[90] may conditionally waive the issuance of WDRs for specific types of discharges if the terms of the waiver conditions are met. Conditional waivers may apply to animal feeding operations, plant crop residues, agricultural and nursery irrigation return water, manure composting and soil amendment operations, and storm water runoff where not regulated by NPDES requirements. Therefore, compliance with this TMDL project will not result in additional costs beyond what is already required by enforcement of WDRs and waivers.~~

~~Animal waste can be managed in several different ways including: prevention of livestock entering a waterway (fencing and water troughs), re-routing runoff water away from areas with animal waste (dike, diversion, roof runoff structure), removing waste (waste storage facility, manure transfer), or treating waste (waste treatment pond, composting facility, anaerobic digester).~~

~~Costs for purchase and maintenance of MPs varies not only by the type of MP needed, but also for the cost of a specific MP depending upon the type and number of livestock, the number of acres for runoff to filter, and the physiography of the acreage. The costs reported in Table 13-4 are based on actual MPs that have been funded through the Farm Bill Environmental Quality Incentives Program (EQIP) in San Diego County from 2004 to 2006.~~

~~Considering that WDRs and the Waiver Policy already require animal feeding operations to conform with regulations that prevent pollutants from being discharged to waters of the U.S., additional costs to install MPs should not be needed for existing facilities, and therefore are estimated to be $0. However, new facilities, or facilities out of compliance, will be required to install the appropriate MPs to meet the conditions in the WDRs and Waiver Policy, and will have a start up cost ranging from $40,000 to $100,000 for poultry, and $3,000 to $50,000 for equestrian facilities (which generally have many fewer animals than poultry farms and dairies in the San Diego Region). Average start up costs for dairy MPs can range from $50,000 to $200,000, depending upon the number of cows. The sheer volume of manure generated at the larger dairy operations requires more ambitious and effective MPs ranging in cost from $100,000 to $500,000. These MPs include composting, solid/liquid waste separation facilities, or anaerobic digestion. To reduce individual operator expenses, these more expensive MP facilities can be shared among dairy operators.~~

[90] California Regional Water Quality Control Board, San Diego Region, Waiver of Waste Discharge Requirements (Waiver Policy), November 1, 2002. Resolution No. R09-2002-0186.

~~*Table 13-4. Environmental Quality Incentives Program - San Diego MP Cost List with Designation of Appropriate Use for Poultry, Dairy, and Horses*~~

~~**Management Practice**~~	~~**Unit**~~	~~**Avg. Cost**~~	~~**Poultry**~~	~~**Dairy**~~	~~**Horse**~~
~~Anaerobic Digester~~	~~EA~~	~~$500,000~~	-	~~X~~	-
~~Animal Mortality Facility~~	-	~~NA~~	~~X~~	-	-
~~Composting Facility~~	~~EA~~	~~$100,000~~	~~X~~	~~X~~	~~X~~
~~Dike~~	~~FT~~	~~$10~~	~~X~~	-	~~X~~
~~Diversion~~	~~FT~~	~~$20~~	~~X~~	~~X~~	~~X~~
~~Fence~~	~~FT~~	~~$4~~	-	~~X~~	~~X~~
~~Grassed Waterway~~	~~AC~~	~~$500~~	~~X~~	~~X~~	~~X~~
~~Lined Waterway or Outlet~~	~~FT~~	~~$100~~	~~X~~	~~X~~	~~X~~
~~Manure Transfer*~~	~~EA~~	~~$30,000~~	-	~~X~~	-
~~Nutrient Management~~	~~AC~~	~~$32~~	~~X~~	~~X~~	~~X~~
~~Open Channel*~~	~~FT~~	~~$10~~	~~X~~	~~X~~	~~X~~
~~Pipeline~~	~~FT~~	~~$10~~	~~X~~	~~X~~	-
~~Pond Sealing or Lining~~	~~EA~~	~~$10,000~~	~~X~~	~~X~~	-
~~Roof Runoff Structure~~	~~EA~~	~~$10,000~~	~~X~~	~~X~~	~~X~~
~~Solid / Liquid Waste Separation Facility~~	-	~~NA~~	-	~~X~~	-
~~Underground Outlet~~	~~FT~~	~~$20~~	~~X~~	~~X~~	~~X~~
~~Waste Facility Cover~~	-	~~NA~~	~~X~~	~~X~~	-
~~Waste Storage Facility~~	~~EA~~	~~$100,000~~	~~X~~	~~X~~	~~X~~
~~Waste Treatment Strip*~~	~~AC~~	~~$400~~	~~X~~	~~X~~	~~X~~
~~Waste Treatment Pond*~~	~~EA~~	~~$50,000~~	~~X~~	~~X~~	~~X~~
~~Waste Utilization*~~	~~AC~~	~~$100~~	~~X~~	~~X~~	~~X~~
~~Watering Facility~~	~~EA~~	~~$10,000~~	-	~~X~~	~~X~~

~~EA = Each; FT = Lineal Feet; AC = Acre, NA = Costs Not Available, X = Appropriate Use~~
~~Values are taken from the NRCS EQIP San Diego Cost Share List for 2006, unless the BMP name has an * after it, then values are taken from the 2004-2005 State Approved Cost Share List or the 2004-2005 San Diego Cost Share List.~~

~~When manure is transferred from an animal feeding operation to be used as fertilizer for crops, then runoff from these fields that contribute to bacterial loading must be considered for MPs. MPs for fields with manure application may include upgrades or installation of new irrigation equipment, and filter or buffer strips. Prices listed in Table 13-5 for irrigation systems are for a complete system, and will be less for upgrading a system already in place. Costs for MPs per site range from $5,000 to $50,000, assuming an irrigation system will not need to be completely replaced.~~

~~*Table 13-5. Environmental Quality Incentives Program, San Diego MP Cost List for Addressing Runoff from Fields with Manure Application.*~~

~~13.2.3.1Management Practice~~	~~Unit~~	~~Avg. Cost~~
~~Irrigation System, Micro-irrigation~~	~~AC~~	~~$6,000~~
~~Irrigation Sprinkler System~~	~~AC~~	~~$4,500~~
~~Irrigation Water Management~~	~~AC~~	~~$50~~
~~Irrigation Tailwater Management~~	~~EA~~	~~$25,000~~
~~Filter Strip~~	~~AC~~	~~$400~~
~~Buffer Strip~~	~~AC~~	~~$800~~

~~*13.2.4Potential Sources of Funding*~~

~~The most prevalent source of funding for agricultural MPs is the funding associated with the Farm Bill EQIP. These funds can be obtained through the USDA Natural Resources Conservation Service (NRCS) Office. For the San Diego Region, the local NRCS Field Office is located at 332 S. Juniper St., Suite 110, Escondido, CA 92025. Upon review and approval of a project, the NRCS will authorize payment for up to 50 percent of the estimated costs for purchasing and installing agricultural MPs.~~

~~Other sources of funding are administered by the SWRCB, which receives funding, through the USEPA, for Federal CWA section 319(h) and section 205(j) programs, and from the State of California Proposition 13 program.~~

~~*13.2.5Cost Estimates for Surface Water Monitoring*~~

~~The Health and Safety Code already requires a monitoring and reporting program for indicator bacteria at ocean beaches throughout California during dry weather.[91] Thus, the dischargers will incur no additional costs for monitoring water quality at beaches from April 1 through October 31 (the required monitoring period). Water quality and flow monitoring for inland surface water, and storm drains will be required to measure the effectiveness of controls implemented by the dischargers to reduce bacteria loads. This additional monitoring will add to the costs of implementing these TMDLs.~~

~~The TMDLs do not specify the locations and frequencies of sampling of inland surface waters, storm drains, and beaches outside the Health and Safety Code requirements, to measure the effectiveness of bacteria load reduction controls. Each watershed is different in terms of size, flow, land uses, existing bacteria load, and reductions needed. Thus, a different monitoring plan individually tailored for each watershed must be formulated and implemented by the dischargers.~~

[91] Health and Safety Code section 15880 (Assembly Bill 411, Statutes of 1997, Chapter 765).

~~This analysis discloses the costs of collecting, transporting, and analyzing a water sample for the four indicator bacteria for which there are inland surface water WQOs. The costs disclosed are that of a two-person team, day-long sampling effort. The laboratory analytical costs were taken from the San Diego Water Board's Laboratory Services Contract cost tables. Where different analytical methods were available, the more expensive method was used in the estimate. Staff costs were estimated based on a two person sampling team in the field for an 8-hour day. The staff costs were estimated based on a billing rate of $90 per hour, the rate used for billing San Diego Water Board staff costs in the Cost Recovery Programs. This rate includes overhead costs. The vehicle costs were estimated assuming a distance traveled of 100 miles per day, and a vehicle cost of $0.34 per mile, the per diem reimbursement rate for San Diego Water Board staff when they use their own cars for State business. This analysis assumes that the dischargers possess basic field monitoring equipment, including meters to measure temperature, conductivity, and pH, and equipment to measure flow in the field. No additional costs were computed for these items. Surface water monitoring costs are summarized in the table below. Assuming that a two-person sampling team can collect samples at 5 sites per day, the total cost for one day of sampling would be $2274.~~

~~Table 13-4. Cost Estimates for Surface Water Monitoring~~

~~**Expenditure**~~	~~**Cost per Unit**~~
~~Laboratory Analyses~~	
~~Total Coliform~~	~~$40 per sample~~
~~Fecal Coliform~~	~~$40 per sample~~
~~Enterococci~~	~~$40 per sample~~
~~*E. Coli*~~	~~$40 per sample~~
~~Staff Costs~~	~~$180 per hr~~
~~Vehicle Costs~~	~~$34 per 100 mi~~

12 Environmental Analysis, Environmental Checklist, and Economic Factors

The San Diego Water Board must comply with the California Environmental Quality Act (CEQA) when amending the Basin Plan as proposed in this project to adopt these TMDLs for bacteria in the San Diego Region. Under the CEQA, the San Diego Water Board is the Lead Agency for evaluating the environmental impacts of the reasonably foreseeable methods of compliance with the proposed TMDLs. The following section summarizes the environmental analysis conducted to fulfill the CEQA requirements. The complete environmental analysis, including the environmental checklist and discussion of economic factors, are discussed in detail in Appendix R.

12.1 California Environmental Quality Act Requirements

The CEQA authorizes the Secretary of the Resources Agency to certify state regulatory programs, designed to meet the goals of the CEQA, as exempt from its requirements to prepare an Environmental Impact Report (EIR), Negative Declaration, or Initial Study. The State Water Resources Control Board's (SWRCB) and San Diego Water Board's Basin Plan amendment process is a certified regulatory program and is therefore exempt from the CEQA's requirements to prepare such documents.

The SWRCB's CEQA implementation regulations describe the environmental documents required for Basin Plan amendment actions. These documents consist of a written report that includes a description of the proposed activity, alternatives to the proposed activity to lesson or eliminate potentially significant environmental impacts, and identification of mitigation measures to minimize any significant adverse impacts.

The CEQA and CEQA Guidelines limit the scope to an environmental analysis of the reasonably foreseeable methods of compliance with the WLAs and LAs. The SWRCB CEQA Implementation Regulations for Certified Regulatory Programs require the environmental analysis to include at least the following:

1. A brief description of the proposed activity. In this case, the proposed activity is the TMDL Basin Plan amendment.
2. Reasonable alternatives to the proposed activity.
3. Mitigation measures to minimize any significant adverse environmental impacts of the proposed activity.

Additionally, the CEQA and CEQA Guidelines require the following components, some of which are repetitive of the list above:

1. An analysis of the reasonably foreseeable environmental impacts of the methods of compliance.
2. An analysis of the reasonably foreseeable feasible mitigation measures relating to those impacts.
3. An analysis of reasonably foreseeable alternative means of compliance with the rule or regulation, which would avoid or eliminate the identified impacts.

Additionally, the CEQA Guidelines require the environmental analysis take into account a reasonable range of:

1. Environmental factors.
2. Economic factors.
3. Technical factors.
4. Population.
5. Geographic areas.
6. Specific sites.

12.2 Analysis of Reasonably Foreseeable Methods of Compliance

The analysis of potential environmental impacts is based on the numerous alternative means of compliance available for controlling bacteria loading to beaches and creeks in the San Diego Region. The majority of bacteria discharged into the 12 watersheds result from urban and stormwater runoff from a combination of point and nonpoint sources. Attainment of the WLAs will be achieved through discharger implementation of structural and non-structural Best Management Practices (BMPs) for point sources and management measures (MMs) for nonpoint sources. The BMP and MM control strategies should be designed to reduce bacteria loading in urban and stormwater runoff.

The controls evaluated in Appendix R include the following non-structural and structural BMPs and MMs:

- Education and outreach;
- Road and street maintenance;
- Storm drain system cleaning;
- BMP inspection and maintenance;
- Enforcement of local ordinances;
- Manure fertilizer management plan;
- Sizing and location of facilities;
- Buffer strips and vegetated swales;
- Bioretention;
- Infiltration trenches;
- Sand filters;
- Diversion systems;
- Animal exclusion; and
- Waste treatment lagoons.

Structural and non-structural control strategies can be based on specific land uses, sources, or periods of a storm event. In order to comply with these TMDLs, emphasis should be placed on BMPs and MMs that control the sources of pollutants and on the maintenance of BMPs and MMs that remove pollutants from runoff.

12.3 Possible Environmental Impacts

The CEQA and CEQA Guidelines require an analysis of the reasonably foreseeable environmental impacts of the methods of compliance with the TMDL Basin Plan amendment. The environmental checklist identifies the potential environmental impacts associated with these methods with respect to earth, air, water, plant life, animal life, noise, light, land use, natural resources, risk of upset, population, housing, transportation, public services, energy, utilities and services systems, human health, aesthetics, recreation, and archeological/historical concerns.

From the 61 reasonably foreseeable environmental impacts identified in the checklist, none were considered to be "Potentially Significant." Fifty-five were considered either "Less Than Significant with Mitigation" or "Less Than Significant." Ten were considered to have "No Impact" on the environment. See sections 4 and 5 in Appendix R for a complete discussion of the potential environmental impacts.

In addition to the potential impacts mentioned above, mandatory finding of significance regarding short-term, long-term, cumulative, and substantial impacts were evaluated. Based on this review, the San Diego Water Board concluded that the potentially significant cumulative impacts can be mitigated to less than significant levels as discussed in Appendix R.

12.4 Alternative Means of Compliance

The CEQA requires an analysis of reasonably foreseeable alternative means of compliance with the rule or regulation, which would avoid or eliminate the identified impacts. The dischargers can use the structural and non-structural BMPs and MMs described in Appendix R or other structural and non-structural BMPs and MMs, to control and prevent pollution, and meet the TMDLs' required load reductions. The alternative means of compliance with the TMDLs consist of the different combinations of structural and non-structural BMPs and MMs that the dischargers might use. Since most of the adverse environmental effects are associated with the construction and installation of large scale structural BMPs, to avoid or eliminate impacts, compliance alternatives should minimize structural BMPs, maximize non-structural BMPs, and site, size, and design structural BMPs in ways to minimize environmental effects.

12.5 Reasonably Foreseeable Methods of Compliance at Specific Sites

The San Diego Water Board analyzed various reasonably foreseeable methods of compliance at specific sites within the subject watersheds. Because this project is large in scope (encompassing 12 watersheds), the specific sites analysis was focused on reviewing potential compliance methods within various land uses. The land uses analyzed correspond to the land uses that were utilized for watershed model development (discussed section 7).

In the discussion of potential compliance methods in section 6 of Appendix R, the San Diego Water Board assumed that, generally speaking, the BMPs suitable for the control of bacteria generated from a specific land use within a given watershed are also suitable for the control of bacteria generated from the same land use category within a different watershed. For example, a BMP used to control the discharge of bacteria from a residential area in the San Diego River watershed is likely suitable to control the discharge of bacteria from a residential area in the Aliso Creek watershed. However, in addition to land use, BMP selection includes considering site-specific geographical factors such as average rainfall, soil type, and the amount of impervious surfaces, and non-geographical factors such as available funding. Such factors vary between watersheds. The most suitable BMP(s) for a particular site must be determined by the dischargers in a detailed, project-specific environmental analysis.

In order to meet TMDL requirements, dischargers will determine and implement the actual compliance method(s) after a thorough analysis of the specific sites suitable for BMP implementation within each watershed. In most cases, the San Diego Water Board anticipates a potential strategy to be the use of management measures, or other non-structural BMPs as a first step in controlling bacteria discharges, followed by structural BMP installation if necessary.

12.6 Economic Factors

The environmental analysis required by the CEQA must take into account a reasonable range of economic factors. This section contains estimates of the costs of implementing the reasonably foreseeable methods of compliance with the TMDL Basin Plan amendment. Specifically, this analysis estimates the costs of implementing the structural and non-structural BMPs which the dischargers could use to reduce bacteria loading.

As discussed in section 7 in Appendix R, the cost estimates for non-structural BMPs ranged from $0 to $211,000. The cost estimates for treating 10 percent of the watershed with structural BMPs ranged from $50,000 to $973 million, depending on BMP selection, with yearly maintenance costs estimated from $10,000 to $68 million. Implementation of these TMDLs will also entail water quality monitoring which has associated costs. Assuming that a two-person sampling team can collect samples at 5 sites per day, the total cost for one day of sampling would be $2,274.

The specific BMPs and MMs to be implemented will be chosen by the dischargers after adoption of these TMDLs. All costs are preliminary estimates since particular elements of a BMP and MM, such as type, size, and location, would need to be developed to provide a basis for more accurate cost estimations.

12.7 Reasonable Alternatives to the Proposed Activity

The environmental analysis must include an analysis of reasonable alternatives to the proposed activity. The proposed activity is a Basin Plan Amendment to incorporate bacteria TMDLs for the beaches and creeks in the San Diego Region. The purpose of this analysis is to determine if there is an alternative that would feasibly attain the basic objective of the rule or regulation (the proposed activity), but would lessen, avoid, or eliminate any identified impacts. The alternatives analyzed include taking no action, modifying water quality standards, and incorporating a Basin Plan amendment to establish a "Reference System Approach." These alternative actions are discussed in section 8 of Appendix R. Because these alternatives are not expected to attain the basic objective of the proposed activity at this point in time, the preferred alternative is the proposed activity itself, which is the Basin Plan amendment incorporating the bacteria TMDLs.

13 Necessity of Regulatory Provisions

The OAL is responsible for reviewing administrative regulations proposed by State agencies for compliance with standards set forth in California's Administrative Procedure Act, Government Code section 11340 *et seq*., for transmitting these regulations to the Secretary of State and for publishing regulations in the California Code of Regulations. Following State Water Board approval of this Basin Plan amendment establishing TMDLs, any regulatory portions of the amendment must be approved by the OAL per Government Code section 11352. The SWRCB must include in its submittal to the OAL a summary of the necessity[92] for the regulatory provision.

This Basin Plan amendment for Bacteria Impaired Waters meets the "necessity standard" of Government Code section 11353(b). Amendment of the Basin Plan to establish and implement bacteria TMDLs in affected watersheds in the San Diego Region is necessary because the existing water quality does not meet applicable numeric WQOs for indicator bacteria. Applicable state and federal laws require the adoption of this Basin Plan amendment and regulations as provided below.

The SWRCB and Regional Water Boards are delegated the responsibility for implementing California's Porter Cologne Water Quality Control Act and the federal CWA. Pursuant to relevant provisions of both of those acts the SWRCB and San Diego Water Boards establish water quality standards, including designated (beneficial) uses and criteria or objectives to protect those uses.

Section 303(d) of the CWA [33 USC section 1313(d)] requires the states to identify certain waters within their borders that are not attaining WQSs and to establish TMDLs for certain pollutants impairing those waters. USEPA regulations [40 CFR 130.2] provide that a TMDL is a numerical calculation of the amount of a pollutant that a water body can assimilate and still meet standards. A TMDL includes one or more numeric targets that represent attainment of the applicable standards, considering seasonal variations and a MOS, in addition to the allocation of the target or load among the various sources of the pollutant. These include WLAs for point sources, and LAs for nonpoint sources and natural background. TMDLs established for impaired waters must be submitted to the USEPA for approval.

CWA section 303(e) requires that TMDLs, upon USEPA approval, be incorporated into the state's Water Quality Management Plans, along with adequate measures to implement all aspects of the TMDL. In California, these are the basin plans for the nine regions. Water Code sections 13050(j) and 13242 require that basin plans have a program of implementation to achieve WQOs. The implementation program must include a description of actions that are necessary to achieve the objectives, a time schedule for these actions, and a description of surveillance to determine compliance with the

[92] "Necessity" means the record of the rulemaking proceeding demonstrates by substantial evidence the need for a regulation to effectuate the purpose of the statute, court decision, provision of law that the regulation implements, interprets, or makes, taking into account the totality of the record. For purposes of this standard, evidence includes, but is not limited to, facts, studies, and expert opinion. [Government Code section 11349(a)].

objectives. State law requires that a TMDL project include an implementation plan because TMDLs normally are, in essence, interpretations or refinements of existing WQOs. The TMDLs have to be incorporated into the Basin Plan [CWA section 303(e)], and, because the TMDLs supplement, interpret, or refine existing objectives, State law requires a program of implementation.

14 Public Participation

Public participation is an important component of TMDL development. The federal regulations [40 CFR 130.7] require that TMDL projects be subject to public review. All public hearings and public meetings have been conducted as stipulated in the regulations [40 CFR 25.5 and 25.6], for all programs under the CWA. Public participation was provided through two public workshops, and through the formation and participation of the Stakeholder Advisory Group. In addition, staff contact information was provided on the San Diego Water Board's website, along with periodically updated drafts of the TMDL project documents. Public participation also took place through the San Diego Water Board's Basin Plan amendment process, which included an additional public workshop, a hearing, and a formal public comment period. A chronology of public participation and major milestones is provided in Table 14-1.

Table 14-1. Public Participation Milestones

Date	Event
March 27, 2003	Public Workshop and CEQA Scoping Meeting
March 9, 2004	Public Workshop and SAG Meeting
March 26, 2004	SAG Meeting
June 15, 2004	SAG Meeting
August 2, 2004	SAG Meeting
September 20, 2004	SAG Meeting
December 14, 2004	SAG Meeting
January 11, 2005	SAG Meeting
February 16, 2005	SAG Meeting
May 10, 2005	SAG Meeting
May 31, 2005	SAG Meeting
December 9, 2005	Draft Documents released for public review
January 11, 2006	Public Workshop
February 8, 2006	Public Hearing
August 4, 2006	Draft Documents released for second public review
September 12, 2006	SAG Meeting
March 9, 2007	Draft Documents released for third public review
April 25, 2007	*2nd Public Hearing*

15 References

Ackerman, D., and S. Weisberg. 2006. Evaluating HSPF runoff and water quality predictions at multiple time and spatial scales. 2005-2006 Southern California Coastal Water Research Project (SCCWRP) Annual Report, Costa Mesa, CA.

Bicknell, B.R., J.C. Imhoff, J.L. Kittle, A.S. Donigian, and R.C. Johanson. 1996 *Hydrological Simulation Program – FORTRAN (HSPF): User's Manual Release 12*. National Exposure Research Laboratory, Office of Research and Development, USEPA, Athens, Georgia.

Caltrans. 2004. BMP Pilot Retrofit Pilot Program, Final Report. California Department of Transportation. Division of Environmental Analysis. Sacramento, CA. January 2004. Report ID CTSW-RT-01-050.
http://www.dot.ca.gov/hq/env/stormwater/special/newsetup/_pdfs/new_technology/CTSW-RT-01-050.pdf

CASQA. 2003. Stormwater Best Management Practice Handbook – New Development and Redevelopment. California Stormwater Quality Association. January 2003. www.cabmphandbooks.com

City of Laguna Niguel and Kennedy /Jenks Consultants. 2003. Report on Water Quality Fecal Contamination Testing—Draft Final Report. Laguna Niguel, CA.

City of San Diego and MEC/Weston. 2004. Mission Bay Clean Beaches Initiative Bacterial Source Identification Study. City of San Diego and MEC Analytical Systems-Weston Solutions, Inc., San Diego California. Prepared for the State Water Resources Control Board, Sacramento, CA.

Colford, M.J., T.J. Wade, K.C. Schiff, C.C. Wright, J.F. Griffith, S.K. Sandhu, S.B. Weisberg. 2005. Recreational water contact and illness in Mission Bay, CA. Southern California Coastal Water Research Project Technical Report No. 449. Southern California Coastal Water Research Project, Westminster, CA.

County of San Diego Department of Environmental Health. 2000. *County of San Diego—Ocean Illness Survey Results (August 1997–December 1999).*

Crane, S.R., and J.A. Moore. 1986. Modeling enteric bacterial die-off: A review. *Journal of Water, Air, and Soil Pollution* (February 1986)27:411–439.

Easton, J.H., J.J. Gauthier, M. Lalor, and R. Pitt. 1999. Determination of Survival Rates for Selected Bacterial and Protozoan Pathogens From Wet Weather Discharges. In *WEFTEC '99*, Water Environment Federation, New Orleans, LA.

Fleming, R., and H. Fraser. 2001. *The Impact of Waterfowl on Water Quality: Literature Review.* Ridgetown College, University of Guelph.

Grant, S., B. Sanders, A. Boehm, J. Redman, J. Kim, R. Mrse, A. Chu, M. Gouldin, C. McGee, N. Gardiner, B. Jones, J. Svejkovsky, G. Leipzig, and A. Brown. 2002. Generation of enterococci bacteria in coastal saltwater marsh and its impact on the surf zone water quality. *Environmental Science & Technology* (November 12, 2001)35: pp. 2407-2416.

Haile, R.W., J.S. Witte, M. Gold, R. Cressey, C. McGee, R.C. Millikan, A. Glasser, N. Harawa, C. Ervin, P. Harmon, J. Harper, J. Dermand, J. Alamillo, K. Barrett, M. Nides and G.-Y. Wang. 1999. The health effects of swimming in ocean water contaminated by storm drain runoff. *Epidemiology* 10:355-363.

Jiang, S., R. Noble and W. Chu. 2001.Human Adenoviruses and Coliphages in Urban Runoff-Impacted Coastal Waters of Southern California. *Applied and Environmental Microbiology* 67:1:179-184.

Los Angeles Water Board. 2002. *Total Maximum Daily Load to Reduce Bacterial Indicator Densities at Santa Monica Bay Beaches During Wet Weather*. California Regional Water Quality Control Board, Los Angeles Region, Los Angeles, CA.

Los Angeles Water Board. 2003. *Total Maximum Daily Loads for Bacteria in the Malibu Creek Watershed*. California Regional Water Quality Control Board, Los Angeles Region, Los Angeles, CA.

Los Angeles Water Board. 2003. *Water Quality Control Plan—Los Angeles Region*. California Regional Water Quality Control Board, Los Angeles Region, Los Angeles, CA.

Orange County Register. 2005. *Runoff goes into the ozone*. October 18, 2005 Edition.

Pyke, Christopher R. and Jaymee Marty. 2005. Cattle Grazing Mediates Climate Change Impacts on Ephemeral Wetlands. *Conservation Biology* (October 2005)19:5:1619-1625.

Sahr, R.C. 2006. Consumer Price Index (CPI) Conversion Factors 1800 to Estimated 2016 to Convert to Dollars of 2005. Oregon State University, Political Science Department, Corvallis, OR. Revised April 11, 2006.

Schiff, K., J. Griffith, and G. Lyon. 2005. Microbial Water Quality at Reference Beaches in Southern California During Wet Weather. Southern California Coastal Water Research Project Technical Report # 448. Southern California Coastal Water Research Project, Westminster, CA.

San Diego Water Board (California Regional Water Quality Control Board, San Diego Region). 1994. *Water Quality Control Plan for the San Diego Basin (9)*. California Regional Water Quality Control Board, San Diego Region, San Diego, CA.

San Diego Water Board. 2007. *Waste Discharge Requirements for Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining to the Watersheds of the County of San Diego, the Incorporated Cities of San Diego County, and the San Diego Unified Port District, and the San Diego County Regional Airport Authority (NPDES No. CAS0108758)*. Order No. R9-2007-0001. California Regional Water Quality Control Board, San Diego Region, San Diego, CA.

San Diego Water Board. 2002a. *Waste Discharge Requirements for Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining to the Watersheds of the County of Orange, the Incorporated Cities of Orange County, and the Orange County Flood Control District Within the San Diego Region (NPDES No. CAS0108740)*. Order No. R9-2002-01. California Regional Water Quality Control Board, San Diego Region, San Diego, CA.

San Diego Water Board. 2002b. *San Juan Creek Watershed Bacterial Study*. Report prepared for the California Regional Water Quality Control Board, San Diego Region by Orange County Public Health Laboratory, San Diego, CA.

SWRCB. 2000. Nonpoint Source Program Strategy and Implementation Plan, 1998-2013 (PROSIP). State Water Resources Control Board and California Coastal Commission. Sacramento, CA.

SWRCB. 2004. Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program. State Water Resources Control Board. Sacramento, CA.

SWRCB. 2005. Water Quality Control Plan for Ocean Waters of California. State Water Resources Control Board. Sacramento, CA.

Soil Conservation Service. 1986. *Urban Hydrology of Small Watersheds, Technical Release 55*. U.S. Department of Agriculture.

Tetra Tech, Inc. 2003. *Lake Elsinore and Canyon Lake Nutrient Sources Assessment – Final Report*. Prepared for the Santa Ana Watershed Project Authority by Tetra Tech, Inc., Fairfax, VA.

USDA, NRCS. 2004. NRCS California Environmental Quality Incentives Program (EQIP) State Approved Practice Cost Share List – Fiscal Year 2004. U.S. Department of Agriculture, Natural Resource Conservation Service.

USDA, NRCS. 2005. NRCS California Environmental Quality Incentives Program (EQIP) State Approved Practice Cost Share List – Fiscal Year 2005. U.S. Department of Agriculture, Natural Resource Conservation Service.

USDA, NRCS. 2005. NRCS Environmental Quality Incentives Program – San Diego Cost Share List - Fiscal Year 2005. U.S. Department of Agriculture, Natural Resource Conservation Service, Escondido, CA.

USDA, NRCS. 2006. NRCS Environmental Quality Incentives Program – San Diego Cost Share List - Fiscal Year 2006. U.S. Department of Agriculture, Natural Resource Conservation Service, Escondido, CA.

USEPA. 1985, June. *Rates, Constants, and Kinetics Formulations in Surface Water Quality Modeling,* 2nd ed. EPA/600/3-85/040. U.S. Environmental Protection Agency, Washington, DC.

USEPA. 1991. *Guidance for Water Quality-Based Decisions: The TMDL Process*. EPA 440/4-91-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

USEPA. 1998. *Better Assessment Science Integrating Point and Nonpoint Sources. BASINS version 2.0*. EPA-823-B-98-006. U. S. Environmental Protection Agency, Office of Water, Washington, DC.

USEPA. 1999. Preliminary Data Summary of Urban Storm Water Best Management Practices. EPA-821-R-99-012. August 1999. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

USEPA. 2000. *BASINS Technical Note 6: Estimating Hydrology and Hydraulic Parameters for HSPF*. EPA-823-R-00-012. U. S. Environmental Protection Agency, Office of Water, Washington, DC.

Wanielista, M., R. Kersten, and R. Eaglin. 1997. *Hydrology: Water Quantity and Quality Control*, 2nd ed. John Wiley & Sons, Inc., New York.